Expert and Government Review Comments on the IPCC WGIII AR5 Second Order Draft – Chapter 11

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23669	11					General comment- much of the chapter is devoted to uncertainty- what will happen to soil carbon or forest stocks with changing climate conditions and this uncertainty has the potential to lead to inaction and paralysis. One potential important discussion that is lacking is what these mitigation options would look like on shorter time frames. If we consider a 25 year rather than a 100 year time frame- how does that change the level of uncertainty? Here the result would likely be in favor of the benefits of certain mitigation options rather than the negative feedback loops	Accepted. Timescale of effects now discussed in section 11.5.
23674	11					General- nowhere in this chapter has there been any discussion of the potential for urban areas or peri urban areas to provide a significant portion of food required. This is happening in developing countries, has been well documented in Africa and Europe, has the potential to reduce food waste, to reduce pressure on traditional agricultural lands,and to make good use of urban residuals	Accepted. Added to waste discussion in section 11.4.
23680	11					General-as said earlier, much of the discussion in this chapter and the associated length of the chapter is the result of the lengthy discussion of uncertainty. This topic is potentially the one with the greatest levels of uncertainty as it focuses on living systems and these systems are hard to predict. The reviewer understands that the role of the authors is not to advocate but to present data as it is available. With all of that said however, the length of the different discussions on uncertainty distract from the overall power of the chapter. It would likely be possible to edit much of this discussion out of the text and replace it with select examples that illustrate uncertainty. The authors in general do not use specific examples but tend to favor large tables or figures to illustrate uncertainties. Here- as well perhaps select specific examples could convey similar information in a clearer and shorter fashion	Accepted. Section 11.2.3 greatly reduced in length.
23676	11					Add something here to give a sense of impact of each of these- again areas targeted (ha) money spent	Noted. Information will be added when available.
23670	11					This table is not helpful- a few examples would be much clearer and take up less space. You include biochar here and do not include anything on other residuals, have limited discussion of water impacts- so incomplete and not sufficient information to merit inclusion	Rejected. The table is a summary and other reviewers found it very helpful. It includes the AFOLU mitigation measures as indicated in section 11.3.
23666	11					If you include the top down estimates here- you get a clear comparison	Rejected. We had difficulties considering this top down due to discrepancies in data.
23677	11					Would there be a way to communicate the land base required for each of these sources? Here meaning that for example dedicated biomass plantaitions would have high land requirement but use of residuals would not	Noted, but would be beyond the capacity of the space-constrained appendix.
23656	11					In the legend- if you added a hyphen between the type of grazing system and then the climate, it would be easier for the reader to understand the legend	Accepted. Legend modified.
23647	11					While the lengthy figure captions are helpful, you can certainly edit these to shorten the document without a loss in clarity	Noted. Due to a number of comments that found it to be useful, text is saved as much as possible.
23651	11					This is shown by region- is it possible to show it also by unit of production? Meaning for example, rice emissions in Asia are by far higher than all other regions. How do emissions there per ton rice produced compare to emissions per ton in other regions?	Noted. This section discusses absolute emissions. Another section in this AFOLU chapter provides emissions per unit product.
23652	11					spelling error in figure caption	Accepted with modification. Figure now deleted.

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23664	11					It would be easier for the reader to understand if the order of figures 16 and 15 were reversed- this would also enable you to delete some of the text that describes the qualifications on the numbers for figure 15	Rejected. This was considered but does not make sense as 11.15 shows AR4 findings and 11.16 shows estimates since AR4, so reversing the figures would confuse the reader.
23665	11					Excellent figure	Noted. Thank you. No action necessary.
23678	11					Could a column be added to this to include byproducts of each process? For example, oil seed crops for biodiesel, you still have biomass and animal feed and in the production of biodiesel you get glycerin which is energy rich for anaerobic digestion	Noted; focus remains on climate change impacts.Hence, no modification.
23679	11					What are SRWC, BG and WCO? Also	Agreed; footnote fixed.
32254	11					Please check the total amounts of gross emissions (2.280)	Accepted. Table now replaced with figure and numbers adjusted.
29522	11					"C sink on farm-land" Does that mean SOC management? Reword to clarify.	Accepted. Revised.
26090	11					*Observation: REDD+ activities can profoundly impact the rights and livelihoods of indigenous communities, and there is significant literature on this topic - even AR4 mentioned the importance of land tenure with regard to forestry. This issue should be adequately addressed somewhere in the text of the report - presently it appears mainly in the tables. As a general note, I found the redd issue somewhat fragmented throughout the report. *Suggested text: REDD+ activities can profoundly impact the rights and livelihoods of indigenous communities. Depending on the rules in place, globally and in each country, in particular the rules regarding access to information, free, prior and informed consent (FPIC) and governance, such impacts may be positive or negative (Cunningham et al, in press). *References Cunningham M, Kanyinke Sena P, Gross T, Tauli-Corpuz V (in press) Climatic Change.	Noted. Revised text will be combined with the discussion of REDD+ social, environmental, as well as rights- and governance-related issues in section 11.10.
26330	11					This figure can be omitted without any great loss.	Thanks : Accepted Is Deleted.
29893	11					It is not clear if freshwater fisheries and acuaculture were really considered in this chapter 11 (page 7, line 15), because I don't find any mention of it except for the gaps in knowledge section (page 72 line 31)	Accepted. A new box has been added on reducing emissions from aquaculture.
23780	11					The answer to this FAQ fails to answer the second part of the question "how is it changing". We need to include the answer that the emissions from deforestation are in continuous decline whereas the contribution of CH4 and N2O in agriculture emissions are rising.	Accepted. We now also report how emissions are changing.
23777	11					Pollination has been listed as a regulating ecosystem service. Actually it is a 'supporting' service. In fact this Figure itself is dispensable as it adds little of value except an oft repeated 'ecosystem' rhetoric!	Rejected. Figure retained to show the multitude of services provided by land. Key part of the Ch11 narrative. Pollination is a regulating service in many assessments since the MA (e.g. the UKNEA, 2011).
23624	11					To prove my comment no.7: this is taken out of the SRREN. Why repeat?	Unclear what this is referring to.

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23623	11					This seens redundant given the investigation in the SRREN and GEA	REJECT . Just an introduction Action: No action required
19167	11					Comments already submitted for the AFOLU chapter.	Noted. A statement with no page or line number. Required action unclear.
32634	11					I appreciate your invitation to share my comments	Noted. A statement with no page or line number. Required action unclear.
32635	11					The document expresses a major effort to integrate the issues of agriculture, forestry and other land uses. I think the goal is reached to present a balanced and complete assessment of current information. Although predominantly notes a comprehensive and quantitative analysis about AFOLU trends, it is neccesary to be include the local perspective. Although some aspects are mentioned, in 11.11 Gaps in knowledge and data. However, in subsequent documents is necessary to promote a better understanding of local mitigation measures, adaptation and perception of climate change.	Noted. Section 11.11 has been reduced in length to cover only headline issues, but the importance of local approaches are discussed in detail in sections 11.7 and 11.8.
32637	11					I suggest include public perception studies with different actors involved with on mitigation measures. Focusing in land users and small producers, en this case, can be subsistence farmers with or without land rights, as in developing countries	Accepted. References on public perception studies were included.
32639	11					Durand, L. y E. Lazos (2008) The local perception of tropical deforestation and its relation to conservation policies in Los Tuxtlas Biosphere Reserve, Mexico. Hum Ecol 36:383–394	Accepted. References on public perception studies were included.
32640	11					Guthiga, P.M. (2008) Understanding local communities' perceptions of existing forest management regimes of a Kenyan rainforest. International Journal of Social Forestry (IJSF), 2008, 1(2):145-166.	Accepted. References on public perception studies were included.
34002	11					This table heading says that this table represents gross net emissions from C from LULCC activities (LULUC??) in the tropics for the period 2000-2005. In the tropics peat emissions (from drained peat and fires) are the highest emissions currently. However, in this table we only see ' wood harvest', 'fuelwood harvest' and 'shifting cultivation', deforestation. Meaning that the highest emissions are not included!?!?! Please change the heading of the table, or add this large emissions source.	Accepted with modification. Data is now in graphic form with caption "Breakdown of mean annual CO2 fluxes from deforestation and forest management in tropical countries " Peat emissions are given in box, and added to fig 11.2. Also in fig 11.6 the only global estimates that include peatlands are EDGAR and FAO, these have been added to fig 11.6 and shown with and without peatlands so it is clear the contribution peatlands make and that the modeled estimates do not include them.
34014	11					change colors/grey scale, there is no difference now	Accepted. Better colours used for final layout.
33997	11					Fig 11.2. the category 'land use' is missing. What about ongoing emission from peat drained for agriculture? Not included in this figure? See also general comment on LU versus LUC. Is there any possibility to give numbers for iLUC in this graph?	Accepted with modification. Land use is included both as agriculture and forest management. Emissions from peat draining and burning added. There is very poor agreement on iLUC numbers, and this section deals with global trends of direct effects of activity.

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32646	11					Fixing Carbon, Losing Ground: Payments for Environmental Services and Land (In)security in Mexico	Noted. A statement with no page or line number. Required action unclear.
32647	11					Tracey Osborne	Noted. Misplaced comment.
32658	11					Denef et al and Eagle et al not in the reference list.	Accepted. Reference list completed for FD.
32659	11					under section on croplands nutrient management make clear that there are net benefits from reducing N2O emissions of fertilizer production and use.	Accepted. Text edited in table 11.3.
25518	11					Some error in the figure	Accepted and fixed.
27234	11		21		21	Please indicate that for some regions or areas data are not available to estimate the CO2 uptake in intact forests.	Accepted with modification. Agree with reviewer, but figure deleted.
27247	11		7	27		The idea that soil carbon can continue to accumulate year after year at the same rate is not a consensus statement (Johnston et al., 2009). Under a new land use soil C stocks may increase, or decrease, as function of residue quantity and quality but the process rate shifts to an equilibrium level determined by factors that control the residue decomposition. For how long the soil accumulates C is still a matter of study but there is ample evidence that it will level off in a few decades. Reference: JOHNSTON, A.E.; POULTON, P.R.; COLEMAN, K. Soil Organic Matter: Its Importance in sustainable agriculture and carbon dioxide fluxes. Advances in Agronomy, v. 101, p. 1-57. 2009.	Rejected. This is a valid comment, however not clear what text (eg. no page number) it applies to. These concerns are covered in the section on Saturation p. 27, l10-20, in any case. Johnston et al . Citation added to section on Saturation.
32638	11					Suggest include that demand for land use and conservation of forests is also influenced by public policies in each country (Durand and Lazos 2008; Guthiga 2008)	Accepted. This is discussed in section 11.10.
32636	11		5	36		11.11 Gaps in knowledge and data	Noted. Misplaced comment.
33998	11					The paragraph heading suggest that there will be discussion on trends and drivers. The trends that are shown are coupled to parts of the world. The main discussion is on animal products and meat consumption, however, this is not complete. The trends in increasing deforestation and peat degradation rates in some parts of the world shall at least be measured, as well as the drivers like the oil palm business, the pulp and paper industry, the biofuel industry etc. Perhaps a separate paragraph is needed on the 'hot' trends, en where (SE Asia, Amazone, Congo Basin etc) they are specifically located.	Accepted. Trends in peat degradation and emissions from deforestation are included in 11.3.3. Section 11.3.2 also shows trends of change in forest area.
33999	11					Paragraph 11.2.2. Given the significance of the source, although not mentioned as separate IPCC category in reporting guidelines, in our opinion 'drained peatland' shall be mentioned e.g. after 'rice'. Box 6.2 illustrates the importance of this source (1.0 G t versus 0.37-0.49 from rice).	Rejected. In terms of emissions from Agriculture, emissions from drained organic soils are reported, but only as N2O. The total global amount is very small, i.e., < 100Mt CO2eq yr-1. The significant component is the CO2 emissions, which are much more sizeable--these are correctly reported and discussed in 11.2.3.
22397	11		8	10	8	Although obvious, it will be helpful to mention in the introduction the main non CO2 GHG emissions. It could be between bracket (eg CH4 etc.)	Accepted. Mentioned in 11.2.2, pg 11, lines 13-18 and 21-22.
34004	11					This paragraph needs improvement.	Accepted. Edited for FD.
34005	11					Lines 16-29: this bullet list is not complete, and gives the suggestion that these are the main potential mitigation activities to reduce climate forcing. However, it seems there is no 'order' or 'ranking' is in this list, why is chosen to mention specifically these measures and not others? Please explain. If this bullet list are the most potential mitigation measures, then 'rewetting' of drained peat shall be added for CO2 emission reduction.	Accepted. Changed description.

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34007	11					Missing: CONSERVATION (keep what you have (forest and peat) as a mitigation measure. Partly its reflected in 'reducing deforestation', but it shall also be reflected more specifically in other categories: reduced cropland development (at the expense of high carbon ecosystems such as forest and peat). The most obvious mitigation measure (which is not mentioned) to reduce negative (climate) impacts from peat oxidation (and thus soil subsidence), soil degradation, fires (emissions and haze), pollution of waters and greenhouse gas emissions is to not develop peat areas for agriculture (conservation). Conservation of undrained peat keeps the ecosystem intact and avoids expensive measures for restoration	Accepted. Changed description.
34008	11					Missing: avoidance of leakage (displacement (iLUC) and ecological leakage)	Accepted. Changed description.
34009	11					If peatlands have to be cultivated, the negative impacts of utilisation should be restricted by mitigation such as reducing drainage, choosing crops that are adapted to high soil moisture, avoiding regular ploughing since this increases oxidation, cultivation of permanent crops and limiting nitrogen fertilization.	Accepted. Changed description.
34010	11					Missing: peat rehabilitation	Accepted. This is included under "Rewet peatlands drained for agriculture." Definition broadened.
34006	11					Table 11.3. Perhaps its better to use the AFOLU categories as main structure (cropland, grassland, wetlands and forest) and then subcategorize these. Add a separate category on Wetlands	Accepted. Table revised.
34012	11					Lines 25 onwards. This is now mostly about boreal peats, since global warming causes permafrost thawing, however, maybe a brief discussion is needed on the increase in frequency of extremes also in other parts of the world and the consequences for peatlands elsewhere. E.g. if peatlands face more droughts in the future, they will be highly susceptible to fire and they will be oxidizing during dry periods, which causes the emissions to increase	Accepted. We have now added more information (and references) to extreme events, in addition to the gradual climate change impacts.
34432	11					This section would benefit from the inclusion of figures that show option-specific mitigation potentials for the different subsectors.	Rejected. Not changed since AR4 so we have simply referred to the AR4 chapters.
26320	11					This resource assessment does not add significantly to the material presented in SRREN and can be addressed using much less space.	The table as been substituted by shortened text.
26321	11					A figure showing the conversion efficiency from primary resources to final energy or the land use requirement for the different forms of final energy would be informative. Maybe this can be added to Figure 11.A.1. I consider the low efficiency of several of the conversion routes as a major problem.	Noted. The conversion efficiencies are implicit in the LCA graphs, especially Figure 11A4. Another graph on the conversion efficiency would be valuable but space is contrained. Action: No action required
26329	11					The section presents valuable new information on both life cycle climate impact and iLUC. However, these figures hang there without being disucssed or referred to. The text cotnains a methodological-theoretical discussion that is not grounded in any empirical findings. This text should be largely replaced with a discussion of the figures, presenting the major emprical findings of the literature reviewed.	Methodology is important as otherwise the figures could not been otherwise adequately be interpreted. The figures are now better discussed.
26333	11					Clearer conclusions can be drawn. The emprical work displayed in Figs 11.A.3-4 clearly shows that some bioenergy sources have climate benefits compared to alternative energy/fuel sources while other many other pathways are more damaging. Conditions for good and bad options have been identified and should be summarized here.	Accepted.

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23662	11					This is difficult- as the uncertainty and potential feedback loops can result in paralysis- you are obligated to present this but is it also possible to place this in the context of ratio of mitigation potential to potential adverse effects?	Accepted. We have now rewritten the section and refer the reader to the relevant sections in IPCC WGII Volume of AR5.
23668	11					This is a critical section and would benefit from a box or two to provide examples. Much of what you discuss here in co-benefits is actually similar to the discussion in the top down or bottom up approach section. If you provide an example or two here- including co-benefits and co-payments for forestry for example, or sustainable agricultural practices including organic N sources you would really drive these points home. You could also then delete a significant portion of the earlier discussion. One of the problems with this sector that the authors are very clearly aware of is the potential overlaps and loops that complicate all analysis and estimates. Examples are a great way to illustrate this more clearly than with the existing text	Noted. Boxes with examples are a good idea. However, we have placed restrictions on the chapter. For this reason, we couldn't include boxes with examples.
26318	11					This draft annex contains some valuable material and new insights compared to SRREN. However, other material is misplaced or superfluous. Especially, there is too much discussion of methodological issues. Key messages are not clear, which may be an appropriate reflection of the status of our knowledge. I would recommend that rely more on SRREN where this is possible and to be clear where new findings lead to a reassessment or better specification. Also, I would recommend for the authors to clearly consider how bioenergy could contribute to climate mitigation and to identify where it would contribute to more climate change.	Accepted. We keep the discussion on methodological issues to a very minimum. Methods are mentioned only in the context of providing an interpretation to the values provided.
26319	11					Issues of resource potentials are discussed in 11.A.2, 11.A.4.3 and qualified in 11.A.4 and 11.A.5. Within the context of mitigation and hence this report, it is not of interest how large the bioenergy potential would be without restricting oneself to bioenergy that contributes to mitigation; also, other sustainability restrictions should be taken into account. Hence, the discussion focusing on the potential contribution to both future energy needs and mitigation should be discussed at only one place, towards the very end of the annex.	Noted. There are conflicting opinions on whether resource potential can be used for mitigation or not. Hence, this issue cannot be detached from the discussion of the potential. . Action: No action required
29416	11					The key components of the success to mitigation in the AFOLU relate to management - this is not well identified and recognised in the Exec Summ (i.e., production systems may or may not have the potential for positive mitigation results). The management issue needs to be recognised. A preliminary discussion regarding this issues has been recently raised by SC Davis, Boddey RM, Alves BJR et al.: Management swing potential for bioenergy crops. GCB Bioenergy, n/a-n/a (2013).	Accepted. Importance of management stated more clearly in the ES.
29417	11					The Executive Summary focuses too narrowly on the role of bioenergy. There are many components within the AFOLU sector that should be recognised. For example to concept of direct and indrect land use change is larger than bioenergy. Any land use will use resources (e.g., water, soil) and therefore all land uses within the AFOLU sector need to be considered.	Rejected. Bioenergy forms only part of the ES, and it focuses mainly on other options in the AFOLU sector.
35289	11	0				This chapter is supposed to cover agriculture, forestry and land use. However, the ES only focuses on the contribution, instead of the impact, of emission reduction from land use. Even though the importance of livelihood is touched upon, the impact on food security is not fully elaborated. It is recommended to add the discussion on food security in this chapter. For example, on Page 4 Line 9, after "land", add "particularly, the impact on food security".	Accepted. Food added at the front of the list of ecosystem services provided by land in first paragraph.

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33465	11	0				Overall comment: Both in Summary for policymakers and in chapter 6 the importance of long term stabilization of the GHG concentration in the atmosphere is emphasized. However, in chapter 11 the discussion of how temporary biogenic CO2 emissions in a sustainable forestry will influence the stabilizaton level, is missing.	Accepted. The contribution of temporary biogenic CO2 emissions in a sustainable forestry in different stabilisation pathways has been elaborated in 11.9.
33466	11	0				Overall comment: One conclusion in AR IV was: "In a long-term a forest management strategy aimed at maintaining or increasin forest carbon stocks, while producing an annual yield of timber, fiber or energy will generate the largest mitigation benefit". Such a conclusion is missing in chapter 11. Is it not valid anymore?	Noted. This statement is indeed still valid, and is implicit in what we wrote.
31456	11	0				Competion for land between food/feed production, forest and bioenergy is mentioned a number of places and is an important issue. Would it be posible to give figures about trend and projections for the number of hectares that is annually changed into the production of biomass for bioenrgy, compared with the number of hectares converted into land for the growing of feed for an increase of the production of animal productsproductsintoandbioenergneeded change in land use to bioenergy and to However there	Noted. We could provide current figures, but future trends are dependent upon many factors, and are best dealt with in section 11.9 in the future scenarios (where they currently appear)
30953	11	0				In various places, the chapter mentions biogeophysical effects of human activities in the AFOLU sector. However, greater discussion of these effects and of how mitigation activities could be adjusted to minimize adverse biogeophysical effects (from a climate change perspective) is recommended. For example, choosing deciduous species for afforestation in temperate/boreal areas. See Anderson,et al., 2010. Biophysical considerations in forestry for climate protection. Front. Ecol. Environ. 9: 174–182. As another example, reversing historic deforestation patterns with afforestation could have a cooling effect in temperate and boreal regions. See Pongratz el al., 2011. Past land use decisions have increased mitigation potential of reforestation. Geophys. Res. Lett. 38: L15701. doi:10.1029/2011GL047848.	Accepted. Added brief discussion in systemic perspective section (11.4)
30954	11	0				Throughout the chapter, the range in the estimates presented is quite broad, yet there is very little discussion on the impact of such uncertainty or on whether or not the uncertainty can be meaningfully reduced. For example, statements such as the following represent significant levels of uncertainty: - Global estimates for economic mitigation potentials in the AFOLU sector in 2030 are 490 to 10600 Mt CO2-eq./yr - Top-down estimates project between 15-225 EJ/yr bioenergy deployment potential in 2050 - Dedicated biomass plantations are estimated to have the largest potential, but there 25 is a wide range of 26-675 EJ/yr	Noted. The uncertainty arises largely from the assumptions used to calculate the potentials - e.g. amount of land assumed to be available, which may in turn depend upon the C price and price of other commodities. Our task is to report the ranges of estimates in the literature, and where possible we have commented on these (e.g. low estimates for agricultural mitigation account only for non-CO2 GHGs and C sinks are not considered) - but a deconstruction of the assumptions behind every estimate in every study is not possible. The generic differences (such as those just mentioned) are already discussed in sections 11.6 and 11.9

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33266	11	0				Considering the structure of the entire report, it is essential that three subjects are discussed in detail in chapter 11 because of their prominence in chapter 6: BECCS, avoided deforestation, and afforestation. It is critical for the treatment of negative emissions in the AR5 that the chapters 6 and 11 are consistent. Chapter 11 needs to discuss carbon dioxide removal and to try to answer the question whether a foundation for chapter 6 scenarios is given, or not.	Accepted. Afforestation and avoided deforestation are now better delineated. BECCS should be discussed in the Appendix
33267	11	0				The integration of the concepts and definitions of the framing chapters 2, 3, and 4, could be improved to increase coherence and consistency across all chapters of the report. Especially, you may want to discuss the link from mitigation to sustainable development in more detail.	Accepted. Concepts and definitions further harmonised
33268	11	0				Uncertainties related to land use need to be treated with great care.	Noted. Uncertainties declared and discussed.
19351	11	0				The text is difficult to read, with long sentences, elevated style expressions and words, multiple misprints, and irrational and misleading conjunctions between sentences. Explanations for abbreviations often come long after they appear in text. The references are a mess both in the text and in the reference list. Why is the reference format different from any other publicaton and why sometimes all authors are named, sometimes "et al."? I found some plagiation from Chapter 6, there might be more, and with other chapters too, as I cannot read and check them all. References to other chapters of WG3 and to other WG:s are not always correct where I have checked. There are all too many articles "in review", and all too many articles from the authors themselves. What happens if the articles are not accepted, what will be referred to then? Are the stated facts valid, if the articles are not accepted? Confidence statements (agreement, evidence) are used only in the summary???	Accepted. Zotero database has been completed and only accepted papers are used in the FD. Thorough edit of the text has been undertaken to improve language and flow. Overlap with Ch6 removed. Confidence statements are only used in the summary as directed.
24771	11	0				The chapter could further mention future shifts in what species will grow where, i.e. range shifts. For example, climate change is predicted to change terrestrial species composition. This could have implications for mitigation of climate change impacts on some terrestrial species that have higher mitigation potentials than others and address flow on impacts on agriculture and other land uses, e.g. urban planning. Suggested citations: Williams, K.J., Dunlop, M., Bustamante, R.H., Murphy, H.T, Ferrier, S., Wise, R.M., Liedloff, A., Skewes, T., Harwood, T.D, Kroon, F., Williams, R.J., Joehnk, K., Crimp, S., Stafford Smith, M., James, C. and Booth, T. (2012) Queensland's biodiversity under climate change: impacts and adaptation – synthesis report. A Report Prepared for the Queensland Government, Brisbane. CSIRO Climate Adaptation Flagship, Canberra. http://www.csiro.au/Organisation-Structure/Flagships/Climate-Adaptation-Flagship/Queensland-biodiversity-under-climate-change.aspx And background working papers from CSIRO: http://www.csiro.au/Organisation-Structure/Flagships/Climate-Adaptation-Flagship/CAF-working-papers/CAF-working-paper-12.aspx • Working Paper 12B - Queensland's biodiversity under climate change: ecological scaling of terrestrial environmental change • Working Paper 12C - Queensland's biodiversity under climate change: terrestrial ecosystems • Working Paper 12E - Queensland's biodiversity under climate change: coastal and marine ecosystems • Working Paper 12G - Queensland's biodiversity under climate change: adaptation principles and options	Accepted. Plant range change is largely dealt with by WGII, but where this affects mitigation potential, should be mentioned in section 11.5.2 where it is now mentioned.
30462	11	0				It would be very useful to see a better reflection of the current knowledge on support and promotion of the REDD+ safeguards as agreed in CP16, FCCC/CP/2010/7/Add.1 and addressed as well in CBD COP 11, 2012 (UNEP/CBD/COP/DEC/XI/19).	Taken into account. Revised text will be combined with the discussion of REDD+ social, environmental, and rights- and governance-related issues.

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30463	11	0				The reference to demand side measures should preferably include the possible impacts of demanding sustainably produced goods such as timber (i.e. such measures should not be limited to dietary change and waste reduction).	Accepted. There is already a section on demand side measures in non-food products in section 11.4.3. Sustainably produced goods are now more prominently mentioned.
22115	11	0				As main share of agricultural emissions is/will be released in the developing world, more attention would have been needed on mitigation options, socio-economic interactions and impacts, power and policy issues, and cultural variability in these regions and on small/subsistence scale.	Accepted. More references on the potential impacts on agriculture have been included in sections 11.4.5, 11,7 and 11,8.
22116	11	0				There is a gap relating to the understanding of climate change feedbacks on soil dynamics (of different soil types) particularly regarding transformation of nitrate and activities of micro organisms.	Accepted. Added to section 11.5.2
20258	11	0				Text is overly rich in citations, which is impeding the flow of easy reading of the chapter. Also, frequent use of text in brackets to clarify and explain a point is also making the comprehension of the substance fairly difficult. Objective should be to use only a few important citations pertaining to more important publications rather than inserting text to maximize number of citations making the reading heavily labored. It may also be useful to consider possibility of clubbing the citations separately in an acknowledgement.	Accepted. Number of citations reduced
19734	11	0				Ecosystem conservation and restoration should emphasized in this chapter, but not only based on the CO2 migitation.	Accepted. Added to co benefits discussed in section 11.7.1.1.
33988	11	0				Paragraph 11.2 is on trends and drivers, but is not highlighting one of the main trends at this moment: pulp and paper industry and oil palm industry (SE Asia and upcoming other countries) which increasingly is developed on peat. Peatlands are major carbon stores. Tropical peatlands globally cover about 40 million ha of land area and store about 70 Gt of carbon of which about 46 Gt C in Indonesian peatlands and 9 tons in Malaysian peatlands (Page et al., 2011). Drainage of peat will lead to peat oxidation and a higher frequency of forest and peat fires, resulting in significant increase in GHG emissions and carbon losses (Gomeiro et al., 2010). Potentially huge amounts of C can be lost, of peat drainage will be ongoing at current rates, and besides, deforestation is ongoing at high rates, specifically in SE Asia. There is a need to highlight this current trend, and we think this chapter would be a perfect location for that. See fig for the importance of emissions in Indonesia.	Accepted. There is already a box on peatland emissions and trends, box 11.2 that cover these points.
33989	11	0				Health problems related to mitigation measures are being discussed (e.g. 'Reduced emissions from agriculture and forestry may also improve air, soil and water quality (Smith, 31 Ashmore, et al., 2013), thereby indirectly providing benefits to human health and well being') in paragraph 11.7.1.1. However, it is important to even more compare 'health' in the BAU and the mitigation scenario. E.g. Fires (forest and peat) that occur in the BAU scenario cause haze, aerosols that affect humans health (e.g. Brown, 1998; Ostermann and Brauer, 2001; Yule, 2010). If mitigation is applied, fire frequency will reduce, peoples health will increase.	Accepted. Added to co benefits discussed in section 11.7.1.1.
33990	11	0				The paragraph on mitigation technology options and practices (paragraph 11.3) has improved, however, its not complete yet (at some points very specific and detailed, at other points 'vague'). It would be of interest if there is some kind of idea of the mitigation potential of the measures that are mentioned, maybe a rating, or a number in terms of GHG emission reduction that can be obtained: e.g. has straw retention in the rice-sector the same mitigation potential as prescribed burning and peatland rewetting? Related: is conservation of forest and peat a mitigation measure? For C accounting it is, how is that in this chapter? If this is a measure (and it looks like it is, because reduced deforestation is included), it shall be added in this table for peat as well: conservation of peat, reduced degradation of peat. We mention here the 2 main options for mitigation measures for reducing emissions from organic soils:	Accepted. We have included a relative ranking with mitigation potential in Table 11.2. The numbers are included in further figures and graphs. We attempted to include in the table but the lack of sufficient information on avoided peatlands is not available as there is with avoided deforestation.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33991	11	0				The most obvious mitigation measure (which is not mentioned) to reduce negative (climate) impacts from peat oxidation (and thus soil subsidence), soil degradation, fires (emissions and haze), pollution of waters and greenhouse gas emissions is to not develop peat areas for agriculture (conservation). Conservation of undrained peat keeps the ecosystem intact and avoids expensive measures for restoration	Rejected. We attempted to include in the table but the lack of sufficient information on avoided peatlands is not available as there is with avoided deforestation. We have included cultivated organic soils as water management and restoration.
33992	11	0				If peatlands have to be cultivated, the negative impacts of utilisation should be restricted by reducing drainage, choosing crops that are adapted to high soil moisture (paludiculture, see fig below for illustration), avoiding regular ploughing since this increases oxidation, cultivation of permanent crops and limiting nitrogen fertilization.	Noted. Included now in restoration of organic soils category
33993	11	0				Given the significance of the CH4-fire pool (it's the second largest CH4 source in Fig 11.2), this shall be added in the body text, including emissions numbers and mitigation potential. Perhaps add a paragraph on page 12 (like the paragraph on rice) and get numbers from literature. It would be good to add biomass burning and peat burning is SE Asia to Fig 11.2 (add to burning of crop residues from Savannah). Another point related to the fire source: it has to be clear what is captured by 'anthropogenic fires' e.g. in Box 11.3. In the case of peat fires: a peat does usually not burn if its wet. Drainage of peat increases the fire frequency and shall be called 'anthropogenic', even if the 'trigger' (e.g. lightning) is a natural phenomena.	Accepted. There is already a box on fire 11.3 that covers some of these points and the fact that many fires are part of a regrowth cycle where losses of CO2 and CH4 are compensated by uptake of CO2 and therefore do not have a mitigation potential. While CH4 has a stronger radiative forcing it is shorter lived in the atmosphere. Drainage of peat is given as a separate number. if it then causes peat fires it is counted as peat fire. The numbers on emissions from peat drainage and burning in the EDGAR database have been added to fig 11.2.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25342	11	0				However report already discuss on green water management, it would be further useful to include a short paragraph showing impact of watershed development program as a mitigation strategy in section 11.5.5 (Mitigation and adaptation synergy and risk- tradeoffs) as well. Various agricultural water management interventions such as in situ practices (mulching, field bunding, proper land form treatments) and ex-situ interventions such as constructing small and low-cost water harvesting structures enhances green water and blue availability, reduce water stress situation and facilitate groundwater recharge locally. There are number of evidences and studies suggesting the need for vapor shift in rainfed areas (from non-productive evaporation losses to productive transpiration) for sustainable crop intensification and enhancing green water use efficiency. Some of the studies also analyzed impact of agricultural water management interventions on various hydrological components and ecosystem services in dry, normal and wet years (For example, Rockstrom et al., 2010; Garg and Wani, 2012; Garg et al., 2012a,b) could be included. Reference cited Garg, K.K., Karlberg, L., Barron, J., Wani, S.P., Rockstrom, J., 2012a. Assessing impact of agricultural water interventions at the Kothapally watershed, Southern India, Hydrological Processes 26(3), 387–404. Garg, K.K., Karlberg, L., Barron, J., Wani, S.P., Rockstrom, J., 2012a. Assessing impact of agricultural water interventions at the Kothapally watershed, Southern India, Hydrological Processes 26(3), 387–404. Garg, K.K., Wani, S.P., Barron, J., Karlberg, L., Rockstrom, J., 2012b. Up-scaling potential impacts on water flows from agricultural water interventions: opportunities and trade-offs in the Osman Sagar catchment, Musi sub-basin, India. Hydrological Processes DOI: 10.1002/hyp.9516 Garg, K.K., Wani, S.P., 2012. Opportunities to build groundwater resilience in the semi-arid tropics. Groundwater National GroundWater Association. doi: 10.1111/j.1745-6584.2012.01007.xRockstrom, J., Karlberg, L., Wani, S.P., Barron, J., Hatibu, N., Oweis, T., Bruggeman, A., Farahani, J., Qiang, Z., 2010. Managing water in rainfed agriculture—The need for a paradigm shift. Agricultural Water Management 97, 543–550.	Partially accepted. Section significantly reduced in length, but water interactions included rather than papers about water in agriculture per se
37594	11	0				The authors should consider complementing the existing literature with discussion of some of Samuel Fuhlendorf's work.	Noted. Many publications on related topics but none obviously related to AFOLU mitigation
37595	11	0				The general tone of the bioenergy discussion is off, and reflects mainly one side of a high complex and controversial set of research. The negative impacts are mainly theoretical/modelled to date, and have not played out in practice as we've seen large decreases in deforestation coincident with large increases in bioenergy production. What can be generally said about bioenergy production is that good global outcomes require good policy at the national/local level. The producers of bioenergy likely have little control over these policies that may occur overseas, and the net outcomes are potentially dependent on actors/regulators in different jurisdictions far from the production decision or mitigation activity. This is true for all AFOLU commodity production, not just bioenergy. Attributing the negative impacts to producer decision/mitigation activity therefore is difficult, since the exact same decision could be highly positive if the non-local actor(s) adopted different policies... the non-local context is determinative, not the production decision (which could be either positive or negative on a global net basis, but is defintiely positive for the producer). The chapter should, therefore, review the legitimacy of claims that biofuels have impacted food prices. It appears that this has been disproven.	Noted. Discussions regarding bioenergy were strongly revised throughout the chapter, including the annex; thereby, immens efforts were invested into ensuring balanced treatment of these issues. Regarding the relation between biofuels and food prices there is a huge range of diametrically opposed views in the peer-reviewed scientific literature and the claim of the reviewer is not generally supported by that literature.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37596	11	0				The chapter needs a section or box up front explicitly detailing what the authors mean by the terms sustainability, sustainable agriculture, sustainable bioenergy, and sustainable forestry. Sustainability is a major theme of the chapter and its attainment is assumed to be as - if not more - important than GHG mitigation. There is, however, no universally accepted definition of sustainability so it is crucial that readers know which definition the authors are using. At the very least, the authors should refer t 4.2.1.1.	Rejected. Defined in glossary
37597	11	0				Throughout the chapter there is a very negative tone when the authors deal with large-scale modern agriculture. This needs to be removed. The negative tone seems related to non-GHG mitigation viewpoints (such as the preference for vegetarian diets or concerns about animal well-being) rather than actual scientific studies or consensus regarding the potential of agricultural operations to reduce their GHG footprint (to say nothing of meeting the food demands of a continually increasing global population).	Rejected. The consideration of dietary shifts as potential demand side measures does not infer a preference for vegetarian diets. The GHG implications of reduced meat diets are explored. There is no negative tone associated with large-scale agriculture - we discuss sustainable intensification as an essential tool in the portfolio of measures to reduce GHG emissions from the AFOLU sector.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37598	11	0				The document places way too much emphasis on changing the world population to vegetarian diets and people in the developed world dropping a few pounds (eating less) as serious GHG mitigation measures. Some parts of the document (for example table 11.5 on page 35) suggests the mitigation benefits could be anywhere from 5.3-20.2 GtCO2 eq per year. Since total global AFOLU emissions are pegged at between 9 and 10 GtCO2 eq per year, the magnitude of the mitigation benefits attributed to these changes in diet are huge. While one can make a reasonably sound conceptual argument that these dietary changes would result in lower GHG emissions the magnitudes discussed in this report and methods by which they were estimated are shaky at best and agenda-driven at worst (for example, there is an assumption that all grazing land not shifted to growing food crops gets dedicated to sequestering carbon - presumably in trees. All this carbon then gets counted as a GHG mitigation benefit. Realistically, much of the world's grazing lands are natural grasslands meaning they are poorly suited to growing trees. Additionally, the authors note in a couple of places that changing diets as described above would be very difficult to do through policy and would take considerable time to accomplish as it would require changing people's preferences for meat. Given the shaky evidence and the barriers to implementation, the coverage of this option needs to be toned down considerably.	Rejected. Through published literature on the subject, the chapter explores the GHG implications of reduced meat diets. This does not equate to "changing the world population to a vegetarian diet" - nowhere are we policy prescriptive in this respect - we simply objectively review the evidence. No evidence is provided by the reviewer to support the statement that the chapter aims to change the world to vegetarian diets. Livestock production through animal feed is many times less efficient that the direct consumption of vegetable matter by humans, and as a consequence direct consumption of vegetable matter uses far less land than livestock production. This GHG impact of livestock production if far greater than that of crop production for direct consumption, and the published literature shows that the technical potential is large as stated. All estimates and the methods used to derive them are published in the peer-reviewed literature. There is no agenda to include these estimates - just an objective comparison of all available technologies. Not including demand side measures would be failing to consider all available options. We acknowledge that changing diets as described above would be very difficult to do through policy and would take considerable time to accomplish as it would require changing people's preferences for meat (as already stated in the chapter), but we reject that the evidence is shaky . No evidence is provided by the reviewer to show why
37599	11	0				The text lays out a good justification for treating forestry and agriculture in one chapter. The execution, however, is not so good. There are so many instances where so many factors apparently need to be mention (e.g., gender equality, animal welfare, sustainability, indigenous people's rights, intergenerational equality, etc.) that the ultimate point is lost and the only conclusion the authors can offer is, "the net mitigation impact is ambiguous. Some attempt should be made to identify and quantify the mitigation impacts of the main drivers and to disaggregate the net mitigation impacts into those achieved in agriculture and those achieved in forests.	Accepted. It is true that the impact of many practices are context specific and this needs to be discussed. The new table structure will help in this regard.
37600	11	0				Recommend an additional Annex consisting primarily of graphs which effectively summarize the data in this chapter. Would be helpful for readers from diverse backgrounds, provide quick information for journalists, and help authors to identify conceptual and data redundancies in the text.	Noted. This was considered, but given the prescribed structure of the chapter, could not be accommodated

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37601	11	0				Since this chapter is part of a larger document meant to inform and guide policy makers the data should be readily accessible with a single format. This is an issue with the general literature too, which will provide data annually or decadal, in terms of percentage net flux or CDE as a ton/acre. This text ought to go the extra step to consolidate, when possible, values into something consistent. If not done in the text it could be done in the suggested, graphics-heavy Annex.	Noted. This was considered, but given the prescribed structure of the chapter, could not be accommodated. The data sources are extremely large and varied (e.g. FAO PRODSTAT, FAO GHG emissions database, EDGAR) and these datasets cannot be presented in an Appendix - but references to the datasets are provided.
37602	11	0				N fertilization is discussed in terms of plant group (see page 17) but the issues with NOx release as a result of N fertilization is not sufficiently addressed in the chapter.	Accepted. NOx gases now discussed in more detail in 11.2.2.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37603	11	0				The section on diet as a (presumably) viable Demand-side options is unconvincing due to the lack of a comparative life-cycle-analysis of vegetarian versus meat diets. There is the issue of fertilization to increase per area yields of vegetable crops as well as the increased need for water resources. Vast sections of the globe (extreme northern and southern hemispheres) regardless of warming, do not have long growing seasons and will have to rely on livestock. Causes of desertification are contentious with some arguing (though none of these arguments are presented in this Chapter and ought to be) livestock grazing at comparatively low densities, in a nomadic-style, increases plant and soil microbial diversity, reduces soil erosion, and thereby increases C sequestration. The authors should present a broad, balanced discussion versus a biased one. Additionally, the intensive use of fertilizers and water for vegetable/grain crops (both of which are expected to increase as per acre-yield demands increase while water supply decreases) does and will continue to significantly impact mitigation via agriculture. This needs to be included in this section. Note OECD (2012) reportsthat CDE from LU becomes negative after 2040 regardless of changes in demand-side options. It is also pointed out in the same document (OECD Environmental Outlook to 2050) that land-use related emissions can be more volatile than energy emissions. This makes their predictability less tractable. The citations listed (page 32) lines 21 & 22 either do not do a LCA or do one for a limited geographic region (e.g. Sweden). This discussion is fraught with issues including those already cited. Finally, what is a 'healthy diet' as recommended by the Harvard medical School and is it an economically feasible diate for the globe?	Rejected. Regarding "the issue of fertilization to increase per area yields of vegetable crops as well as the increased need for water resources" this is not required. The mitigation arises largely from diversion of crops used for animal feed (which are already fertilised and use water) to direct human consumption - so no additional fertilization would be required - indeed, required fertiliser levels would probably drop, since direct consumption of vegetable matter is far more efficient than consumption via a livestock intermediate. We agree that large areas are unsuitable for cropping and not this (and cite references to support it, e.g. Gill et al., (2009) and that livestock grazing in these systems is the best mechanism to derive human edible food from that land. We do not present a biased view of this issue, which is written too by our livestock sector specialists. We acknowledge that fertilizers and water for vegetable/grain crops (both of which are expected to increase as per acre, yield demands increase while water supply decreases) does and will continue to significantly impact mitigation via agriculture, but we also know that this is exacerbated by feeding those products to livestock which are 15% efficient heterotrophs, and then consuming the livestock products. It is a fact that direct consumption of vegetable products by humans is a more efficient use of resources. If you know this not to be the case, please provide the evidence. Exploring demand side measures

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37604	11	0				Productivity enhancement is a (supply-side) category of mitigation activity that merits greater prominence in the discussion, analogous to the other categories of supply-side activities (changes in land management and land use) and demand side activities ("reducing waste" and "changing food diets â€“ ie, reducing demand for livestock"). A growing literature suggests that agricultural R&D that increases the productivity of the sector has been (Borlaug 2007; Burney, Davis and Lobell, 2010; Stevenson et al. 2013) -or could be in the future (Wise et al. 2009; Choi et al. 2011; Lobell, Baldos, and Hertel 2013; Jones and Sands, forthcoming 2014; Valin et al. in review) - a powerful global GHG mitigation strategy. In the current draft, there are some limited, and somewhat inconsistent, mentions of productivity enhancement activities. Eg, the various types of productivity enhancements are in fact listed in Table 11.3 (Summary of supply-side options); and there are a few textual and table references that appear somewhat inconsistent in their treatment - lines 35-42, page 29 [sec 11.4.2] refer to increasing yields as potentially increasing competition for land; the discussion of Table 11.5 appears to refer to productivity gains as a demand-side measure that creates "spare land". (See the comment on [lines 35-42, page 29] for literature that provides a framework to reconcile these two perspectives.) Given the substantial mitigation potential, it is appropriate to elevate the concept to higher prominence in the oft-repeated list of agriculture sector supply-side and demand-side mitigation activities.	Accepted. Sustainable intensification was mentioned, but was not discussed in enough detail. This has now been redressed in section 11.3.1.
37605	11	0				Textual discussion could be added in section 11.3 (complementing table 11.3) and 11.4. Addtionally, Several studies are available for inclusion in the costs and potentials section (11.6), which estimate the cost or mt CO2-eq avoided of r&D investments. A discussion of R&D policy would be appropriate to include in section 11.9. Borlaug, N. 2007. Feeding a hungry world. Science 318(5849), 359. Burney, J.A., S.J. Davis, and D.B. Lobell. 2010. Greenhouse Gas Mitigation by Agricultural Intensification. Proceedings of the National Academy of Sciences 107(26): 12052-12057. (this is for historical R&D; incorporates CO2 and non-CO2) Stevenson, J.R., N. Villoria, D. Byerlee, T. Kelley, and M. Maredia. 2013, forthcoming. Green Revolution research saved an estimated 18 to 27 million hectares from being brought into agricultural production. PNAS. (this is for historical R&D; incorporates CO2 and non-CO2) Wise, M., K. Calvin, A. Thomson, L. Clarke, E. Bond-Lamberty, R. Sands, S.J. Smith, A. Janetos, and J.A. Edmonds. 2009. Implications of Limiting CO2 Concentration for Land Use and Energy. Science 324: 1183-1186. (incorporates land use change CO2 emissions only) Choi, S., B. Sohngen, S. Rose, T. Hertel, and A. Golub. 2011. Total Factor Productivity Change in Agriculture and Emissions from Deforestation. American Journal of Agricultural Economics 93(2): 349-355. (incorporates only CO2 emissions from land use change) Lobell, D.B., U.R.C. Baldos and T.W. Hertel. 2013. Climate adaptation as mitigation: the case of agricultural investments. Environ. Res. Lett. 8:015012. (incorporates land use change CO2 emissions only) Jones, C.A. and R.D. Sands. 2014 (forthcoming). Impact of Future Agricultural Productivity Gains on Greenhouse Gas Emissions: a Global Analysis. American Journal of Agricultural Economics. 96(2). (incorporates non-CO2 emissions only) Valin, H., P. HavlÃ-k, A. Mosnier, M. Herrero, E. Schmid and M. Obersteiner, Agricultural productivity and greenhouse gas emissions: trade-offs or synergies between mitigation and food security? (2013, Under review at Environ. Res. Lett.). (incorporates both CO2 emissions from land use change and non-CO2 emissions from land and livestock management)	Accepted. Some of these references were included, but others were not. These references and the perspectives therein (especially on sustainable intensification aspects) are now included in section 11.3.
37606	11	0				One way to reduce the text would be to not repeat tables and figures from other chapters, but to refer to them in their primary location. Eg, Figure 11.18 is the same as Figure 6.18;	Accepted. Redundancy removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37607	11	0				Reference is made consistently to: (see for example, ES, page 4, lines 15-19) "Opportunities for mitigation include supply-side measures through reduction of emissions arising from land use change and land management, increasing carbon stocks by sequestration in soils and biomass, or the substitution of fossil fuels by biomass for energy production, and demand-side measures (i.e. by reducing losses and wastes of food, changes in diet, changes in wood consumption)." It seems important to include livestock management in this list as well; therefore, Insert "livestock management" or "livestock animal management" after "land management"	Accepted. "Livestock management" or "livestock animal management" are supply side measures in the AFOLU sector (see the many options listed in table 11.3), but that was ambiguous, so livestock management is now included explicitly.
37608	11	0				It seems the overall "message" for biofuels - particularly in the biofuels appendix is - bioenergy from wood residues are good, for all other feedstocks the impacts are good or bad or neutral depending on a lot of other things. This conclusion could have been much quicker. There must be some more useful insights than this.	Noted. This is an overly simplistic interpretation of the main message on "biofuels". Main messages for Appendix have been rewritten.
37609	11	0				When the text discusses a "price" of CO2- is this essentially a tax or a market value based on a cap and trade system? It would be useful to state that the first time the price of CO2 is discussed in the chapter.	Noted. CO2 price is discussed in the framing chapters and does not belong in a sector chapter.
37610	11	0				REDD+ should always be written with the "+".	Accepted. Text revised.
37611	11	0				Please reflect the well crafted statements on the role of biomass better in the main document, where the recognition that not all biomass may lead to net GHG reductions is currently understated.	Noted. But not clear where these statements should be added as no page or line numbers are given
37612	11	0				The treatment of mitigation options (e.g., proportion of chapter and amount of tech literature etc) should be commensurate with the mitigation potential. This is obvious in comparing table 11.7 to table 11.3. Table 11.3 lists a whole host of mitigation options in AFOLU, while table 11.7 clearly demonstrates that forestry has many times the potential of agriculture. It is well-known that oceans and forests are the largests sinks of CO2, but from reading this chapter one could very well think agriculture is the most important means towards mitigating climate change.	Rejected. The statement is untrue. The mitigation potential in the agriculture and forestry sectors is very similar (see figure 11.15 - agriculture has more potential). Tables 11.3 lists measures available and table 11.7 lists ranges reported for total global potential so are not comparable. The fact that oceans and forests are the largest sinks does not mean they have the greatest mitigation potential - if these sinks occur in unmanaged systems, the mitigation potential is zero (as they cannot be manipulated so the sinks are not additional).
27874	11	0				The possibilities to create carbon sinks and substitute fossil fuels are not presented in a balanced manner. The manifold problems of these mitigation options are not presented adequately.	Noted. But this is a statement that cannot be acted upon as it is not specific enough - there are no page or line numbers and suggested remedies to the stated concern is not provided.
22480	11	0				Carbon emission from land use change should be considered in two aspect: emission from maintaining and changing existing land use. So the carbon emission and mitigation potential should be considered and estimated in the perspective of changing existing land use.	Noted. This is already the case. Estimates are compared against a business as usual baseline.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30201	11	1		143		This chapter is a well thought out "tour-de-force" of all the AFOLU mitigation (and adaptation) options and consequences. This is no mean feat as the complexity of the subject would tax even the most versitile of brains. In particular I am pleased there is some mention of biodiversity considerations throughout. This is important because often biodiversity considerations are secondary to climate mitigation, but should be as maintaining biodiversity in the face of climate change is as much a priority.	Noted. Thank you. No response required.
23463	11	1		143		It is a well written consistent text providing solid and up-to-date scientific knowledge.	Noted. Thank you. No response required.
25997	11	1				Chapter 11 has no data on water use and irrigation in agriculture etc. There are emissions in those uses.	Rejected. Emissions due to energy use in irrigation and water use are small and are not accounted for in the AFOLU sector (to avoid double counting).
26057	11	1	1	91	11	General comment: Second generation biofuels are not necessarily better from the climate point of view. Example Conventional (first generation?) solid wood fuels need much less processing than the advanced second generation biofuels based lignocellulosic feedstock! Due to the higher processing energy the SG wood-based fuels have basically a much lower displacement factor of fossil fuels.	Noted. This is now discussed in Appendix I
21060	11	1	1	91	10	The text has improved considerably. Unfortunately, it still contains parts that lack in-depth and intimate knowledge about the details and interdependencies of the carbon cycle and forest management. For example, there is ample literature on forest growth, yield, wood use, replacement effects etc. that is not, or, in case of replacements, only marginally reflected here but has direct relevance to mitigation. I cannot judge whether this is due to lack of experience and knowledge from the authors or due to content requirements set in advance, but the overall quality of this chapter - as far as forest-related issues are concerned - is rather poor.	Accepted. The forestry sections have been thoroughly revised.
23645	11	1	8			You should also point out here that climage change will likely impact the other services provided by land	Accepted. Change made.
30961	11	10	1	10	6	Should the link to decreases in forest area and increases in agricultural areas (land use change) be made here?	Rejected. Although there are many references to the linkage between deforestation and increased agricultural land throughout the chapter, section 11.2.2 is not the appropriate place for it, since the GHG emissions discussed are not related to land use change.
37664	11	10	1	10	2	Clarify Latin America has the largest net loss in terms of area, and not percentage	Accepted. Clarification made.
37665	11	10	1	10	2	Please add the amount in total ha (either the 1990 inital amount or the final amount) for completeness	Accepted. Total Mhas have been added.
27889	11	10	1	10	6	Please give also for Oceania in line 3 as for the other region the percentage number for forest area decrease.	Accepted. Oceania's percentage forest loss of 3.5% has been added.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37669	11	10	10	10	11	Why is fertilizer application in forests not covered? Seems like it is highly related to subject at hand is is something we should not be ignoring.	Rejected. The text already clarifies that this emission category is not covered because these are very small compared to those arising from fertilizer application in cropland. Furthermore, these are small also in comparison to other non-CO2 greenhouse gas emissions from FOLU.
25354	11	10	11	10	13	Cumulative non-CO2 GHG emissions from agriculture in 2010 were estimated to be 5.4-5.8 GtCO2eq./yr'. But in Page 10, L 36-37, it is mentioned that 'rice cultivation (11%) is a major source of global CH4 emissions, which in 2010 were estimated to be 493-723 GtCO2eq./yr'. Emission from rice alone should not be more than total non-CO2 GHG emission.	Accepted. Emissions were erroneously reported in Gt instead of Mt in the text.
22126	11	10	13	10	16	Why is machinery use not accounted for? These are existing emissions.	Accepted. Section title refers more in general to GHG emissions from agriculture.
22398	11	10	13	10	16	This is non CO2 GHG emissions. Lines can be deleted	Rejected. Specification is needed to avoid confusion regarding which emissions are covered in the various AFOLU sectors.
20260	11	10	13	10	15	Delete these lines on fossil fuel emissions as these are not accounted for in AFOLU.	Rejected. Specification is needed to avoid confusion regarding which emissions are covered in the various AFOLU sectors.
20121	11	10	13	10	16	Why is machinery use not accounted for? These are existing emissions	Rejected. Specification is needed to avoid confusion regarding which emissions are covered in the various AFOLU sectors.
37670	11	10	15	10	16	Why were machinery, such as tractors, irrigation pumps, etc. not accounted for in the AFOLU sectors. This seems like an important omission - are they included in energy CO2 emissions?	Rejected. Machinery emissions are indeed accounted for in the energy sector rather than in the AFOLU sector.
20261	11	10	17	10	40	The discussion on the three separate datasets, i.e., FAOSTAT, EPA and EDGAR can further be condensed especially when the same are in agreement in view of the large uncertainties in the IPCC default methodologies. Also Figure 11.4 can be deleted to save on the length of the chapter. Deletion of this Figure does not affect the quality of the text.	Partially accepted. Section has been condensed. However, figure 11.4 is useful to illustrate the data range across sources.
22127	11	10	19	10	40	It is not clear whether non-CO2, CH4 or N20 is being discussed. The whole section is quite confusing and it is not easy to follow what the authors want to say. It would be helpful if the statement includes some absolute numbers (range of the different estimates) as has been done for rice. Doing this for all categories would make the percentage changes much clearer and more transparent. Even tough numbers can be estimated from the graph below. This summary would be stronger with absolute numbers.	Rejected. Absolute values of each emission category are given in details for each emission category. By contrast, the preceding paragraphs being discussed herein focus on providing the reader with relative importance of the various emission categories, so that percentage values are more appropriate.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20122	11	10	19	10	40	It is not clear when is talked about non-CO2, CH4 or N2O. The whole section is quite confusing and it is not easy to follow what the authors want to say. I would be helpful if the statement includes some absolute numbers (range of the different estimates) as it is done for rice. Doing this for all categories would make the %-changes much clearer and give much more transparency. Even tough numbers can be estimated from the below graph, this summary would come across much stronger with absolute numbers.	Rejected. Absolute values of each emission category are given in detail for each emission category. By contrast, the preceding paragraphs being discussed herein focus on providing the reader with the relative importance of the various emission categories, so that percentage values are more appropriate.
37671	11	10	20	10	20	Is EPA 2011, not 2013?	Accepted and modified in text accordingly.
22535	11	10	21	10	22	The mention to key categories here may be confusing. Key category is a very specific term in IPCC guidelines and good practice guidance for the elaboration of GHG inventories. "Significant" or "important" could be more addequate instead of "key".	Accepted and modified in text accordingly.
32652	11	10	23	10	24	given the large uncertainties in IPCC default methodologies, the chapter suffers from a great deal of misplaced concreteness. These uncertainties -- of measurement, temporal permanence, etc. -- have to be placed in the foreground of the analysis.	Rejected. First, this session provided graphs with uncertainty bars for three different datasets, which was not attempted in many chapters including AFOLU, before AR5. Second, most emission figures are given with ranges rather than single numbers. Third, uncertainty is not limited to default IPCC methodologies, but loom large in higher tier approaches as well.
30962	11	10	3	10	5	There should be a reference to support the apparent claim that fires since 2000 in Australia have permanently shifted the vegetation to something other than forest	Accepted. Reference to forest fires in Australia as main source of deforestation figures cited in text has been removed.
27891	11	10	32	10	37	Please clarify whether CH4 or N2O or both emissions are concerned for the respective percentages.	Accepted. Clarified in text.
31462	11	10	37	10	37	Check the figure 493-723 Gt CO2-eq/yr for Global CH4 emissions. More than 10 times the global emissions of all GHGs.	Accepted. Emissions were erroneously reported in Gt instead of Mt in the text.
33305	11	10	37	10	37	Is it 493-723 MtCO2eq/yr instead of Gt?	Accepted. Emissions were erroneously reported in Gt instead of Mt in the text.
19722	11	10	4	10	5	Here and elsewhere, please be careful not to confuse "forest loss" with "forest cover loss". Fires usually generate a forest cover loss, not necesarily a forest loss per se. Trees may regrow if fires abate.	Accepted. Text modified in multiple places with added clarifications.
32650	11	10	4	10	5	it should be a central part of the analysis and conclusions regarding carbon sequestration potential (or lack thereof) that we're talking about a sector where drought and fires are expected to increase in many regions.	Noted. These issues are discussed later in the chapter, such as when we discuss interactions between mitigation and climate change.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27890	11	10	7	10	7	Lines 13 to 16 deal with fossil fuel emissions as well, so add fossil fuel to the headline too.	Rejected. The section discusses non-CO2 emissions. The information of CO2 emissions from fossil fuels is added only as a minor clarification and as a service to the reader.
22399	11	10	8	10	40	Could bemore concise with less figures	Rejected. Figures are necessary to better illustrate the text.
37668	11	10	9	10	10	The authors should consider removing "Other important- thus not treated here -applications in forests." If is not to be addressed in this Chapter why mention it?	Rejected. This is useful information even if not treated in detail in the section.
30963	11	10		20		This section should be made more concise and easier to follow, especially section 11.2.3	Accepted.
23648	11	10				It would be helpful to clearly state the sum of emissions related to animal production including manure storage and entereic fermentation, offsets related to manure use (fertilizer avoidance and potential soil C sequestration). As animal populations are expected to grow understanding this independently is important	Accepted. This information is presented in the revised figure 11.2
27209	11	10	19		19	is it meant to say IPCC Tier 1 approaches and emission factors?	Noted. Indeed, the term "IPCC Tier 1 approaches" includes the application of default emission factors. No need to further specify.
27210	11	10	22		22	When referring to ... manure management and manure are available... Manure emissions associated with application in soils and in pastures?	Noted. Yes, these are emissions from N deposited as either organic fertilizer on cropland or manure deposited on pasture.
27211	11	10	27		28	replace IPCC reporting guidelines by IPCC inventory guidelines	Accepted. Change in current version pg. 11 line 5.
27212	11	10	32		32	biomass burning here refers to burning of crop residues, as this section refers to Agriculture? Please clarify	Noted. It refers to burning of crop residues as well as (main component) to prescribed burning of savannahs. Clarification added.
37666	11	10	7			There is a lot of good information in this section, but it is presented in a way that is very hard to follow. For example, --□line 12-13, the AFOLU share of total emissions is cited, butit is difficult to figure out what reference provides the total emissions being used in denominator (it is not Linquist et al 2012). --It is not clear where the final conclusion p. 20 (lines 1-8) actually comes from in the material above.	Accepted. Range of emissions revised according to sources presented in 11.2.2. Reference to Lindquist removed. Denominator of total anthropogenic emissions taken from AR5 data.
37667	11	10	7			Section 11.2.2 would benefit from a general discussion of how CH4 and N2O are emitted by agricultural practices. The introduction to Section 11.2.3 has a nice description of carbon cycling/fluxes associated with forests and other land uses.	Accepted. New explanatory text on pg.11 lines 13-18.
22483	11	10	7			The present situation and spatial distribution of emission in agriculture soil and biomass burning could be considered and stated in this section.	Accepted. The section has been revised to include more detailed information on agricultural soil and biomass burning.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30335	11	10	8	10	40	Add reference literature following literature :Hashimoto S (2012) A New Estimation of Global Soil Greenhouse Gas Fluxes Using a Simple, Data-Oriented Model. PLoS ONE 7(8): e41962. doi:10.1371/journal.pone.0041962	Rejected. This study provides estimates form both natural and anthropogenic emissions, so that comparisons of estimates of anthropogenic fluxes are difficult to make and not appropriate.
32651	11	10	8			per capita data is also important here. Of course, Asia is the largest emitter in some categories, compared to the US and EU, but close to half the world lives in Asia. Per capita data provides a more exact understanding of where emissions come from and reduction potentials. I attach a separate file called "comparative emissions of developed and developing countries.docx" it is some back of the envelope work, using public databases, to demonstrate the gross per capita disparities in non-CO2 emissions in the agriculture sector.	Rejected. Although the point made by the reviewer is sound, this section reports absolute levels of GHG emissions. GHG indicators, focusing on emissions per unit input rather than per capita, are reported later in the chapter.
22400	11	11				For rice huge disparity between Stat FAO and other sources. Any explanation?	Noted. The text does comment on the wide range and provides support for the lower figure in the given range from independent references. It is not clear why other databases give much higher figures, although the figure shows that the differences are within uncertainties.
27213	11	11				The figure indicates EPA (2011) and the text of the figure EPA (2012). Please ensure consistency	Accepted. EPA 2011 reference used throughout section.
20123	11	11				What is meant by MMS? No explanations in text	Accepted. There is an explanation in the legend of the figure (11.4).
20124	11	11		12	15	description of the categories in an order according to Figure 11.4 would make following figure and text easier	Noted. Specified text discusses disaggregated categories in correct order.
37673	11	11	12	11	16	Please provide a reference.	Accepted. Reference added.
21228	11	11	14			Change term to "agricultural"	Rejected. It is clear that this section refers to emissions from enteric fermentation.
23649	11	11	15			Do cows fart more than other animals per unit of product or were there just more cows?	Noted. Both cases apply.
22130	11	11	17	12	7	Mention that these paragraphs cover the category Ag. Soil to improve understanding.	Accepted. Added text for improved clarity.
20126	11	11	17	12	7	mentioning that these to paragraphs cover the category Ag. Soil would improve understanding.	Accepted. Added text for improved clarity.
37674	11	11	17	11	33	At least in the southern United States poultry is a major source of nitrogen based gasses. Why isn't mentioned here?	Rejected. The analysis presented focuses on main emission sources from a global and regional perspective only. The case mentioned is a very small contributor to the larger trends discussed.
22128	11	11	2	11	6	What is meant by MMS? No explanation provided in the text.	Accepted. There is an explanation in the legend of the figure (11.4).
33964	11	11	21			delete the dot at end of line	Accepted. Revision made.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37675	11	11	24	11	25	The authors should provide some explanation for why emissions grew at a slower pace in Asia and the Americas while they decreased in Europe.	Rejected. This part of the section presents statistical data and their trends and cannot comment on every single occurrence, unless robust references can be cited.
23650	11	11	34			Emissions from synthetic fertilizer- do they include both production emissions and fugutive emissions following application?	Noted. They only include direct and indirect emissions following application. They do not include CO2 emissions linked to production. The latter are reported in the industry sector.
24167	11	11	7	13	11	The discussion here is lack of consistency in terms of the time dimension. The assessment on the global emission trend in AFOLU is based on the situation between 1971 and 2010 on page 7, but from page 11 the discussion is based on different time ranges. Sometimes it is from 1961 to 2010, and sometimes it is from 1750 to 2010. we suggest to use the same time range through the whole chapter.	Rejected. The different time periods used correspond to different type of analyses and are each appropriate for the different sections mentioned. Ch 7 deals with overall--albeit very uncertain--historical trends since 1971, based on the need to conduct a global, multi-sectoral analysis based on the EDGAR database. However, robust data for agriculture exist for a longer time period (1961-2010), while robust data for forest and other land uses (FOLU), can only be robustly documented since 1990 (and even later for satellite-based information). The AFOLU chapter focuses on summarizing the best-available information for AFOLU and its sub-sectors, and thus uses necessarily, reflecting the above, different databases and different time periods in order to provide robust information.
22129	11	11	7	11	33	Include absolute numbers to back up percentage change and increase transparency.	Rejected. Each of the detailed discussion on the most important emission categories contains both absolute values and percentages for the global trends, and only percentages for regional trends. It would be to cumbersome to include all regional absolute values associated with the discussed trends.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20125	11	11	7	11	33	absolute numbers to back up %-change and increase transparency	Rejected. Each of the detailed discussions on the most important emission categories contains both absolute values and percentages for the global trends, and only percentages for regional trends. It would be to cumbersome to include all regional absolute values associated to the discussed trends.
37672	11	11	7	11	7	Instead of indicating the range of growth (1.3 to 2.0), the authors should consider providing the average growth during the period 1961-2000; better for diverse readers.	Noted. Average growth rates associated with the absolute numbers already provided on the following line.
27892	11	11	7	11	35	Please clarify whether CH4 or N2O or both emissions are concerned for the respective percentages in lines7,10,18,31,35.	Accepted. New text added on page 12, line 15 clarifies the analyses refer to combined non-CO2 emissions for each of the categories.
24168	11	11	10	11	11	Suggest delete sentence " in 2010 , 1.0-1.5 …… developing coutries". Because there is no data sources provided for such conclusion.	Rejected. FAOSTAT reference is implicit throughout the paragraph, but added nonetheless for clarity.
27350	11	11	17		17	include Annual average before Global emissions	Partially accepted. The term "annual average" was included, but only once, at the beginning of this section (pg. 16 line 21). All other annual data reported is intended and annual means.
19617	11	11	19	11	22	Delete from "Emissions …….as also confirmed by Herrero et al. (2013)". FAOSTAT, 2012 can not give emission data and Herrero et al. (2013) is not published. There are not sufficient publications supporting the conclusions.	Partially accepted. First, emission data are given through the new FAOSTAT Emission database. The reference to Herrero has been moved later in the text in conjunction with other peer-reviewed analyses.
24169	11	11	21	11	22	Suggest delete sentence " with 80% of emissions …… developing coutries". Because there is no data sources provided.	Rejected. Appropriate references were nonetheless moved to the end of the sentence, for clarity.
27351	11	11	30		30	include Annual average before emissions from manure	Partially accepted. The term "annual TOTAL" was included, but only once, at the beginning of this section (pg. 16, line 21). All other annual data reported in these section clearly refer to annual totals.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27352	11	11	34		34	include Annual average before emissions	Partially accepted. The term "annual TOTAL" was included, but only once, at the beginning of this section (pg. 16, line 21). All other annual data reported in these section clearly refer to annual totals.
27349	11	11	7		7	include Annual average before Global emissions	Partially accepted. The term "annual TOTAL" was included, but only once, at the beginning of this section (pg. 16, line 21). All other annual data reported in these section clearly refer to annual totals.
25794	11	11	8	11	8	The growth rates of 0.95% should be recalculated. The data should be 1.07%.	Rejected. The correct average growth rates are obtained as compound rates. Figure is correct.
27348	11	11	6		6	remove (from from (from (Tubiello et al., 2013).	Accepted. Revision made.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32544	11	1133				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Partially accepted. Life-cycle analysis was replaced with life-cycle assessment and the abbreviation LCA used thereafter. Not all suggested references could be used, however, because this chapter/section discusses policy options. Methodological issues related to LCA are relevant only insofar as they need to be raised to understand their implications in that context. Apart from that, methodological issues are discussed in the "Methods and Metrics" Annex.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32545	11	1142				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Accepted. Wording changed. Not all primary literature can be cited.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32546	11	1179				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	This work mainly refer to the climate impacts from bioenergy produced from wooden products at their end of life (paper, buildings, etc.). This is indeed an important topic that we did not cover in the SOD. We have added a short paragraph in the TOD where this topic is briefly reviewed (and these papers considered).

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32547	11	1182				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted. The term lifecycle analysis is not used in text.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32548	11	1184		1185		The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted Action: Check

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32549	11	1198				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted.
27214	11	12				what is MMS in Figure 11.5?	Accepted. Manure Management Systems. Text added for clarification.
19091	11	12				Is it necessary to have both Fig 11.4 and Fig. 11.5 (Page 12)?	Rejected. Information provided by the two figures is important, showing regional break-downs of global figures.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34000	11	12				Page 12, footnote 1. 'peatlands are dealt with in Box 11.2'. Why in a box and not in the body text? It should be incorporated in the main text since it's a main AFOLU source, and the launching of the Wetlands Supplement by half ways this year underlines this. Also other bodies such as VCS (Voluntary Carbon Standard) updates their AFOLU requirements, including wetlands and peatlands.	Accepted with modification. It is in a box to highlight it, and because peatlands exist under agricultural land and under land subject to FOLU, so it is a crosscutting issue across subsections 11.2.2. and 1..2.3. But to further raise the importance of peatland fluxes, they are included now in fig 11.2.
25515	11	12				Unclear figure	Rejected. Information provided shows clearly regional break-downs of global figures discussed at the beginning of this section.
37676	11	12	14	12	14	Add "/yr" to "1.4%"	Accepted. Text modified accordingly.
37677	11	12	16			The graph is barely legible. Better to use 0 than the dash (-).	Noted. Original graph was reduced in size for space reasons. Suggested edits will be implemented before production.
27894	11	12	16	12	16	Preferably the figures should become bigger.	Noted. Original graph was reduced in size for space reasons.
27356	11	12	18		19	remove (from from (from (Tubiello et al., 2013).	Accepted. Text revised accordingly.
27895	11	12	21	12	21	The footnote states that CL and GL are assumed to be in balance with respect to CO2. According to the inventory reports of developed countries this it not always true especially for CL.	Accepted with modification. Agree with the reviewer. However, it is variable between sites that are sources and sinks, and there is a lack of data even regionally, let alone globally. Plus, sources and sinks are an order of magnitude smaller than changes between croplands and forestlands. Hence the "assumption" is unavoidable given current knowledge and data availability at this scale. Deleted the footnote and explained in the text that the section focuses on the most significant fluxes for which there are global trend data.
21006	11	12	22	12	24	Please reconsider this - the equilibrium hypothesis is contested in the ecological literature because even if there was no anthropogenic interference, natural drivers would lead to changes, especially in forested ecosystems where natural "cycles" / generations may take several hundert years to complete.	Accepted. Deleted sentence.
27896	11	12	22	12	23	Plant respiration adds to emissions too, please add this to the list.	Accepted. Text added. Note that this text is now moved to introduction.
31463	11	12	23			Please consider to rephrase the term "by fires" to e.g. "combustion", since biomass also can be oxidized in a bioenergy plant, stove or open fireplace.	Accepted. Text replaced. Note that this text is now moved to introduction.

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30964	11	12	23	12	24	This does not capture the large fluxes associated with Boreal fires. Fluxes associated with forest fires may reach the same pre-disturbance level on decadal time-scales, but are not in equilibrium. Suggest reviewing.	Accepted. Text deleted. Note that this text is now moved to introduction.
30965	11	12	24	12	25	1. The role of natural disturbances is not acknowledged. 2. The phrase to "deforestation and other fires" implies that deforestation only results when fire is used and/or that fire is only the result of human activity. Suggest revising to say "…in the absence of human activity or changes in natural disturbance regimes. Natural disturbances (e.g. fire, drought, storms), changes in land use and management can be both sources of CO2 to the atmosphere (e.g. deforestation, fires, ...".	Accepted with modification. Deleted "other fires" and deleted sentence on equilibrium. Note that this text is now moved to introduction.
30966	11	12	24	13	2	The sentence beginning “Changes in land use and management can be …" is difficult to understand. Suggest: “Changes in land use and management can be both sources of CO2 to the atmosphere (e.g. deforestation, fires, and decomposition of soil carbon, cut biomass, and dead plant material decay) as well as sinks of atmospheric CO 2 (e.g. vegetation regrowth and afforestation).”	Accepted. Sentence modified. Note that this text is now moved to introduction.
19723	11	12	25	13	1	The list of CO2 sources in parenthesis is somewhat disconcerting and a bit of a grab bag. I would suggest limiting to "deforestation and forest degradation" that at least both clearly imply increased on-site CO2 losses to the atmosphere. "Other fires" is unclear; fires as part of boreal ecosystems and it is the increase in fire frequency that may result in increased emissions. Forest products decay may be carbon neutral if the source forest lands have a long history of sustainable management and a stable carbon content. In addition, substitution effects and increase in harvested wood products pools may generate a net GHG reductions.	Accepted with modification. Sentence modified. Used deforestation and peat drainage as clear examples, deleted the rest, and deleted "other fires". Note that this text is now moved to introduction.
19353	11	12	25	12	25	Deforestation is not necessarily caused by fires ("deforestation and other fires").	Accepted. "Other fires" deleted. Note that this text is now moved to introduction.
37678	11	12	26			Footnote 1: please add 'approximately' in front of 'in balance' on the 4th line of this footnote. Soil GHG impacts may not be in balance but do indeed more assessment. This acknowledgement of the role of soil carbon is included in various places later on in this chapter, so it should also be included here, rather than this rather simplistic approach.	Accepted with modification. Footnote now deleted. Agricultural soil CO2 emissions are variable between sites that are sources and sinks, and there is a lack of data even regionally, let alone globally, plus sources and sinks are an order of magnitude smaller than changes between croplands and forestlands. Hence it is not possible to give information on trends on this given current knowledge and data availability at this scale. Deleted the footnote and explained in the text that the section focuses on the most significant fluxes for which there are global trend data.
23343	11	12	8			This is "Paddy rice" which differs from dryland rice	Accepted. Clarification added in text.
27893	11	12	8	12	8	Please clarify whether CH4 or N2O or both emissions are concerned for the respective percentages.	Noted. Emissions only include CH4. Those related to N2O linked to use of fertilizers are discussed under "synthetic fertilizers."

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27355	11	12	10		10	is it really year-on-year? Or year-by-year basis?	Accepted. What was meant is that emissions have even decreased in certain years over the period 2000-2010. Specific paragraph shortened and use of year-on-year term eliminated altogether, for improved clarity.
27353	11	12	6		6	Include annual before Emission growth rates	Partially accepted. The term "annual TOTAL" was included, but only once, at the beginning of this section (pg. 16, line 21). All other annual data reported in these section clearly refer to annual totals.
27354	11	12	8		8	include Annual average before Global emissions	Partially accepted. The term "annual TOTAL" was included, but only once, at the beginning of this section (pg. 16, line 21). All other annual data reported in these section clearly refer to annual totals.
21364	11	12		20		I couldn't see any mention of the methane sink in forests (soils) or the impact of LUC on this?	Noted. The analysis in this section is based on the best available information relative to global and regional trends in FOLU. Although the role of methane sinks is getting increasing attention, there was not enough information available to include robustly in this synthesis.
22555	11	12		11		footnote: surprised that croplands and grasslands are treated equally ie that both are generally assumed to be in balance	Noted. The assumed balance typically refers to the fate of biomass, since this is fixed in annual cycles, hence amounts lost do not add CO2 to the atmosphere. IPCC guidelines further assume that, as a first approximation, soil carbon is also in balance for systems under the same management for long periods. Of course, this is not true when management changes (i.e.,. from tillage to no till), or when a land use change occurs.
25512	11	12				The section "Trends of C fluxes from forestry and other land use (FOLU) change" is filled with worthy analysis, the discriptive points can be summerize and deleted for shorten the section.	Accepted. Section shortened.
27215	11	12	21		21	the term FOLU has been used previouisly (e.g., in the text of Figure 11.2). Please provide explanation there	Accepted with modification. Removed from earlier section, and explanation added here.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21007	11	12	21	14	36	In your description of FOLU C flux components you forgot the indirect effects of wood use. These replacement (substitution) effects are attributed to other sectors, however, changes in the forest (changes in FM or amount of timber provided for use in products) influence these effects and thus the overall GHG balance. Please at least indicate that there are interactions that are not captured by assessing C fluxes from FOLU lands alone.	Accepted with modification. This text is now deleted with something equivalent in the introduction which then goes on to talk about substitution.
32426	11	12	21	14	36	WGI Ch06 is now well referenced. Please make sure that potential updates to the latest numbers are also incorporated in the WGIII draft.	Accepted.
27216	11	12				change forests, grasslands and agricultural land by forest land, grassland and cropland, to be consistent with the IPCC 2006 land-use categories	Accepted with modification. Text now deleted from here and moved to introduction. Changed "forests" to "forest land."

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32550	11	1200				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted.

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32551	11	1202				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted.

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32552	11	1208				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted.

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32553	11	1214				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted.

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32554	11	1220				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted.

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32555	11	1228				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted.

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32556	11	1231				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted.

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32557	11	1238				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted.
29845	11	124	17	124	17	“still there be enough land” should be “will there be enough land”	Accepted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32558	11	1240				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Noted.
24170	11	13		13		the last row before the "550 "should be added "-" (minus sign) in table 11.1	Accepted. Added sign.
30971	11	13				A negative sign is missing before 550 in the first column of the 'Residual terrestrial sink' row.	Accepted. Added sign.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25998	11	13				table 11.1 should be shown also in graphic form, to show fluxes and amounts	Rejected. Table changed to exclude some components of the C budget less relevant to this chapter so a graphic would not capture all elements and be misleading. Also other information added from other sources. With new table a graphic would not work, especially showing the errors from different sources, a and also given the different time periods in the table (cumulative and decadal fluxes).
27219	11	13				The value 550 ± 330 GtC in table needs to be corrected to read -550 ± 330 GtC	Accepted. Added sign.
37687	11	13				The authors should consider presenting as graph instead	Rejected. Table changed to exclude some components of the C budget less relevant to this chapter so a graphic would not capture all elements and be misleading. Also other information added from other sources. With new table a graphic would not work, especially showing the errors from different sources, a and also given the different time periods in the table (cumulative and decadal fluxes).
24786	11	13	1	13	1	Soil carbon does not decay. Replace with "soil organic matter".	Accepted. Text replaced. Note that this text is now moved to introduction.
37681	11	13	11	13	11	"while FOLU emissions have likely declined"...is likely here supposed to be also? Likely makes it sound like we don't know...or you could say 'per most estimations have declined'...	Accepted with modification. Reviewer correct but text now deleted
30968	11	13	12	13	20	This discussion seems to be missing some important points. Forests around the world including northern extra-tropical forests are experiencing increased drought and related mortality, with implications for C. See Allen et al. (2010), A global overview of drought and heat-induced tree mortality reveals emerging climate change risks for forests. For Ecol Manage 259. As well, an important part of environmental variability and change is natural disturbance regimes affecting forest, and there is evidence that these regimes are changing in response to climate change. See Kasischke et al. (2013), Impacts of disturbance on the terrestrial carbon budget of North America, J. Geophys. Res.: Biogeosciences, DOI: 10.1002/jgrg.20027. See Flannigan et al. (2009), Impacts of climate change on fire activity and fire management in the circumboreal forest, Global Change Biol. 15, DOI: 10.1111/j.1365-2486.2008.01660.x.	Accepted with modification. Agree with reviewer, but restricted on space to add too many examples, and actually much of this detail is now gone with saving space in the chapter. However the section later on feedbacks refers to examples of climate impacts on forests and references IPCC WGII which is the correct place for the wealth of information on climate change impacts, detection and attribution.
24787	11	13	12	13	15	Please specify whether this text applies to the future or the past.	Accepted. Text clarified.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25513	11	13	12	26		The explanative discussion about environmental variability and change can be suggested to avoid or delete. It is quite lengthy description which is not necessarily need at this point.	Accepted with modification. Text has been greatly reduced in length but not deleted, it is necessary to understand other data e.g. Pan et al. but also the context of LUC data and attributing direct anthropogenic LUC activity impacts versus indirect effects of environmental change. It is also relevant to protecting sinks (REDD)
22131	11	13	13	13	15	Please provide evidence for this statement on prolonged growing season and enhanced CO2. There is more recent research which shows that this is not necessarily happening.	Accepted with modification. Much of this detail is now gone with saving space in the chapter. section later on feedbacks refers to examples of environmental change impacts on forests and references IPCC WGI and II which goes into this in more detail.
20127	11	13	13	13	15	Please give evidence for this statement of prolonged growing season and enhanced CO2. there is more recent research which shows that this is not necessarily happening.	Accepted with modification. Much of this detail is now gone with saving space in the chapter. section later on feedbacks refers to examples of environmental change impacts on forests and references IPCC WGI and II which goes into this in more detail.
31519	11	13	15	13	20	I would change "cannot separate out" to "difficult to separate out". There are a few examples in the literature that researchers were able to tease out the different impacts of management and environment.	Accepted with modification. Text deleted.
30202	11	13	17	13	19	"increase in mature 17 forest biomass or growth rates have been identified in inventory measurements from both managed 18 and unmanaged lands in temperate and tropical regions (Phillips et al., 1998; (Luyssaert et al., 2008; 19 Lewis et al., 2009; Pan et al., 2011)." These papers refer to INTACT forests. Certainly Lewis et al. and Pan et al. are explicit about this. This is an important concept, meaning much more than "mature" or "unmanaged" (see also Fig. 11.8). It's simply wrong to assign this to forests generally, the papers are quite specific that this applies to undisturbed forest, rather than to regrowth following any deforesation or deagradation as implied by the IPCC use of the term "unmangaged". It's important because often intact forests are simply viewed as static with respect to carbon balance, but this is not so. I suggest This could be changed to "increase in mature 17 forest biomass or growth rates have been identified in inventory measurements from both managed 18 and unmanaged (intact or undisturbed) lands".	Rejected. Pan inventory measurements in the tropics are in intact forests only. However, in the temperate and boreal areas they are for all forests, the majority of which are managed, and many of which are re-growing after past deforestation and degradation caused by e.g. acid rain.
37679	11	13	2	13	2	The authors should change"gives" to "produces"	Accepted with modification. Text deleted.
27897	11	13	2	13	2	Build-up/increasing of soil carbon through change in forest management should be added in the brackets.	Rejected. Need to cut text generally and this is adding too much detail.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19725	11	13	20	13	21	It ay also be argued that a significant portion of this sink results in the US and possibly is parts of Europe in the old-field to forest successional processes.	Accepted with modification. Added text that some of the sink may be due to AFOLU activities not accounted for in the models.
37682	11	13	21	13	21	Please explain what 'pools' are included in the natural terr sink (specifically does it include forest C?)	Accepted with modification. it includes all pools and all land. It is the residual so accounts for anything not included in the FOLU flux. We now say "the land as a whole was a net sink" i.e.. including all pools. It is also clear it includes forest carbon as we talk about forest inventories confirming this sink.
37683	11	13	21	14	8	Please clarify some elements here: net land use change is positive, meaning overall release to the atmosphere (largely anthro), though this is counterbalanced by the RTSink, which does or does not include forest carbon (largely 'natural')? It seems as though it does due to the numbers but would like this text to state that explicitly.	Accepted with modification. The residual terrestrial sink is in all ecosystems as stated "globally, the net effect of the natural response of ecosystems to environmental change is a sink" it is calculated as the residual after land use change is taken account of so it is largely a natural response of ecosystems to human induced environmental change. Confusion may have been due to a missing minus sign in the table, now modified.
37684	11	13	22	13	26	It seems that it is also possible the net residual link led to increased emissions (positive numbers reported)	Accepted with modification. This was an error in the table now corrected, the residual is a sink
32255	11	13	23			estimated 550 ± 330 GtC from 1750 to 2011 (in the table 11.1, it showed not -550 but 550)	Accepted. Minus added to table.
30969	11	13	23	13	23	There appears to be an error in the units of measurement reported here (should read -550 +/- 330 GtCO2 and -9.2 +/- 4.4 GtCO2 (as given in Table 11.1), rather than GtC.	Accepted. Minus added to table.
32654	11	13	23			ditto. -550 +/-330 Gt? -9.2 +/-4.4 Gt?	Accepted. Minus added to table.
27898	11	13	23	13	13	The fertilizing effects of N deposition is mentioned here promoting C sequestration. We recommend to add that it has at the same time manifold detrimental effects on human health, biodiversity and ecosystem services (Rockström et al. 2009, Ecology and Society, Vol 14, NO 2, Art 32; Sutton et al. 2011, The European Nitrogen Assessment, Cambridge University Press). Its potential to enhance carbon sequestration by forests and natural vegetation is limited, because the fertilizing holds only as long as the system is not nitrogen saturated and neither water nor other nutrients are limiting growth.	Rejected. This section is about trends in GHG emissions from FOLU, not about other ecosystem services or pollution effects.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37685	11	13	25	13	26	Implying that all the residual land sink is "natural" and not the result of human management decisions is dubious. E.g., policy decisions and economic changes that resulted in vast reforestation of the United States over the past century were anything but "natural" regrowth, and instead highly human induced. Establishment of wilderness areas, national forests and parks, economic incentives to reforest marginal ag lands or retain productive forestland, etc. are not really "natural residual land sink"... they are the result of management/policy, even if the decision made is to "not manage (intensively)".	Accepted with modification. This is not implied, in fact it is clearly stated that "this natural residual sink response of ecosystems to environmental change" and earlier in eh paragraph this environmental change is explained as including increased levels of CO2 and N and climate change. So we do not say the residual sink is natural, but is a what ecosystems do in response to anthropogenic change. In theory the management effects the reviewer states should be included in FOLU estimates, for example in he USA the Houghton model approach finds sinks due to afforestation as stated later in he text. However we have altered text to say "A sink of the right order of magnitude has been accounted for in models as a result of the indirect effects of human activity on ecosystems, i.e. the fertilising effects of increased levels of CO2 and N in the atmosphere and the effects of climate change (IPCC WGI chapter 6; Le Quéré et al., 2013), although some of it may be due to direct AFOLU activities not accounted for in current estimates (Erb et al., 2013). This sink capacity of forests is relevant to AFOLU mitigation through forest protection.
31464	11	13	27			Check if the figure for land to atmosphere, 110 should be -110	Accepted with modification. Checked and it is correct as is without the minus sign i.e.. over the whole period the net land-atmosphere flux was a sink due to the residual flux, even if it is currently a source due to the AFOLU. However this line is now deleted from the table.
37686	11	13	27			Check the signs (+/-) on some of these numbers, whichseem to be incorrect (e.g. should it be -550, not +550?).	Accepted. Changed to a minus.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31518	11	13	3	13	13	Atmospheric nitrogen deposition is not uniform around the world. Although an important factor in forest productivity "downwind" of major industrial regions, in other areas where there is sparse population and not "downwind", it is a minor input. In such forested areas, such as the Democratic Republic of Congo or Siberia, atmospheric nitrogen inputs is likely to be less the 5 kg N ha-1 yr-1 even under high emission scenarios. I would suggest a re-evalution of the literature, with a focus on forested areas with sparse human population. I know these paragraphs are based on WGI section 6.3.2.6.5, so these comments may be best presented to the author of that section.	Accepted with modification. Agree with the reviewer but the text is general and does not discuss regional differences but overall driving forces. Much of this text as now deleted in any case to shorten the chapter.
19354	11	13	31			I seems that Residual terrestrial sink should be a negative figure, THEN the land-to atmosphere flux will be 110 (660-550)	Accepted. Minus sign added to table.
30970	11	13	32			In the last row of this table, the value given for Residual terrestrial sink during 1750-2011 (550) should be negative, i.e., it should read -550 (as reported in text on P13 L23).	Accepted. Minus sign added to table.
32653	11	13	6			4.0 +/- 2.9 Gt. The size of these error bars are impressive. All subsequent analysis in the chapter dependent on these numbers should be qualified with these uncertainties.	Rejected. This is not quite true as uncertainties are large partly due to uncertainties about past land cover changes, but also due to different processes in the global models. However, assessing mitigation potential usually starts with land area and is based on specific activities that are evaluated. In any case no change needed in this section.
19724	11	13	8	13	9	I guess that the meaning of "first primarily" refers to the 1750-2011 period of Table 11.1. This should be clarified as the mention of "2000-2009" in the sentence just above seems to imply a reference to that very recent time frame. Also I tend to doubt the important contribution of "boreal zones" in that context, especially if you include the re-growth of forets in the fenno-scandinavian forests where most of boreal "deforestation" would have taken place in the earlier part of the 1750 to 2011 period.	Accepted. Deleted text about areas of deforestation.
30967	11	13	9			Table 1 1.1 does not present data to support the distribution of deforestation among biomes over time. This statement may need a reference.	Accepted. Deleted text about areas of deforestation.
37680	11	13	9	13	9	As written, the sentence is not clear; the authors should clarify.	Accepted. Deleted text about areas of deforestation.
29425	11	13	1	13	1	soil carbon does not decay. Replace with "soil organic mattter".	Accepted. Text replaced. Note that this text is now moved to introduction.
29426	11	13	12	13	15	It is not clear whether this text applies to the future or the past. Reword to clarify.	Accepted. Text clarified.
27218	11	13	23		23	please note an inconsistency in line 23 regarding the terrestrial C sink (-550 ± 330 GtC from 1750 to 2011) and Table 11.1 that indicates a source (550 ± 330 GtC).	Accepted. Table modified to include minus sign.
19620	11	13	5	13	11	The findings should be based on data at the same period. Please choose either data from 1750-2011 or data from 1971-2010.	Rejected. 1750 to 2011 tells us about the total contribution of LUC to the current atmospheric burden of CO2, whereas more recent data tell us about recent trends and move about recent human activity. Decades are chosen to report recent trend data across the whole volume.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27357	11	13	15		15	change may reduce it by may have decreased it.	Accepted with modification. Text deleted when chapter length shortened
27217	11	13	8		8	remove ; from deforestation; occurring	Accepted. Deleted.
19413	11	133	31	134	9	There are two references of Smith & al. (2013, to be submitted in 2012), which I believe both refer to one article. However, the authors are partly different in the two references. Then also, if it was to be submitted in September 2012, isn't it now "in Review". If not, then omit it from here, dead line for submitted articles for WG3 has already gone. If an article is in the phase where even the writers list is not yet final, how could you expect it to be published in time for the report to be ready?	Accepted.
25514	11	14				The points is the Box 11.1 Different approaches to calculating the FOLU flux can be further abridged.	Accepted. Box deleted and text abridged.
30973	11	14	10	14	14	This is difficult to follow. Suggest “For managed lands, calculations the effects of changing land use and forest management on carbon stocks and fluxes can include the impacts of environmental change either explicitly, or implicitly, if the impacts are inherent to the data or methods used.	Accepted with modification. Text now largely deleted and replaced with model specific text that explains the methods.
24788	11	14	10	14	12	Suggested citation in relation to methods for factoring out that describes two approaches: Cowie, AL. Kirschbaum MUF and Ward M 2007 Options for including all lands in a future greenhouse gas accounting framework. Environmental Science and Policy.10, 306-321	Accepted with modification. Text now deleted.
37688	11	14	13	14	14	The last sentence in paragraph is a fragment.	Accepted. Text deleted.
31505	11	14	14			Typo of word "calculated"	Accepted. Text deleted.
30974	11	14	15	14	36	This paragraph could be shortened, given the detail presented in Box 11.1	Accepted. Paragraph shortened and box deleted and integrated with text.
30975	11	14	23	14	23	Suggest defining "legacy effects", or delete.	Accepted. Deleted.
37689	11	14	26	14	26	A better explanation/definition is warranted, as well as citation for legacy effects	Accepted with modification. Text clarified and "legacy effects" deleted.
37690	11	14	31	14	32	The authors should mention the possible causes of the 1.93 +/- uncertainty	Accepted. It was already stated in the text reasons fir differences among the results (now modified to "Global FOLU CO2 flux estimates (Table 11.1 and Figure 11.6) are based on a wide range of data sources, and include different processes, definitions, and different approaches to calculating emissions (see Houghton et al. 2012; Le Quéré et al., 2013; Pongratz et al., 2013). This leads to a large range across global FOLU flux estimates. ") Plus methods of calculating the errors (e.g. expert opinion or model standard deviation) are given in Table notes.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32655	11	14	35	14	36	ditto. 2.93 Gt with an uncertainty of up to +/-2.93 Gt.	Accepted. It was already stated in the text reasons fir differences among the results (now modified to "Global FOLU CO2 flux estimates (Table 11.1 and Figure 11.6) are based on a wide range of data sources, and include different processes, definitions, and different approaches to calculating emissions (see Houghton et al. 2012; Le Quéré et al., 2013; Pongratz et al., 2013). This leads to a large range across global FOLU flux estimates. ") Plus methods of calculating the errors (e.g. expert opinion or model standard deviation) are given in Table notes.
33306	11	14	37	15	44	Box 11.1 Approaches to calculating FOLU flux could be shifted to Metrics and Methodologies Annex and be replaced by a box “Deforestation”, as this is persistently a major contributor to emissions and the information in the main text is somewhat scattered.	Accepted with modification. While most of the data in this section is on deforestation, it is the inclusion of forest management that is patchy and the reason for some of the differences between results. However the text in eh box has been simplified and incorporated within the main text in amore systematic manor.
22132	11	14	37	15	44	Box 11.1 could be shorter. The descriptions are too long.	Accepted. Box deleted. Text shortened and incorporated with main text.
21008	11	14	37	15	44	Please give the sources for the three databases in paragraph a). Also, FAOSTAT does not rest on IPCC Tier 1 methodologies, rather, country-specific approaches are used and much more information than included in GHG reporting is contained in this database.	Accepted. References given to databases. FAO approach to estimating emissions is based on IPCCC approach, this text has been prepared by FAO lead author who worked on eh emissions estimates. Yes FAO uses their own information rather than IPCC defaults, but the methodological approach deliberately follows IPCC to be consistent. Also the text only says "based on" so is not exclusive to IPCC data and information.
20128	11	14	37	15	44	Box 11.1 can be shorter, description are quite extensive.	Accepted. Text abridged and incorporated in main text, box deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22484	11	14	37	15	44	Different approaches to calculating the FOLU flux were listed in the box 11.1. The differences and characteristics should be pointed out because they were based on a variety of theoretical basis and assumptions, suitable for different regions and scenarios.	Rejected. Agree with reviewer, but box now deleted and text considerably shortened.
37691	11	14	41	14	45	In addition to information about mandatory and optional reporting why not include examples of countries whose optional reporting provides a successful prototype to emulate - assuming this is a document to inform and guide. If the authors deem this inappropraite, then perhaps a citation or two which would provide the illustration.	Rejected. Text here has been significantly shortened in line with other review comments, guidance in methodologies is provided under IPCC 2006. Box deleted and very reduced information is now in the main text
29518	11	14	45		47	Explain which IPCC guidelines are used for reporting in KP-CP1 and CP2	Rejected. Text here has been significantly shortened in line with other review comments and KP no longer mentioned
29428	11	14	45	15	3	Clarify which IPCC guidelines apply for KP CP-1, CP-2 and which are used in these databases.	Rejected. Text here has been significantly shortened in line with other review comments and KP no longer mentioned
24789	11	14	45	15	3	Clarify which IPCC guidelines apply for KP CP-1, CP-2 and which are used in these databases.	Rejected. Text here has been significantly shortened in line with other review comments and KP no longer mentioned.
37692	11	14	45	14	45	"reporing" should be "reporting"	Accepted with modification. Text deleted.
25827	11	14	47	14	47	Definition of the term "emission factor" in Glossary should be modified by adding the words "or product" after the word "activity". Several other issues are seen with the Glossary: (a) Definition of "geenhouse gases" should include one more gas (i.e. Nitrogen trifluoride (NF3) for the second commitment period of the Kyoto Protocol. (b) Definition of "market-based mechanism" includes "taxes' which is not correct, since taxation measures are fiscal measures and not market-based measures. (c) In definition of the term "Meeting of the Parties (MOP)" the words "to the Protocol" should be added after the words "Meeting of the Parties" in line 15. (d) In line 41 of the Glossary, instead of "six types" it should say "seven types" or should delete the words "six types of".	Noted. For the glossary.
21229	11	14	7			Change term to "cumulative"	Rejected. This comment does not seem to relate to the given page and line number.
19355	11	14	7	14	8	I don't understand this sentence.	Accepted. Text modified.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30972	11	14	9	14	10	In addition to direct effects of human activity, and indirect environment change effects, which is the effect of natural disturbances and changes in natural disturbance rates. It is unclear here if this is meant to be captured by the term "environmental change" effects. Thus ideally we would determine FOLU fluxes, i.e. the effect of human activity, by factoring out indirect environmental effects and natural disturbance effects. The importance of trying to factor out natural disturbances has been recognized in UNFCCC negotiations in which the 2011 Durban agreement on LULUCF under the Kyoto Protocol allowed Parties to exclude natural disturbance emissions so as to better reflect anthropogenic emissions/removals (Decision 2/CMP.7 at http://unfccc.int/resource/docs/2011/cmp7/eng/10a01.pdf#page=11).	Accepted with modification. Text now deleted. changes in natural disturbance, if they are bought about by changes in climate or CO2, would be part of the indirect environmental change effects, added this to the previous paragraph. While UNFCCC attempts to factor out indirect environmental change effects (e.g. reference levels in FM and excluding natural disturbance) this is less relevant to the other methods in fig 11.6, modeling methods do not account for natural disturbance, satellite or fire methods would pick it up.
27899	11	14	9	14	9	Add after "methods" "models".	Rejected. Models is one of the methods. In any case this text is now deleted.
30976	11	14		15		Suggest revising or removing Box 11.1 - it is quite lengthy and overly detailed.	Accepted. Box removed.
27227	11	14	2		3	be more precise: there is no such thing as Tier 1 IPCC Guidelnes. There are tier 1 methodologies in the IPCC Guidelines. Do they use default values from the good practice guidance or from the 2006 IPCC Guidelines. Should be clearer on what they use.	Accepted with modification. Text now forms a footnote earlier in the chapter as follows: "Parties to the UNFCCC report net GHG emissions according to IPCC methodologies (IPCC 2006). Reporting is based on a range of methods and approaches dependent on available data and national capacities, from default equations and emission factors applicable to global or regional cases and assuming instantaneous emissions of all carbon that will be eventually lost from the system following human action (tier 1) to more complex approaches such as model-based spatial analyses (tier 3)."

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27221	11	14	38		38	IPCC does not have accounting methods, only methodologies for estimating and reporting GHG net emissions	Accepted with modification. Text now forms a footnote earlier in the chapter as follows: "Parties to the UNFCCC report net GHG emissions according to IPCC methodologies (IPCC 2006). Reporting is based on a range of methods and approaches dependent on available data and national capacities, from default equations and emission factors applicable to global or regional cases and assuming instantaneous emissions of all carbon that will be eventually lost from the system following human action (tier 1) to more complex approaches such as model-based spatial analyses (tier 3)."
27222	11	14	40		40	Please correct: IPCC GHG Inventories Guidelines and Guidance - few estimates have been produced under the UNFCCC using the 2006 GLs. Only from 2015 onwards, Annex I Parties will use the 2006 IPCC Guidelines to report their GHG emissions and removals to the UNFCCC. So far they have used the 1996 Revised IPCC Guidelines and Good Practice Guidance (IPCC 2000, 2003)	Accepted with modification. Text now only refers to IPCC methodologies (not estimates) and gives reference to 2006 as the most up to date reference to look up the methods. Note also text much reduced and appears as a footnote earlier in the chapter.
27223	11	14	41		45	Please be more precise: Annex I Parties report annually to the UNFCCC their net GHG emissions as part of their commitments under the Convention. In addition, Annex I Parties that are Parties to the Kyoto Protocol report and account (following specific accounting rules agreed by the Convention body) GHG emissions from mandatory (afforestation, reforestation and deforestation) and elected (if any, among forest management, cropland management, grassland management and revegetation. Footnote: from 2015 onwards, these Parties shall report and account net emissions from forest management; and can elect wetland drainage and rewetting).	Accepted with modification. Text now forms a footnote earlier in the chapter as follows: "Parties to the UNFCCC report net GHG emissions according to IPCC methodologies (IPCC 2006). Reporting is based on a range of methods and approaches dependent on available data and national capacities, from default equations and emission factors applicable to global or regional cases and assuming instantaneous emissions of all carbon that will be eventually lost from the system following human action (tier 1) to more complex approaches such as model-based spatial analyses (tier 3)."

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27224	11	14	45		45	please add: reporting to the UNFCCC and to the KP is based on a range of methods and approaches	Accepted with modification. Text now forms a footnote earlier in the chapter as follows: "Parties to the UNFCCC report net GHG emissions according to IPCC methodologies (IPCC 2006). Reporting is based on a range of methods and approaches dependent on available data and national capacities, from default equations and emission factors applicable to global or regional cases and assuming instantaneous emissions of all carbon that will be eventually lost from the system following human action (tier 1) to more complex approaches such as model-based spatial analyses (tier 3)."
27225	11	14	46		47	... And national capacities, from use of default methods and emissions factors (tier 1) to use of more complex approaches (e.g. model based) referred to as tier 3.	Accepted with modification. Text now forms a footnote earlier in the chapter as follows: "Parties to the UNFCCC report net GHG emissions according to IPCC methodologies (IPCC 2006). Reporting is based on a range of methods and approaches dependent on available data and national capacities, from default equations and emission factors applicable to global or regional cases and assuming instantaneous emissions of all carbon that will be eventually lost from the system following human action (tier 1) to more complex approaches such as model-based spatial analyses (tier 3)."
27226	11	14	48		48	Non-Annex I Parties report on a less regular basis and use the 1996 Revised IPCC Guidelines, being encouraged to use the IPCC Good Practice Guidance on Land Use, Land-use Change and Forestry (IPCC, 2003).	Accepted with modification. Text now only refers to IPCC methodologies (not estimates) and gives reference to 2006 as the most up to date reference to look up the methods. Note also text much reduced and appears as a footnote earlier in the chapter.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29427	11	14	9	14	14	This par is not clearly expressed, so needs rewording. At line 10, cite in relation to methods for factoring out Cowie, AL. Kirschbaum MUF and Ward M 2007 Options for including all lands in a future greenhouse gas accounting framework. Environmental Science and Policy.10, 306-321 , which describes two approaches for factoring out.	Accepted with modification. Text now deleted.
27220	11	14	21		21	change human action by human intervention	Rejected. "Action" is more like "activity" which is the term more commonly used in IPCC.
37693	11	15	1	15	1	Citation(s) needed after EDGAR and FAOSTAT	Accepted. Added references.
34001	11	15	13	15	14	Page 15 lines 13/14: 'assuming instantaneous emissions…….emissions from cl=ultivated organic (peatland) soils…..'. Note that CO2 emissions from cultivated organic soils are not instantaneous but rather continues over time as long as the soil is drained. Please check if the emissions factors that are given than are reliable.	Rejected. I agree that theses emissions re not instantaneous, but this is the assumption of the methodology being applied. In any case text is deleted from here but still found in footnote at start of this section.
21230	11	15	14			Change term to "calculated"	Noted. It seems to be for a different page and line number.
30203	11	15	19	15	25	Houghton's book keeping model relies on FAO data, which in turn relies on country reporting. It is worth mentioning it as many consider the country-dependent nature of reporting as introducing errors. Suggest rephrase to "based 20 primarily on REPORTING BY INDIVIUAL COUNTRIES TO FAO FRA data since 1970, with regional assumptions made about conversion to 21 different land use.	Rejected. Agree with the reviewer but text in this section has had to be shortened considerably. Since the Houghton data, the HYDE data and the FAO data in this section are all based on FAO reporting this issue is common to all and not limited to the Houghton approach. It is incorporated in the estimated uncertainty based on expert opinion in the Houghton et al., 2012 paper referenced here.
30977	11	15	20	15	32	This is difficult to understand. Suggest converting sentence fragments to a bulleted list.	Accepted with modification. Box now deleted and text incorporated into main text in proper sentences.
29519	11	15	3			Specify which IPCC guidelines are used in these databases (1996?2006?).	Rejected. Text now deleted.
25355	11	15	4	15	4	EDGAR covers the period 1970-2008: Now EDGAR has got data up to 2010, which have been used in Chapter 5	Accepted. Reference to time period deleted.
27230	11	15	12		12	please explain of a NET forest conversion mean? Does it mean the result from the emissions from forest - removals from the new land-use category to which it has been converted? Not clear...	Accepted with modification. Text deleted.
27231	11	15	13		13	instantaneous emissions of living biomass? Or other C pools?	Accepted with modification. Text deleted, although it was from all pools.
27232	11	15	39		39	instantaneous emissions of living biomass? Or other C pools?	Accepted with modification. Text deleted, although it was from all pools.
27228	11	15	5		5	what the acronym GFED stand for?	Accepted. Wrote out acronym.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27229	11	15	6		6	what other fires? Burning of crop residues?? Please give examples.	Accepted with modification. Text modified but not added examples as distinguish AFOLU fires from other (i.e.. non AFOLU) fires "However, GFED 2.0 fire data does not distinguish anthropogenic AFOLU fires from other fires, unlike GFED 3.0 (van der Werf et al., 2010; Box 11.2)"
27358	11	15	11		11	remove OF from estimated of forest C stock	Accepted with modification. Sentence now deleted.
27359	11	15	20		20	change to WOOD products	Accepted with modification. Sentence now deleted.
22401	11	16				Difficult to read this figure	Accepted. Figure simplified.
19092	11	16				Dotted bule line not distinct	Accepted. Figure simplified.
19093	11	16				Figure not coloured. Difficult to determine!	Accepted. Figure simplified, but the original was coloured.
31465	11	16	1	16	20	In the figure text "Forestry" is included as a source of emission. Is that correct? Forestry in this respect must be understood as sustainable forest management practices on forest land remaining forest? Forestry (Sustainable forest management) must be a sink, not a source? Please see residual terrestrial sink in table 11.1. And TS.4.6 AFOLU	Rejected. Forestry is not all sustainable forest management, in many parts of the world forest management is not sustainable and results in degradation and net carbon loss. The residual sink term is the effects on environmental drivers on unmanaged lands.
30978	11	16	1			For interpretation, it would be helpful to know the likely reason for the anomalously high carbon emissions from land use and forestry during the 1950s based on most of the approaches shown in this figure.	Accepted with modification. Figure now only shows emissions from 1970 in line with focus period for this chapter. The reason for the peak is an active point of discussion among the modeling and data groups, it seems is may be partly an artifact in the underlying HYDE data set, when there was a shift from a variety of historical data and assumptions to use of the FAO database.
21009	11	16	1			Please consider reworking this figure. The number of lines is too high (the graph is too confusing) and given the inherent uncertainties deleting some lines or grouping models and giving bands would result in a figure that is easier to comprehend.	Accepted. Figure simplified.
37695	11	16	1			The authors should consider setting this information in the context of what we need to mitigate in order to retain a 2C rise within the time frame of this data set; what is the time frame of this data set and the resulting dollars (2007 dollars, 2010?)?	Noted. Page number wrong.
37696	11	16	1			This graph is only mentioned twice in the text is not well integrated with those comments. In addition the enormous variation represented by the three models is not addressed and needs to be	Noted. Page number wrong.
37697	11	16	1			Define COP in the caption; "RED" in the second box under 2005 is this correct or should be REDD?	Noted. Page number wrong.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37694	11	16	1			Is the mean harmonic or geometric?	Noted. Neither the mean is arithmetic.
19356	11	16	13			I can't see the symbols for the different models in this Figure, instead there are a lot of question marks.	Noted. Formatting problem; figure simplified.
30979	11	16	14			This figure has formatting problems. Suggest using color for the bars depicting the various approaches to estimating carbon fluxes from land use change and forestry.	Noted. Formatting problem, figure looks fine and in colour in my version, figure in any case simplified.
30980	11	16	14			The x-axis label obscures negative values. None of the vegetation models results can be easily identified, and only 3 of the 6 models are mentioned in the text. Perhaps simplify the figure.	Accepted. Figure simplified.
21010	11	16	14			Bars are not coloured, please correct or delete individual models' results from the figure.	Noted. Formatting problem; figure simplified.
37698	11	16	14			Visability/readability on this figure is challenging	Accepted. Figure simplified.
32656	11	16	15			this is an example of a figure where the error bars in measurement need to be reflected.	Rejected. The majority of the errors is signified in the range across the models, as there is no estimate of the regional error available.
22485	11	16	15			Some words in this figure can not be correctly shown.	Noted. Formatting problem; figure simplified.
19043	11	16	16			This figure is very hard to read. You may need to improve the quality (resolution) and also change the alignement of the dates (avoid overlaping).	Accepted. Figure modified.
37699	11	16	16			In the caption, does assumed gross energy value of DM biomass refer to harvest or at consumption?	Noted. Page number wrong.
37700	11	16	24			The enormous variation between models and between carbon pricing costs needs to be further discussed in the text. Suggest a box highlighting hypothesized causes for this variation (from published literature) and point to solutions for policy makers to consider at various scales and in various contexts.	Noted. Page number wrong.
27233	11	16	10		10	remove putsputs from The remaining process models putputs were updated	Accepted. Text deleted.
24159	11	17				Taiwan is not a sovereign state, and it is part of China. The figure should use the same colour with China.	Accepted with modification. Agree with the reviewer, but IPCC is an assessment of published literature, and this was how the figure was published. Countries are not specified. In any case, figure now deleted.
25146	11	17				Unfortunately, this figure is basically impossible to decipher. That it requires such an extended explanation suggests it will be incomprehensible even to specialists.	Noted. Page number wrong.
22402	11	17		17		All Africa appears under Tropical in the legend. This is certainly not true.	Accepted with modification. Agree with the reviewer, but IPCC is an assessment of published literature, and this was how the figure was published. In any case, figure now deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19094	11	17				The Indian sub-continent is missing frrom Fig. 11.8. However, the latest FAO figures show the forest area is stable in India, so I suspect that there may be a slight source of CO2. Overall, there are possitive sinks of 3.86 and 4.43 GtCO2 eq./yr for the periods 1990-99 and 2000-2007 yet in Fig. 11.6 and on page 14 lines 35 &36, for the same periods, the net emissions are 4.40 and 2.92 GtCO2/yr. Why the difference? Are you just comparing regrowth with gross deforestation? SEAsia and Latin America show net emissions and all the other regions are net sinks. Figure 11.9 on page 18 seems to differ from figur 11.8. Should be consistent!	Accepted with modification. Agree with the reviewer, but IPCC is an assessment of published literature, and this was how the figure was published. In any case figure now deleted. Reforestation in India mentioned earlier in the section under regional fluxes. There is also a new graph added with the Pan data showing clearly what is regrowth and what is gross deforestation.
26144	11	17				The message in the figure related to the decreasing sink in Northern Europe does not correspond to our knowledge/information based on UNFCCC/LULUCF data. The figure seems erraneous. It would be necessary to provide similar kind of information based on UNFCCC/LULUCF data. At least the limitations/uncertainties of the figure should be explained in the the text.	Accepted with modification. The pic did not produce this figure but reproduces it from the literature, its methods differ from UNFCCC reporting, this section is already clear about the high uncertainties in estimating FOLU data. It is not possible to also show the same form UNFCCC data as not all countries report, and methods vary so much between countries, including how much of their forest land they report on. In any case the figure is now deleted, in part because it was confusing as the data in northern extratropics were for FOLU plus intact forests.
27235	11	17	1	17		Here the emphasis is given to the recent afforestation in China and India but no mention has been made to the PRODES data since 2000 which has shown a decrease in deforestation in Amazonia of 36 % until 2007, or if we consider 2005 to 2010 a reduction of 63 %. Our suggest: This is consistent with a reduced rate of deforestation, for example Brazil (box 11.7), and some areas of afforestation most notably in India and China (FAO (FRA, 2010)	Accepted with modification. Previous sentence mentions reduced rate of deforestation in LAM, added example of Brazil.
21231	11	17	10			Term "putputs" might need to be revised	Accepted. Deleted.
29430	11	17	11	17	11	What regions?	Accepted. Added "temperate and boreal."
24791	11	17	11	17	11	Please specify what regions are being referred to.	Accepted. Added "temperate and boreal."
35290	11	17	13	17	24	Taiwan is part of China, and should have the same color as China.	Accepted with modification. Agree with the reviewer, but IPCC is an assessment of published literature, and this was how the figure was published, countries are not specified. figure now deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22403	11	17	29	17	32	Any explanation regarding the decline of net FOLU emissions	Accepted. The previous paragraph discusses the reduced rates of deforestation and some areas of afforestation in India and China.
31466	11	17	4	17	4	Substitute "temperature" with "temperate"	Accepted. Text modified.
19357	11	17	7	17	7	Crop abandonment? Or crop land abandonment?	Accepted. Modified to cropland abandonment.
24790	11	17	7	17	11	This is a substantial effect. However, it is stated to be based on unpublished work. Its veracity must be assessed before inclusion. If it is agreed to be an accurate assessment then it deserves greater prominence.	Accepted. Paper now published.
29429	11	17	8	17	11	This is a substantial effect. However, it is stated to be based on unpublished work. Its veracity must be assessed before inclusion. If is is agreed to be an accurate assessment then it deserves greater prominence.	Accepted. Paper now published.
27236	11	17	25	18	14	Please consider bringing the text that starts on line 25 (page 17) and ends on line 14 on page 18 be inserted BEFORE Figure 11.8, to facilitate analysis.	Accepted. Text and figures placement will be set at publication.
30984	11	18				The total under gross emissions does not equal the sum of the sub-totals.	Accepted. Table now replaced with figure and numbers adjusted.
25147	11	18				The table suggests gross emissions from industrial wood harvest of 1.65 GtCO2/yr and net of only 0.01. This does not seem plausible, and in any event does not incorporate more recent research and analysis on “net carbon neutrality” for the harvested wood products supply chain and for forest carbon pools, including soil carbon. See for example: McKinley et al., "A synthesis of current knowledge on forests and carbon storage in the United States," Ecological Applications 21(6), 2011, pp. 1902-1924. available at: http://www.fs.fed.us/rm/pubs_other/rmrs_2011_mckinley_d001.pdf	Accepted with modification. Agree with the reviewer, but IPCC is an assessment of published literature, and this was the published data. There is not space in the paper to go into all the many errors with the methods, needless to say this chapter acknowledges the errors are large as reflected in the error estimates given in Table 11.1. The table is now deleted and replaced with a graphic.
27238	11	18				remove the zero from the total under gross deforestation (2.280 should read 2.28)	Accepted with modification. Table now replaced with figure and numbers adjusted.
27237	11	18				Include ANNUAL AVERAGE gross and net emissions of carbon	Accepted. Table replaced with figure that says "mean annual CO2 flux."
19095	11	18				The gross emissions total of 2.280 are in GtC not GtCO2 eq. All other figures in the table are in GtCO2 eq.	Accepted. Table now replaced with figure and numbers adjusted.
19096	11	18				The figures in this table are given in Pg C/yr for the period 2000-2009. For consistency should be given as Gt C/yr (or Gt CO2 eq./yr. I estimate that if all the bar totals are added, the total emissions are 5.6 GtC/year - equivalent to 20.5 GtCO2/yr! They don't seem to be compatible with data in Fig. 11.8 or Table 11.2. I am confused.	Accepted with modification. Figure deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37705	11	18				The authors should consider adding a summary box or graph showing emissions from Peatlands, Fires, etc.	Accepted with modification. There is already a summary box for emissions from fires and for peatlands. Fire-based CO2 emissions where they are associated with FOLU are already included in the modeled FOLU emissions estimates in the other figures and tables in this section. Emissions from peat are generally not included in the modeled estimates, but are included in the FAO and EDGAR estimates and these are now shown with and without peats in figure 11.6. Also peat fires and non-CO2 Flu fire emissions re added to fig 11.2.
37701	11	18	1	18	1	Please define "FD".	Noted. Comment does not seem relevant to this location.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21362	11	18	11		12	Refering to harvesting as degradation demonstrates a woeful lack of understanding of forestry. The political assumptions in relation to stocks and flows for reporting have no place in describing the science. Under ipcc definitions there is no emission from harvested wood as it leaves the forest, nor is there any sink process in wood products, but there is an emission when wood is combusted. If the IPCC is not going to follow its own definitions and science principles, it must explain why not and why an alternative has been selected.	Accepted with modification. To clarify from the broader term "degradation" text has been modified to say "representing a degradation for forest carbon stocks" Table is now replaced with a graphic showing sources and sinks, the term "degradation ' is not used. The numbers are from the scientific estimates of Houghton et al. which does not follow IPCC methodologies . Within the scientific model assessments attempts are made to calculate all stock changes and all fluxes the atmosphere sees . When wood is harvested some carbon is lost from slash and soil decomposition, some goes into sinks in wood products and the carbon is release later from these product pools at different timescales (e.g. paper, timber). it is not possible to use UNFCCC/IPCC reporting methods to estimate tropical FOLU emissions as data is so patchy . IPCC working group reports do not have to follow IPCC reporting methodologies but must rather assess all the science available. IPCC reporting methods are the result of specific needs, capabilities and political negotiations e.g. an assumption if instantaneous emissions under tier 1 methods, and for HWP.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21012	11	18	15	18	24	If you give the KP 3.4-activities Afforstation and Deforestation, Reforestation should be given explicitly, too. In addition, considering wood harvest as degradation in general is "questionable". Please explain how you define and estimate legacy fluxes. If harvest emissions are estimated on a stand-level "instantaneous oxidation" basis, including legacy emissions from residues would be double-counting.	Accepted with modification. This was not following KP definitions but is from a publication in the scientific literature. Wood harvest in and of itself is not considered degradation in this paper, it is only where wood harvest leads to a loss of carbon over time that this paper considers it to be degradation of forest carbon stocks leading to net emissions. To clarify from the broader term "degradation," text has been modified to say "representing a degradation for forest carbon stocks". Reference to "legacy fluxes" now deleted from this section.
21014	11	18	15	19	4	Please either delete the figure or the table and / or expand the table to a global scale. Figure and table contain the same type of information.	Accepted with modification. Is now combined to a figure based on data in the table. Not possible to expand to the global scale as this analysis was based on tropical satellite data. Non-tropical net emissions can be seen in figure 11.7.
27900	11	18	15	18	24	Check numbers in the second column, the total should be 8.36 instead of 2.280.	Accepted. Table now replaced with figure and numbers adjusted.
22486	11	18	15			The total gross emissions should include sub-total forest area change(3.52)and sub-total for degradation(4.84), which may be 8.36 rather than 2.280.	Accepted. Table now replaced with figure and numbers adjusted.
19358	11	18	21			The total in the first column is wrong, should be 8.36.	Accepted. Table now replaced with figure and numbers adjusted.
24793	11	18	21			Gross emissions column does not add up.	Accepted. Table now replaced with figure and numbers adjusted.
30981	11	18	22			The value given for total gross emissions (2.280, bottom row of this table) should read 8.36 (sum of the subtotals 3.52 and 4.84) rather than 2.280. The latter value appears to be erroneously given in units of GtC/yr rather than GtCO2/yr (2.28 GtC/yr = 8.36 GtCO2/yr).	Accepted. Table now replaced with figure and numbers adjusted.
37702	11	18	22	18	24	How is 'uptake from recovering forests' defined and calcualted? Is it from the forest/region the wood harvest and subsistence activities were conducted? This is very vague, so please explain how these numbers are derived.	Accepted with modification. It is regrowth after harvest in the same location. Numbers are derived from the Houghton bookkeeping methodology as now stated in new figure caption with methods explained briefly earlier in text. Note that this table now appears as part of a figure.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30982	11	18	25			This figure difficult to interpret. If it is necessary to retain this figure, then more explanation is needed.	Accepted. Figure now replaced with one based on data in Table 11.2.
30983	11	18	25			Please identify the components "a" to "e" in the figure caption.	Noted. Figure now deleted.
31506	11	18	25			Need to define categories a to e on y axis	Noted. Figure now deleted.
21013	11	18	25	19	4	This figure needs more explanation. What is meant by "a." - "e.", why are there two bars showing "net flux"?	Noted. Figure now deleted.
27901	11	18	25	18	27	Preferably the figure should become bigger.	Noted. Figure now deleted.
37703	11	18	26	19	4	Please explain in more depth the lines a-e (eg the difference between the two net flux lines)	Noted. Figure now deleted.
27239	11	18	28		28	do the Las mean CO2 emissions are balanced by uptakes	Accepted with modification. No, it is meant to refer to carbon, i.e. there is not net change in carbon stock. This is because burning emits CO2, CO and CH4, but regrowth takes up CO2, so overall net stock remains the same if the fire cycle is sustainable. Text now deleted.
37704	11	18	40	18	40	The authors should rewrite this sentence as it is unclear in its current state.	Noted. This location does not exist, comments must be for elsewhere.
29431	11	18	6	18	6	Not clear what is meant by "and this is the amount that can be mitigated". Reword.	Accepted. Text deleted.
24792	11	18	6	18	6	Please clarify what is meant by "and this is the amount that can be mitigated".	Accepted. Text deleted.
21011	11	18	6	18	9	Please give a citation backing the assumption that temporary forest cover loss due to management amounts to forest degradation.	Accepted with modification. No citation is needed, if emission are not balanced by uptake, this represents an overall net loss of forest carbon, however to clarify from the broader term "degradation" text has been modified to say "representing a degradation for forest carbon stocks". The reference is already given as Baccini et al., 2012 . The data from Baccini and Hiang and Asner have been swapped to make this clearer.
29432	11	18		18		Gross emissions column doesn't add up.	Accepted. Table now replaced with figure and numbers adjusted.
23778	11	19				Gross emissions should total up to 8.36 GtCO2/yr.	Accepted. Table now deleted.
34003	11	19	14			compliancy needed on the emissions factor. Here it is 0.75 Gt CO2/yr, while in other parts of the document 0.7 Gt is being reported.	Accepted. Here we give all numbers to 2 decimal places and this is the correct number.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37706	11	19	20	19	45	Fires with grass mostly balance out the CO2 issue- in general- the amount of CO2 leaving a grassland is similar if it is burned, grazed or nothing at all-- it is just the rate that changes-- fire all at once, grazing through a cow, no grazing through slow decomposition. when you move into shrubs and forests it gets a bit more complex. The stems and such are carbon that do not decompose very fast so in a sense it is sequestered although eventually much of it ends up in the atmosphere. The big issue is how much of the carbon ends up in the soil-- most fires do not affect soil carbon-- although some in the boreal forest may. The other important issue is that charcoal-- resulting from incomplete combustion that occurs in every fire-- is extremely long-lived in the soil or buried in a lake- this black carbon may be an important soil feature and could be a long source of sequestration. Some of the best data on this is from the Konza Prairie in Kansas but there are many good studies around the country. Such information can/should be reflected in the text here.	Accepted with modification. Agree with the reviewer but this level of detail is too much when overall the amount of text has to be cut. Deleted text on systems in balance.
31507	11	19	21			Typo of word "ecosystem"	Accepted. Text modified.
26086	11	19	22			*Observation: Which study is being referred to here (no reference provided)? Pendleton et al (2012) estimate that 0.15–1.02 billion tons of carbon dioxide are released annually from blue carbon ecosystems (0.09–0.45 (Pg CO2 yr-1 from mangroves). It would be valablue to expand this section to discuss the potential value of blue carbon in more detail (currently addressed only in a sinlge sentence 'more research needed on the mitigation potential of mangroves'), as there is also a need to explore carbon market mechanisms to compensate those conserving blue carbon ecosystems, such as indigenous and local communities practicing traditional watershed management systems (e.g.in the traditional practice of “satoumi” (now implemented as part of Japan’s national environmental policies), Japanese fishermen participate in habitat rehabilitation activities, such as seagrass planting and tree planting in watersheds (Yagi 2011); other traditional watershed management systems include the Hawaiian ahupua’a, the Yap tabinau, the Fijian vanua, the Marovo (Solomon Islands) puava and the Cook Islands tapere (Vieros, in press). *Reference: Pendleton L, Donato DC, Murray BC, Crooks S, Jenkins WA, Sifleet S, Craft C, Fourqurean JW, Kauffman JB, Marba N, Megonigal P, Pidgeon E, Herr D, Gordon D. and Baldera A. (2012) Estimating Global ‘‘Blue Carbon’’ Emissions from conversion and degradation of vegetated coastal ecosystems. PLoS ONE, vol 7, issue 9, pp: 1-7 | Yagi N (2011) Satoumi and institutional characteristics of Japanese coastal fishery management. In: United Nations University Institute of Advanced Studies Operating Unit Ishikawa/Kanazawa (2011). Biological and Cultural Diversity in Coastal Communities, Exploring the Potential of Satoumi for Implementing the Ecosystem Approach in the Japanese Archipelago. Secretariat of the Convention on Biological Diversity, Montreal, Technical Series no. 61. | Vierros M (in press) Communities and blue carbon: the role of traditional management systems in providing benefits for carbon storage, biodiversity conservation and livelihoods, Climatic Change.	Rejected. This section had to be considerably shortened. The box title was modified from "peatlands, wetlands" to "peatlands, mangroves."
21015	11	19	25			Please give at least one citation backing the equilibrium hypothesis concerning fire-related emissions. And please explain in greater detail how deforestation and degradation fires were differentiated from other fires. With regard to constant change and existing natural and anthropogenic drivers no fire can be considered to NOT result in net emissions. And, lastly, the fire prevention management conducted in the conterminous USA resulted in unpreceded fuel loads and "catastrophic" fires, so this sink is quite vulnerable.	Accepted with modification. Text deleted.
31467	11	19	26	19	26	Please consider to include “Black carbon” in this sentence?	Accepted. Added black carbon.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29779	11	19	26	19	45	Please, consider contributions on tropical savannas such as Grace, J., San José, J., Meir, P., Miranda, H. & Montes, R. 2006. Productivity and carbon fluxes of tropical savannas. J. Biogeogr. 33:387-400 and San José, J. & Montes, R. 2007. Resource apportionment and net primary production outcome across the Orinoco savanna-woodland continuum. Acta Oecol. 32:243-253.	Rejected. This section had to be considerably shortened, it therefore focuses on the main FOLU fluxes, Savannas burn as part of a natural and also managed cycle. Only managed burns are relevant here, but net emissions are not as high as for deforestation and forest degradation.
37707	11	19	27	19	29	In the ES, this burning/regrowth balance was discussed in the context of the 'natural cycle' balancing over time in the absence of human activity. Here, however, the examples given via eg seem human-based activities, hence it cannot be held for certain that this balance would come to pass in decades. Please either fix this sentence/sentences to reflect the non-anthro circumstance of this balance over time or refine this sentence to not be so definitive (in the context of antro-activities, c emissions may or not be balanced over time due to frequency and other human interventions).	Accepted with modification. Text deleted.
30987	11	19	29	19	31	The sentence beginning "Only fires where…" is misleading. Perhaps reword as: "There are net emissions to the atmosphere if regrowth is prevented (e.g. deforestation, drained peatlands) or reduced (e.g. from increasing levels of disturbance degrading the soil and reducing carbon stocks)."	Accepted with modification. Text deleted.
22404	11	19	29	19	32	Sentence not clear "Only fires where land is permanently cleared (e.g. deforestation, 29 drained peatlands), or has increasing levels of disturbance resulting in degradation of soil and 30 vegetation carbon stocks, are there net emissions of carbon to the atmosphere".	Accepted with modification. Text deleted.
37708	11	19	29	19	31	This is oversimplying the issue and a generalization. Without any detailed discussion of timeframes, this may not hold and should NOT be included in such a definititive statement. Where are the citations (more than one here would be useful)?	Accepted with modification. Text deleted.
30988	11	19	33	19	33	Suggest changing to "It can be hard to separate…" It is not the case that it always is hard to separate the causes of fire as natural or anthropogenic. In northern and especially unmanaged forests where human populations and activity are low, it can be easy to identify natural fires.	Accepted with modification. Text deleted.
31468	11	19	40	19	42	The figure, 0.38 Gt C/yr from tropical deforestation and degradation fires including CO2, CH4,CO and BC is converted to 1.4 Gt CO2 eq. Is this correct; the warming effect from metane and BC may justify a higher conversion factor	Rejected. Agree with the reviewer but the GFED publication only gives total carbon emissions.
37709	11	19	43	19	45	This is unbalanced in terms of reviewing/representing the lit. Some studies have shown the complete oppose result, so this statement cannot be justified solely on one citation - the jury is out on this one, so this should also say, "but in some cases it may not".	Accepted with modification. Deleted sentence.
37710	11	19	44	19	45	How are they incorporated? If per the above rationale, they would be a zero, as they are balanced (which is a generalization of the issue and not always true). Please state explicitly how they are incorporated.	Rejected. It is not possible to go into all the details of how they are included , especially as this chapter had to be shortened. However, the text on fires being balanced is deleted. Essentially how they are incorporated is it is assumed some of the land clearing is by fire, and this has a different emission pattern over time to clearing by harvest.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24794	11	19	5	19	23	Box 11.2: This is a very important message - support that this be kept when the chapter is shortened. Also, suggest consider including reference to the fact that sea level rise will push mangroves and other coastal habitats inland; if this retreat is impeded by land use factors (barriers to movement) then there is potential to lose the carbon sink that mangroves etc. represent. Would carbon stores originally put in place by mangroves be quickly released from the seabed when mangroves leave? Suggested citations: Eric L. Gilman, Joanna Ellison, Norman C. Duke, Colin Field (2008) Threats to mangroves from climate change and adaptation options: a review. Aquatic Botany, Volume 89, Issue 2, Pages 237–250 Lovelock CE et al. (2012) Tidal wetlands. In Marine Climate Change Impacts and Adaptation Report Card for Australia 2012 (Eds. E.S. Poloczanska, A.J. Hobday and A.J. Richardson). Retrieved from www.oceanclimatechange.org.au [08/03/2013] http://www.oceanclimatechange.org.au/content/index.php/2012/report_card_extended/category/tidal_wetlands Traill, L.W., Perhans, K., Lovelock, C.E., Prohaska, A., Rhodes, J.R. and Wilson, K.A. (2011) Managing for global change: wetland transitions under sea level rise and outcomes for threatened species Diversity and Distributions, 17: 1225–1233 Shoo. L, O'Mara, J., Perhans, K., Rhodes, J.R., Runting R., Schmidt, S.,. Traill LW, Weber LC, Wilson KA, Lovelock C.E., Adaptation for the maintenance of biodiversity with climate change. Regional Environmental Change, in review McLeod, E. and Salm, R.V. (2006) Managing mangroves for resilience to climate change. IUCN, Gland, Switzerland. Burley, J., McAllister, R., and Lovelock, C.E. (2011) Integration, synthesis and climate change adaptation: A narrative based on coastal wetlands at the regional scale. Regional Environmental Change, in press DOI: 10.1007/s10113-011-0271-4] Gilman, E., H. Van Lavieren, J. Ellison, V. Jungblut, L. Wilson, F. Areki, G. Brighouse, J. Bungitak, E. Dus, M. Henry, I. Sauni Jr., M. Kilman, E. Matthews, N. Teariki-Ruatu, S. Tukia, K. Yuknavage. 2006. Pacific Island Mangroves in a Changing Climate and Rising Sea. UNEP Regional Seas Reports and Studies No. 179. United Nations Environment Programme, Regional Seas Programme, Nairobi, KENYA. http://www.unep.org/PDF//mangrove-report.pdf Great Barrier Reef Marine Park Authority 2012, Informing the outlook for Great Barrier Reef coastal ecosystems, Great Barrier Reef Marine Park Authority, Townsville. Productivity Commission 2012, Barriers to Effective Climate Change Adaptation, Report No. 59, Final Inquiry Report, Canberra. Caldeira, K (2012) Avoiding mangrove destruction by avoiding carbon dioxide emissions. Proceedings of the National Academy of Sciences of the United States of America, vol. 109 no. 36 pages: 14287–14288 The management of natural coastal carbon sinks, eds D. Laffoley and G. Grimsditch, IUCN, the International Union for Conservation of Nature, Gland, Switzerland	Accepted with modification. This text has been kept. this section is about trends the suggestions from the reviewer are about future threats to mangrove systems, and thus does not belong here.
19359	11	19	8	19	9	Why would peatlands be burned for agriculture? Peat is burned for energy, and can be used as soil for sowing. If it burns, it is a disaster for both energy and soil usage.	Accepted. "and burning" deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30985	11	19	5	19	23	The text in Box 11.2 on peatlands and wetlands seems strongly oriented toward tropical regions. Recommend either a) omit this box entirely; b) change the title to "Tropical peatlands and wetlands"; or c) include additional information and references on boreal peatlands. For example, drainage of boreal peatlands for forestry does not necessarily lead to increases in C emissions (Minkkinen, K., Korhonen, R., Savolainen, I. and Laine, J. (2002), Carbon balance and radiative forcing of Finnish peatlands 1900–2100 – the impact of forestry drainage. Global Change Biology, 8: 785–799. doi: 10.1046/j.1365-2486.2002.00504.x. Another example is that drainage of boreal peatlands may lead to increased C uptake in the absence of fire but also leads to much greater C losses when fire occurs so that peatland drainage-fire interactions could diminish the future C sink of northern peatlands (Turetsky, M.R., Donahue, W.F. & Benscoter, B.W. (2011). Experimental drying intensifies burning and carbon losses in a northern peatland. Nature Communications vol. 2, DOI:10.1038/ncomms1523).	Accepted with modification. The box gives global numbers and also numbers for Europe, have added numbers for Annex I from Joosten where trends are already discussed but numbers not given. The text says that drainage results in a rapid increase in decomposition. It does not talk about the net carbon balance of drainage for forestry. It concentrates on global or regional trends rather than specific locations and activities. There is not room in the text to give national numbers. However, we do present numbers for emissions from degrading peat from Joosten; in their table 5, Finland has the 5th largest emissions by country of 0.05 MtCO2/yr.
30986	11	19	25	19	45	The text in Box 11.3 on fires seems oriented toward tropical or subtropical vegetation types such as savannas with frequent grass fires that have minimal impacts on tree mortality. In North American boreal and temperate forests, stand-replacing crown fires (and some tree-killing insects such as mountain pine beetle and spruce budworm) can have major, long-lasting (multi-decadal) impacts on carbon cycling. Given this, one would question the statement (L29-31) that "Only fires where land is permanently cleared..or has increasing levels of disturbance.., are there net emissions of carbon to the atmosphere".	Accepted with modification. Some of the text is now deleted and the rest modified. Only numbers for the tropics here. Due to lack of space, we focused on the largest source of fire emissions. Regional numbers on FOLU flux including deforestation and forest management by fire are given in the text and in figure 11.7 . The reviewer mentions insect attack - please note that this, and some fires, are considered natural disturbance and not part of the FOLU flux.
22405	11	20		20		line 31 maybe a word missing	Noted. There is no word missing, but sentence edited to avoid confusion.
33307	11	20	1			FAQ answers only first part of question about AFOLU contribution to global emissions, not second part about how this is changing.	Accepted. We now also report how emissions are changing.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21363	11	20	1		8	There may be a few hangovers from former LULUCF terminology here, and forestry is not mentioned except in relation to deforestation. In this as well as preceeding sections it appears that rather than combine all land uses there is a distinct separation of agriculture from 'the rest' (FOLU). hence it conveys an impression that deforestation is part of 'forestry'. Given the widespread deforestation is almost exclusively the first act in expanding agriculture, why is the deforestation not attributed to agriculture? at least, if there is separation, for clarity i would suggest separation into 3 components: agriculture, forestry, and LUC. An example of deforestation linked to agriculture can be found in 'Attribution of CO2 emissions from Brazilian deforestation to consumers between 1990 and 2010' (Karstensen, J., Peters, G.P., Andrew, R.M Environmental Research Letters. Vol 8. 024005 doi:10.1088/1748-9326/8/2/024005) which states "We find that 30% of the carbon emissions associated with deforestation were exported from Brazil in the last decade, of which 29% were due to soybean production and 71% cattle ranching." Much of the debate around biofuels relates to iLUC, so for consistency and comparability the same should apply to agriculture.	Partially accepted. We now also refer to forest management. Indeed, deforestation is strongly driven by agricultural expansion. However, we stick to the general definition separating into non-CO2 emissions from agricultural production and emissions from FOLU.
29895	11	20	1			Readers want to know if the share of AFOLU to total emissions is increasing/decreasing and if the total size of AFOLU emissions is increasing/decreasing. The FAQ indicates only current level of emissions as parcentage to the total emissions. The FAQ should also discuss the past trend and future projections of emissions from AFOLU in a concise manner. In addition to the percentage to the total emissions, absolute sizes of emissions should also be summarized.	Accepted. We now also report how emissions are changing and absolute sizes of emissions are summarized.
30989	11	20	11	20	12	Demand-side options are not just about reducing demand for food and fibre products - they can be about changing what is demanded, for example by demanding sustainably-produced wood products to replace more emissions-intensive (on a life-cycle basis) metals or concrete in construction. In this case, the result could be an increase in demand for fibre products, but the net GHG effect of the production (including land-related emissions and removals), use and disposal of the fibre products would be less than that of the alternative. This type of mitigation action was noted in AR4, WGIII, Chapter 9.	Accepted. This has now been included in the description of demand-side measures.
29819	11	20	13	20	13	Typo: “focussed” should be written “focused”	Accepted. Wording changed.
22537	11	20	16	20	29	Harvested wood products as a carbon pool should be included here, not only the enhancement of C sequestration in biota and soils (lines from 20 to 23). The substitition of intensive-energy materials with HWP could also be included.	Accepted. Long-lived products are now mentioned; details are discussed later on in the chapter (section 11.4.3).
37714	11	20	16	20	16	Insert 'ghg emissions and thus' before climate forcing	Accepted. Wording changed.
27903	11	20	16	20	29	add for each bullet point the subchapter where the mitigation activities are dealt with. The activity substation of energy intensive products is missing, please add it to the list at the end or to bullet point two.	Partially accepted. Use of biomass for long-lived products was added to bullet point 2, as suggested, as was provision of low GHG products as an own bullet point. As this enumeration cannot be simply mapped onto the following chapters the proposal to refer directly to subsections was not implemented.
22536	11	20	17	20	17	Mitigation activities in relation to CH4 and N2O should include prevention of fires (mainly in forests, but also on agricultural lands)	Accepted. Fire included in section 11.2.3

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37715	11	20	17	20	17	How can husbandry and cropping be altered to reduce CH4 and N20 emissions - can the authors provide examples?	Accepted. As per table 11.3. Changed to "croplands, grazing lands and livestock."
37711	11	20	2		8	forestry is not mentioned here - please make its inclusion here explicit (aside from the 'F' in AFOLU'.	Accepted. We now also mention forestry.
27902	11	20	2	20	8	Insert absolute GHG numbers in addition to the percentages given.	Accepted. We now include absolute GHG numbers.
21232	11	20	21			Should the term be "ecosystems" instead of "scosystems"	Accepted. Wording changed.
31470	11	20	21	20	22	Could you clearify if N og P deficiency limits soil carbon directly, or if it is through limiting photosynthesis and thus plant growth so the supply of dead plant material to the soil is lower.	Partially accepted. Due to length constraints, the example was removed.
29433	11	20	21	21	23	Explain how N or P deficiency limits soil carbon. Delete "increased soil carbon storage" - covered in next bullet point.	Partially accepted. Example deleted.
24795	11	20	21	20	23	Explain how N or P deficiency limits soil carbon. Delete "increased soil carbon storage" - covered in next bullet point.	Partially accepted. Example deleted, formulation revised.
19097	11	20	24	20	26	Add: planting and management of trees outside the forest. Have an additional bullet namely: Increase arable and pastoral productivity, especially with the use of agro-forestry trees and shelterbelts, thus curtaining deforestation	Rejected. Agroforestry is already included explicitly in table 11.3. Does not need to appear here also.
37716	11	20	26	20	26	Increased stocking densities might work like the rice revolution proposed by Mao. Increasing the density does not necessarily mean increasing production and may even decrease production.	Rejected. Increased stocking density increases the amount of C stored per unit area (and hence sequesters C); nowhere it was claimed it would result in higher wood product output.
37717	11	20	27	20	27	How can albedo be changed? See, "Changes in albedo that increase reflection of visible light."	Noted. Some changes in land use and land cover have significant effects on albedo and hence sunlight reflectance which has a significant climate effect. This mechanism is well documented in the peer-reviewed literature, e.g. Cherubini, F., Bright, R.M., Strømman, A.H., 2012. Site-specific global warming potentials of biogenic CO2 for bioenergy: contributions from carbon fluxes and albedo dynamics. Environmental Research Letters 7, 045902.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31471	11	20	28	20	29	QUOTATION: "Provision of bioenergy with low GHG emissions that can replace high-GHG energy (e.g. fossil fuels) in the energy, industry and transport sectors, thereby reducing their GHG emissions." COMMENT: Why is not this a part of the conclusion in Ch 11.A.6 on page 90? The sentence should be changed to "Provision of bioenergy that can replace fossil fuels in the energy, industry and transport sectors, thereby contribute to stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The overall climate goal is stabilization of the GHG concentration as explained in chapter 6. QUOTATION:" bioenergy with low GHG emissions" COMMENT: Will not displacement of fossil emissions with all types of sustainable bioenergy in general lead to a lower stabilization value of GHG in the atmosphere in a relevant timescale? Please also see line 39 on page 26 in chapter 11.	Accepted. Wording harmonised with wording in bioenergy appendix.
30990	11	20	28	20	29	More generally, bioenergy is one type of replacement of relatively emission intensive products (steel, concrete, fossil fuels) with biomass-based products whose production and use result in less emissions on a life-cycle basis. Suggest this bullet be explained in this type of broader way, or a new bullet be added to explicitly note mitigation activities involving substitution of biomass products (other than bioenergy) for other products.	Accepted.
37718	11	20	28	20	28	It should be made clear how bioenergy is going to create less greenhouse gases.	Accepted.
37719	11	20	29	20	29	Delete "their" and insert "energy"	Accepted.
37720	11	20	30	20	30	Add a bullet: Productivity enhancements, resulting in lower input requirements per unit of output. (Followon to chapter-wide comment.)	Accepted. Bullet point added.
30991	11	20	31	20	32	Suggest deleting the first sentence or move it lower down; the focus here is all AFOLU supply-side measures so it is odd to start with a sentence that focuses on only one part of AFOLU.	Noted. Rather than removing the sentence, another has been added for forestry.
19042	11	20	32		34	You may need update your citations. Another example, enteric CH4 emissions can be reduced but can also be associated with increased emissions from manure storage. For example, Benchaar et al. (Journal of Dairy Science, 2013) showed that the use of corn distillers grains with solubles (a by-product of the ethanol industry) can be an effective means to mitigate enteric CH4 emissions from dairy cows, but this can also lead to increased emissions of CH4 from manure storage as evidenced by increased volatile solids in the manure.	Accepted. Citations have been reviewed, rationalised, and updated.
30992	11	20	33	20	34	Listing the examples using "e.g." without brackets makes the sentence structure less clear.	Accepted. Wording changed.
27241	11	20	33	20	34	The statement “improved agroforestry with legume trees can have a negative impact on N2O emission” is not justified by any literature cited. A search of the literature found only two papers which show large increases in soi carbon following planting of legume trees in degraded areas of the humid tropics (Macedo et al. 2008; Chaer et al., 2011). There is a potential for increased N2O emissions but no estimates of the CO2eq balance between the C sequestration and N2O emission. We recommend more caution with respect to this matter as legume-tree based agro-forestry systems have many other benefits including food security issues (see ICRAF publications). Reference: MACEDO, I.C.; SEABRA, E.A.J.; SILVA, E.A.R. Greenhouse gases emissions in the production and use of ethanol from sugarcane in Brazil: the 2005/2006 averages and a prediction for 2020. Biomass and Bioenergy, v. 32, p. 582–595, 2008. CHAER, G.M.; RESENDE, A.S.; CAMPELLO, E.F.C.; DE FARIA, S.M.; BODDEY, R.M. Nitrogen-fixing legume tree species for the reclamation of severely degraded lands in Brazil. Tree Physiology, v. 31, p. 139-149, 2011.	Accepted. References added and wording changed.
19098	11	20	33	20	34	"improved agroforestry with legume trees can have a negative impact on N2O emissions". If soil nitrogen poor, most if not all N will be taken up by crops.	Accepted. References added and wording changed.
37721	11	20	35	20	35	"ae" should be "are"	Accepted. Wording changed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25826	11	20	36	20	36	The term "biochar" is not defined correctly in Annex I (Glossary). Only its utility is explained. This is a generic issue with the glossary; terms are explained rather than defined. First, a term should be defined, then its use, context, scope etc should be explained (perhaps always in a separate paragraph).	Accepted.
20262	11	20	38	20	38	Bring paragraph 11.A.6 Conclusion from pages 90 (lines 27-48) and 91 (lines 1-10) of the Annex on 'Bioenergy: Climate effects, mitigation options, potential and sustainability implications', just below line 37 of Section 11.3.1, and delete the whole Annex from pages 74-91.	Partially Accepted. Wording harmonised with wording in bioenergy appendix. Bioenergy annex deletion needs to be discussed with TSU.
31469	11	20	4	20	8	States that emissions from agricultural production comprise 10- 12 % of global antrop. Emissions and C-flux from land use and landuse change 12-20 %. A bit unclear how this adds up to 24-34 % of the global total.	Accepted. We now include absolute GHG numbers and updated the share in total anthropogenic GHG emissions.
32574	11	20	4	20	8	The figure for emissions from agriculture, 10-12 %, applies for "at present", whilst the figure 12-20% from land use and land use change seems to be given for the 1990s. I possible we suggest to use as updated figures as possible and to the extent possible for the same year and that you specify which year for both categories.	Accepted. We now updated emissions to the time period of 2000 to 2009.
32575	11	20	7	20	8	This text indicates that the AFOLU-sector is responsible for about one quarter to one third of anthropogenic emissions "The total contribution of the AFOLU sector to anthropogenic emissions is therefore 24-34% of the global total". Other estimates is given in ch. 11 page 4 line 10, in TS p.28 l 3-4 and in fig 11.2. Please make this information consistent and precise regarding whether it is GHG-emissions or CO2.	Accepted. We now updated emissions to the time period of 2000 to 2009.
29896	11	20	7			I don't understand why average emission in the 1990s is relevant here.	Accepted. We now updated emissions to the time period of 2000 to 2009.
37712	11	20	8	20	8	What is the basis for 24-34% ? A simple summing yields 22-32%. Text is not set up to see the estimates that feed this range in a transparent way.	Accepted. We now include absolute GHG numbers and updated the share in total anthropogenic GHG emissions.
37713	11	20	9	20	9	Add to title "and behavior aspects" supply-side	Accepted. Title changed and behavioural aspects added.
24171	11	20	1	20	8	As the global total anthropogenic greenhouse gas emissions have been dramatically increasing since 1990s, the share (10-12%) of agricultural non-CO2 GHG emissions (5.4-5.8 GtCO2eq./yr) in 2010 (see lines 11-12 in page 10) can not be directly added with the share (approximately 12-20%) of the C-fluxes (about 1.1± 0.9 Gt C / yr in the 1990s). In this regard, the statement "with mean values of about 1.1± 0.9 Gt C / yr in the 1990s" in line 7 should be deleted. Instead, add the estimated values ("? - ? GtCO2eq./yr") of 2010 for the global total anthropogenic greenhouse gas emissions immediately following "... 24-34% of the global total".	Accepted. Ranges now given with direct and indirect emissions also separated out, and new contribution provided in revised FAQ 11.1.
27240	11	20	16		29	this part could be moved to page 6 (paras 9 to 13)	Rejected. Not clear what "part" this comment refers to, so could not be acted upon.
25795	11	20	27	20	27	This sentence 'Changes in albedo that increase reflection of visible light.' should be reconsidered. Since it may increase or decrease the reflection of visible light. That depends on other factors.Please read this literature'Radiation partitioning and its relation to environmental factors above a meadow ecosystem on the Qinghai-Tibetan Plateau' .	Accepted. Albedo wording revised - fifth bullet point of section 11.3 in FD - it used the word "changed" rather than specifying increase or decrease.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33308	11	20	9			11.3 discusses only supply-side measures, demand-side options are discussed in 11.4 Infrastructure and systemic perspectives. However, behavioural aspects seem to be demand-side by nature and are not discussed in this section. There should be a focus on how choices at various levels drive emissions and on the effects of behaviour on emissions.	Accepted. Behavioural aspects added.
27360	11	20	30		30	CORRECT: references ARE provided	Accepted. Wording changed.
24172	11	20	9	39	12	Re-organize sections 11.3 and 11.4, with section 11.3 being entitled "mitigation measures and effectiveness", and 11.4 being entitled "Mitigations pracices, behavioural aspects, infrastructure and systemic perspectives". The reorgnized section 11.3 includes foure sub-sections: "11.3.1 Supply-side mitigation measures"; "11.3.2, supply-side mitigation effectiveness"; "11.3.3 Demand-side mitigation measures"; and, "11.3.4 Demand-side mitigation effeciveness". The other contents under sections 11.3 and 11.4 of the SOD are all included in the re-organized section 11.4.	Rejected. We are working according to an outline prescribed by the IPCC.
23779	11	20	12	20	23	If the peatland emissions in SE Asia alone are 1 GtCO2/yr and mangroves upto 0.12 GtCO2/yr as stated in these lines then it does not make sense not to explicitly include these in the estimates presented in Figure 11.6.	Accepted. These numbers have been revised and are included in Figure 11.6 (under the appropriate categories).
29434	11	21				The list of forestry references cited is very limited compared with the agriculture references, and should be expanded.	Accepted. References have been added.
29435	11	21				The description of SFM in native forests fails to mention productive function	Accepted. Has been applied according to the IPCC glossary.
21365	11	21				Reduced Forest degradation line refers to 'changes within the forest' which affect the 'stand or site'. Suggest uniformity of terms along standard definitions to avoid confusion eg use FAO forest terminology. This description also supports comment above that harvesting is not degradation, indeed harvesting can rejuvenate forests leading to increased productivity.	Accepted. Has been applied according to the IPCC glossary.
21366	11	21				Reforestation description refers only to forest plantations. Should be extended to include any form of reforestation ie planted, enriched, or natural regeneration	Accepted. Has been applied according to the IPCC and FAO glossary.
21367	11	21				the distinction between plantation forest management and sustainable native forest management is not clear. The artifical separation of 'plantation' from 'native' is troublesome - which category is a native species plantation? If the plantation is not sustainable, it should be considered as degradation, and a mitigation option is to ensure the management is sustainable.	Accepted. Has been applied according to the IPCC glossary. Native forest refers to the natural forest, not native species.
21368	11	21				under management there is the possibility of species change to alter the product qualities and hence market penetration and lifespan. This is the key to many of the demand side options in table 11.4 since many plantation species do not produce timber that is suitable to widespread substitution for energy/carbon-intensive materials, or appropriate for multiple/cascading uses (eg need for chemicals/coverings to improve durability preventing recycling or combustion).	Accepted. A reference was made to the table 11.4.
22556	11	21				croplands agronomy: C - crop varieties improved for what characteristic?	Noted. Improved for C inputs (residue or roots).
22557	11	21				croplands agronomy: N2O. How is NUE defined here? Is it the efficiency with which plants scavenge N from the soil (and soil water) and/or the efficiency with which plant metabolism uses mineral N?	Noted. We could not define in this table, but greater efficiency for utilizing N inputs (fertilizer or manure).
22558	11	21				croplands nutrient management: should there be reference to the importance of a balanced nutrition here (which is cited elsewhere in the chapter)?	Accepted. Table 11.2 has been completely revised, descriptions improved, and new references added.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22133	11	21		25		It would be useful if the table included quantification of the possible mitigation range. These are all very important measures and it would be good if the table demonstrated how effective they are and at what cost.	Accepted. We included a relative ranking of mitigation potential, ease of implementation, and availability.
22134	11	21		25		Several fields without description or reference.	Accepted. Table revised.
22135	11	21		25		Addition to Croplands-water management: CH4: decomposition of plant material, N20: nitrate and run-offs ///Addition to Grassland - grazing: N20socking density and animal waste/// Addition to Livestock breeding: CH4: improved fertility/// Addition Bioenergy from dedicated plants: indirect LUC, should be indicated here and regarding this real emissions and consideration if mitigation possible	Accepted. Table revised.
22406	11	21		25		This table is too long, mainly definition can be reduced	Accepted and modified.
25796	11	21				Box "Reduced deforestation": an important point to be included here or elsewhere (e.g. Agroforestry, page 24; Integration of biomass...; page 24) is to mention the application of appropriate alternative protein or amino acid sources to be used in pig, poultry and ruminant nutrition instead of soybean meal reducing the motivation to deforest new areas.	Accepted.
27242	11	21				reproduce the definition of reforestation and afforestation from UNFCCC (2006) as provided	Accepted.
27243	11	21				why corn, sugarcane, beetroot - the most relevant crops for bioenergy production are not included under Bioenergy from dedicated plants?	Noted. Bioenergy is discussed in the annex.
27244	11	21		25		In this Table (page 22) the benefit of crop residues towards C sequestration in soil in no-till agriculture is mentioned, but only one untraceable reference (not in the reference list) made to N2O emissions. Although in temperate regions some studies have shown increased N2O emissions under no-till, the recent comprehensive review of Rochette (2008) showed that no-till only induces increased N2O emissions in poorly drained soil. This is corroborated by Jantalia et al. (2008) indicating that emissions of N2O on Ferralsols , under mechanised agriculture are much lower than in temperate regions and the change from conventional tillage to no-till only has a marginal effect. Reference: JANTALIA, C.P.; SANTOS, H.P. dos; URQUIAGA, S.; BODDEY, R.M., ALVES, B.J.R. Fluxes of nitrous oxide from soil under different crop rotations and tillage systems in the South of Brazil. Nutrient Cycling in Agroecosystems, v. 82, p. 161-173, 2008.	Accepted. Table revised.
27245	11	21		25		Grazing land management. The largest benefit of improved feed quality, whether by improved grassland management or by improved dietary components, is the impact this may have on enteric methane emissions per kg of product (carcass or dairy product) (Millen et al. 2011). In this Table the extremely large mitigation potential of intensification of bovine production is barely perceptible. For Brazil and many other countries which practice extensive grazing, this strategy for the reduction of methane could be the most cost effective and applicable in the immediate future without waiting for more technical developments such as are needed for specific rumen supplements and antibiotics (Saggar et al., 2004). As is shown in Figs 11.2 and 11.4 (pages 8 and 11) enteric methane emissions are the second most significant of all AFOLU emission sources, and the largest of all non-CO2 source in this sector. It is essential that the Table 11.4 is modified to include this large mitigation potential. Reference: MILLEN, D.D.; PACHECO, R.D.L.; MEYER, P.M.; RODRIGUES, P.H.M.; DE BENI ARRIGONI, M. Current outlook and future perspectives of beef production in Brazil. Animal Frontiers, v. 1, p. 46-52, 2011. SAGGAR, S.; BOLAN, N.S.; BHANDRAL, R.; HEDLEY, C.B.; LUO, J. A review of emissions of methane, ammonia, and nitrous oxide from animal excreta deposition and farm effluent application in grazed pastures. New Zealand Journal of Agricultural Research, v. 47, p. 513-544, 2004.	Accepted. Table revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27246	11	21		25		Bioenergy: In this section of the Table there is no mention at all of bioethanol. The only liquid biofuel mentioned is Jatropha which is only produced on a small scale as yet. The US and Brazilian bioethanol programs need to be cited instead. The extremely high mitigation potential of Brazilian bioethanol from sugar cane (Macedo, 1998; Macedo et al., 2008; Galdos et al., 2010) is not mentioned. Reference: MACEDO, I.C. Greenhouse gas emissions and energy balances in bio-ethanol production and utilization in Brazil. Biomass and Bioenergy, v.14, n.1,p.77-81, 1998. MACEDO, I.C.; SEABRA, E.A.J.; SILVA, E.A.R. Greenhouse gases emissions in the production and use of ethanol from sugarcane in Brazil: the 2005/2006 averages and a prediction for 2020. Biomass and Bioenergy, v. 32, p. 582–595, 2008. GALDOS, M.V.; CERRI, C.C.; LAL, R.; BERNOUX, M.; FEIGL, B.; CERRI, C.E.P. Net greenhouse gas fluxes in Brazilian ethanol production systems. Global Change Biology Bioenergy, v.2, p.37-44, 2010.	Noted. This has now been removed from Table 11.2 and is dealt with in Appendix I.
19099	11	21				Under Forestry Options add: encourage the planting and management of trees outside the forest	Accepted.
21016	11	21				Please bear in mind that afforestation and reforestation do not necessarily result in forest plantations, they do not even require planting to be conducted. If the flawed use of the vocabulary is a quote please correct this nonetheless. And why do you differentiate FM between plantations and native forests? Should plantations (by the way: how do you define them or which definition do youse, resp.?) not be managed sustainably? Or are these just two examples from all the different possibilities to define, classify or order forest management?!?	Noted. Please see glossary for explanation of terms.
20129	11	21		25		It would be a valuable addition if table would include quantification of the possible mitigation range. This are all very important measures and it would be supportive if the table would include how effective they are and at what cost.	Accepted. We included a relative ranking of mitigation potential, ease of implementation, and availability.
20130	11	21		25		several fields without description or reference.	Accepted.
20131	11	21		25		Addition to Croplands-water management: CH4: decomposition of plant material, N20: nitrate and run-offs ///Addition to Grassland - grazing: N20socking density and animal waste/// Addition to Livestock breeding: CH4: improved fertility/// Addition Bioenergy from dedicated plants: indirect LUC, should be indicated here and regarding this real emissions and consideration if mitigation possible	Accepted. Table 11.2 has been completely revised, descriptions improved, and new references added.
40717	11	21				The far-left cell in the first column under "Forest Management" should read "Forest management in planted forest" instead of "Forest management in plantations". "Planted forests" is more appropriate for the context here because the word "plantation" generally refers to those forests managed for a commercial commodity production such as gum and timber in a relatively short harvesting cycle.	Accepted.
40718	11	21				The far-left cell in the second cell under "Forest Management" should read "Sustainable forest management" instead of "Sustainable forest management in native forest" (i.e., delete "in native forest"). Sustainable forest management contributes to mitigation regardless of whether it takes place in natural forests or those under human interference.	Accepted and improved. Page 48 line 43 "forest" need to be added as "sustainable forest management."
27904	11	21		21		In column 1 reduced degradation is not an ARD activity and should be dealt with under Forest Management. Under cropland agronomy in column 2 the term "agricultural biotechnology" is used first and only time. Please define at least in the Glossary and explain what is meant by that term or delete.	Accepted. Has been changed from "forest degradation" to "deforestation."
27905	11	21		25		Please mention in all boxes the by the activities concerned GHGs. It is assumed that all empty boxes will be filled in the final version. The activity substution of energy intensive materials is missing.	Accepted. Table revised.
29208	11	21		22		Table should make note of the potential conflict between enhanced C sequestration under minimal or no-till systems with potential for increased N2O emissions due to compaction. His is particulalry thought an issue for heavier soils in wetter climates such as those of the UK.	Accepted. Table revised. References include review articles.
31473	11	21	1			BECCS seems to be missing in the table. BECCS is in chapter 6 assumed to reach 40-100% of modern bioenergy by 2050 and 2100 respectively.	Noted. Bioenergy is discussed in the annex.
31472	11	21	1			In the 4. row on p. 23, the wording "soil fertility reduction" seems the opposite of what expected	Accepted. Table revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30993	11	21	1			This table needs further work. It is inconsistent in its treatment of options in a number of important respects. First, forestry options and some others are presented simply as definitions, yet for other options a listing of possible activities and corresponding references if provided. The latter is more useful. In particular, the treatment of agriculture is far more detailed than for other options. Second, the definitions given in the forestry section have a number of problems. For example, for the definitions of afforestation and reforestation it is not clear what source is being referred to (could not find the document referred to as UNFCCC 2006). Moreover, the definition of reforestation, while commonly used in forestry in some countries is not that used under the Kyoto Protocol or in the IPCC 2006 GL where both afforestation and reforestation refer to land converted to forest land, and there is not consistent use of the "reforestation" in this chapter. And, given the context of this report and its use in climate change negotiations, definitions used in negotiations (i.e. Kyoto Protocol) should be acknowledged. More generally, however, getting into definitional discussions is not likely to be particularly valuable. Third, the discussion of forest bioenergy refers to environmental effects, which is a valid point. However, this appears to be one of a few or the only place where positive or negative side effects of mitigation options are noted in this table. Either there should consistent mention of side effects or considerations for each option in this table, or these should be addressed elsewhere.	Accepted. Considered and improved.
30994	11	21	1			The section on Bioenergy raises issues of inconsistency, or perhaps insufficient explanation. Bioenergy is just one type of replacement of relatively emission intensive products (steel, concrete, fossil fuels) with biomass-based products whose production and use result in less emissions on a life-cycle basis. Mitigation involving biomass for bioenergy is placed under supply side mitigation apparently because the focus is on the supply of biomass for bioenergy. Yet mitigation involving biomass used in wood products is placed under demand-side mitigation, apparently because the focus is on changing demand for such products. While mitigation involving all biomass-based products (bioenergy, wood products) has both demand and supply side aspects. The reason for this approach to the two is not clear.	Noted. Bioenergy is discussed in the annex.
20263	11	21	1	25	1	Table 11.3 'Summary of supply-side mitigation options in the AFOLU sector…..' should better be written in running form. Also, descriptions and definitions which are already agreed to and well known need not be explained in the running summary. For example, afforestation, reforestation and deforestation under section on 'Forestry', being familiar and widely-used terms, should not take much space. However, management of plantation forest and native/natural forest (sustainable management of forest) still a developing concept can be mentioned.	Accepted. Table revised.
20264	11	21	1	25	1	Similarly, section on 'Land-based Agriculture' including sub-sections on 'Grazing Land Management', 'Revegetation' and 'Livestock' can be reduced. Section on 'Bioenergy' should be further shortened by clubbing at one place in running form as the 'Bioenergy from i) Forest, and ii) Agriculture.	Noted. Bioenergy is discussed in the annex.
31508	11	21	1	25	1	There are too many references used in some definitions: e.g. grasslands - grazing. I don't see the point to use more than 3 references per definition and it will reduce the size of Table 11.3	Accepted. Table revised.
25812	11	21	1	25	1	(a) Title of the table: second sentence incomplete/ malformed. (b) "Description" column has text that is inconsistent: first two entries provide definitions of terms instead of describing the emission reduction or removal measures. This kind of inconsistency also appears in several other entries in the table. (c) Definitions not consistent with UNFCCC agreements: "Afforestation" under the UNFCCC rules relates to land "being forested" rather than being "classified as forest" (a legal status of land or land-use). "Reforestation" does not apply to "temporarily unstocked" lands as noted in the table. In fact, "temporarily unstocked" lands are already "forests" (they don't lose their status as forest(ed) lands) [see Decision 11/CP.7 "LULUCF" - later adopted as 16/CMP.1 which defines "forest", "afforestation", and "reforestation"]	Accepted and improved.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25813	11	21	1	25	1	(a) Under section "Land-based Agriculture" of the table, there is some inconsistency in format since "Description" text is grouped under sub-headings "C", "N2O" and "CH4" which is not the case in the section on "Forestry" in the same table. (b) In entry on "Croplands - agronomy" the text "High input carbon practices" perhaps should read "high input cropping practices". (c) The text in the entire table is rather loose, unstructured and incomplete, and can benefit greatly from reorganization / rewriting.	Accepted. Table revised.
32657	11	21	1			under croplands agronomy section: the practices in this list should be reasonably evident to an informed person to be related to inputs of carbon. Improved crop varieties or genetic engineeing per se do not increase soil carbon sequestration. In contrast, the list is missing practices that directly put carbon into soils, such as use of manures and composts. why mention biochar as a technology that puts C directly ito soils but not mention these other practices in the agronomy section? See for example the significant amount of work by the lab of Johan Six at UCD, starting with De Gryze, S., M.V. Albarracin, R. Catala-Luque, R.E. Howitt, and J. Six. 2009. Modeling shows that alternative soil management can decrease greenhouse gases. Cal. Ag. 63:84-90.	Accepted. Table revised. We cannot provide all the variances in this table.
37722	11	21	1			N2O Improved plant use efficiency. Not supported by most literature.	Noted. Not plant N use efficiency, but agronomic N use efficiency.
37723	11	21	1			Some rows are populated with gases but not with any explanatory text - please add	Accepted. Table revised.
37724	11	21	1			Croplands - set-aside and LUC = what does this mean/address/include? For C, it has long term fallow and community forestry, but that doesnt seem to address the text in first column completely...	Accepted. Table revised.
37725	11	21	1			Bioenergy from plant residues. How can this be accomplished without creating even more GHG.	Noted. Bioenergy is discussed in the annex.
37726	11	21	1			For bioenergy from plant residues, forestry: which of the citations specifically addresses black liquor in this context? The authors should be explicit here.	Noted. Bioenergy is discussed in the annex.
37727	11	21	1			This removal of ag crop residues should have the same language as forests above concerning "environmental effects of primary residue removal depend on land management practice and local conditions, and removal rates need to be controlled considering local ecosystem, climate, topography, and soil factors" as residues add to soil C as well as erosion control	Accepted. Table revised.
21233	11	21	13			Change term to "focused"	Accepted. Table revised.
20907	11	21	2			References should be updated. I have not found some of them in the literature. For instance, I have not found any paper of Denef et al. (2011) in the literature.	Accepted. Table revised.
19362	11	21	2			This is a very fine Table! However, there are some issues probably caused by not thinking it over carefully enough at all places. E.g. Description doesn't always match the Option, e.g. Reduced Forest degradation is NOT "Changes within the forest that negatively affect…". Also Cropland agronomy is not an "Option", an Option would be "Cropland agronomy to improve C storage". Also "Croplands" is not an option, but "Soil carbon increase in croplands" would be. If Degraded soils restoration is an Option, how does it fit with "soil fertility reduction" (in Description) ... etc. Also, I have myself studied Biochar (given as an Option) a little, and have found that it does not necessarily increase biomass productivity. I don't think that there is evidence for its beneficial influence yet. The last window on page 25 "Bioenergy from organic wastes", shouldn't also wastes from shops be mentioned? Wastewaters meaning sewage sludge?	Accepted and improved.
19361	11	21	2	21	2	Some words missing?	Accepted. Table revised.
24796	11	21	2			Suggest include productive function in the description of SFM in native forests	Accepted and improved.
24797	11	21	2			The list of forestry references cited is very limited compared with the agriculture references, suggest expanding	Accepted and improved.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31474	11	21	27	42		The policy relevant time frame should be consistent throughout the report, including the time-frame for stabilization in chapter 6. “End of the century” or approximately 100 years?	Rejected. Mitigation timeframe 2030 to 2050. Longer term stabilization is discussed only in section 11.9.
21234	11	21	34			Change term to "agro-forestry"	Accepted. Table revised.
21235	11	21	35			Change term to "are not described"	Accepted. Table revised.
21236	11	21	35			Change term to "are provided"	Accepted. Table revised.
19618	11	21	1	25		This table should be re-organized. Delete the descriptions, but add the effect on GHG mitigation, cost, applicable regions. The readers are more interested in the cost-effectiveness of those practices instead of a descriptions. Here I present several papers on this aspect, actually there are a lot papers:(1) Liu C, Wang K, Zheng X, 2012. Responses of N2O and CH4 fluxes to fertilizer nitrogen addition rates in an irrigated wheat-maize cropping system in northern China. Biogeosciences 9, 839-850. (2)Liu C, Wang K, Zheng X, 2013. Effects of nitrification inhibitors (DCD and DMPP) on nitrous oxide emission, crop yield and nitrogen uptake in a wheat-maize cropping system. Biogeosciences Discusssion, 10, 1-27. doi:10.5194/bgd-10-1-2013. (3)Cai ZC, Tsuruta H, Gao M, Xu H, Wei CF, 2003. Options for mitigating methane emission from a permanently flooded rice field. Global Change Biology 9, 37-45.(4)Xie B, Zheng X, Zhou Z, Gu J, Zhu B, Chen X, Shi Y, Wang YY, Zhao Z, Liu C, Yao Z, Zhu J, 2010, Effects of nitrogen fertilizer on CH4 emission from rice fields in China: multi-site field observations. Plant and Soil 326: 393–401.	Accepted. We have reduced the description and thus the size of the table. We included a relative ranking of mitigation potential, ease of implementation, and availability. Because of the volume of literature we referenced only those papers that were reviews, meta-analysis or broad in scope. We did not use references that were site specific.
20908	11	22				In some agroecosystems, long-fallowing may not be considered as a mitigation option. In Mediterranean systems it has been observed decreases in SOC stocks in cereal-fallow rotations (with fallow periods of 16-18 months) (see Álvaro-Fuentes, J., López, M.V., Arrúe, J.L., Moret, D., Paustian, K. 2009. Tillage and cropping effects on soil organic carbon in Mediterranean semiarid agroecosystems: Testing the Century model. Agriculture, Ecosystems and Environment, 134, 211-217).	Accepted. Table revised.
33965	11	22				some descriptions are missing	Accepted. Table revised.
29436	11	22				Delete 'Taghizadeh-Toosi et al., 2011'; this reference should be cited against 'N2O' in the next row.	Accepted.
29437	11	22				Change 'Singh et al. (2010)' to 'Singh et al. (2012)' because 'Singh et al.; 2010 is appropriate for N2O studies. (Singh BP, Cowie AL, Smernik RJ (2012) Biochar carbon stability in a clayey soil as a function of feedstock and pyrolysis temperature. Environmental Science & Technology, 46, 11770-11778.)	Accepted.
29438	11	22				'Lehmann et al. 2003'; this reference is missing in the reference list.	Accepted.
29439	11	22				Singh et al., 2010'; this reference is missing in the reference list. (Singh BP, Hatton BJ, Singh B, Cowie AL, Kathuria A (2010) Influence of biochars on nitrous oxide emission and nitrogen leaching from two contrasting soils. Journal of Environmental Quality, 39, 1224–1235).	Accepted.
29440	11	22				Biochar and N2O. Please insert reference here Van Zwieten et al., (2010) Van Zwieten, L., Kimber, S., Morris, S., Downie, A., E. Berger, E., Rust, J., Scheer, C. (2010) Influence of biochars on flux of N2O and CO2 from Ferrosol, Special Issue: Australian Journal of Soil Research 48, 555-568	Rejected. In this table, we are not able to list all references and sections. We relied heavily on synthesis and review papers.
29441	11	22				Biochar and C. Please insert reference here as Slavich et al., (2012). The authors describe changes in field biomass and long term C storage under pasture system. Slavich PG, Sinclair K, Morris SH, Kimber S.W.L., Downie A and Van Zwieten L (2013) Contrasting effects of manure and green waste biochars on the properties of an acidic ferralsol and productivity of a subtropical pasture Plant and Soil http://dx.doi.org/10.1016/j.scitotenv.2013.02.054	Rejected. In this table, we are not able to list all references and sections. We relied heavily on synthesis and review papers.
24798	11	22				Delete 'Taghizadeh-Toosi et al., 2011' under biochar, this reference should be cited against 'N2O' in the next row	Accepted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24799	11	22				Change 'Singh et al. (2010)' to 'Singh et al. (2012)' because 'Singh et al.; 2010 is appropriate for N2O studies. (Singh BP, Cowie AL, Smernik RJ (2012) Biochar carbon stability in a clayey soil as a function of feedstock and pyrolysis temperature. Environmental Science & Technology, 46, 11770-11778.) or, Cowie, AL, Downie AE, George BH, Singh BP, Van Zwieten L, O'Connell D 2012 Is sustainability certification for biochar the answer to environmental risks? Pesquisa Agropecuária Brasileira 47 (5), 637-648	Accepted.
24800	11	22				'Lehmann et al. 2003'; this reference is missing in the reference list.	Accepted.
24801	11	22				Singh et al., 2010'; this reference is missing in the reference list [Singh BP, Hatton BJ, Singh B, Cowie AL, Kathuria A (2010) Influence of biochars on nitrous oxide emission and nitrogen leaching from two contrasting soils. Journal of Environmental Quality, 39, 1224–1235]	Accepted.
24802	11	22				Suggested further reference on Biochar and N2O: Van Zwieten et al., (2010) [Van Zwieten, L., Kimber, S., Morris, S., Downie, A., E. Berger, E., Rust, J., Scheer, C. (2010) Influence of biochars on flux of N2O and CO2 from Ferrosol, Special Issue: Australian Journal of Soil Research 48, 555-568	Rejected. In this table, we are not able to list all references and sections. We relied heavily on synthesis and review papers.
24803	11	22				Suggested further reference describing changes in field biomass and long term C storage under pasture system: Slavich PG, Sinclair K, Morris SH, Kimber S.W.L., Downie A and Van Zwieten L (2013) Contrasting effects of manure and green waste biochars on the properties of an acidic ferralsol and productivity of a subtropical pasture Plant and Soil http://dx.doi.org/10.1016/j.scitotenv.2013.02.054	Rejected. In this table, we are not able to list all references and sections. We relied heavily on synthesis and review papers.
23781	11	22				A more appropriate description of forest degradation would be "forest degradation refers to anthropogenic changes within forests which negatively affect the structure or function of the forests and forest lands including their capacity to regenerate and produce forest goods and services"	Rejected. Good comment, but in this case, it is still appropriate to use the definition of "deforestation."
30280	11	22		22		Under Grazing Land Management, the two subheadings “Grasslands management” and “Grasslands grazing” seem repetitive. Thornton and Herrero (2010), at least, seems to fit under both. And the descriptions are also nearly identical.	Accepted. Table revised.
23344	11	22				Several references missing from list - eg Lehmann et al 2003; Taghizadeh-Toosi et all 2011 - but is this latter reference relevant here? - is maybe based on N2O so should be in row below.	Accepted.
27906	11	22		22		In the option "croplands - set aside & LUC" "& LUC" should be deleted. LUCs could also lead to emissions.	Rejected. We defined LUC as replanting to grasses or trees.
30995	11	22		22		Croplands - water management, N2O: drainage management - missing reference.	Accepted. Table revised.
30996	11	22		22		In the Biochar - N2O section of the table, there is a reference provided with no description (this is also the case in Grasslands Management) - shouldn't the reference mean that a description can be provided?	Accepted.
25797	11	23				Box "Livestock - feeding": This seems to me to be a rather arbitrary selection of a limited number out of a large number of papers. I suggest to include the newest papers in this field (2012 and 2013). The list also contains in vitro studies. I guess, for instance Blummel et al 2010, which is not quoted in the reference list. These studies at least should be restricted to in vivo studies.	Accepted. Citations were reviewed and updated.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25798	11	23				Box "Livestock - feeding": I miss choosing favorable diet types in addition "improved feed and dietary additives" as measures. Here it should be clarified whether increasing the proportion of concentrate in the diet really leads to a net GHG decrease or if the reduced enteric methane is compensated by both manure-derived methane and CO2 from fossile sources in order to produce and transport the concentrate. Many governments consider the increase in productivity of the animals by intensive use of concentrate as the best/only measure. This aspect is more or less added without critical comment also in the following Box "Livestock breeding..." But "diet types" also includes the question about the ideal forage quality. With higher forage quality, fiber digestibility increases leading to more methane, but at the same time productivity of the animals is increased. In developing countries starting from a very low forage quality and animal performance, this will for sure reduce methane per unit of animal-source food produced, in countries with high forage quality level this might turn out to be the opposite.	Accepted. Caveats have been added around 'net' reductions, a paragraph has been added about the intensity approach, and forage quality has been specifically mentioned.
25799	11	23				Box "Manure management": please add diet type as well. "animal fed nitrification inhibitors" should read "animals…". Is there really a save method? wa method without residues in milk, meat and egg? which can be expected to be eventually accepted by the public?	Partially accepted. Diet type has been added, 'animal-fed N inhibitors' is used. The issue of safety is not applicable here, as this is technical potential.
25800	11	23				Box "Biosolid application": do you mean integrated crop-livestock systems?	Noted. No, this could include urban wastes as well as from livestock.
23615	11	24				Regarding the "Forestry" parts in the Bioenergy section (p.24): this is a very selective range of literature. I do not understand what the criteria for this selection where. The text does not necessarily back up the references used and vice versa. Example: bioenergy sustainability context of forestry material (where I believe you used Lattimore et al. 2009) has been updated by Lamers et al. 2013. DOI: 10.1016/j.biombioe.2013.02.002	Noted. Bioenergy is discussed in the annex.
23345	11	24				Suggest change "Bioenergy" sub-heading to "Biomass" and delete "Bioenergy from" the 4 cells below.	Noted. Bioenergy is discussed in the annex.
25968	11	24		24		The quote Eriksson and Gustavsson (2010) is missing in the reference list.	Accepted. References updated and reference list now complete.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26085	11	24	42			*Observation: The mitigation potential and social resilience of traditional livelihoods is relevant to this discussion. *Suggested text: Traditional livelihoods in particular, such as subsistence farming, pastoralism, artisanal fishing, swidden agriculture, and hunting and gathering, are often associated with elaborate social and land tenure arrangements that contribute to the management of resources, reinforce societal resilience in the face of climate change, and contribute to climate change mitigation (Nakashima et al, 2012; Ziegler et al, 2011). Small farmers typically cope with and prepare for climate change, through a series of agroecological practice that minimise crop failure. Observations of agricultural performance after extreme climatic events in the last two decades have revealed that resiliency to climate disasters is closely linked to the high level of on-farm biodiversity, typical of traditional farming systems (Altieri and Nicholls, in press). *References: Altieri M and Nicholls CI (in press) The adaptation and mitigation potential of traditional agriculture in a changing climate Climatic Change | Nakashima DK, Galloway McLean K, Thulstrup, HD, Ramos Castillo, A and Rubis, JT. 2012. Weathering Uncertainty: Traditional Knowledge for Climate Change Assessment and Adaptation. UNESCO/UNU-IAS, Paris/Darwin. ISBN: 9789230010683/9780980708486.. Downloadable from: http://www.ipmpcc.org/wp-content/uploads/2012/06/Weathering-Uncertainty_FINAL_12-6-2012.pdf | Ziegler, A, Fox, JM, Webb, EL, Padoch, C, Leisz, SJ, Cramb, RA, Mertz, O, Bruun, TB and Vien, TD. 2011. Recognizing contemporary roles of swidden agriculture in transforming landscapes of Southeast Asia. Conservation Biology, 25(4): 846–4	Accepted. Social resilience and traditional livelihoods are dealt with in section 11.4.5 and table 11.11.
19726	11	25				"bioenergy from unutilized forest growth" Bioenergy use in the developed world is lways in teh form of a "project" whose GHG reduction benefit has to be assessed with respect to a reference. In the case of unharvested forest growth, the reference would presumably be "trees left standing". Analyses have shown that this source of bioenergy would not yield GHG mitigation benefits for many decades to nearly a century (e.g. Bernier and Paré GCB Bioenergy 2012 DOI: 10.1111/j.1757-1707.2012.01197). I am not certain if this option should be considered as viable.	Noted. Bioenergy is discussed in the annex.
29442	11	25				Bioenergy from unutilised forest growth' - "Biomass from growth occurring in forests judged as being available for wood extraction, which is above the projected biomass demand in the forest industry." - this needs clarification. If the biomass is available in the existing forest it is much more likely to be actually used when there is a market and therefore higher value uses of wood will dominate compared to say bioenergy. Therefore this definition could be incorporated into 'Bioenergy from plant residues: forests'	Noted. Bioenergy is discussed in the annex.
24809	11	25				Bioenergy from unutilised forest growth' - "Biomass from growth occurring in forests judged as being available for wood extraction, which is above the projected biomass demand in the forest industry." - This needs clarification. If the biomass is available in the existing forest it is much likely to be actually used when there is a market and therefore higher value uses of wood will dominate compared to say bioenergy. Therefore this definition could be incorporated into 'Bioenergy from plant residues: forests'	Noted. Bioenergy is discussed in the annex.
22559	11	25				bioenergy from organic wastes: include other on-farm residues eg vegetable processing discards, in biogas generation. Also no mention of purpose grown energy crops eg maize and grass silage in biogas production.	Noted. Bioenergy is discussed in the annex.
23782	11	25				Biomass from silvicultural thinnings and loging should not be placed under the category 'bioenergy from plant residues' but under 'Bioenenrgy from unutilized forest growth'	Noted. Bioenergy is discussed in the annex.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23616	11	25				Regarding the "Forestry" parts in the Bioenergy section (p.25): you may also want to include Jonker et al. 2013. Carbon payback period and carbon offset parity point of wood pellet production in the Southeastern USA. GCB Bioenergy. Online early view.	Noted. Bioenergy is discussed in the annex.
23346	11	25				In "Agriculture" cell Jatropha is not "high-yielding" so suggest change to palm oil. And cell to left change "Dedicated plants" to "Dedicated energy crops"	Noted. Bioenergy is discussed in the annex.
27913	11	25		25		Row "Bioenergy from unutilized forest growth": mentioning of criteria how to judge biomass as being available for wood extraction seems to be necessary, especially in terms of biodiversity protection and soil nutrient conditions	Noted. Bioenergy is discussed in the annex.
37728	11	25	1			For bioenergy from unutilized forest growth - this needs further explanation. Does this mean that any growth above a projected future baseline demand should be considered 'available' and thus carbon neutral"? And what is the definition of "biomass that is not traditionally used by the forest industry"? Natural forest, old growth included? There should be language here about 'maintaining sustainable levels of forest stock' or something to that effect.	Noted. Bioenergy is discussed in the annex.
37729	11	25	1			Bioenergy from dedicated plants, both forest and ag: need to add language per considerations of GHG impacts of LUC/LU management change or crop shifting on existing croplands that are necessary for dedicated energy crop production	Noted. Bioenergy is discussed in the annex.
32660	11	25	10			are these reasonable assumptions? The range of the literature do not really support this as the principal assumption.	Partially accepted. The assumptions of stability and durability of effects are consistent with meta-analysis of Spokas and Jeffery et al, Biederman & Harpole. Caveats are clearly stated. Some re-wording allays these concerns.
27911	11	25	11	25	11	The assumption might not be justified as Jeffery et al., 2011b clearly shows. Therefore add at the end of the sentence in line 12 "however those assumptions are not fully proven" or delete the whole sentence.	Partially accepted. The importance of the assumptions around the uncertainty apparent in the meta-analysis is more explicit through re-wording.
24805	11	25	12	25	12	This Chapter misses the opportunity to point out that pyrolysing biomass can significantly reduce emissions of soil GHGs N2O and CO2. There is a new publication (Van Zwieten et al., 2013) which could be referenced which uses in-field automated chamber technology to compare raw poultry litter application vs. the same material pyrolysed. A sentence could be included to capture this as “Significant reductions in emissions of N2O from field trials were demonstrated when poultry litter was pyrolysed. Similar crop yields resulted between raw poultry litter and pyrolysed poultry litter (Van Zwieten et al., 2013).” Suggested citation: Van Zwieten L, Kimber SW, Morris SG, Singh BP, Grace P, Scheer C, Rust J, Downie A, Cowie A (2013) Pyrolysing poultry litter reduces N2O and CO2 flux. Science of the Total Environment. http://dx.doi.org/10.1016/j.scitotenv.2013.02.054	Partially accepted. Although this (new) one is important as it is field based and has high temporal resolution it is also very specific (soil and biochar type) and of still limited duration. There is limited space to go into the details of specific studies as requested, but the general statement strengthened. The inclusion of the effect in the global analysis (and the sensitivity of the analysis to it) are emphasized.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23333	11	25	12			Positive effects of biochar on N2O and CH4 emissions are still uncertain basically because many publications do not provide an adequate characterisation of the biochars used and there is a general lack of understanding of soils. Now the definition of biochar is given by the IBI Standards. Based on this definition, some of the publications that showed effects on N2O emissions were carried out using charcoals that no longer fulfil the definition of biochar (especially as it refers to C stability). As an example, if you add labile C to a soil, microbes will start decomposing it and N will concomitantly become immobilised (stored in microbial cells). Therefore, less N will be available for either nitrification or denitrification --> that means that N2O emissions will be reduced. However, this cannot be generalised to all studies on biochar and N2O emissions.	Partially accepted. This is detail that supports a comment on the current uncertainty of the effect (while noting the potential). The lack of information is primarily on the diversity of biochar - the response of soils should be predictable in the way suggested if more was known about the range in biochar properties.
37733	11	25	15	25	15	Add period after ˜sustainable' and start next sentence with ˜Woolf'	Accepted. Generally sentences shortened to improve readability (note: Endnote citations are putting brackets around author names supposed to be in the text).
37734	11	25	16	25	16	Does the ˜competition' referred to reference fast pyrolysis for biofuels? If not, please clarify.	Accepted. But no change required - any form of energy conversion.
23347	11	25	17			Why 1.01 and not 1 Gt?	Rejected.- att units in this box given to 2 d.p. or units of 10 Mtc
23334	11	25	18			Meta-analysis of biochar is under evaluation. Some studies have added biochars with a high liming equivalence to a calcareous soil and observed negative effects of biochar on crop production as expected. Nonetheless the indicated 15% increase in crop production is a reasonable value if the adequate biochar is added to balance specific soil needs. A forthcoming book chapter on the classification of biochars will include the BC100 + the classification of biochars based on their added value and should be available for referencing before Sept 2013.	Accepted. New meta-analysis referenced, but no expansion required, a note on soils with constraints giving larger effects covers this (until new publications emerge).
23653	11	25	2			What about instances of biochar resulting in N deficiency? Ippolito et al in JEQ is one example	Accepted. Probably a function of application rate - note added on experimental dosages versus realistic / economic doses.
19100	11	25	2	25	2	Biochar. Soot collected from improved stoves with chimneys is also biochar.	Rejected. If used in soil some would categorize this as biochar. However, it comprises a small portion of biomass carbon and would not on its own constitute an important strategy to mitigate climate change.
37730	11	25	2	26	15	Biochar Box 11.4 only has two references. Recommend increasing the number of references to increase reader confidence especially in light of such a brief, tight, summary. Recommend including papers assessing C mitigation potential of biochar, cost of biochar in light of competition between agriculture and soil restoration versus biofuel production, to name a few (Cornell University and Iowa State University have produced such publications). Indication that "economic factors currently constraining biochar"not considered' (lines 10 & 11) is insufficient.	Partially accepted. The topic is large (600 papers since 2008) so difficult to summarise concisely other than with reference to meta-analyses and global assessments. Economics is an important aspect but has to be within the limits of considerations (of economics) elsewhere in the chapter. Note on economics expanded.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27907	11	25	2	26	15	The box should be shortened. What is in there shows that there are still a lot of assumptions made which might not be realistic. It seems there is a lot more work to be done. A short summary of procedures to produce biochar (it is not alone pyrolysis but ETC for instance as well. possible advantages and disadvantages should be shortly listed and research gaps should be mentioned.	Rejected. The scale of the (new) mitigation opportunity warrants the box provided; the many research gaps are implicit in the discussion. Highlighting both is necessary to further assess the possibility.
31502	11	25	2	26	15	In this box, it could be useful to mention the development of very small-scale biochar systems - in particular - cookstoves that produce biochar as well as heat for cooking. See, for example [Whitman, T., Nicholson, C.F., Torres, D., Lehmann, J., 2011. Climate change impact of biochar cook stoves in western Kenyan farm households: system dynamics model analysis. Environmental science & technology 45, 3687–3694.] and [Torres-Rojas, D., Lehmann, J., Hobbs, P., Joseph, S., Neufeldt, H., 2011. Biomass availability, energy consumption and biochar production in rural households of Western Kenya. Biomass and Bioenergy 35, 3537–3546.]. Although not yet widely deployed, there is substantial development occurring on such stoves, important due to their impacts on human health (indoor air pollution), fuel flexibility, and agricultural effects, in addition to their climate impact.	Partially accepted. Biochar technologies of any type can not be described as 'widely deployed' (other than in the sense of tried out experimentally in different parts of the world). Very few tonnes of biochar have been demonstrably created as yet. Micro-scale units where co-production of energy would be for cooking is one option It would fall under the options for 'remote, seasonal or diffuse biomass resource' use.
31503	11	25	2	26	15	In this box, it would also be useful to emphasize that, as with other biomass bioenergy systems, the net C impact is strongly influenced by the baseline scenario - particularly what would have happened to the biomass were it not used in this system. See [Whitman, T., Scholz, S., & Lehmann, J. (2010) Biochar projects for mitigating climate change: an investigation of critical methodology issues for carbon accounting. Carbon Management, 1:89-107.]	Rejected. The counterfactuals are (as always) important. It is noted in the text that the potential abatement is greater when fossil energy substitution is not the bioenergy alternative.
27912	11	25	20	25	23	The range and the sentence in lines 24-26 show that the effects are quite uncertain and more data are needed before this activity is recommendable. This should be reflected in the box.	Partially accepted. These ranges were used for the purpose of sensitivity analysis. This enables R&D effort to be targeted. The use of biochar is not recommended, but put forward as a potentially significant technology option.
29444	11	25	26			insert the reference '(Singh et al., 2010)' after the text 'biochar amendment'. (Singh BP, Hatton BJ, Singh B, Cowie AL, Kathuria A (2010) Influence of biochars on nitrous oxide emission and nitrogen leaching from two contrasting soils. Journal of Environmental Quality, 39, 1224–1235). Additionally, this sentence could be referenced to Van Zwieten et al., (2009), where a range of mechanisms discussing impacts of biochar on N2O flux are discussed. Van Zwieten, L., Singh, B-P, Joseph S, Kimber, S, Cowie, A and Chan Y. (2009) Biochar reduces emissions of non-CO2 GHG from soil. Chapter 13, pp 227-249 in “Biochar for Environmental Management: Science and Technology” eds Lehmann J and Joseph S. Earthscan	Partially accepted. A number of references to capture the range of studies reporting biochar effects on N2O emission inserted (scale, duration, conditions).
29445	11	25	26	25	26	change 'years' to 'months'	Accepted. Most of these studies involved daily to weekly measurements over a period of 1-2 yrs max.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29446	11	25	26	25	26	Cite Singh BP, Hatton BJ, Singh B, Cowie AL, Kathuria A (2010) Influence of biochars on nitrous oxide emission and nitrogen leaching from two contrasting soils. Journal of Environmental Quality, 39, 1224–1235 as an example of "short-term dramatic suppression"	Partially accepted. A number of references to capture the range of studies reporting biochar effects on N2O emission inserted (scale, duration, conditions).
24806	11	25	26	25	26	Suggest further reference '(Singh et al., 2010)' after the text 'biochar amendment': (Singh BP, Hatton BJ, Singh B, Cowie AL, Kathuria A (2010) Influence of biochars on nitrous oxide emission and nitrogen leaching from two contrasting soils. Journal of Environmental Quality, 39, 1224–1235). Additionally, this sentence could be referenced to Van Zwieten et al., (2009), where a range of mechanisms discussing impacts of biochar on N2O flux are discussed. Citation: Van Zwieten, L., Singh, B-P, Joseph S, Kimber, S, Cowie, A and Chan Y. (2009) Biochar reduces emissions of non-CO2 GHG from soil. Chapter 13, pp 227-249 in “Biochar for Environmental Management: Science and Technology” eds Lehmann J and Joseph S. Earthscan	Partially accepted. A number of references to capture the range of studies reporting biochar effects on N2O emission inserted (scale, duration, conditions).
24807	11	25	26	25	26	change 'years' to 'months'	Accepted. Most of these studies involved daily to weekly measurements over a period of 1-2 yrs maximum.
24808	11	25	26	25	26	Cite Singh et al 2010 as an example of "short-term dramatic suppression" Citation: Singh BP, Hatton BJ, Singh B, Cowie AL, Kathuria A (2010) Influence of biochars on nitrous oxide emission and nitrogen leaching from two contrasting soils. Journal of Environmental Quality, 39, 1224–1235)	Partially accepted. A number of references to capture the range of studies reporting biochar effects on N2O emission inserted (scale, duration, conditions).
24804	11	25	3	26	16	Biochar is highly variable in definition and durability. Half-life is dependent on particle size and constitution, and the period may be in terms of years to decades depending on the form of biochar. Suggest either: 1) remove language/section which promotes biochar in an unbalanced way, or 2) If the authors want to retain the current level of promotion for biochar, further context be included- in particular the full life cycle analyses must be considered as it has a high energy requirement to produce and can produce volatile gases that may have significant global warming potential.	Partially accepted. The box does not promote biochar use. Points on risks of fugitive emissions and making clear the link between production and properties is added. The LCA and counter-factual aspects are covered.
37731	11	25	4	25	26	It should be mentioned that low heat forest fires produce a tremendous amount of charcoal.	Rejected. The natural black carbon cycle operates at a scale within an order of magnitude of that scoped by Woolf et al. It would be best if this was signaled in another chapter of the report dealing with the natural carbon cycle, referring to this box?
27908	11	25	4	25	4	Expression "alternative or enhancement to bioenergy" is unclear, please clarify. Furthermore according to IPCC reporting rules biochar would be reported under soil organic matter not under biomass. It is not clear what biomass stabilization means here.	Accepted. Wording changed to address these points. "biomass C stabilisation' is used to introduce the concept of pyrolysis, its should be obvious that the crux is its storage in soil.
37732	11	25	5	25	26	Box 11.4: do the analyses cited here take into account the energy expended to heat the biomass against the GHG 'benefit' of biochar? Please state clearly here if so/not.	Rejected. Yes, the system carbon abatement referred to at the outset has to account for the whole system, LCA is implied.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27909	11	25	7	25	7	There is no evidence whether biochar added to soils will enhance plant growth or will have negative impacts on it.	Rejected. The evidence for these impacts resides within the meta-analysis (now analyses) referred to in the box.
27910	11	25	8	25	8	Pyrolysis is an exothermic procedure, so that the primary energy systems from biomass itself. Therefore it is important that the biomass for pyrolyse doesn't come from biomass that is not solely grown for energy use but from waste biomass. As discussed in literature 10 to 25 t biochar per hectar are necessary to affect plant growth. For this 2 to 10 hectares of biomass crops are needed. That doesn't work. LCA is therefore desperately needed.	Partially accepted. The point about ratio of area of biomass sourcing versus area of biochar applied is important, especially w.r.t. dose. Most - but not all - studies have used "experimental doses" reflecting the stage of the research. This is now more explicit in the text. Dose / response curves do not exist but may not be linear (crop response to small incremental additions annually could also be positive).
29443	11	25	12			This Chapter misses the opportunity to point out that pyrolysing biomass can significantly reduce emissions of so GHGs N2O and CO2. There is a new publication (Van Zwieten et al., 2013) which could be referenced which uses in-field automated chamber technology to compare raw poulty litter application vs the same material pyrolysed. A sentence could be included to capture this as " Significant reductions in emissions of N2O from field trials were demonstrated when poultry litter was pyrolysed. Similar crop yields resulted between raw poultry litter and pyrolysed poultry litter (Van Zwieten et al., 2013)." Van Zwieten L, Kimber SW, Morris SG, Singh BP, Grace P, Scheer C, Rust J, Downie A, Cowie A (2013) Pyrolysing poultry litter reduces N2O and CO2 flux. Science of the Total Environment. http://dx.doi.org/10.1016/j.scitotenv.2013.02.054	Partially accepted. There is limited space to go into the details of specific studies, but this (new) one is important as it is field based and has high temporal resolution. The 'box' mentioned the indirect effects of biochar, while noting that the duration and specificity of effects (in relation to biochar type and dose) requires some caution in over-emphasizing this aspect.
19363	11	26	1	26	1	N2O flux while explainable are not certain???? Meaning? Or are words missing?	Partially accepted. Experimental observations can be explained, without the certainty required for the purposes of prediction. Wording updated to be clearer.
37735	11	26	1	26	15	It should be mentioned that low heat forest fires produce a tremendous amount of charcoal.	Rejected. The natural black carbon cycle operates at a scale within an order of magnitude of that scoped by Woolf et al. It would be best if this was signaled in another chapter of the report dealing with the natural carbon cycle, referring to this box?
21237	11	26	13			Change term to "acquisition"	Rejected. Does this relate to the discussion of economic "return" (to biochar use through crop productivity)? Wording changes may address this.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29449	11	26	14		15	cite a reference that summarizes the risks eg Downie A, Munroe P, Cowie A, Van Zwieten L , Lau D (2012) Biochar as a Geo-engineering Climate Solution: Hazard Identification and Risk Management. Critical Reviews of Environmental Science and Technology 42:225-250 or Cowie, AL, Downie AE, George BH, Singh BP, Van Zwieten L, O'Connell D 2012 Is sustainability certification for biochar the answer to environmental risks? Pesquisa Agropecuária Brasileira 47 (5), 637-648	Accepted. References cited.
24811	11	26	14	26	15	Suggested reference that summarizes the risks: Downie A, Munroe P, Cowie A, Van Zwieten L , Lau D (2012) Biochar as a Geo-engineering Climate Solution: Hazard Identification and Risk Management. Critical Reviews of Environmental Science and Technology 42:225-250	Accepted. References cited.
23336	11	26	14			Standards of biochar are already available. See http://www.biochar-international.org/node/3340	Accepted. Reference cited. These standards are from a NGO and not by a regulatory body.
20265	11	26	16	28	10	Paragraph 11.3.2 on 'Mitigation effectiveness (non-permanence: saturation,….)' can further be reduced as the concept of non-permanence is now fairly well understood. However, displacement specifically in the context of iLUC as also impact of climate change on mitigation potential need to be included as more studies, research, knowledge and information are expected on these two elements of AFOLU.	Accepted. iLUC expanded and other sections reduced (since they were discussed already in AR4).
29450	11	26	23		24	"Various types of carbon sinks (e.g., forestry, agricultural soil C)" Here and elsewhere "sink" is used inaccurately to refer to a carbon pool or reservoir. A sink is a process that removes CO2 from the atmosphere. Forestry may be a sink activity - through A/R or FM, or it may be a source if the C stock decreases. Agricultural soil C is a reservoir; management of SOC can result in a sink or a source.See Cowie AL, Pingoud, K and Schlamadinger, B 2006. Stock changes or fluxes? Resolving terminological confusion in the debate on land-use change and forestry Climate Policy 6 (2006) 161–179 . Substitute "Carbon sequestration in biomass or soil has an inherent risk of future reversal."	Accepted. Ambiguous and incorrect use of term "sink" has been corrected.
24812	11	26	23	26	24	"Various types of carbon sinks (e.g., forestry, agricultural soil C)" Here and elsewhere "sink" is used inaccurately to refer to a carbon pool or reservoir. A sink is a process that removes CO2 from the atmosphere. Forestry may be a sink activity - through A/R or FM, or it may be a source if the C stock decreases. Agricultural soil C is a reservoir; management of SOC can result in a sink or a source. Substitute Carbon sequestration in biomass or soil has an inherent risk of future reversal. Citation: p36. Cowie AL, Pingoud, K and Schlamadinger, B 2006. Stock changes or fluxes? Resolving terminological confusion in the debate on land-use change and forestry Climate Policy 6 (2006) 161–179.	Accepted. Ambiguous and incorrect use of term "sink" has been corrected.
32662	11	26	24	26	26	this last sentence should be struck. The atmosphere doesn't have buffer pools or insurance to compensate for reversals. This point has nothing to do with real mitigation.	Accepted. Sentence removed.
27914	11	26	24	26	26	Delete the sentence starting with "various " and ending with "occur". The mechanisms discussed don't change emissions or removals to the atmosphere but what is accounted for a respective party to the Kyoto Protocol. Such considerations are not an issue for this scientific report.	Accepted. Sentence removed.
37736	11	26	25	26	25	Please elaborate on "emissions trading schemes" by using some examples	Noted. This sentence has now been removed. (see response to 32662, 27914)
37737	11	26	26	26	26	Please include citations for such programs.	Noted. This sentence has now been removed. (see response to 32662, 27914)
30997	11	26	27	26	36	Could remove this text to shorten chapter.	Accepted. Paragraphs removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27915	11	26	27	26	32	As we are asked for suggestions to shorten the chapter, this para could be deleted. According to the hardline the chapter is not about monitoring and reporting.	Accepted. Paragraph removed.
29448	11	26	37		40	Delete - unnecessary	Rejected. This detail is important as it describes the difference in non-permanence between different types of AFOLU mitigation and also leads into bioenergy.
27248	11	26	37		37	change avoided by reduced	Accepted.
30998	11	26	39	26	40	The same also applies to the use of biomass-based products used to displace more emissions-intensive products (e.g. Wood in place of concrete or steel) in construction.	Accepted. Included in section 11.4.
29451	11	26	41		43	reword: the beginning and end of the sentences are contradictory Suggestion: Unintentional reversals may be caused by natural events that affect yields / growth (e.g. frost damage, pest infestation, fire) and although these will affect the annual increment of C sequestration or N2O flux, they may not result in a permanent decline in carbon stock.	Accepted. Reworded and included in section 11.5.
30999	11	26	41	26	43	This sentence is confusing, as it refers to "unintentional reversals" that lead to a change that "is not a reversal". Also, the sentence seems to imply that natural disturbances such as pests and fire cannot lead to reversals. Consider rewording this sentence to read "Unintential reversals may occur following some types of natural disturbances such as stand-replacing forest fire and tree-killing pest infestations."	Accepted. Reworded and included in section 11.5.
24813	11	26	41	26	43	The beginning and end of the sentences are contradictory. Suggest reword: "Unintentional reversals may be caused by natural events that affect yields / growth (e.g. frost damage, pest infestation, fire) and although these will affect the annual increment of C sequestration or N2O flux, they may not result in a permanent decline in carbon stock."	Accepted. Text edited to account for comments. 29451, 30999, 24813
21017	11	26	41	26	45	Please be careful - of course losses of annual crops can be reversals (their service has to be gotten from something different, resulting in - negative - replacement effects or additional HANPP) and the same holds true for reductions in annual increment. For example, a long-term large area reduction in growth may lead to increased use of area for feedstock or crop production.	Accepted. Comment regarding annual crops deleted; above ground biomass in annual crops not a component of carbon sequestration.
37738	11	26	41	26	43	"Unintentional reversal" are not reversals." While this may be true when no human interventiosn are likely, it does seem these areas (certainly in the case of fire) are at greater risk for permanent conversion. So it seems it may be more accurate to say these are short-term reversals with a higher chance for long term reversal.	Accepted. Unintentional removed and losses described as short term and long-term.
27916	11	26	41	26	43	Delete "unintentional" for emissions and removals to the atmosphere it doesn't matter. This matters only for compliance under the Kyoto Protocol. Delete the last part of the sentence in line 43 after the comma or modify it; for instance: delete "is" and insert "might" and add after reversal "in the long run".	Partially accepted. Unintentional removed, paragraph edited in line with this and comments. 29451, 30999, 23813.
31000	11	26	42	26	48	The argument in this paragraph relates to whether or not the released C can be balanced by subsequent uptake, but the section is on reversibility. Reversals release previously stored carbon. For forests, more than the annual C increment if affected. Fires have direct emissions as well as indirect emissions from decaying dead trees. These events cause the release of previously stored carbon, and are reversals.	Noted. The paragraph describes (a) the importance of considering losses, and (b) considering those losses in terms of recovery and the timeframes involved.
32663	11	26	44			citation needed. Why would you expect that only soil carbon less than one year old is affected?	Accepted. This sentence has now been removed.
22538	11	26	45	26	48	The loss of C after a forest fire is a fact, independently of what happens following the fire. There might be a recovery of the stock later, unless a land use change occurs, but, even in the case of no-land use change, for a period of time the stock will be below what was there before the fire. Emissions of non-CO2 gases has to be considered too.	Accepted. Text added.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37739	11	26	48	27	2	This is correct - however this runs counter to language earlier that was very definititive that emissions from fire (natural or anthro) were replaced (sequestered) and thus balanced (which is wrought with gross assumptions)(Page 19 line 27-31). I suggest leaving this language on page 26/27 as is and editing/fix earlier langauge	Accepted.
19364	11	26	5	26	5	IF biochar is absolutely stabile, HOW could it then IMPROVE biomass production (as said in Table 11.3)?	Rejected. Biochar modifies the chemistry and physical properties of the soil aside independent of its mineralisation (short term - release of soluble ash, provision of cation exchange capacity, etc., water holding and release...)
23335	11	26	6			New work led by the International Biochar Initiative (IBI) has estimated the fraction of C in biochar that will remain stable in 100 years. BC100 has a nice (negative) relationship between this value and the molar H/C org value of the biochar giving an idea of C aromaticity. The lower the value the greater the aromaticity. The BC100 has been determined based on 5-year incubations + modeling. Debbie Reed, the Exec Director of the IBI would be the person to contact if access to the document is needed.	Rejected. Published work is already cited; IBI work is not yet published.
29447	11	26	7	26	8	Include additional reference to justify this range, and provide explanation. substitute: 'extrapolated from direct short- to medium-term observations, estimates ranging from <50 to >10,000 years (Spokas, 2010; Singh et al., 2012), with greatest stability found for biochar made at higher temperatures, and from woody biomass, and lowe stability for manure-based biochars (Singh et al, 2012)	Partially accepted. Note to emphasise the median value added; the general importance production to properties is now signaled.
24810	11	26	7	26	8	The text 'extrapolated from direct short-term observation, estimates ranging from <50 to >10,000 years 7 (Spokas 2010).' should read as ...'extrapolated from direct short- to medium-term observations, estimates ranging from <50 to >10,000 years (Spokas, 2010; Singh et al., 2012).' Also suggest insert the following line after '(Spokas, 2010; Singh et al., 2012).' ...”Certainly, the stability of all biochars in soil is not the same and can be influenced by pyrolysis conditions (e.g. temperature) and biomass feedstock source (Singh et al. 2012)."	Partially accepted. Note to emphasise the median value added; the general importance production to properties is now signaled.
32661	11	26	7			add to citation list Schmidt et al. nature 478: 49-56	Accepted. It is useful to put the projected half-life of biochar against those of other fractions of carbon in soil. This citation is appropriate and could be added / cross-referenced in the report.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31613	11	26				Info on case study: Creating Sustainable Livestock management practices to reduce CO2 levels and cure climate crisis Curing environmental malfunction: A 1% increase in soil organic matter over 12 billion acres of grasslands, as a result of introducing holistic planned grazing of livestock (minimizing overgrazing by “maintaining a high graze/trample: recovery ratio (generally no more than 3 days grazing always followed by 3 to 9 months of recovery) on the land at all times”, would represent the net carbon sequestration of 67.5 ppm CO2 = 135 gigaton of carbon from the atmosphere (Savory Institute 2013, Ibarra-Howell, 2012). Allan Savory of the Savory Institute suggests that if half the world’s grasslands were managed in the manner documented above (as is already being successfully practiced in some areas of the world), much desertification could be reversed and the grasslands would be able to store enough carbon to reduce atmospheric CO2 to pre-industrial levels (Savory, 2009). His methods have been proven to be realistic and are known to work. References: Savory, A. (2009), Allan Savory - Keeping Cattle: cause or cure for climate crisis? Feasta Lecture 2009, http://vimeo.com/8239427#at=0 Savory Institute 2013, http://www.savoryinstitute.com/wp-content/uploads/2013/03/Science-Methodology-Holistic-Mgt_Update_March.pdf Ibarra-Howell, D. (2012), Current Livestock Production Models Are Unsustainable, http://www.savoryinstitute.com/2012/04/blog/current-livestock-production-models-are-unsustainable/	Noted. Carbon sequestraion thorugh grazing land management (including, but not limited to, the practices descibed in this comment) is already included. Peer reviewed sources used to support the potentials quoted.
25516	11	26				Under the "Mitigation effectiveness (non-permanence: saturation, human and natural impacts, displacement)", I found that the sub theme such as Non-permanence / reversibility, Saturation, Human and natural impacts, Displacement / leakage, Additionality and Impacts of climate change either can be further summarized into points or can be illustrated these points through a table.	Noted. We considered a table, but have retained the text format.
30521	11	26	24	26	26	It is also important to mention the non-permanence solution provided by the CDM: tCERs and lCERs as an alternative to permanent CERs. It seems unreasonable to quote several mechanisms without refering to the official solution currenly adopted under the UNFCCC.	Noted. Non-permanence is dealt with in 11.3.2 and 11.5
29209	11	26	33	26	36	Very long term data series are available for UK agriculture from the Rothamsted experiments. These indicate that carbon is lost from systems far more quickly than it is accumulated.	Noted. Non-permanence and timecourse of loss / gain is dealt with in 11.3.2 and 11.5
23783	11	26				This box on Biochar lacks clarity. The text should have just 3-4 lines on what biochar is and how it was used in ancient times and 5-6 lines on its potential and the most likely sites it could be used in the coming 20 years or so.	Partially accepted. Ancient use is a distraction as the purpose was different and the soil augmented over very long timeframes. The clarity of the box as a whole has been improved.
34011	11	27				Line 40/41 states that iLUC is being discussed in section 11.4, however, this shall be discussed in more detail, e.g. suggesting procedures to account for iLUC, give estimates of the impact of iLUC versus LU and LUC, how big is this problem? What are spatial boundaries to look at iLUC? In what sectors is iLUC important? What are measures to avoid iLUC?	Rejected. iLUC is discussed in more detail in the bioenergy Annex; Sect 11.A.4.2 in particular

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31001	11	27	1	27	3	This text seems isolated and does not contain any citations - it could be removed to help shorten.	Rejected. This is the final sentence in the discussion on fire effects and carbon loss. It does contain a reference. Is the correct page reference given here?
21369	11	27	10		20	The item on saturation needs to be revised to separate the physical reality from the accounting impacts. A production forest may have steady state C stock, and still yield a constant supply of timber. Hence despite a steady stock the sink clearly remains. The sink is balanced by the source during combustion/decay. The emissions from bioenergy exceed those from fossil fuels for same energy output, hence there is no actual avoidance from this activity, only an artefact of the accounting system.	Noted. The section effectively describes how sequestration occurs until a steady state is achieved, with this steady state being the sink. Bioenergy emissions are described in the bioenergy Annex.
37740	11	27	10	27	20	Please rewrite paragraph for clarity	Accepted. Paragraph edited.
27918	11	27	10	27	10	Delete from "avoided" until "bioenergy" and start the sentence with "Substitution of fossil fuel, and material with biomass". Please insert "substituted fossil fuel" before "emissions". Only those emissions are avoided, CO2 is emitted too if biomass is burned. Material substitution should be added.	Partially accepted. Some edits to the section. This section is describing saturation in broad terms by contrasting mitigation activities that avoid emissions and those that involve sequestration.
27919	11	27	10	27	10	Substitution of materials should be added as well.	Accepted. Text added.
29452	11	27	11			sequestration, not sequestered	Accepted. Text added.
24814	11	27	11	27	11	Please amend sequestered to sequestration	Accepted. Text added.
32665	11	27	17			this isn't so much an alternative view as it is a qualification -- in some systems (old-growth forests) saturation may not occur. Old-growth forests are the only system for which you include evidence to back up this claim.	Noted.
29820	11	27	22	27	22	“change” should be written “changes”	Accepted. Text added.
29520	11	27	24			Sinks can also…: Does this refer to sink processes or forest C stocks? Reword to clarify.	Accepted. It applies to both. Text edited accordingly.
29821	11	27	25	27	28	“Between the direct human induced […] of that piece of land” could be cut and rewritten as: “Indirect human-induced changes can impact carbon sinks and are influenced by human activity, but are not directly related to the management of that piece of land”. Shorter for the same info.	Accepted and changed.
37741	11	27	28	27	28	Rewrite "management atmospheric nitrogen" to "management; examples being, induced climate change and atmospheric N deposition."	Accepted and changed.
27920	11	27	29	27	30	There is scientific evidence that rising levels of tropospheric ozone caused by human activities may counteract the fertilizing effect of CO2 in the atmosphere and N deposition at least for some tree species (Sitch et al. 2007, Nature448, 791 - 794; Matyssek et al. 2010, Environmental Pollution 158 (2010) 2527-2532). This aspect should be added to the text.	Accepted. This text added.
21018	11	27	3	27	4	This does not constitute a permanence issue, this is saturation (the sink does not continue to REMOVE carbon, which does not mean it will start to EMIT / LOSE carbon).	Accepted. This text removed.
27917	11	27	3	27	9	What is the result of the estimates and studies? It is not so interesting how longevity of soil C is defined(that could go to the Glossary) but by which activity it can be influenced.	Accepted. Text edited. Permanence discounting functions added.
21019	11	27	31	27	47	You include the timing of wood use, but do not include substitution? Please include replacement (substitution) effects here, too.	Rejected. Example given includes replacement in housing construction materials.
29453	11	27	32		35	Reword for clarity	Rejected. Existing wording is clear.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37742	11	27	33	27	35	The definition for leakage here is not the usual definition as used in the leakage literature for this sector and is incorrect. Leakage does not necessarily stem from a reduction in emissions. It is from a change in land use/land use management that causes a change in emissions elsewhere (postive or negative). Please revise the text accordingly.	Accepted. Revised definition of leakage inserted, using this text.
29822	11	27	35	27	35	One possible reference is Paul C. WEST et alii's 2010 article, "Trading carbon for food: Global comparison of carbon stocks vs. crop yields on agricultural land", Proceedings of the National Academy of Science of the United States of America vol. 107 no 46, p. 19645– 19648, DOI: 10.1073/pnas.1011078107 — This article discusses, provides interesting data and offers quantification and comparison for different geographical zones on the trade-off carbon intake/release and agricultural activity. It raises issues regarding policies of incentives and compensation that relate to many points made throughout chapter 11, I would have it quoted if only once, here. It is also referred to as important in Foley's 2011 major article, "Solutions for a cultivated planet".	Accepted and text inserted.
37743	11	27	35	27	39	If explanations or hypotheses were given for the huge variance in estimated leakage, then the authors should include	Noted. Uncertain what the point is here.
22136	11	27	39	27	41	iLUC discussion can be included here as this also considers changing diets and displacement of crop, feed and livestock production. For more details see Bowes et al. (2012); "What's cooking? Adaptation and mitigation in the UK Food system"; Roeder et al. (2011): "Sustainable global wheat supply scenarios under future climate change impacts, Revisiting the Socio-Political and Technological Dimensions of Climate Change, 19-21 May 2011, Preston, UK (conferences proceedings), University of Central Lancashire; E. Dawkins et al. (2011): Written evidence to 'Consumption-based emissions reporting' Inquiry, UK Government Energy and Climate Change Committee	Rejected. As pointed out in the text iLUC is discussed in Sect 11.4 and in the bioenergy annex. These references not used as they are not in refereed sources.
20132	11	27	39	27	41	iLUC discussion can be included here as this is also to consider regarding changing diets and displacement of crop, feed and livestock production. for more details see: A. Bows et. al 2012. What's Cooking? Adaptation & Mitigation in the UK Food System/// M. Roeder et al. 2011, Sustainable global wheat supply scenarios under future climate change impacts, Revisiting the Socio-Political and Technological Dimensions of Climate Change, 19-21 May 2011, Preston, UK (conferences proceedings), University of Central Lancashire./// E. Dawkins et al. 2011 Written evidence to 'Consumption-based emissions reporting' Inquiry, UK Government Energy and Climate Change Committee	Rejected. As pointed out in the text iLUC is discussed in Sect 11.4 and in the bioenergy annex. These references not used as they are not in refereed sources.
37744	11	27	39	27	39	iLUC was defined earlier so the acronym is not necessary here	Accepted and edited in text.
31002	11	27	4	27	10	Repetition of earlier text: Ch11, P13, L12, and this is covered nicely in Section 11.5.2. Could be removed.	Rejected. Text inserted to link to 11.5.2. Text here also considers the economic treatment of permanence which is important in trading schemes.
22137	11	27	42	27	43	Timing of mitigation benefits also applies to crop (food and non-food). There exists plenty of literature about timing of activities	Rejected. Not certain how to incorporate this comment without specific references to literature.
20133	11	27	42	27	43	Timing of mitigation benefits also applies to crop (food and non-food). There exists plenty of literature about timing of activities	Rejected. Not certain how to incorporate this comment without specific references to literature.
32666	11	27	42	27	47	paragraph is not clear. Delete or reword.	Rejected. This paragraph contains information important for this discussion. Have slightly reworded.
27921	11	27	42	27	47	It is unclear what "timing of mitigation benefits" means. An example would be useful.	Accepted. Reworded and additional text added.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37745	11	27	44	27	45	Remove first "of' from "modeled the impact of timing of benefits"'	Rejected. Have reworded the remainder of this sentence.
27922	11	27	44	27	47	Mitigation potential of harvested wood products differ in developing countries and developed countries depending on the average lifetime and mix of the different wood types. A detailed analysis would help to assess if rules for land use change have to be differentiated for different countries.	Rejected. This is a good point but would require considerable space to accommodate. Similarly, not clear if refereed literature exists around this.
29823	11	27	45	27	45	“varies” should be “varying”	Accepted. Have removed this word.
29824	11	27	46	27	46	Typo: the point should be a coma	Accepted and edited.
29454	11	27	47			atmospheric CO2 concentration, not CO2 contents	Accepted and edited.
29526	11	27	47			Insert at end of page: The temporal pattern of emissions and removals is especially important in mitigating emissions of short-lived gases through carbon sequestration: Lauder et al (2013) have proposed a novel approach to offsetting a constant flux of livestock methane through a single carbon sequestration event. Reference: Lauder, Enting et al (2013) Offsetting methane emissions — An alternative to emission equivalence metrics. International Journal of Greenhouse Gas Control 12: 419–429	Accepted and text inserted.
24815	11	27	47	27	47	Please amend CO2 contents to atmospheric CO2 concentration	Accepted and edited.
32664	11	27	7	27	9	this sentence should be struck. The topic of this section is mitigation -- what the atmosphere sees. What the market sees is irrelevant. Discounts don't matter to the atmospheric concentrations of GHGs.	Accepted. Sentence removed.
22560	11	27	29	27	29	sentence suggests box 11.2 contains information on the rate of C uptake by peatlands but this does not appear to be the case	Accepted. Relative mitigation rates now included in table 11.2.
29210	11	27	31	27	41	Potentially worth referencing the Powlsen et al (2011) paper on this	Accepted. Citation to paper by Poulsen et al. 2011 added.
21370	11	28	1		3	Explain why additionality is an issue? if an activity reduces emissions or creates sinks is it less valuable if it was always going to happen?	Noted. If it will occur anyway, it will be in the baseline and does not constitute additional mitigation.
25148	11	28	1	28	3	The “additionality” concept deserves more discussion as it is a significant institutional risk to mitigation in general, particular for sinks strategies and AFOLU measures. Additionality was badly handled in the Clean Development Mechanism, basically became the downfall of the LULUCF accounting provisions under the Kyoto Protocol and now threatens to undermine REDD. A good critique is the working paper by Leigh Raymond, “Beyond Additionality in Cap-and-Trade Offset Policy,” available at: http://www.brookings.edu/~/media/research/files/papers/2010/7/additionality-raymond/07_additionality_raymond	Noted. Wording improved, but this paper not used due to preference for peer-reviewed literature.
22539	11	28	1	28	3	the concept of additionality related to forests. This shall be related to multifunctionality of forests, and multifunctional management of all the services they provide, including C storage. Managing forests thinking only on mitigation effects will be counterproductive, and this might be made clear when talking about additionality.	Noted. Functionality of forests and other ecosystems emphasised throughout.
32667	11	28	1	28	3	this discussion does not belong here. Again mitigation is being confused with marketability of offsets. What does the atmosphere see? Additionality is irrelevant to the atmosphere. Strike this sentence.	Rejected. If it will occur anyway, it will be in the baseline and does not constitute additional mitigation. This chapter is about mitigation.
37746	11	28	1	28	3	"Additionality" is an accounting concern for thinking about offsets or comparing level of effort across parties, not a mitigation effectiveness concern. The atmospheric outcome doesn't care at all whether something is additional or not, only that sufficient mitigation activity overall occurs globally to reduce GHG concentrations. Could the discussion of additionality be moved to section on offsets or markets or REDD?	Rejected. If it will occur anyway, it will be in the baseline and does not constitute additional mitigation. This chapter is about mitigation.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37747	11	28	1	28	3	To follow the ending sentence in line 3 on page 28, the authors should consider including: The additionality of incentive schemes for mitigation may be low if these goals align (see discussion in Jones, Nickerson and Heisey, 2012, under review). Additionality estimates for conservation tillage, a profitable practice on some farmland, range between 20%-51% (Claassen et al., 2013, under review; Mezzatesta, 2013). For less economically feasible farmland practices that can have large upfront costs such as structural, vegetative, buffer and soil conservation practices, additionality estimates are larger at approximately 80% (Claassen et al., 2013, under review, Mezzatesta, 2013). Claassen, R., Duquette, E. and Horowitz, J. Additionality in Agricultural Conservation Payment Programs. Under review at Journal of Soil and Water Conservation. Jones, C. A., C. Nickerson, and P. Heisey, New Uses of Old Tools? An Assessment of Current and Potential Agricultural Greenhouse Gas Mitigation with Sector-based Policies, (2012 under review at AEPP). Mezzatesta, M., D. A. Newburn, and R. T. Woodward. 2013. "Additionality and the Adoption of Farm Conservation Practices," Land Economics, forthcoming.	Noted. References not added as they are too specific - this level of detail is not possible for such a wide-ranging chapter.
37748	11	28	1	28	3	The authors should at least add a definition here with pertinent citation. And why is this the first reference to something in the glossary (not done for terms above)?	Noted. Where necessary, terms will be defined in the glossary.
27923	11	28	1	28	3	Delete whole para. Additionality is only an issue when it comes to compliance judgment and accounting issues under the Kyoto Protocol.	Rejected. If it will occur anyway, it will be in the baseline and does not constitute additional mitigation. This chapter is about mitigation.
23785	11	28	10		20	This theory of saturation of carbon in SOC and followed by loss through emission is of doubtful origin. If it were a reality it should be occuring in undisturbed rainforests of Amazon or of southern India over vast extents. There is no evidence of such an event on any substantial scale anywhere. Loss of SOC occurs through (i) oxidation process that is activated when the forest cover over the soil is lost and (ii) through leaching by water which is a continuous process. Please remove this para on saturation altogether.	Noted. Misplaced comment - probably relates to lines 10-20 on p 27.
22141	11	28	11	29	14	points out very important synergies about the complexity and interdependence of socio-economic and natural factor regarding land use	Noted. Thank you. No action necessary.
20137	11	28	11	29	14	points out very important synergies about the complexity and interdependence of socio-economic and natural factor regarding land use	Noted. Thank you. No action necessary. (duplicate comment)
37752	11	28	11	39	12	There are several subsections related to changing diet as a tool to reduce GHGs. While useful in theory, in practice this would be an awfulyl controversial and difficult thing to do. To increase realism in the report it might be better to eliminate - or at elast caveat - the comments about changing diets.	Rejected. We discuss potentials for GHG reduction that could be realized by changing food consumption patterns and also outline likely implementation difficulties. Deleting this option would result in a biased assessment.
21020	11	28	20	28	21	Please shorten list of authors in citation to "Coelho et al.".	Accepted. Citation format corrected for FD.
21021	11	28	26	28	27	What is the reference for the judgement of "positive" / "negative"? Suggest to delete and just state that human activities have consequences …	Accepted. Revised.
23784	11	28	3	28	4	The sentence should read like "The permanence of a soil carbon sink is defined as the longevity of the sink, i.e. how long it continues to retain carbon away from the atmosphere"	Accepted. Wording changed.
37749	11	28	3	28	3	Line 3 rather than, or in addition to, referring to the glossary provide a brief definition of 'additionality'. This is a contentious point when estimating C budgets.	Noted. One line retained on additionality.
22139	11	28	30	28	30	Please clarify 'currently'	Accepted. Revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19101	11	28	30	28	33	"Currently, almost one quarter of the global terrestrial net primary production (one third of the aboveground part) is foregone due to land use related losses in NPP, harvested for human purposes or destroyed during harvest or in human-induced fires". Above-ground annual NPP for land plants is about 2ZJ (53 Gt C). If this is not used, it will revert back to CO2 - the carbon cycle. There is considerable potential to use more of this NPP rather than lose it.	Partially accepted. The sentence was revised. However, it is not correct that all NPP not used for human purposes returns to the atmosphere, see the large literature on the terrestrial C sink. Parts of the C in biomass synthesized by green plants in photosynthesis is stored in C stocks in biota and soils; increasing the fraction of C used for human purposes will in many cases reduce the C flowing into such stocks and hence reduce the C sink strength of biota and soils.
20135	11	28	30	28	30	Please clarify 'currently'	Accepted. Revised. Duplicate comment.
19365	11	28	31	28	32	I don't see how primary production is "foregone", when "harvested for human purposes". We harvest for reason, and most often sow and plant again, which we have to do to live, so I think that as long as we are here, we will have to continue harvesting.	Accepted. Formulation revised. The word "foregone" was borrowed from Vitousek et al. 1986 and refers to the fact that much of the human-used land has a lower NPP than the original vegetation that would prevail in the absence of land use. See papers by Vitousek et al. 1986 in BioScience, DeFries 2002 in Geophys. Res. Lett. and Haberl et al. 2007 in PNAS.
27924	11	28	34	28	34	This is the first time NPP occurs. Please give full name and add it to the Glossary.	Accepted. Meaning of the acronym plus a short explanation added.
37753	11	28	35	28	35	Change "underling that humans increasingly" to "exemplifying human dominated ecosystems"	Partially accepted. Revised.
37754	11	28	36	28	37	Rewrite "Growth in the use of" for clarity	Accepted. Revised.
31510	11	28	38	28	39	Format of last reference appears wrong: multiple authors listed in text instead of et al.	Accepted. Citation format corrected for FD.
31509	11	28	4	28	10	A seminal paper on climate change impacts on forests, uncertainties, and more importantly interactions of various factors was written by Karnoksy in 2003. I really should be cited in this section. The reference: Karnosky, DF (2003) Impacts of elevated atmospheric CO2 on forest trees and forest ecosystems: knowledge gaps. Environment International 29: 161-169.	Rejected. We are focussing on post AR4 literature.
32668	11	28	4	28	10	reference to add. Philipps et al. 2012. Ecology Letters doi:10.1111/j.1461-0248.2012.01827.x	Noted. Thanks but reference number was reduced. Phiipps et al. 2009 is cited.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37750	11	28	4	28	10	This section seems substantially underdeveloped compared to the existing science on expected impacts... while much of this will be highlighted in other WG reports, the importance of this point should not be understated. E.g. basically every developed country is anticipating reduced AFOLU sequestration rates going forward (including many becoming net emitters), with much of those anticipated declines resulting from climate-induced mortality. The seriousness and extent of these impacts does not translate into the broader narrative of the document, nor its relation to potential mitigation actions (e.g. bioenergy is a better bet if you anticipate that carbon stock to emit anyway due to climate mortality). The U.S. Forest Service and the U.S> Global Change Research Program document much of these impacts domestically in the recently released National Climate Assessment reports and the USFS Resource Planning Act assessment. The supporting literature to those reports could be included.	Noted. Section rewritten and more cross-reference to IPCC WGII added, where these issues are dealt with in detail.
37751	11	28	4	28	6	These efforts are typically not 'predicting' such impacts, like one predicts the weather; rather, they give estimates/ranges of estimates to provide insights. Please remedy.	Accepted. Wording changed
22140	11	28	40	29	4	This paragraph jumps in topics and is not well structured.	Accepted. Revised.
20136	11	28	40	29	4	this paragraph jumps in topics and is not well and clear structures.	Accepted. Revised. Duplicate comment.
32669	11	28	41			growing demand for carbon sequestration? Need citations to demonstrate this demand outside of brazil?	Noted. The formulation chosen does not claim that there were land demand outside Brazil for C sequestration; by contrast, it discusses several factors resulting in increasing land competition. These are evidenced by a much larger literature referenced here and in other parts of section 11.4.
22138	11	28	8	28	8	This requires more explanation as it is not clear what this exactly means for mitigation options.	Accepted. Wording clarified.
20134	11	28	8	28	8	this requires more explanation as it becomes not clear what this exactly means for mitigation option	Accepted. Wording clarified.
24816	11	28	4	28	10	Suggest listing Mangroves (and barriers to retreat issue) as an example this paragraph. Suggested citations: Lovelock CE et al. (2012) Tidal wetlands. In Marine Climate Change Impacts and Adaptation Report Card for Australia 2012 (Eds. E.S. Poloczanska, A.J. Hobday and A.J. Richardson). Retrieved from www.oceanclimatechange.org.au [08/03/2013] http://www.oceanclimatechange.org.au/content/index.php/2012/report_card_extended/category/tidal_wetlands (see 'Adaptation responses' section etc.) Gilman, E and Ellison, JC and Jungblut, V and Van Lavieren, H and Wilson, L and Areki, F and Brighouse, G and Bungitak, J and Dus, E and Henry, M and Kilman, M and Matthews, E (2006) Adapting to Pacific Island mangrove responses to sea level rise and climate change. Climate Research, 32 (3). pp. 161-176. ISSN 0936-577X	Rejected. First reference is in the grey literature; second describes research and policy requirements, rather than reporting responses per se.
29211	11	28	4	28	10	Potentially worth referencing the Cox et al (2000) Nature paper on this	Accepted. Text added.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33309	11	28	11			This section should discuss spatial dimensions of system transformations, infrastructure change as key historic driver and - to some extent - urban form. Sections 11.4.2 and 11.4.4. discuss land use competition and land demand, respectively, but there is no direct discussion of above subjects.	Noted. The links of urban form with those kinds of mitigation which are within the scope of ch11 are weak; importance of urban form is, to our knowledge, discussed in chapters 8 and 12. Some aspects of spatial dimensions of land transformation are mentioned in the section, but space limitations do not allow to discuss this (important and interesting) topic in more depth.
25814	11	28	11	28	11	The word "Infrastructure" does not fit in the section title. Perhaps the author meant to say "Interactions and systems persepctive"?	Rejected. We are working to an outline prescribed by the IPCC, and infrastructure appears for the energy end-use chapters - it is included here even though less relevant for AFOLU.
25825	11	28	11	28	11	The definition of the term "afforestation" in Annex I (Glossary) is not accurate. Text "proof must be given that the land was not forested for at least 50 years" is not correct. Since afforestation and reforestation are equivalent activities under CDM/JI, no distinction is required to be made between them. The only requirement, under the CDM, is that the land should not have been forested on 31 December 1989.	Accepted. Definitions revised in Table 11.2.
27249	11	28	26		26	too general statement that Land use change is a PERVERSIVE driver of global environmental change	Rejected. The formulation is "Land use change is a pervasive driver …" ("pervasive" means ubiquitous). This is correct and supported by that reference.
31003	11	28	30	28	33	Consider re-wording sentence on NPP, it is confusing and the point is lost.	Accepted and revised.
27250	11	28	31		32	how the human-related losses have been factored out from the natural and indirect effects?	Noted. The methods used are discussed in depth in the cited articles. They cannot be explained here for length reasons.
19572	11	28	15			The section which idenfies land as a complex system in the AFOLU context needs to clearly state the special role and relationships that Indigenous communities across the world have with the land. The documentation of community-approved land uses of these communities is one urgent mitigation tool as it will identify both crucial human uses and potentially unknown carbon sinks and other land features. Lastly the role of Indigenous land rights is at the very heart of how Indigenous societies and communities can mitigate CC impacts and they need to be discussed too.	Partially accepted. The role of land for vitally important resource supply of indigenous communities is now mentioned more strongly. The policy-prescriptive formulations suggested by the reviewer could not be incorporated. No peer reviewed literature was available supporting the claim that land use by indigenous communities would result in reduced GHG emissions.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37760	11	29				"Figure 11.10 makes clear why feedbacks are different for demand-side and production-side effects." Not to this reader. Particularly unclear is the representation of GHG implications of the supply chain - the ultimate question of the inquiry. Though the title admittedly states "global land use and biomass", several elements raised my expectations that GHG emissions were also an outcome being represented: (in figure title) "The difference between inputs and outputs in the consumption department is assumed to be directly released to the atmosphere (eg, CO2 from respiration)"; and the box at right hand side of figure labeled GHG emissions.. But the fact that GHG emissions occur at each stage of the production chain is NOT represented clearly in the figure. The authors should either take out the GHGs altogether , or do a more effective job of representing them.	Accepted. The Figure and the discussiong surrounding it was revised.
27925	11	29	13	29	14	It is not self-evident which phenomena are meant. An example would be useful.	Accepted. Revised.
22142	11	29	16	29	16	changing consumption patterns' need to be more specific. E.g. 'increased demand for bioenergy' is a also a changing consumption pattern.	Accepted. Revised.
19102	11	29	16	29	18	"Driven by economic and population growth, changing consumption patterns, increased demand for bioenergy as well as land demand for conservation, competition for land is expected to intensify (Smith et al., 2010; Woods et al., 2010)". So why is it not mentioned that tempering population growth should curtail demand for goods and services? Other requirements for mitigation are: better understanding of training reuqirements, better understanding of vested interests, better understanding of land owership/tenure/usufructuary rights.	Rejected. Population policy is outside the scope of this chapter. The influence of different population growth trajectories on aggregate global food demand is discussed in this and other chapters in WGIII. Policy-prescriptive statements on population cannot be part of this chapter due to our mandate.
20138	11	29	16	29	16	changing consumption patterns' need specification. E.g. 'increased demand for bioenergy' is a also a changing consumption pattern.	Accepted. Revised. Duplicate comment.
23654	11	29	17			Some mention of accelerating rate of externational land puchasing would drive this point home. For example % of arable land in Africa owned by non African agricultural producers	Noted. Land grab / FDI related to land are contested concepts and would have required a lot more space to be elaborated sufficiently in that context.
31004	11	29	20	29	21	It is not clear that Fig 11.10 shows why feedbacks are different for demand-side and supply-side measures. Perhaps another sentence can be added to explain.	Accepted. Text was revised.
22143	11	29	22	29	26	Why is that? Paragraph need more explanation.	Accepted. Text was revised.
20139	11	29	22	29	26	Why is that? Paragraph need more explanation.	Accepted. Revised.
37755	11	29	22	29	22	"Demand side measures" generally reduce inputs and land demand. Changing food diets is a general concept, and as income increases with development over time - as the authors note - the pattern is to increase livestock consumption. This term needs a qualifier "demand side measures that shift demand to lower GHG emitting food". Effects of policies on the cost of different foodstuffs to consumer will also affect level of demand - and that also needs to be taken into account.	Accepted. Revised.
37756	11	29	27	29	27	Define biomass-flow cascades, not just give examples	Accepted. Revised.
27926	11	29	28	29	29	Further advantage may be C storage in long lasting products and use cascades;	Noted. This is the case in some instances; including it here would require a lot of space because of the differentiation needed for a precise statement. C storage in long-lived products is discussed below (section 11.4.3).

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27927	11	29	29	28	34	Especially for the use of crop residues and forest residues respecting C and nutrient balances is a pre-request in publications cited in line 28	Noted. No action required because the publications cited in the end of the paragraph provide more detail on these issues than those mentioned by reviewer.
29825	11	29	30	29	30	“are may also be” should be written either “are also” or “may also be”	Accepted. Revised.
32670	11	29	30			delete "may"	Accepted. Revised.
31005	11	29	35	29	35	Suggest removing emphasis on "of cropland" as it's misleading. The bullet should read "Increases in yields:"	Accepted. Revised.
37757	11	29	35	29	35	Why is only cropland highlighted/bolded? Should apply to all production lands. Rewrite: "Increases in yields of production lands, including cropland...." and highlight through production lands.	Accepted. Revised.
37758	11	29	35	29	42	More recent research provides insights into how to resolve the apparently contradictory findings in the literature on productivity and land use change. The story line is as follows: higher crop yields mean less land is required for a given level of production; but as prices fall with declining costs of production (associated with higher crop yields), demand for agricultural products will increase; this encourages further expansion of agricultural production (in some literature referred to as a "rebound effect" apparently), and therefore further cropland conversion and the associated GHG emissions. In a single agricultural commodity model, Hertel (2012) has recently shown global cropland expansion necessarily declines with higher productivity only if agricultural demand is inelastic and the productivity changes are globally uniform. Simulations illustrate how the patterns of cropland conversion can vary across regions: the ones that are more likely to experience higher GHG emissions with increasing productivity are those with low yields, high supply-elasticity of land, and high emission-intensity per unit of output, which characterizes Sub-Saharan Africa and Latin America but not North America; they also show that, for realistic parameter assumptions, the global impact is likely to lead to falling global cropland conversion with productivity increases (Lobell, Baldos, and Hertel 2013). Hertel, T. W. 2012. Implications of Agricultural Productivity for Global Cropland Use and GHG Emissions: Borlaug vs. Jevons. GTAP Working paper 69. https://www.gtap.agecon.purdue.edu/resources/download/6110.pdf (under review at AJAE) Lobell, D.B., U.R.C. Baldos and T.W. Hertel. 2013. Climate adaptation as mitigation: the case of agricultural investments. Environ. Res. Lett. 8:015012.	Accepted. The paragraph was revised and the reference to the ERL paper by Lobell added. However, we cannot explain this here in so much depth due to length constraints.
32671	11	29	39	29	42	this is an important point.	Noted. Thanks. No action required.
37759	11	29	43	29	43	Define 'land-demanding measures', don't just give examples.	Accepted and revised.
31511	11	29	46	29	47	Format of last reference appears wrong: multiple authors listed in text instead of et al.	Accepted. Citation format corrected for FD.
21022	11	29	46	91	10	Please check citations for lists of authors. Quite often, the lists contain more than 2 names followed by "et al." where one name + "et al." would suffice. Examples: "Chum et al.", "Coelho et al.".	Accepted. Citation format corrected for FD.
19727	11	29	5	29	6	I would include "substitution effects" in that short list of elements taht make GHG impacts of AFOLU dificult to determine. Substitution benefits arise for eample from replacing fossil fuel with biomass, particularly residual forest biomass, or from replacing structural steel or concrete elements with solid wood products.	Noted. No changes made: substitution effects are discussed in section 11.4.3 and are also implicitly included in the feedbacks mentioned in the list.
27361	11	29	29		29	EDITORIAL - please revise construction.	Accepted. Revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22487	11	29	15			Feedbacks with land use competition may be difference due to the regions and countries, so regional feedbacks could be mentioned in this section.	Noted. We agree, but space constraints in that section do not allow discussing regional differences.
27251	11	29	17		17	why only bioenergy? How about other renewable sources such as hydro, eolic, solar, etc... That also takes land from other uses?	Noted. We agree that other renewable energies also require land, but the area needed is 2-3 orders of magnitude lower per unit energy supplied (see Global Energy Assessment, chapter 20) and we cannot explicitly mention all drivers here due to space constraints (they are implicitly included in "population and economic growth"). By contrast, bioenergy requires very substantial land areas and might require 5-25% of the land surface if ambitious bioenergy targets are pursued.
26260	11	3	11	3	12	11.3.2 Mitigation effectiveness (non-permanence: saturation, human and natural impacts, 11 displacement) could be shortened to 11.3.2 Mitigation effectiveness	Rejected. This is the title provided by IPCC which we have to use.
26261	11	3	21	3	21	11.5.2 Implications of climate change on land use carbon sinks and mitigation potential could be shortened to 11.5.2 Land use carbon sinks and mitigation potential	Rejected. This is the title provided by IPCC which we have to use.
26262	11	3	22	3	22	11.5.3 Implications of climate change on peat lands, pastures/grasslands and rangelands could be shortened to 11.5.3 Peat lands, pastures/grasslands and rangelands	Rejected. This is the title provided by IPCC which we have to use.
26263	11	3	23	3	24	11.5.4 Potential adaptation measures to minimize the impact of climate change on carbon stocks in forests and agricultural soils could be shortened to 11.5.4 carbon stocks in forests and agricultural soils	Rejected. This is the title provided by IPCC which we have to use.
19104	11	30				Figures from the various arrows do not add up! For example the use of wood from forestry add to 1.94 Gt dry matter, yet the output is 1.91 Gt dry matter. This is not an isolated incidence. Figures should be checked. The total for energy use is 2.04 GT dry matter. This is equivalent to about 38 EJ/yr. Table 7.1 on page 10 of chapter 7 gives the estimated consumption of biomaas and waste to be 53.47 EJ/yr, 40% more than the figure in Figure 11.10!	Accepted. Numbers cross-checked and revised.
21023	11	30				Please check the numbers. For example, "food" in the "processing" compartment has inflows of 1.78, but outflows of only 1.68. Is the difference due to trade (which would be the main way to get goods from one compartmen to the other, in which case there should be an arrow from "frade" to "waste / residues") or should this difference be thought of as emissions (and the arrow from "processing" to "GHG emissions" is missing)?	Accepted. Numbers cross-checked and revised. Caption revised.
37764	11	30				In the caption - does assumed gross energy value of DM biomass refer to harvest or at consumption?	Accepted. Caption revised.
37761	11	30	1	30	1	Pressures are not limited to forests... are on all other land uses. Rewrite: "... pressures on existing land uses and GHG...."	Partially accepted. Revised. The notion of "land use" refers to human activities, but what was meant here were pressures on the ecosystem, so the proposed formulation could not be used.
29456	11	30	11			"above-mentioned effects" - not clear exactly which. Suggest numbering the points	Accepted. Revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24818	11	30	11	30	11	Not clear exactly which "above-mentioned effects" are being referred to. Suggest numbering the points	Accepted. Revised.
32672	11	30	11			delete "may". If you use biomass for other purposes you definitely prevent the return of nutrients and C to the soil.	Rejected. Some technologies such as biogas return most of the nutrients and a substantial fraction of the C to the soil so this statement is technology-dependent. A comprehensive description of these issues is not possible at this point due to space constraints but some of these issues are discussed elsewhere in the chapter and the Bioenergy Annex.
37762	11	30	13	30	15	The statement is way too strong. As with many policies we must consider whether we want the perfect to be the enemy of the good. So here, do the authors really mean we should not pursue a mitigation approach that significantly reduces hunger, improves local economies, and a few other goods at the expense of say biodiversity or good governance? A fully integrated approach should be an ideal but we should be will to consider less in actual implementation.	Accepted. Many thanks. This also helped to remove policy-prescriptive language which needs to be avoided.
27929	11	30	16	30	16	Are harvested wood products allocated in the "materials" box?	Noted. Unclear comment. Wood products are not harvested, wood is. If wood is converted into wood products then they are in the "materials" box.
23348	11	30	17			and "total" biomass.	Partially accepted. We agree that "biomass" needs to be qualified but the figure does not show total biomass flows which would also include biomass remaining in ecosystems, e.g. food webs. It shows socioeconomic biomass flows. Appropriate revision was made.
22145	11	30	23	30	23	Please specify "changes in demand" which then lead to the described assumptions. So far changing food demand has has a negative image as it tends to increase leading to higher emissions. Now it indicates the positive impacts only. This can be misleading. The term should be used in a consistent way or better describe what it means.	Accepted. Revised. However, specifying the changes that help reduce GHG emissions in the first sentence did not seem necessary because the immediately following text discusses in depth which changes are meant.
20141	11	30	23	30	23	please specify 'changes in demand' which then lead to the described assumptions. So far changing food demand had a negative notion as it tends to increase leading to higher emissions. Now it indicates positive impact only. This can be misleading. The term should be used in a consistent way or be better describe what it means.	Accepted. Revised. Duplicate comment, see line 931.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31006	11	30	24			Suggest changing 'Changes' to 'Reductions'. Changes is not specific enough. Reductions in GHG emissions cannot be had by increasing demand but only by reducing demand. Change could be either an increase or a reduction.	Partially accepted. Note that we also discuss increased use of wood as replacement for concrete and steel in buildings which saves emissions due to the much smaller energy requirements as well as the C storage in long-lived products. Also, we are only partially talking about reduced food demand but more importantly of substitution of GHG emission intensive foods by less GHG emission intensive foods. Therefore, the proposed formulation would not have been entirely accurate.
24817	11	30	5	30	5	State the positive effect that is intended by reference to "land" in this sentence.	Accepted. Revised.
31512	11	30	6	30	8	Format of last reference appears wrong: multiple authors listed in text instead of et al.	Accepted. Reference format corrected for FD.
19728	11	30	9	30	12	Two points. 1- it is unclear if "increased land demand" refers to a demand for more land or a greater demand from each piece of land. This should be clarified. 2- the list of "competing uses of biomass" is a mixed bag of correct and incorrect attribution, depending on which definition of "increased land demand" one chooses tu use. And "wood residues for chipboard, paper and bioenergy" in developed nations usually refers to chips remaining after saw timber production, a source of fiber that has no additional impact on the forest land base.	Accepted. Bullet point deleted and material integrated in the other cases which was more appropriate.
22144	11	30	9	30	12	Please add reference.	Accepted. This whole bullet point was deleted and the argument integrated in the others.
19103	11	30	9	30	9	Competing uses of biomass. Add: Manage annual wood surplus better. Need for good inventory of stock and yield	Partially accepted. This option is referred to in the subsection on demand-side measures related to wood and forestry.
20140	11	30	9	30	12	please add reference	Accepted. This whole bullet point was deleted and the argument integrated in the others. Duplicate comment.
27928	11	30	9	30	12	he competition with material use (e.g. bio-based plastics, bio-based chemicals) should be added	Rejected. We need to shorten, not expand; the largest current competitors (feed, pulp/paper, chipboard) are mentioned as e.g.
27252	11	30				replace unused forests by unmanaged forests; else, explain what unused forests are	Accepted. "Unused" forests explained in the caption. These are forests included in the "wilderness" layer of the map published by Sanderson (2002; BioScience), i.e. pristine forests not used for harvest or otherwise.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29455	11	30	5			How is "land" a positive effect? Reword to clarify.	Accepted. Revised.
30522	11	30	9	30	11	The term "may prevent the return of nutrients and C to soil" is more dependent on the type of management techniques adopted. It is not necessarily a simple effect of potential competing uses of land and of biomass. A more balanced language is in order, since there may also be positive benefits to nutrients and C stock in the soil, depeding on management techniques.	Accepted. Revised.
25517	11	30				I would like to add some important documents. If it is quite some years ago, the arguments and analyses are compatible and rational with modern day failure of the Industrialized Agricultural Model and transportation. The idea "distance to the plate" emphasize that the export-oriented mass production has ecological and socioeconomic impacts. First, it drags small scale farmers into poverty which transfers onto countries a vulnerable future. Secondly, the environmental pollution will be a result of the long distance trade of food production (food miles) (ICFFA 2003:4). Source:- MANIFESTO ON THE FUTURE OF FOOD Ratified by The International Commission on the Future of Food and Agriculture (2003)	Noted. The ICFFA manifesto was reviewed but this is a political statement, not a scientific study. (Sustainable) development aspects are dealt with in section 11.4.5. and food transport issues are discussed in section 11.4.3.
33310	11	30	23			Demand-side options include behavioural change as driver of dietary change to lower ghg food consumption, this discussion should be placed in section 11.3.	Rejected. Because demand-side options reduce GHG emissions through their systemic effects, it was agreed in the writing team at LAMs1&2 to cover them in section 11.4; cross-links are placed in section 11.3.
37763	11	30	23	34	41	Section 11.4.3 is an opportunity to significantly reduce the amount of text. Currenty 5 pages devoted to this, food waste deserves a couple paragraphs, and discussion of diet requires a couple more.	Noted. We worked very hard to be as short as possible while providing sufficient detail and comprehensiveness.
22488	11	30	23			The global and regional range of mitigation potential can not be learned clearly in this section, more data of which should be available.	Accepted. The whole section was thoroughly revised.
27253	11	30	26		26	or CO2 from tractor FOSSIL fuels	Noted. No action required because it is generally known that tractors mostly use fuels from fossil sources. But even biofuels are not necessary CO2 neutral, so adding "fossil" here would have resulted in a longer but not necessarily more precise text.
23618	11	31				Row 3: Holtsmark 2012 is not a proper reference for the statements made.	Accepted. Revised.
23619	11	31				Row 5: Again Holtsmark 2012 may not be the proper reference. I suggest e.g. Ingerson, A. (2011). "Carbon storage potential of harvested wood: summary and policy implications." Mitigation and Adaptation Strategies for Global Change 16(3): 307-323.	Accepted. Revised.
20145	11	31				Table 11.4 Row Substitution of wood for C intensive products: please consider also changes in energy demand	Noted. We agree, but it was not clear what should have been changed in the text because changes in (fossil) energy use are discussed extensively in that paragraph. The paragraph has also been revised due to other reviewer comments.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23349	11	31				Add a row: Reduction in direct energy inputs from improved efficiency" See for example FAO 2011 already referenced.	Partially accepted. No new row was added, but the point and reference was strengthened in the Table.
29212	11	31				Mitigation achievable through HWPs storing carbon and substituting for high energy materials is mentioned for the first time - this short be brought into the narrative, as discussed above.	Noted. These issues are discussed in their own subsection that is part of the same section. No changes required, but perhaps the Table should be placed towards the end of the section during typesetting.
20142	11	31	1	31	1	see comment 31	Noted. Unclear comment because reference to the line has been lost through the collation of comments in one sheet.
23655	11	31	10			Peri urban and urban agriculture in developing countries is a potential way to reduce food loss due to spoilage.	Noted. This seems plausible, but no peer-review literature was available to substantiate that point.
22149	11	31	10	34	41	It would help the reader if the order of these paragraphs matches the order in Table 11.4.	Accepted. Revised.
20147	11	31	10	34	41	it would help the reader it order of these paragraphs would be the same order as table 11.4	Accepted. Revised. Duplicate comment.
37770	11	31	10	31	18	The numbers used here appear to be higher than currently being used. Post harvest loss is an extremely complicated problem and was the subject of a recent U.S. State Department workshop.	Noted. We agree that this is a complex and under researched issue. The numbers quoted here are supported by the quoted peer-reviewed literature. As per IPCC standards we cannot overrule numbers in peer-reviewed articles by anecdotal evidence which is not supported by peer-reviewed literature. A caveat was introduced to avoid over-interpretation.
25817	11	31	12	31	15	It appears intuitively contradictory that there should be 40% food wastage in developing countries: wastage depends upon the relative value/ importance of a resource and it is incredibly hard to believe that this much food is wasted in developing countries. From my personal experience too it appears to be too high a value. However, if the research data are firm and final, then I have nothing to say. I would recommend at least to revisit the research data.	Noted. These numbers are directly taken from the quoted articles, but we agree that this is a complex and under researched issue. The numbers quoted here are supported by the quoted peer-reviewed literature. As per IPCC standards we cannot overrule such numbers by anecdotal evidence which is not supported by peer-reviewed literature. Caveat introduced in order to avoid over-interpretation.
20146	11	31	13	31	13	please add reference	Noted. It is not clear to what statement this refers because the statements in this paragraph are referenced.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19367	11	31	18	31	18	Peelings of potatoes, roots and vegetables are probably as important as peelings of fruits.	Accepted. Revised.
22146	11	31	3	31	4	There is a lot of research proving that meat consumption is more than protein. It not only provides other nutrients but also has non-food functions. Moreover, as mentioned in this chapter, livestock can use land not suitable for crop production. Reducing meat overconsumption by plant protein would require land use shifts to produce all this plant-based protein.	Noted. Misplaced comment - seems to refer to lines 15ff not to lines 3-4. There, the reader is referred to section 11.5. where cultural aspects of food are discussed. Increased plant protein production is considered in the cited studies quantifying possible emissions reductions from changed diets, in particular in Stehfest et al. 2009.
20143	11	31	3	31	4	There is a lot of research proving that meat consumption is more than protein, it not only provides other nutrients but has also non-food functions. Moreover, as mentioned in this chapter, livestock can use land not suitable for crop production…reducing meat overconsumption by plant protein would require large land use shifts to produce all this plant based protein. Reducing the consumption of emission intense foods are valuable mitigation options. But such shifts should not just happen on the basis of emission accounting but considering interactions with other food supply chains, socioeconomic and cultural values. E.g. meat consumption is closely linked to a set of norm, values and sociocultural structures. see also M Roeder 2008. A cultural ecological approach for meal security - a case study of the dynamics of the food habits in El Obeid, Sudan	Noted. Partly duplicate comment, see line 957. Regarding the second part, this is dealt with in section 11.4.5. and was considered when revising that part.
32673	11	31	3	31	5	there is a need here for differentiation. It must be pointed out that this reduction in animal consumption is not needed in developiong countries with very low per capita comsumption. Use figures that compare consumption data between e.g., northern europe and sub-saharan africa. a beginning matrix of this data is in the supplemental file "comparative emissions of developed and developing countries." also see Davidson, E.A. 2012. Environmental Research Letters 7, 024005. doi:10.1088/1748-9326/7/2/024005.	Accepted. We are aware of the differences in food consumption in different regions but an in-depth discussion of food consumption in different regions is beyond the scope here. We inserted a half-sentence to be sure the text is not interpreted as a call for reduction of (animal) protein in undernourished regions.
29826	11	31	4	31	4	“with of” should be “with”	Accepted. Revised.
22407	11	31	4	31	4	"with of" check this line	Accepted. Revised.
25801	11	31	4	31	5	"adequate protein content": this is too vague since there is a requirement for metabolizable amino acids rather than a requirement for (crude) protein in man and animal.	Accepted. The word "adequate" includes quantitative and qualitative adequacy; this is now made explicit through a revised formulation.
25815	11	31	6	31	6	The term "socioeconomic C stocks" is not clear, nor known.	Accepted. Revised.
37765	11	31	6	31	6	Define 'socioeconomic C stocks' please	Accepted. Revised.
34377	11	31	6	51	36	This paragraph on financial barriers suits better in the barriers section (11.8).	Noted. No discussion of financial barriers could be found on p. 31 (nor elsewhere on p 31).
22147	11	31	8	31	8	Please add reference.	Noted. This sentence only refers the reader to another section; doing this does not require the quotation of scientific literature. No action required.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20144	11	31	8	31	8	please add reference	Noted. Duplicate comment, see reply in line 966.
31475	11	31	9			BECCS seems to be missing in the table. BECCS is in chapter 6 assumed to reach 40-100% of modern bioenergy by 2050 and 2100 respectively.	Noted. BECCS is a supply-side measure, not a demand-side measure. It is discussed in the Bioenergy Annex. No action required.
19366	11	31	9			In "Changes in diet" the problem is stated for "heated greenhouses". I think that Cooled greenhouses are also a problem.	Noted. We agree that actively cooled greenhouses could constitute a similar problem as heated greenhouses, but in the literature reviewed by the writing team cooled greenhouses were not discussed as a widespread phenomenon. Moreover, this presents only examples; therefore, no action was required.
24819	11	31	9			In the last row of this table the term "sequestration" is used when referring to wood products - "storage" would be a more accurate term.	Accepted. Revised.
24820	11	31	9			Another relevant, recent reference that should be considered for inclusion in the last row of this table is Ximenes et al 2012, Greenhouse Gas Balance of Native Forests in New South Wales, Australia. Forests, 2012, 3, 653-683. The paper illustrates the impact of native forest management scenarios on carbon stocks over time.	Accepted. Revised and reference added.
22148	11	31	9			Row substitution of wood for C intensive products: please also consider changes in energy demand.	Noted. As discussed in this cell of the table, a substantial fraction of the GHG reduction stems from reduced fossil energy demand.
20266	11	31	9	31	9	Table 11.4 requires a rearrangement in the order in which the options are figuring at present. As is clear in the text before and after the Table 11.4, option titled ‘Reduced losses in the food supply chain’ comes before the option ‘Changes in diet’. Same order needs to be maintained in the table also. It will be logical and coherent to move the option on ‘Reduced losses….’ up, and bring the ‘Changes in diet’ down at number 2 in the Table 11.4.	Accepted. Revised.
31513	11	31	9			Too much text in table, please reduce. Also consider reducing the number of references	Accepted. Table was revised.
22540	11	31	9	31	10	"Reduced losses in the food supply chain" can be also considered as a supply side mitigation option.	Noted. A decision had to be taken whether to include this in 11.3 or in 11.4; because reduced FSC losses reduce GHG through systemic feedbacks it was decided to discuss this in 11.4.
25816	11	31	9			There is some contradiction here: "wood consumption can be reduced" vs. "increased substitution of other materials by wood" and "increased C stocks in wood". While "sustainable wood harvest" is a clearly understood measure, reduction of wood consumption can easily be misunderstood to mean "do the reverse substituion" (e.g. less wood, more aluminimum).	Partially accepted. Removing wood from a forest incurs 'C costs' (therefore saving wood saves GHG emissions) but these C costs may be offset if more GHG is saved by substitution. Table was revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37766	11	31	9			Third row, middle cell: Forest protection can only be promoted by certification in cases where forest products/forest health is supply constrained. In the US case, forest management and investment is currrently demand constrained... e.g. we could produce and invest in the sector more than currently, but do not because there are no markets for additional commodity products, not because there is a lack of available timber supply. Therefore, in a demand-constrained wood product system, adding additional economic burden to producers further reduces forest investment and can lead to even further Land Use Change to more profitable activities, and/or forest health impacts such mortality from pathogens, insects, and wildfire.	Noted. Certification is discussed in section 11.10. Table was revised.
37767	11	31	9			On table 11.4 or section 11.4.3: Add distinction between sustainability managed forests and deforestation in Amazon, Indonesia, and Congo, for example. Definition is too narrow.	Noted. Sustainable forest management is discussed in other sections. Table was revised.
37768	11	31	9			4th row, middle column: Among forest systems, it seems plantation forests could produce the most mitigation of the type referred to here. In many cases, they could also be managed as plantation forests for decades - if not longer. Hence, in this sense, they could be described as sustainable. Are plantation forests include as sustainable here? Last 3 lines of middle column - please clarify what is meant by "optimizing forest management and wood use" - optimized with respect to what? This sort of lack of clarity is a problem throughout the document.	Partially accepted. As this section is focused on demand side and systemic effects, forest management is discussed in other sections. Table was revised.
37769	11	31	9			Can the table replace much of the text discussion in section11.4.3?	Partially accepted. Table was shortened, as requested by other reviewers, to reduce duplication between table and text.
40719	11	31	9			The box of the 3rd row and the second column says "Wood consumption can be reduced ...". On the other hand, the descriptions by Holsmark, 2012 and Werner et al, 2010 are different (in line from 22 to 25, page 34) . In order not to cause a misunderstanding, the 3rd row of Table 11.4 should be deleted all.	Accepted. Table was revised and shortened.
27930	11	31	9	31	10	Add before "diet" "human" (first box).	Accepted. Revised.
27931	11	31	9	31	9	Row "Substitution…." these aspects should be widened to different kind of biomass instead of focusing on wood	Partially accepted. Table substantially revised. However, agricultural. Biomass is discussed in the two rows above (reduced losses in the FSC, diet change).
27254	11	31				in substitution of wood for carbon intensive products, suggest to change The efficiency of emissions displacement depends on the product by The efficiency of emissions reduction depends on the product, since the word emissions displacement was used in REDD+ with a different meaning (synonyn to leakage for CDM projects)	Accepted. Revised.
29457	11	31	9	31	9	In the last row of this table the term "sequestration" is used when referring to wood products. Substitute "C stock". The words "and uses" in "products and uses" should be deleted. ie C stock in products can be increased by altered processing methods, shifts in products used, end-use durability, and landfill management. C stock in forests and products can be maximized by optimizing forest management and wood use.	Accepted. Revised.
29458	11	31	9	31	9	Another relevant, recent reference that should be considered for inclusion in the last row of this table is Ximenes et al 2012, Greenhouse Gas Balance of Native Forests in New South Wales, Australia. Forests, 2012, 3, 653-683. The paper illustrates the impact of native forest management scenarios on carbon stocks over time.	Accepted. Revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23786	11	32				Changes in diet from rice grown on irrigated lands to coarse millets grown on dry lands will also reduce GHG emissions significantly.	Noted. This statement is most likely correct but not supported by a peer-reviewed publication. No changes made.
37771	11	32	11	32	11	The authors should consider replacing the narrow discussion of "taxation" with something like "other measures to provide incentives to reduce waste." Additionally, the practicality of such meaures - esp in light of other parts of the text that suggest being overwight seem to be highly intrusive into one's personal freedoms. Some address about the practicality of some of these mitigation measures ought to be presented.	Accepted. Revisions were made. Even before the revisions, taxation was just one example among several potentially available measures. A formulation that might have been perceived as policy-prescriptive was also revised.
20267	11	32	15	33	12	The message in the text on 'Changes in diets' is very clear that for the same amount of energy and protein, vegetarian diet causes least emissions compared to vegetarian diet with dairy products or diet with animal meat. The text although very interesting, has the scope of getting reduced especially when it has two figures to illustrate the subject (Figures 11.11 and 11.12). Option to delete the figures 11.11 and 11.12 after making the relevant text self sufficient, can also be explored.	Partially accepted. It is important to show the places in the world where the highest potential for increases in feed efficiency could have a significant role in GHG mitigation.
37772	11	32	15	34	13	Very strong focus on diet; valid point but should still not be extensive focus of the chapter.	Noted. In contrast to other measures that had already been included in AR4, dietary change is new and contested so there is a need to treat this with a certain level of detail.
27933	11	32	15	32	15	Add before "diet" "human"	Accepted. Revised.
19369	11	32	19	32	50	All this could be omitted, as it is self-explanatory and dealt with in other instances. Start at row 50 with "The potential…"	Rejected. These 30 lines discuss some 20-30 studies (out of many more) that have required a large amount of effort and time to determine factors that influence GHG emissions of different diets using LCA methods. As this topic is new since AR4 (and contested), it was decided that it deserves to be treated with a certain level of detail.
24821	11	32	19	32	19	The correct term is "Life Cycle Assessment".	Accepted. Revised.
22150	11	32	2	32	2	Please specify "recent".	Accepted. "Recent" was deleted because from the date of the reference it is clear that the studies refer to the second half of the first decade of the 21st century.
20148	11	32	2	32	2	please specify 'recent'	Accepted. Revised. Duplicate comment.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27932	11	32	2	32	4	Data for Germany is 82 kg/year and person, average 2,02 persons per household = 165 kg/household and year (source BMELV, University of Stuttgart 2012). Please consider these data in your ranging.	Noted. The study was reviewed. It supports the range (150-300 kg per household per year) given in the text. As per IPCC rules, non-peer-reviewed studies can only be used if the peer-reviewed literature is not sufficient to make a certain point, so the study was not included.
37773	11	32	22	32	22	What about LUC for food production (ie soybean production in Brasi)?	Noted. The effect of land requirement on GHG emissions is discussed on p. 34, lines 1-10 of draft 2.
29460	11	32	27		30	This is an inadequate explanation of the differences between ALCA and CLCA. Refer to Annex II	Accepted. Revised.
24822	11	32	27	32	30	Suggest Refer to Annex II for a more comprehensive discussion of the differences between ALCA and CLCA	Accepted. Revised.
19368	11	32	3	32	6	This is a huge difference in estimates, either 150-300 kg per household or 280-300 kg per capita in industrialized countries. Could this kind of difference be explained somehow?	Accepted. Household wastes are only a fraction of total FSC wastes. Also, different methods are used; the FAO study was based on top-down modeling while the Parfitt et al. paper was based on a review of different studies that used several different methods. We implemented revisions to make that clearer.
37774	11	32	32	32	37	So how about beef from retired dairy cattle? Since virtually all dairy cattle are ultimately slaughtered it seems this comparison should at least acknowledge this source of beef as virtually emissions free.	Noted. No peer-reviewed studies were found on the basis of which this effect could be discussed.
29521	11	32	34		38	and Figure 11.11. This study needs more emphasis (assuming it is published in time) pointing out that mixed livestock/cropping gives lowest emissions from livestock production at least in some cases. Explain A and B in figure caption.	Partially accepted. Mixed systems do not give the lowest emissions per unit of product consistently in all the regions and across all products. Only in temperate regions, because of higher grain feeding of livestock A and B in the caption, explained.
35293	11	32	36	32	42	From line 36-40, it is said "In addition, emissions intensities for the same livestock product vary largely between different regions of the world due to differences in agroecology, diet quality and intensity of production (Herrero et al., 2013; Figure 11.12). In overall terms, Europe and North America have lower emissions intensities per kg of protein that Africa, Asia and Latin America." The reason for the large variation on emissions intensities may also be different levels of technology and management. It is suggested to provide detailed discussions in this chapter on how to transfer technologies and advanced management skills from Europe and North America to Africa, Asia and Latin America. From line 39-42, it is suggested to add the following sentence before “However” (L40): "developed countries in Europe and North America should provide technologies and advanced management skills to developing countries in Africa, Asia and Latin America.”	Partially accepted. Good evidence exists that as systems in the developing world become more market-oriented, improved breeds, feeding and management, usually based on systems in the developed world, are adopted. However, the key is to match the intensification strategy to local resources and contexts.
29827	11	32	40	32	40	“However” should be replaced with “Additionally”	Accepted. Revised.
29461	11	32	42		42	Also add that pastures have higher SOC than cropland	Accepted. Revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24823	11	32	42	32	42	Suggest add that pastures have higher SOC than cropland	Accepted. Revised.
22151	11	32	43	33	12	Please consider complexity of food consumption and that not just isolated products change but this could change whole set ups of meals and diet and result in other emissions. This requires a whole system approach as food is eaten within a socio-cultural context. M Roeder: A cultural ecological approach for meal security - a case study of the dynamics of the food habits in El Obeid, Sudan describes how single factor changes in a diet can change whole meal setting. A. Bows et. al 2012. What's Cooking? Adaptation & Mitigation in the UK Food System describe how emissions change under different food future considering shifts not in a single product but within a particular socio-economic setting, including policies and behavioural shifts.	Accepted. The argument on the complexity of nutrition was included in a new table in 11.4.5, where behavioural change options are presented. However, other references were assessed as more relevant, mainly because of a wider coverage.
20149	11	32	43	33	12	Please consider complexity of food consumption and that not just isolated products change but this could change whole set ups of meals and diet and result in other emissions. This requires a whole system approach as food is eaten within a socio-cultural context. M Roeder: A cultural ecological approach for meal security - a case study of the dynamics of the food habits in El Obeid, Sudan describes how single factor changes in a diet can change whole meal setting. A. Bows et. al 2012. What's Cooking? Adaptation & Mitigation in the UK Food System describe how emissions change under different food future considering shifts not in a single product but within a particular socio-economic setting, including policies and behavioural shifts.	Accepted. The argument on the complexity of nutrition was included in a new table in 11.4.5, where behavioural change options are presented. However, other references were assessed as more relevant, mainly because of a wider coverage.
32675	11	32	48			"Technical mitigation measures alone" -- what are the assumptions here? Need to be stated.	Accepted. We now state 'Technical mitigation measures options on the supply side such as improved cropland or livestock management.'
29828	11	32	50	32	50	"was assumed" should be "were assumed"	Accepted. Revised.
24824	11	32	50	33	2	Do these studies include analysis/modelling scenarios for differing uptake rates for behavioural change? This would give context to the comparison with technical abatement potential.	Noted. Duplicate comment: see response in line 989.
32674	11	32	9	32	14	include discussion of recycling and composting of wasted food to complete nutrient cycling and reduce need for synthetic fertilizers.	Noted. We agree that composting unavoidable wastes is a beneficial activity, but no peer-reviewed study was available to quantify GHG emission reductions from such behavioural change.
29459	11	32	19	32	19	The correct term is "Life Cycle Assessment".	Accepted. Revised.
24162	11	32	36	32	40	It states that " In addition emissions intensities for the same livestock product vary largely between different regions of the world due to differences in agroecology, diet quality and intensity of production (Herrero et al., 2013; Figure 11.12). In overall terms, Europe and North America have lower emissions intensities per kg of protein that Africa, Asia and Latin America." The reason for the large variation on emissions intensities may also due to technology and management. Please provide suggestions on how to transfer technologies and advanced managements from Europe and North America to Africa, Asia and Latin America in some places of this chapter.	Accepted. The need for knowledge and technology transfer is dealt with in sections 11.8 (barriers and opportunities) and 11.10 (policies).
24163	11	32	39	32	42	at the end of this paragraph, Please add sentence " developed countries in Europe and North America should provide technologies and advanced managements to Africa, Asia and Latin America".	Partially Accepted. Not added here but the need for knowledge and technology transfer is dealt with in sections 11.8 (barriers and opportunities) and 11.10 (policies).
27362	11	32	39		39	editorial - change THAT to THAN in per kg of protein that Africa, Asia...	Accepted. Revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29462	11	32	50	33	1	Do these studies include analysis/modelling scenarios for differing uptake rates for behavioural change? This would give context to the comparison with technical abatement potential.	Noted. The studies assume that diets are changed as described in the text. Caveats regarding difficulties of wide-spread adoption of dietary changes were added.
19105	11	33				I assume that A is for beef and B is for milk?	Accepted. Revised.
21024	11	33				Please either give an explanation for the abbreviations or a reference where they are explained (in this report).	Accepted. Revised.
23657	11	33	1			Can you insert a sentence or two on relative land requirements for the different diets?- or just reference table 11.5	Noted. The study discussed in line 1 on p 33 includes only non-CO2 gases. The land requirements are discussed explicitly in Table 11.5. No action required.
19370	11	33	13			Could be omitted, is self-explanatory	Partially accepted. This Figure presents important information, and so was retained, but the figure was totally revised to make it more informative.
27935	11	33	13	33	13	Clarify all abbreviations in the figure.	Accepted. Revised.
35291	11	33	17	33	19	The map here is problematic. It is suggested to change the map. Even if the map has to be remained, it should be replaced by a border free map.	Accepted. The map was excluded.
19371	11	33	17			Could be omitted	Accepted. The map was excluded.
27934	11	33	7	33	9	What is understood by "healthy diet"? No ruminant meat? No meat? No animal products at all?	Accepted. Revised.
19619	11	33				Delete the Table, since the Herrero et al. (2013) is still under review.	Noted. Paper in press.
27255	11	33				please provide in the caption of the future the regions associated with the acronyms	Accepted. Revised.
31007	11	33	1	33	12	While a reduction of meat and dietary changes can decrease GHG emissions, these statements need to be balanced and account for additional trade-offs considering for example that livestock production in some areas (e.g. Canada's prairies) help to conserve the natural habitat and biodiversity. Also, there does not appear to be any mention into how 'feasible' it is to restrict meat consumption (socially this could be very difficult)?	Accepted. A caveat on social and cultural barriers was introduced. Positive effects of livestock rearing are discussed (see lines 40-42 on p. 32 of draft 2).
27256	11	33	16		17	The figures presented in the sentence ... Per-capita, carbon stored in wood products amounted to ~1.4 t C / capita in 1900 and ~1.0 t C 16 / capita in 2008 heve been obtained using the same approach and methodology? Please clarify in the text.	Noted. Misplaced comment, probably relates to p. 34, line 16. Text revised to make clear that the study discussed here reports on a comprehensive, consistent global time series.
29464	11	34	10		12	Realistically, total consumptionof animal products is not likely to decrease; rather it may remain steady as developed country consumers reduce consumption and developing country consumer increase consumption. It is the distribution that may change, not the total. There needs to be a justification inserted here as to the relevance of animal welfare to the mitigation objective, otherwise this text should be deleted as irrelevant to the discussion, which is about emissions in the food supply chain.	Accepted. Revised.
24826	11	34	10	34	13	Realistically, total consumption of animal products is not likely to decrease; rather it may remain steady as developed country consumers reduce consumption and developing country consumer increase consumption. The distribution may change, not the total. Suggest amending to reflect this. Also, suggest that either 1) justification is needed as to the relevance of animal welfare to the mitigation objective, or 2) this text should be deleted as irrelevant	Accepted. Revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21238	11	34	12			Removed extra "(" from "((Stehfest…"	Accepted. Revised. (Comment seems to refer to line12 on p 33).
31008	11	34	14	34	20	A number of statistics are reported in these sentences without any interpretation. Are the reported values consistent with each other, do some of them represent a complete accounting?	Accepted. Revised.
29463	11	34	2		2	Which study is referred to here? Is the contrast between using land for agriculture and reforestation? Make this clear.	Accepted. Revised.
24825	11	34	2	34	2	Which study is referred to here? Is the contrast between using land for agriculture and reforestation? Make this clear.	Accepted. Revised. Duplicate comment.
29829	11	34	20	34	20	“If inflows would rise” should be written either “Should inflows rise” or “If inflows rose”, or even “If inflows were to rise”	Accepted. Revised.
31476	11	34	22			"Increased wood use does not always reduce GHG emissions because changes in wood harvest affect the carbon balance of forests". If wood from sustainable forestry displace fossil emissions, and the forest carbon stocks are increased or maintained in the long term, this may give the best mitigation benefit? The finding in AR 4 was; "In the long-term a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fiber or energy will generate the largest mitigation benefit". If this statement is not valid anymore, this please provide some explanation in this chapter.	Accepted. Revised.
27936	11	34	22	34	23	Delete the sentence. How can increased wood use in general at all reduce GHG emissions?	Accepted. Revised. We agree that wood has GHG costs and hence increasing wood use may often increase GHG. However, substituting wood for GHG emission intensive products may reduce overall GHG.
23617	11	34	23			Why only Böttcher et al. And Holtsmark et al. ? There are about 25 plus publications on this aspect (see review by Lamers, P. and M. Junginger (2013). "The ‘debt’ is in the detail: a synthesis of recent temporal forest carbon analyses on woody biomass for energy." Biofuels, Bioproducts and Biorefining online early view. DOI: 10.1002/bbb.1407). Also, neither of the two aforementioned pinpointed to this aspect first. I believe that the first proper modeling effort was done by Harmon, M. E., W. K. Ferrell and J. F. Franklin (1990). "Effects on Carbon Storage of Conversion of Old-Growth Forests to Young Forests." Science 247(4943): 699-702.	Accepted. Lamers and Junginger 2013 and Ingerson 2010 were added. Priority is given to new publications because assessment reports should focus on new publications since the last assessment report period. It is clear we cannot cite all publications discussing a particular phenomenon for reasons of space.
31009	11	34	25			Not clear why GHG benefits are highest when 'energy use is focused on by-products and wood wastes'. This statement needs some explanation.	Accepted. Revised. What was meant was that use of woody biomass for products that replace emission-intensive raw materials provides larger GHG benefits than use of woody biomass for energy provision.
24827	11	34	25	34	30	Suggested reference- recent published study that highlights this very point could be cited: Ximenes, F and Grant, T. 2012. Quantifying the greenhouse benefits of the use of wood products in two popular house designs in Sydney, Australia. International Journal of Life Cycle Assessment DOI 10.1007/s11367-012-0533-5	Accepted. Revised. Reference included.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27937	11	34	25	34	25	To be added: "…and energy use is focused on by-products, wood wastes and end of life cycle use for long lived wood products".	Accepted. Revised.
19372	11	34	27	34	27	Concrete will be needed anyway as foundation of houses, but it's use could be reduced.	Accepted. Revised.
23658	11	34	28			comment on the magnitude or range of reductions	Noted. These are strongly context-dependent and cannot be generalized.
20745	11	34	29	34	30	In this sentence, the importance of increasing carbon sequestration or HWP stock change is underestimated. Reduction by HWP stock change is not so smaller than by material and fossil fuel substitution. And further more, if there is no positive HWP stock change, there are no reduction by material substitution and no increase of wooden residues for fossil fuel substitution, because these sustitutions occur effectively only when HWP stock grows.	Noted. The reviewed literature showed that the C sequestration effect was not that large because increased timber use requires harvest of standing trees which reduces C stocks in the forest. Because the reviewer comment was not based on a peer-reviewed reference, no changes could be made.
37775	11	34	31	34	41	Replacing concrete and steel works for low buildings but not for multistoried apartment buildings. Building many more one or two story buildings uses up land that may well have been productive crop land. (For example see the valley around Logan Utah.) Furthermore the lumber comes from forests and dramatically increasing lumber usage would result in deforestation. Can the authors address this in the text?	Noted. A caveat regarding applicability was introduced, but details regarding substitution of wood for other materials in buildings are discussed in another chapter (9) and cannot be included here for reasons of limited space. The reviewed literature considers effects of increased wood harvest on C stocks in forests. Use of wood from destructive harvest is excluded through the formulation "wood from sustainable forestry", see also Table 11.4, last row.
37776	11	34	31	34	41	How relevant is this discussion of wood buildings? Its not practical that a lot of buildings are wood, and furthermore, where buildings are built, land is being changed in other more profound ways, likely impacting GHG emissions much more than the buildings themselves. I feel this muddies the argument.	Rejected. The reviewed peer-review literature suggests that there exists a potential which we discuss. Caveats are clearly stated; deleting the argument would not be justified.
31010	11	34	35	34	35	Suggest insertion of phrase to read: "..an integrated modelling framework showed that a change to wood-based construction of one million flats.."	Accepted. Revised.
32676	11	34	35			something is missing in the argument here -- if we build one million houses we reduce GHG emissions?	Accepted. Revised.
19373	11	34	36	34	36	Construction of flats will not reduce GHG emissions, but construction of flats based on wood might.	Accepted. Revised.
27938	11	34	36	34	36	Insert before "would" "instead of concrete ones". Mitigation works only if some energy intensives activities or materials are substituted.	Accepted. Revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22152	11	34	42	37	2	This section neglects mitigation options in small-scale/subsistence farming in Africa, S. America and Asia. Very low yields can be significantly improved there through conservation farming (more than double) and at the same time improve soil carbon, soil fertility. Hencer, there are methods to improve insufficient yield, building resilience against adverse events and climate change and mitigation GHGs at the same tiem. Additionaly, this has benefits for food security, livelihood improvement, positive environmental impacts and improved soil fertility.	Accepted. Revision plus reference added.
20150	11	34	42	37	2	This chapter neglects mitigation options in small scale/subsistence farming in Africa, South America and Asia. There very low yields can be significantly improved through conversation farming (more than double) and at the same time improve soil carbon, soil fertility. Hence, there are methods to improve insufficient yield, building resilience against averse events and climate change and mitigate GHGs at the same time. Additionally, this has benefit for food security, livelihood improvement, positive environmental impacts, improved soil fertility	Accepted. Revision plus reference added. Duplicate comment.
37777	11	34	42	36	49	The text and a note in table 11.5 should include more discussion of the reference scenario. We are simply told it is similar to FAO (2006c) projections. But the text and table are making some very debatable claims about demand side mitigation - particularly the magnitudes of the mitigation benefits. A reader could conclude the authors are claiming that the planet could eat its way out of as much as 50 % of the GHG emissions problem by going vegetarian and eating less. Earlier it was claimed taking these action would reduce the cost of global GHG mitigation by 50%.	Accepted. More information on the TREND scenario was added. The statements questioned by the reviewer are supported by peer-reviewed literature and are assessed as being correct. However, a caveat regarding possible substantial barriers towards implementation was added.
29465	11	34	25	34	30	A recent published study which highlights this very point could be cited: Ximenes, F and Grant, T. 2012. Quantifying the greenhouse benefits of the use of wood products in two popular house designs in Sydney, Australia. International Journal of Life Cycle Assessment DOI 10.1007/s11367-012-0533-5	Accepted. Reference inserted.
19106	11	35				Should be an increase in soil C under trees.	Noted. It was unclear how this related to the material presented in Table 11.5.
29213	11	35				If land use change for bioenergy production includes afforestation, there will be increases in land-based carbon storage as well as mitgation through fossil fuel substitution. While it is true that the land use change options are mutually exclusive. the one-off increase in land carbon stocks should be included (and if it is, clearly stated).	Partially accepted. Some energy crops do indeed sequester C (e.g., perennial grasses or wood species if grown on degraded land, or even good cropland, but others do not or may even lead to C losses from the soil. The effect noted by the reviewer needs to be judged on a case-by-case basis; at the present state of scientific knowledge no general recommendation on the possible use of spare land, if available, is possible because the optimal solution will be context-specific. Revisions were introduced to explain that.
22153	11	35	1	35	1	Please provide numbers for "low animal production" and "higher yield".	Accepted. Revised.
20151	11	35	1	35	1	please give numbers for 'low animal production' and 'higher yield'.	Accepted. Revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23350	11	35	10			Example where to change "bioenergy" to "biomass for energy"	Accepted. Revised.
23351	11	35	17	35	200	Change "bioenergy value" here and line 19 to "energy value". Suggest change "10t/ha/yr" to "200 GJ/ha/yr" since talking about energy values. Delete "and reduces GHG by 45%" as is not always true. Maybe simply say "and can reduce GHGs"	Partially accepted. This is a footnote to Table 11.5. explaining the assumptions that had to be made in calculating the figures reported there, not a statement that such reductions can always be reached. Revised to make this more clear.
37780	11	35	25	35	27	Language like this should be inserted in the very beginning of this chapter to ensure that when 'biomass' is discussed, it is with these considerations/caveats in mind.	Accepted. Revised.
37781	11	35	28	35	34	Rewrite paragraph for clarity.	Accepted. Revisions were made. More concrete information on what was unclear would have been helpful.
21255	11	35	33	36	3	In Smith, Zhao, and Running (2012) we show the low end of this reported range (7%) is too low relative to the natural productivity potential of the biosphere (see Figure 5 in Smith, Zhao, and Running, 2012). The value of 7% of current croplands is derived assuming the maximum yield of Sugarcane (69 MJ m-2) without considering the availability of land capable of supporting such high yields (Pacca and Moreira, 2011). We suggest changing this range to reflect a more realistic range of yield potentials, which we estimate to be 6.6 - 18.8 MJ m-2 (Smith, Zhao, Running, 2012). Smith, W. K., Zhao, M., & Running, S. W. (2012). Global Bioenergy Capacity as Constrained by Observed Biospheric Productivity Rates. BioScience, 62(10), 911–922. doi:10.1525/bio.2012.62.10.11.	Partially accepted. Reference added, but as no number is given in that paragraph on the future bioenergy demand underlying that land demand, claims of an overstated yield potential are not a conclusive reason for rejecting the potential area demand. Area demand may also be low if bioenergy use is low, even if yields are low as well.
37779	11	35	8			Provide information for the enormous amount of bioenergy on spare land, variance. This is the driver for the variance in total mitigation potential. Hypotheses for future research or citing research aimed at understanding this variance will help to direct policy makers.	Noted. Footnote 2 explains assumptions underlying the results in the column "Biomass for energy on spare land" and cites the respective studies, one of which (the lower one) is the IPCC SRREN.
37778	11	35	8	35	34	Most grazing land is marginal with respect to other uses (including crop production). This implies that shifting from grazing to forests or energy crop production would require incurring significant costs - such as bring in water and applying fertilizer. So the potentials shown in table 11.5 and discussed in the accompanying text are optimistic at best. Can the authors find additional references that present alternative perspectives to the information shown in Table 11.5?	Partially accepted. Caption, footnotes, and description of the Table were revised. The caveats voiced by the reviewer are acknowledged, but we give very large ranges also because we are aware of these uncertainties.
37782	11	36	1	36	2	Please provide an example of ecological zoning approaches	Rejected. Unclear comment. Zoning is not mentioned in lines 1-2 on p 36.
23659	11	36	11			This paragraph could be shortened by starting with a sentence to the effect that you need a global strategy to optimize results- then limit examples	Accepted. Revised. This section has been shortened.
19374	11	36	11	36	15	Could be omitted. Start at row 15 with "Restrictions…."	Accepted. Revision made.
37783	11	36	11	36	11	Decades of under investment in agriculture - what is meant by this phrase and can it be backed up by data? Data exists that shows a steady increase in actual dollars being invested in agriculture. One can of course use a surrogate such as dollars per person or total land in tillage but in terms of dollars there has been increasing investment.	Accepted. This section has been excluded.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37784	11	36	12	36	12	Please clarify what is meant by "decades of undervestment in agricultur".	Accepted. This section has been excluded.
37785	11	36	14	36	17	Please provide an example	Rejected. Examples are given in the following paragraphs.
27939	11	36	15	36	15	Delete "avoided" and insert "reduced". This is the term used also in international negotiations, "avoided" was refused because especially in projects "avoided" would not guarantee reduction. As the same emissions could occur outside the project.	Partially accepted. We now use the term forest conservation.
37786	11	36	25	36	33	The authors ought to include recognition of agricultural intensification in terms of NOx, GHG release	Rejected. The interplay between agricultural intensification and GHG emissions is already included in this paragraph.
23660	11	36	26			Some discussion here of production potential in non traditional lands- ie urban agriculture should be included - fits well into discussion on line 45	Rejected. This paragraph does focus on intensification and not the use of agriculture on traditional or urban land.
31011	11	36	26			The statement about agricultural land intensification and economic costs/environmental problems should be more balanced to better reflect a complex reality. While more intensive land use can certainly have a greater impact on the environment and incur more costs from greater input use, this can also lead to improvements in output from less land and can generate better economic returns in some cases.	Accepted. We now more clearly state that yield increases can lead to improvements in output from less land and generate better economic returns for farmers.
37787	11	36	26	36	37	A simple optimal solution is too much to ask for. Most often we are asking to optimize conflicting objectives and so the best that we can hope for is a Pareto optimal.	Noted. Not clear what should have been changed.
30204	11	36	27	36	28	"While yield increases can help to reduce competition for land". But this can also lead to increases land conversion to agriculture. This is acknowledged later in the chapter: "Agricultural productivity can increase the profitability of production and may result in increased land conversion (Rose et al. 2013b)" (pg. 77 ln. 17-18.). Similarly there is a discsssion of the concept of "land sparing" on pg. 68 ln. 37-40). I couldn't find "Rose et al 2013b" in the ref list (missing?), but certainly there are others who have raised this point, e.g. Rudel, T.K., Schneider, L., Uriarte, M., Turner II, B.L., DeFries, R., Lawrence, D., Geoghegan, S., Hecht, S., Ickowitz, A., Lambin, E.F., Birkenholtz, T., Baptista, S. & Grau, R. 2009. Agricultural intensification and changes in cultivated areas, 1970–2005. Proceedings of the National Academy of Sciences 106: 20675–20680. So, in the three places the "land sparing" concept is made, there should be some reference to the fact there is uncertainty about the validity of this concept. Especially if the concept is applied without protection of ecosystems.	Noted. This is mentioned on p 29, lines 35-42 of the original draft, also supported by several references.
37788	11	36	27	36	31	Clarification needed - "Agricultural intensification" only occurs when it's returns exceed it's costs and its the most profitable action for the landowner to take.	Accepted. Revised.
30264	11	36	30	36	30	The “toxic effects of pesticides” are mentioned here, and “impacts of climate induced pests” are mentioned on p.28, line 10. Concerns exist about the potential combination of the two, that is the potential for climate change to alter patterns of temperature and precipitation in ways that can favor crop pests, and result in more application of agricultural chemicals to field crops. Furthermore, if these chemicals are more rapidly volatilized because of higher temperatures, greater rates of application may result. The chapter would benefit by some mention of the potential of these factors to affect surface and groundwater quality, if runoff of these chemicals raises concerns, and to mention possible occupational health concerns among agricultural workers from inhalation and dermal exposures with potentially higher application rates.	Accepted. The text on pesticides have been removed.
27940	11	36	33	36	33	To be added: "… a central challenge, requiring sustainable management of natural resources as well as the increase of resource efficiency" see de Fries and Rosenzweig.	Accepted and changed accordingly.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37789	11	36	38	36	44	The authors should mention the negative effects of large-scale bioenergy but do not explain why. It should explain why	Noted. Negative and positive effects of bioenergy are both mentioned; although more detail is provided in the bioenergy annex.
24828	11	36	39	36	42	The statement recognises that large-scale energy may negatively affect biodiversity and ecosystem resilience. However, it fails to acknowledge that positive alternate outcomes may also be achieved through appropriate management, such as establishing bioenergy crops in already degraded ecosystems or depauperate areas , is also likely to be environmentally beneficial. There is a pervasive one-sided negative element to the narrative on LUC for GHG mitigation in this text. Suggested rewording: "Improperly managed large scale bioenergy may negatively impact biodiversity (Groom et al 2008) …in the future (Landiset al 2008). However implementing appropriate management, such as establishing bioenergy crops in already degraded ecosystems or depauperate areas , represents an opportunity where bioenergy can be used to achieve positive environmental outcomes"	Accepted. We now also state the potential benefits of bioenergy crops on degraded lands and include relevant publications.
37790	11	36	42	36	43	"Because climate change is also an important driver of biodiversity loss (Sala et al., 2000), bioenergy may also be beneficial for biodiversity if it slows down climate change (see Annex I)." This statement is bold and unsupported. Please provide references to support it or delete it.	Accepted. We now support this statement with recent references.
31477	11	36	43	36	44	Quotation: "…, bioenergy may also be beneficial for biodiversity if it slows down climate change (see Annex I). "If it slows down climate change" is a very negative description of bioenergy! "Idealized implementation of bioenergy may also be beneficial for biodiversity" sounds much better.	Accepted. We now state that bioenergy for climate change mitigation may also be beneficial for biodiversity if it slows down climate changes planned with biodiversity conservation in mind (Heller et al. 2009, Dawson et al. 2011).
29523	11	36	6		10	This jumbled list of positive and negative feedbacks and nonGHG factors is not helpful. Spell out more clearly the points being made, or delete.	Rejected. The effects are described in more detail in the following sentences.
27258	11	36	15		15	replace avoided deforestation by forest conservation -more consistent with language in line 17, page 36; and line 5 in page 39	Accepted. Revision made.
27259	11	36	16		16	REPLACE OR by AND in ... afforestation or reforestation	Accepted. Revision made.
29466	11	36	31		33	Mention successes in this regard, such as through precision agriculture whereby inputs are reduced while yields are enhanced. Eg Use of site-specific management zones to improve nitrogen management for precision agriculture. R Khosla; K Fleming; J A Delgado; T M Shaver; D G Westfall Journal of Soil and Water Conservation; Nov/Dec 2002; 57, 6; Research Library pg. 513	Accepted. Revision made and reference included.
30281	11	36	32	36	32	Suggest adding “and social” after “environmental” so that it reads “…reducing negative environmental and social effects of agricultural intensification.” Particularly when intensification comes in the form of industrialized animal agriculture, there can be numerous negative social, environmental, and animal welfare issues that should be avoided. Pew Commission on Industrial Farm Animal Production. 2008. Putting meat on the table: industrial farm animal production in America, pp. vii, 6, 23. www.ncifap.org/bin/e/j/PCIFAPFin.pdf. Accessed April 20, 2013; Mirle C. (2012). The industrialization of animal agriculture: implications for small farmers, rural communities, the environment, and animals in the developing world. The 10th European International Farming Systems Association Symposium in Aarhus, Denmark, July 1-4. Workshop 1.3: Understanding agricultural structural changes and their impacts, to support inclusive policy dialogue and formulation. Available at: http://www.ifsa2012.dk/downloads/WS1_3/ChetanaMirle.pdf.	Accepted. Revision made.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29467	11	36	39		42	The statement recognises that large scale energy may negatively affect biodiversity and ecosystem resilience. However, it fails to acknowledge that positive alternate outcomes may also be achieved through appropriate management, such as establishing bioenergy crops in already degraded ecosystems or depauperate areas , is also likely to be environmentally benefical. There is a pervasive one sided negative element to the narrative on LUC for GHG mitigation in this text. Suggestion: "Improperly managed large scale bioenergy may negatively impact biodiversity (Groom et al 2008) …..in the future (Landiset al 2008). However implementing appropriate management, such as establishing bioenergy crops in already degraded ecosystems or depauperate areas , represents an opportunity where bioenergy can be used to achieve positive environmental outcomes"	Accepted. We now also state the potential benefits of bioenergy crops on degraded lands and included relevant publications.
27257	11	36	4		4	replace avoided deforestation by forest conservation -more consistent with language in line 17, page 36; and line 5 in page 39	Accepted. Revision made.
33966	11	37				fix font	Noted. Has been discussed with IPCC.
23620	11	37				Check readibility	Accepted.
31514	11	37				Style/formating issue in figure	Accepted. Revised.
19107	11	37				Figure difficult to read.	Accepted. Figure revised.
21025	11	37				Please rework figure. The text contains non legible symbols.	Accepted. Figure revised.
33311	11	37	20			Figure 11.13 and Table 11.6 could be combined and one version cut.	Rejected. This would affect ease of readability.
19375	11	37	20			In my version there are lots of small question marks…	Rejected. I don't have access to "his/her" version.
31012	11	37	21			This figure could be removed because this information is presented in Table 11.6.	Rejected. The aim of the figure is to clarify the difference between effects and development conditions, while the table enunciates the issues.
22489	11	37	21			The words in this figure can not be correctly shown.	Accepted and fixed.
27941	11	37	3	39	12	As the headline signals the chapter is about sustainable development. Later on in the text and as captions for tables and figures "sustainable" is missing. Please add it where correct.	Accepted.
29214	11	37	20	37	20	Figure reproduction - text is slightly garbled	Accepted. The figure was damaged in the pdf transformation.
20269	11	37	3	39	12	Migration of population from rural areas to cities is a universal phenomenon associated with socio-economic development of people across countries. The trend of migration is sharper in developing countries than the developed ones. This kind of migration is likely to reduce pressure on natural resources specially forest and community lands in rural areas. And in long term, the land availability for forest conservation, reforestation and afforestation will most likely improve in developing countries including India and China. This, in long term, could potentially contribute to increase in the quantum of forest carbon stocks, notwithstanding the vulnerability of forest sinks. This may appropriately be factored into Section 11.4.5 on 'Sustainable development and behavioural aspects'.	Partially accepted. Migration to urban areas is a trend in most developing countries. However, that this will reduce pressure on natural resources is not necessarily true, as migrants will still need energy and food.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27260	11	37	4		4	do you mean AFOLU MITIGATION MEASURES? Please insert the word mitigation	Rejected. Using the term AFOLU mitigation measures is redundant, and using it throughout the chapter will take a lot of space unnecessarily. This is WGIII dealing with mitigation. When dealing with adaptation, this is explicitly written (as in section 11.5).
30282	11	38		38		Animal welfare should be added to the issues listed in the “social and human assets” portion of the table. Animal welfare is a sustainable development issue. See, e.g. Stern S., U. Sonesson, S. Gunnarsson, I. Öborn, K.-I. Kumm, and T. Nybrant (2005). Sustainable development of food production: a case study on scenarios for pig production. Ambio 34(4), 402-407. Mollenhorst H., P.B.M. Berentsen, and I.J.M. De Boer (2006). On-farm quantification of sustainability indicators: an application to egg production systems. British Poultry Science 47(4), 405-417. Additionally, people around the world care about the welfare of animals raised for food. World Society for the Protection of Animals (2007). WSPA International Farm Animal Survey (China & Brazil), Dec. 14; Zogby International (2003). Nationwide views on the treatment of farm animals. Poll for the Animal Welfare Trust; Lusk J.L., F. B. Norwood, and R.W. Prickett (2007). Consumer preferences for farm animal welfare: results of a nationwide telephone survey. Available at http://asp.okstate.edu/baileynorwood/AW2/InitialReporttoAFB.pdf; and Penn, Schoen & Berland Associates (2005). Poll for the Humane Society of the United States, Washington, DC. (Illustrating consumer concern for farm animal welfare in the United States of America.)	Accepted. The issue has been included, as well as some of the references.
21026	11	38				What is meant by "FPIC"? Please explain.	Accepted. A participatory mechanism (as implied by the e.g.), the abbreviation has been spelled out for clarification.
24829	11	38	1			Should be made clear if industrial capacity is included under 'State of infrastructure and technology'.	Accepted. Term included.
37792	11	38	14	38	15	Biodiversity loss is also a major concern for large energy plantations	Accepted. The issue is considered in section 11.7, where co-benefits and potential adverse side effects are discussed.
29830	11	38	18	38	18	“at differenttimes” should be written “at a different time”	Accepted and corrected.
29831	11	38	22	38	22	“with regard of” should be written “with regards to”	Accepted. Text edited.
37793	11	38	24	38	28	How are "market considerations" not "economic considerations"?	Accepted. Paragraph reworded.
29832	11	38	25	38	25	“influencbd” should be written “influenced”	Accepted. Paragraph reworded.
24830	11	38	28	38	28	As economic considerations are a major driver there should be further discussion of this point; e.g. in relation to bioenergy: a market for small stems for bioenergy provides incentive to intensify forest management, increasing C sequestration in some cases. The market can be used to drive change. Shareholder value should be included as it is an important driver in corporate decision-making. Suggested citation: Schaltegger, S. and Figge, F. (2000), Environmental shareholder value: economic success with corporate environmental management. Eco-Mgmt. Aud., 7: 29–42. doi: 10.1002/(SICI)1099-0925(200003)7:1<29::AID-EMA119>3.0.CO;2-1	Partially accepted. This discussion is included in the bioenergy annex. We should include a cross-reference only.
37794	11	38	28	38	33	Recommend starting a new paragraph by breaking the sentence in two "Different values…value chain." Then new paragraph with discussion of"Behavior can be included through…"	Accepted. Paragraph reworded.
37795	11	38	35	39	3	Need to clarify (define) what each of these dilemas are.	Accepted. Paragraph reworded.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34366	11	38	35			Please consider cross-referencing relevant chapters in WGII. The same goes for page 52, line 34.	Accepted. This was done whenever considered appropriate. However, the comment is extremely vague.
23661	11	38	4	39	3	This discussion could be deleted or significantly shortened	Accepted. Paragraph reworded.
19376	11	38	4	38	21	Could be omitted, is said elsewhere.	Accepted. Paragraph reworded.
25519	11	38	4		15	Here, I would like to suggest the term of spatial scale and following argumet which is applied in critical geographic analysis. Critical Human geographers and political ecologist argue that addressing the scale matters will accomplish sustainability in environmental governance and management. Traditionally, environment has been governed or managed in the nested hierarchical political-administrative system. The relevant spatial or temporal scales in sustainable development policy implementation has to be focused to understand the different scale matters (Görg,2007; Moss and Newig, 2010).Source Görg,Christoph., 2007. Landscape governance: the "politics of scale" and the "natural" conditions of places, Geoforum.38, 954–966 and Moss,Timothy., and Newig, Jens.,2010. Multilevel Water Governance and Problems of Scale: Setting the Stage for a Broader Debate, Environmental Management 46:1–6	Accepted. Great suggestion! The terms "spatial scale" and "temporal scale" were used.
37791	11	38	8	38	10	Either define what a "social scale line" is in this context or recommend removing the sentence "One can identify…"	Accepted. Paragraph reworded.
29468	11	38		38		State of infrastructure and technology. Should be made clear if industrial capacity is included here.	Accepted. Term included.
27261	11	38				in institutional arrangement, expand the acronym FPIC	Accepted. Acronym expanded.
27363	11	38				change options by measures	Rejected. The term "options" was included in the layout. It implies that it is not mandatory, but an option. Both terms are necessary in the text.
30523	11	38	13	38	15	Large-scale energy plantations can have both positive and negative impacts, depending on the type of management adopted. The sentence only mentions negative impacts. Thus, it is important to balance the text in order to avoid a biased outcome.	Accepted. Sentence reworded to indicate that the positive impacts were already mentioned in the sentence before.
27267	11	38	16		21	would suggest to include also examples of negative impacts - for instance, for forest conservation, over time and a changing climate, reversal of carbon stock may occur, or link with section 11.5 (vulnerability, lines 26-27, etc)	Accepted. In order to avoid repetitions, however, we highlight that impacts of AFOLU mitigation measures are discussed in 11.7. This example is only to illustrate the different spatial scales of the impacts.
27263	11	38	17		17	please include positive and negative before impacts	Accepted. Sentence reworded to indicate that the positive impacts were already mentioned in the sentence before.
27364	11	38	18		18	editorial - different times	Accepted. Text edited.
27264	11	38	19		19	include positive before impact	Accepted. Sentence reworded to indicate that the positive impacts were already mentioned in the sentence before.
27265	11	38	19		19	include in reducing GHG emissions	Accepted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27266	11	38	19		20	reforestation will have an increasing POSITIVE impact on C REMOVAL over time	Partially accepted. Reforestation will have a POSITIVE impact on carbon SEQUESTRATION.
27365	11	38	25		25	editorial: influebced BY influenced	Accepted. The paragraph has been reworded.
29469	11	38	28	38	28	As economic considerations are a major driver there should be further discussion of this point; eg in relation to bioenergy: a market for small stems for bioenergy provides incentive to intensify forest management, increasing C sequestration in some cases. The market can be used to drive change. Shareholder value should be included as it is an important driver in corporate decision making. see Schaltegger, S. and Figge, F. (2000), Environmental shareholder value: economic success with corporate environmental management. Eco-Mgmt. Aud., 7: 29–42	Accepted. The issue is considered in the bioenergy annex. However, the reference is too old for this AR.
27262	11	38	4		15	the issue of scale needs to capture the spatial dimention (e.g.) relative to e.g., the size of the country, etc Please relativize the paragraph -	Partially accepted. The impacts we are discussing in the paragraph are related to the absolute size in terms of area of any intervention. This is not related to the relative impact as related to the size of a country.
37796	11	39	1	39	1	The authors should provide an illustrative example of "social survival dilemma"	Noted. Comment applies to different section, addressed by 11.4 authors.
22154	11	39	13	43	23	This is a well-written section which points out the importance of the synergies between adaptation and mitigation, and that these need to be seen within an interactive and interdependent system.	Noted. No action required.
20152	11	39	13	43	23	This is a well written chapter pointing out the importance of the synergies between adaptation and mitigation and that these need to be seen within an interactive and interdependent system	Noted. No action required.
37800	11	39	13	43	11	This section on impacts and adaptation is introduced as a brief discussion of these issues as they are discussed in other chapters - however, this section is 4 pages long. Since this chapter is over, the authors should focus on trimming this section to save space and avoid overlap with other chapters.	Accepted and modified.
21239	11	39	18			Provide space i.e. "different times"	Accepted and modified.
31478	11	39	22	39	24	QUOTATION: "Land-use changes can either help mitigate or contribute to climate change by affecting biophysical processes (e.g. evapotranspiration, albedo) and/or change in carbon fluxes to and from the atmosphere (WGI and II)." COMMENT: From chapter 6 we understand that the relevant measure is the stabilized GHG concentration in the atmosphere and not carbon flux as stated here. Please cross-check or clarify.	Noted. No action required since Carbon flux is also correct. The statement in its current form is also more comprehensive, as it recognizes that AFOLU can help mitigate or contribute to warming, depending on the type of measure.
21240	11	39	25			Change term to "influenced"	Accepted and modified.
29471	11	39	31		31	reword "land use carbon sinks". Substitute "terrestrial carbon pools".	Noted. Wrong page number given. Refers to heading on page 40 in the pdf. Considered and title modified to refer to terrestrial carbon pools.
29472	11	39	34		35	"Carbon sinks in tropical ecosystems are vulnerable to climate change." Reword "carbon sinks". Why single out tropical ecosystems? Suggestion: Either "Carbon sequestered in reforestation projects" or "Carbon pools in forest ecosystems" - depending on what was intended.	Accepted. Modified to terrestrial carbon; sentence rephrased.
31013	11	39	37	39	38	It is assumed that bioenergy plantations reduce biological diversity - but this must depend on what land cover or land use is replaced by the bioenergy plantations. Suggest changing to "while bioenergy plantations, where they reduce biological diversity, may diminish...."	Accepted. Text modified in response to earlier comments, which also address this comment.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24832	11	39	38	39	38	Insert "potentially" before "reducing biological diversity".	Accepted. Text modified in response to earlier comments, which also address this comment.
37801	11	39	39	39	42	The authors should delete this sentence as it is repetitive of points made elsewhere about potential from ILUC from various mitigation activities. Do not need to restate in every section, particularly since the scale of such effects is controversial.	Accepted. Sentence deleted.
37797	11	39	4	39	12	The authors should consider deleting this paragraph, as it has no conclusions and implies outcomes not supported by basic economics. Activities described in the paragraph may have limited direct implication for overall landscape carbon or sustainability outcomes. E.g., the certification of bioenergy is especially dubious, given biomass is a bulk, low-value commodity which in many waste senarios, actually has negative economic value (e.g. residual harvest material from forest health treatments, etc.). Adding econonomic barriers to such a low-value product (e.g. certification requirements) is likely the worst possible application of a certification system, as it forces production into centralized and industrialized production chains (rather than dispersed waste and residual utilization) that can support the added certification cost. As such, adding certification low-value/margin commodity producers can decrease sustainability rather than increase it compared to business as usual production methods. Given the dubious validity of the paragraph and the need cut the chapter down in size, suggest this paragraph's deletion.	Accepted. Paragraph deleted. All bioenergy aspects now dealt with in Appendix I (summarised in box 11.5)
37798	11	39	4	39	5	Adding "regarding a holistic land use or forest conservation" renders this sentence meaningless - as it makes the sentence unclear.	Accepted. Sentence removed.
37802	11	39	43	39	46	For these lines (and remainder of paragraph), the authors should consider moving this paragraph to the beginning of the section	Accepted. Paragraph shifted.
37799	11	39	5	39	5	The authors should use a word other than "holistic"	Accepted. Word removed.
19377	11	39	9	39	12	This sentence could well be omitted, is already said.	Accepted. Sentence removed.
29215	11	39	38	39	38	Misplaced comma? "may diminish, adaptive capacity" instead of "may diminish adaptive capacity"	Accepted.
22561	11	39	6			is there evidence that labelling and certification for mitigation is successful in the food supply chain in influencing consumer behaviour?	Accepted. Reference included.
27366	11	39	12		12	replace options by measures	Accepted.
33312	11	39	13			Solid section, provides answers to key questions, climate change feedbacks of particular relevance and synergies / trade-offs between mitigation and adaptation. However, no mention of knowledge gaps (neither in 11.11). Also, the interlinkages with WGII should be specified.	Noted. Knowledge gap section modified; linkage with WG I and WG II added and further specified.
22490	11	39	13			Mitigation technologies have been underlined in this chapter.The adaption options of climate change in AFOLU should be described in detail as it is useful to climate mitigation.	Noted. Due to lack of space, adaptation options not included - these issues are covered in WG II.
32427	11	39	22	39	24	Please provide a more specific reference to the WGI AR5 contribution, i.e., chapter/section.	Noted. Chapter detail added in appropriate places.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24831	11	39	34	39	42	Suggest that a point be made in this paragraph that mitigation activities/actions and land use in coastal catchments can have flow on effects for important marine systems (like coral reefs), including some that have mitigation value in their own right (e.g. seagrass systems) i.e. can affect their biological function and ecological services and also their contribution to mitigation (sequestration etc.). Implications of land based mitigation actions for water quality are particularly important. Suggested citations: Great Barrier Reef Marine Park Authority 2012, Informing the outlook for Great Barrier Reef coastal ecosystems, Great Barrier Reef Marine Park Authority, Townsville. Department of Premier and Cabinet 2009, Reef Water Quality Protection Plan 2009 for the Great Barrier Reef World Heritage Area and adjacent catchments, Reef Water Quality Protection Plan Secretariat, Department of Premier and Cabinet, Brisbane, viewed 18/10/2012, http://www.reefplan.qld.gov.au/resources/assets/reef-plan-2009.pdf Great Barrier Reef Marine Park Authority 2009, Great Barrier Reef Outlook Report 2009, Great Barrier Reef Marine Park Authority, Townsville	Noted. Mitigation in marine systems is not included in Chapter 11, and thus not included in this section.
27367	11	39	34		34	replace choices by measures	Accepted and modified.
30524	11	39	37	39	39	There are several cases where bioenergy plantations may also increase the biodiversity and reduce pressure on native forests, when good management practices are adopted, e.g. FSC Principles and Criteria, domestic legislation mechanism. The sentence should be adjusted and balanced (Useful References: SCOLFORO, 2008, ALCIDES, Felipe Rodrigues, 2007 etc.)	Noted. Text modified to address the concern by stating 'If."
29470	11	39	38	39	38	Insert "potentially" before "reducing biological diversity".	Noted. Text modified by inserting 'If' in response to earlier comment.
27368	11	39	15		15	editorial - throughthe by through the	Accepted and modified.
22666	11	4	1			The authors have done a good job on revising the FOD. Congratulate the authors and contributors on a tremendous amount of hard work.	Noted. Thank you. No response required.
19088	11	4	1	73	26	General comments. This chapter is a vast improvement on the FOD. However, there are still inconsistencies and far too many citations. The above-ground NPP is of the order of 2ZJ so the estimated (maximum) potential for biomass use of 0.5 ZJ could be achieved with concerted efforts. However, some of the low range estimates are less than the present consumption of biomass use today (54 EJ for energy alone and 22 EJ for 'industrial' wood products). Good inventory information is required for annual and perennial crops on all land use types, as well as production for annual crops and annual increments for perennial crops. Once this is known then the use of surpluses can be prioritised. Secondly, trees could be used to reclaim land and expansion of plantations could be undertaken. The biggest cause of deforestation is clearing land for arable and pastoral agriculture, driven by population increase and the need for more cash crops. The world's population is forecast to increase by 1.4 billion from 2010 to 2030 and a further 1.2 billion up to 2050, all but 0.2 billion will be in LDCs. Also, per-capita income will increase by about 1 to 2% per year in LDCs. How to meet the increase in demand for biomass products without degrading the natural resources? Agricultural and silvicultural productivity is necessary to stabilise if not reverse 'deforetation'. Investment in these areas is critical. This should boost rural income and assist in poverty alleviation.	Rejected. The chapter does not deal with maximum technical potentials (i.e. exploiting all biomass on earth for energy). Instead, the economic potentials are assessed and where possible barriers to implementation (e.g. competing uses of the land for food etc.) are also considered. Reforestation, competition for land and population increase are all considered. All statements should be supported by references, so citations cannot be reduced greatly.
37613	11	4	1	5	42	Section 11.7 is not mentioned in the Executive Summary and we feel it should be.	Accepted. Sentence added and section 11.7 now referred to in the ES.
31457	11	4	10	4	11	The information "The AFOLU-sector is responsable for about one third of anthropogenic emissions" seems not consistant with TS p.28 l 3-4 indicating one quarter. Also fig 11.2 i chapter 11 seemto indicate a lower figure than one third.	Accepted. Depends what sources are included, but these numbers have now been harmonised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19360	11	4	10	4	10	It says here that AFOLU is responsible for about one THIRD of anthropogenic GHG emissions; in WG3 Ch 5 p. 10, Fig. 5.2.3 it is shown that AFOLU is responsible for about one FOURTH of the GHG emissions (23.9%). Who is right?	Accepted. Depends what sources are included, but these numbers have now been harmonised.
25144	11	4	10	4	12	It's not entirely clear whether the reference to anthropogenic AFOLU emissions is net or gross emissions. This also appears in FAQ 11.1: "The total contribution of the AFOLU sector to anthropogenic emissions is therefore 24-34% of the global total."	Accepted. Depends what sources are included, but these numbers have now been harmonised.
19089	11	4	10	4	11	While Figure 11.1 shows the net emissions of C from AFOLU, what I think should be added is the above-ground net primary production (NPP) of biomass, which is about 4ZJ of which about 2ZJ is by land plants: this is equivalent to about 53 Gt C. The maximum potential is given as 25% of this figure namely about 13 GT C. I think this should be mentioned.	Rejected. The chapter does not deal with maximum technical potentials (i.e. exploiting all biomass on earth for energy). Instead, the economic potentials are assessed and where possible barriers to implementation (e.g. competing uses of the land for food etc.) are also considered.
33994	11	4	11			'The afolu sector is responsible for one third of the anthropogenic GHG emissions, mainly form deforestation and agricultural emissions from livestock and soil and nutrient management. Forest degradation and biomass burning (forest fires and agricultural burning) also represent relevant contributions'. Peat drainage shall be mentioned separately given the source strength and peat fires shall be mentioned.	Accepted. These numbers have been mentioned explicitly.
37614	11	4	11	4	13	Deforestation, livestock management, degradation, fire - should organic soils also be mentioned?	Accepted. Now mentioned.
24772	11	4	12	4	13	Suggest that the sentence "Forest degradation…contributions" should make specific reference that it means anthropogenic sources only.	Accepted. Now mentioned.
22117	11	4	15	4	16	Even though mitigation option related to LUC, land management and carbon sequestration offer a large potential, N2O emissions from fertiliser use should be much stronger considered as they are a significant share of agricultural emissions. As little as is know about soil nitrate dynamics under climate change impacts, these will be the emissions being a major challenge to come by in the future of growing food demand, increasingly degraded soils and averse climatic conditions. for more details see: A. Bowes et. al 2012. What's Cooking? Adaptation & Mitigation in the UK Food System	Noted. Reduction in N2O emissions arises from nutrient management, so this is already explicitly included at the position mentioned. No changes necessary.
20111	11	4	15	4	16	Even though mitigation option related to LUC, land management and carbon sequestration offer a large potential, N2O emissions from fertiliser use should be much stronger considered as they are a significant share of agricultural emissions. As little as is know about soil nitrate dynamics under climate change impacts, these will be the emissions being a major challenge to come by in the future of growing food demand, increasingly degraded soils and averse climatic conditions. for more details see: A. Bows et. al 2012. What's Cooking? Adaptation & Mitigation in the UK Food System	Noted. Reduction in N2O emissions arises from nutrient management, so this is already explicitly included at the position mentioned. No changes necessary. Identical to comment 22117.
33995	11	4	16			Land use (not only land use change!!) shall also be mentioned here as opportunity for mitigation measures.	Noted. Land use is already mentioned as land management. No change made.
22530	11	4	17	4	17	Substitution of fossil fuels by biomass for energy production is a demand side measure in our view, not a supply-side measure	Rejected. Demand side measures work through change in e.g. energy demand. Biomass does not change demand for energy, but does change the feedstock from which it is supplied - so is a supply side measure.
23337	11	4	17			Why only biomass? Better: "…. By renewable energy including biomass for….."	Accepted. Wording changed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37616	11	4	17	4	17	Please add language in here like that in the annex: "Bioenergy is a versatile form of energy, which can be deployed as solid, liquid and gaseous fuels to provide transport, electricity, and heat for a wide range of uses, including cooking. Bioenergy systems can have either positive or negative GHG mitigation implications.	Accepted. Better to add this to the paragraph on bioenergy on page 5, line 15, where it has been included.
37615	11	4	17	4	19	It is not clear where the substitution is to take place. If this means to burn wood for fuel rather than to use fossil fuel the savings is not clear.	Rejected. Mitigation occurs through reduction in use of fossil fuels as the energy is instead generated through a renewable resource.
22118	11	4	18	4	19	Changes in food or wood (biomass) consumption done not happen isolated and/or will have knock-on effects, e.g. change in energy consumption and demand causing also emissions.	Noted. This is discussed in section 11.4.
20112	11	4	18	4	19	Changes in food or wood (biomass) consumption done not happen isolated and/or will have knock-on effects, e.g. change in energy consumption and demand causing also emissions.	Noted. This is discussed in section 11.4.
27875	11	4	18	4	19	The term diet is not clear, please add before "diet" "human more plant-based" and after " impact " "up to 4.3Gt CO2eq/yr(page 33, lines 9-10.	Rejected. More plant based food is only one option for changing diet. Overconsumption is another aspect, o the generic term "changes in diet" is more appropriate for the ES - more detail is given in section 11.4.
23338	11	4	19			….. consumption, and improved efficiency of energy inputs into primary production systems." Note:, this term includes fisheries.	Accepted. Though this is accounted for in the end use sectors.
30369	11	4	2	4	22	Somewhere in the first two paragraphs of the SPM there needs to be a mention of the non-GHG effects of AFOLU, eg. Albedo and evaporation, as rightly mentioned several times in the main body of the chapter.	Accepted. Non-GHG effects now mentioned.
40716	11	4	2			…is derived from management of land and livestock. should be "…is derived from both enhancement of removals of GHGs as well as reduction of emissions ." The emphasis regarding uniqueness of the sector should be given to that its mitigation potential comes from its characteristics as both sink and source of GHGs.	Accepted. Wording changed.
37617	11	4	20	4	20	There is inconsistency between the confidence shown in chapter and that shown in SPM and TS. This needs to be rectified - and begs for a cross-reference of ALL confidence statements in the TS and SPM.	Accepted. SPM and TS are earlier drafts. Confidence statements should be adopted from the chapters.
35292	11	4	23	4	24	Technology transfer from developed countries to developing countries can play a crucial role for developing countries in achieving emission reduction in the area of AFOLU. However, this chapter lacks discussion on such aspect. It is suggested to make some revisions as follows: Insert "including accessibility to AFOLU finance, poverty, institutional, ecological, technological development, diffusion and transfer barriers "between" many barriers" and "to implementation of available mitigation options".	Accepted. New wording added.
26992	11	4	23	4	25	Consider rephrase this sentence. The barriers for implementation of mitigation options is not an exclusive problem of AFOLU sectors, but also of all sectors, including those related to energy and oil.	Accepted. Wording changed.
27876	11	4	23	4	23	Add after "barriers" and opportunities" (see page 7, lines 7-9)	Noted. Not clear what action is required. Not clear what the reviewer wants to add.
32641	11	4	28	4	30	such frameworks would provide a mechanism for valuing SOME synergies and trade-offs. Please be very clear about the limited and contested uses of frameworks that are focused on environmental or ecosystem services. Given these limitations, I would suggest this statement not appear in the executive summary.	Accepted. Reference not removed, but acknowledgement that this is just one framework has been added.
37618	11	4	30	4	31	This sentence seems to be a tautology. Please revise.	Accepted. Wording revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27877	11	4	30	4	33	More differentiation on the implications of large scale afforestation and bioenergy use on biodiversity, food security in relation to the timing and scale of action required in the different overshot and stabilization scenarios.	Accepted. Revised.
33851	11	4	33	4	34	change "suggest" in: show	Rejected. "Show" implies certainty and is more appropriate for demonstration of facts. "Suggest" is a better word for future model projections due to the inherent uncertainty in the models and scenarios used to drive them.
32642	11	4	33	4	35	disaggregate discussion of sequestration and avoidance.	Rejected. Cannot be done in this sentence.
37619	11	4	37	4	40	How is this to be accomplished and what is the evidence that large scale energy can be produced cheaply in AFOLU?	Noted. As stated, this is the outcome of the projections of the Integrated Assessment Models. More details are given in sections 11.6 and 11.9 as stated.
37620	11	4	37	4	45	This discussion implies that biomass is carbon neutral. Current USG studies as well as some in the UK are reevaluating this assumption, as all biomass cannot be assumed carbon neutral without evaluation. Please add language that makes this explicit to this ES (and rest of document - it is brought up on page 35 but not before). In lines 41-43, these modeled scenarios likely assumption biomass as c neutral, making this indeed 'idealized'. If this is indeed the assumption, it must be made clear here, perhaps at the end of the paragraph where the 'more realistic' discussion takes place. There is new literature about biofuels and land use impacts - the evidence in previous literature may have been overstated. The text should reflect this development.	Rejected. There is no assumption that biomass is carbon neutral. Large parts of the chapter and the Bioenergy Appendix are devoted to showing that biomass is not carbon neutral. Even if not carbon neutral, biomass can reduce GHG emissions relative to fossil fuels; this can occur without assuming carbon neutrality.
24773	11	4	38	4	38	"Provide headroom" needs explanation. Does it refer to the concept of "emissions space"?	Accepted. Wording changed.
32643	11	4	44	4	45	what is the value of deploying something that doesn't work (with significant spatial and temporal leakage and economic implications)? Also there is a need to be more direct and explicit about the temporal leakage, particularly in the case of soil carbon sequestration. finally the non-fungibility, incommensurability of sequestration with emissions avoidance must be emphasized.	Noted. Leakage is a risk, not an inevitability. It is appropriate to note the risk.
37621	11	4	44	4	44	What is meant by temporal leakage?	Accepted. Temporal leakage means that emissions are displaced in time, i.e. they occur later. Wording changed to clarify.
30955	11	4	46	5	4	The upper global estimate of 10600 Mt CO2-eq./yr for total economic mitigation potentials in the AFOLU (agriculture, forestry and other land use) sector is smaller than that given for forestry alone (13000 Mt CO2-eq./yr Is there an error in reporting these estimates?	Noted. AFOLU estimates are only included when both agriculture and forestry potentials have been considered together. Separate studies cannot be added together as they may assume overlapping areas (double counting).
33852	11	4	46	5	5	use Gt in stead of Mt (like in the Summary)	Accepted. Changed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19090	11	4	48	5	1	Global estimates for economic mitigation potentials in the AFOLU sector in 2030 are 490 to 10600 Mt CO2-eq./yr at prices up to 100 US$/t CO2-eq., with ranges amongst agricultural sectoral studies of 260 to 4600 Mt CO2-eq./yr at prices up to 100 US$/t 1 CO2-eq., and among forestry sectoral studies of 198 to 13000 Mt CO2-eq./yr. However, in the energy chapter - Table 7.2 on page 18, the maximum potential is given as 500 EJ/yr (49,000 MtCO2 equi.) . I think that the maximum of 10,600 is on the low side. Also adding agriculture and forestry gives a range of 458 to 17,600 tCO2 eq., which differs from 490 to 10600 Mt CO2-eq./yr.	Noted. Energy substitution is not included as this is dealt with in the Bioenergy Annex. AFOLU estimates are only included when both agriculture and forestry potentials have been considered together. Separate studies cannot be added together as they may assume overlapping areas (double counting). They cannot simply be added together.
37622	11	4	49	4	49	The terms US$ and USD. One or the other should be used consistently	Accepted. Harmonised throughout volume.
27878	11	4	49	4	49	It should be noted that the ranges of mitigations potentials became higher with regard to maximum and minimum in comparison to AR4.	Accepted. Increased range is now noted.
24774	11	4				The key components of the success to mitigation in the AFOLU relate to management - this is not well identified and recognised in the Executive Summary (i.e., production systems may or may not have the potential for positive mitigation results). The management issue needs to be recognised. A preliminary discussion regarding this issues has been recently raised by: SC Davis, Boddey RM, Alves BJR et al.: Management swing potential for bioenergy crops. GCB Bioenergy, (2013).	Accepted. Importance of management stated more clearly in the ES. Note identical to comment 29416.
24775	11	4				The Executive Summary focuses too narrowly on the role of bioenergy. There are many components within the AFOLU sector that should be recognised. For example to concept of direct and indirect land use change is larger than bioenergy. Any land use will use resources (e.g., water, soil) and therefore all land uses within the AFOLU sector need to be considered.	Rejected. Bioenergy forms only part of the ES, and it focuses mainly on other options in the AFOLU sector. Note identical to comment 29417.
19612	11	4	10	4	12	"livestock and soil and nutrient management" should be "livestock, soil and nutrient management" to accord with Figure 11.2 in Page 8	Accepted. Changed.
29412	11	4	12	4	13	Sentence "Forest degradation…contributions." should make specific reference that it means anthropogenic sources only.	Accepted. Changed.
19613	11	4	19	4	20	Changes in diet can have a significant impact on GHG emission from a life-cycle perspective, not only in food production, but food processing and transportation.	Accepted. Additional savings added.
24160	11	4	23	4	23	Between "many barriers" and "to implementation of available mitigation options." insert "including accessibility to AFOLU financing, poverty, institutional, ecological, technological development, diffusion and transfer barriers".	Accepted. Changed.
29413	11	4	38	4	38	"provide headroom" needs explanation. Does it refers to the concept of "emissions space"?	Accepted. Reworded.
37803	11	40	12	40	12	Add "mitigation-adaptation' to title	Noted. Page and line numbers not matching.
37804	11	40	12	40	12	Change "in their economic' to "n terms of their economic'	Accepted and modified.
37805	11	40	15	40	15	Add space after "through' and add"their potential to store or release"	Accepted and modified.
37806	11	40	15	40	15	Remove "the' after "through'	Accepted and modified.
37807	11	40	15	40	16	Remove 'the can store or release'	Accepted and modified.
30370	11	40	18	40	18	As a lead author on WG2 Chapter 4 I suggest we work closely in the preparation of our final drafts, as this area of our chapter mentioned here has evolved since our FOD.	Noted. Text modified based on WG II chapter 4, SOD.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25818	11	40	19	40	25	This paragraph can be made clearer. First, deforestation (even in mid to high latitudes) perhaps cannot be said to create net cooling effect over a period of 100 years when all the carbon pools are taken into account (e.g. forcing(2000 tCO2 per hectare, 100 yrs) + forcing(albedo per hectare, 100 yrs) <= 0?) Second, the evaporative cooling resulting from transpiration by forests is perhaps a local transfer of energy rather than exchange of energy between the earth and the outer space (more evaporation = more moisture which is also a GHG). Thirdly, the last line of the paragraph is not clear: "positive feedback on regional climate change" means net cooling or net warming (net forcing)?	Noted. Text In this paragraph is based on literature. Last line of paragraph: Positive feedback is leading to net warming.
31014	11	40	21	40	21	Consider qualifying the sentence "..the low albedo of boreal forests provide [sic] a positive climate forcing (Bonan, 2008b)" to read "..the low albedo of coniferous boreal forests..". As indicated in Bonan's paper, deciduous boreal forest types such as aspen have higher albedos and thus the albedo feedbacks are smaller.	Accepted and modified.
37808	11	40	21	40	25	Rewrite for clarity	Accepted and modified.
30371	11	40	22	40	22	I would say it is more than "hypothesised" - there is increasing evidence (and indeed WG1 include a negative radiative forcing from deforestation in their RF diagram, as previously done in TAR and AR4 with increasing LOSU). A paper formally detecting the influence of land cover change in historical regional scale temperatures is Christidis et al (2013) GRL, 40, 589–594, doi:10.1002/grl.50159	Accepted. Text modified.
19729	11	40	23	40	25	Changes in forest cover can occur through tree species migration of change in relative composition of spceies already present on the territory. Because of the processes involved, both pathways will yield significant changes at secular time scales only. I believe that the present report would try to be pertinent over a much shorter time scale, or at most until 2100. This issue of time scale should be mentioned here, or the point about deciduous tree cover expansion dropped.	Accepted. Text modified in conjunction also with earlier comments.
30372	11	40	23	40	25	As a lead author on WG2 Chapter 4 I suggest we discuss this statement on projected climate change impacts on forest cover, in order to ensure consistency in our final drafts.	Noted. Text made consistent with WG II SOD.
37809	11	40	23	40	23	Change 'show that there will be' to 'support the probability of'	Accepted. Text modified.
31015	11	40	24	40	25	The paper by Swann et al (2010) refers to the modelling of climate feedbacks induced by northward expansion of deciduous trees onto bare ground in arctic regions. Thus, suggest being more specific by rewording the sentence to read "In this context, (Swann et al., 2010) suggest that the northward expansion of deciduous forest into barren areas of the arctic would have a positive feedback on regional climate change".	Accepted. Text modified.
37810	11	40	28	40	28	Add period after 'system ' and begin the following sentence with 'These models'	Accepted. Text modified.
24833	11	40	31	40	31	Suggest reword "land use carbon sinks" to "terrestrial carbon pools"	Accepted and changed to 'terrestrial carbon sinks.' We feel 'sink' is better than 'pool.'
27942	11	40	31	42	6	The terminology of the subchapters is confusing. It is recommended to unite 11.5.2 and 11.5.3 under the headline "implications of climate change on/ carbon stocks in forest and agricultural soils/ or /land use sinks and sources" and use a similar headline for 11.4..5.	Accepted. The title of 11.5.2 changed to focus on forest and 11.5.3 to focus on peatlands.
24834	11	40	34	40	35	"Carbon sinks in tropical ecosystems are vulnerable to climate change." Reword "carbon sinks" to either 'Carbon sequestered in reforestation projects' or 'Carbon pools in forest ecosystems' depending on what was intended. Also explain why tropical ecosystems are singled out (or include mention of all other climate-zone ecosystem carbon sinks)	Noted. Sentence deleted in response to another comment since it is repetition of previous statement.
37811	11	40	34	40	35	Remove sentence 'Carbon sink... climate change.'	Accepted. Text deleted.
37812	11	40	35	40	35	Add 'type' after 'landuse'	Accepted. Text modified.
37813	11	40	36	40	36	Add'by' after'cycle'	Accepted. Text modified.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30205	11	40	39	20	47	Implications of climate change on C sinks (forests). There is no mention here to the fact that deforestestion magnifies the effects of climate change (drought, fire etc) to provide a positive feedback mechanims. This is especially pronounced for the Amazonm. Indeed, many beleive that intactness is teh key to proving resilience to climate change (Malhi et al. 2009). The CBd's own report also emphsises this point “Evidence suggests that intact forests, particularly primary forests, will be more resistant to climate change than second-growth forests and degraded forests.” (CBD 2009). There is a substantial number of publications on this interaction between logging, deforestation, fragmenttaion and increased vulnerability to climate chaneg impacts. Following are a few reecnt references: Laurance, W.F., Camargo, J.L.C., Luizao, R.C.C., Laurance, S.G., Pimm, S.L., Bruna, E.M., Stouffer, P.C., Williamson, B., Benítez-Malvido, J., Vasconcelos, H.L., Van Houtan, K.S., Zartman, C.E., Boyle, S.A., Didham, R.L., Andrade, A. & Lovejoy, T.E. 2011. The fate of Amazonian forest fragments: a 32-year investigation. Biological Conservation 14: 56-67. CBD (Convention on Biological Diversity) 2009. Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change. CBD Technical Series No. 41 http://www.cbd.int/doc/publications/cbd-ts-41-en.pdf Malhi, Y., Aragão, L.E.O.C., Galbraith, D., Huntingford, C., Fisher, R., Zelazowski, P., Sitch, S., McSweeney, C. & Meir, P. 2009. Exploring the likelihood and mechanism of a climate-change-induced dieback of the Amazon rainforest. Proceedings of the National Academy of Sciences. 106: 20610-20615. Nepstad, D.C., Stickler, C.M.,Soares, B.& Merry, F. 2008. Interactions among Amazon land use, forests and climate: Prospects for a near-term forest tipping point. Philosophical Transactions of the Royal Society B 363:1737–1746. Ray, D.; Nepstad, D. C. & Mourinho, P. 2005. Micrometeorological and canopy controls of fire susceptibility in mature and disturbed forests of an east-central Amazon landscape. Ecological Applications 15: 1664-1678	Noted. The focus of this section is on impact of climate change on carbon sinks and not the impact of deforestation on climate change, which is covered in WG I.
30206	11	40	39	40	40	"Most model based studies suggest that rising temperatures, drought and fires will lead to forests 39 becoming a weaker sink or a net carbon source before the end of the century". More recent research indicates the forecast is not as bad as previously thought. See, e.g. Huntingford et al. 2013. Simulated resilience of tropical rainforests to CO2-induced climate change. Nature Geoscience 6: 268-273.	Noted. Sentence taken from WG II, chapter 4, SOD.
31516	11	40	39	40	47	The authors in this section have bias their selection of references to papers that only discuss the negative impacts of climate change on forests. There are a number of peer-reviewed papers that concluded climate change for certain forest types, in certain environments could benefit with climate change with increased productivity - and this could apply to a large number of environments throughout the world. Also, agricultural land that is likely to be unproductive with climate change (i.e. due to drought) may be suitable for afforestation as forests can be still productive in areas that receive less preciptiation. I would highly recommend that authors to re-examine the literature in this area. Here are some examples: Norby RJ, Warren JM, Iversen CM, Medlyn BE, McMurtrie RE (2010) CO2 enhancement of forest productivity constrained by limited nitrogen availability. Proceedings of the National Academy of Science USA 107: 19368-19373; Kirschbaum, M.U.F, Watt, Tait, and Asseil (2012) Future wood productivity of Pinus radiata in New Zealand under expected climatic changes. Global Change Biology 18, 1342 - 1355; Meason D.F., and Mason (2013) Evaluating the deloyment of alternative species in planted conifer forests as a means of adaptation to climate change-case studies in New Zealand and Scotland. Annals of Forest Science, in press.	Noted. Sentence taken from WG II, chapter 4, SOD.
37814	11	40	39	40	39	Replace 'lead to' with'weakened'	Rejected. Sentence does not work.
37815	11	40	40	40	40	Remove 'becoming'	Rejected. Sentence unclear.
31016	11	40	46	40	47	Please correct this cross-reference - Section 11.2.1 presents supply and consumption trends. Has the section on forest fire emissions been removed?	Accepted. Sentence deleted in response to earlier comments.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21241	11	40	8			Change term to "sustainability"	Rejected. The term mitigation-adaptation is better suited in the context of this section; refer to section 11.4. 5 for broader discussion of sustainable development linkages.
37816	11	40	46	40	47	Remove sentence 'The emissions...presented in section 11.2.1.'	Accepted. Sentence removed.
31515	11	40				I believe there is too much detail in this section and could be easily reduced. Are Fig 11.13 and Table 11.6 both needed?	Accepted. Text reduced by 1/3.
27369	11	40	16		16	editorial - absorbtion by absortion	Accepted. Modified to absorption.
27370	11	40	21		21	editorial - privide by provide	Accepted and modified.
34367	11	40	3			Please replace 'risk trade-offs' with 'trade-offs' when used as the antonym of 'synthesis' since the former term should only be used when the discussion evolves around trading off different risks (example: increase of climate risk if a mitigation option such as BECCS is not implemented vs increase of risk related to this particular option such as groundwater contamination). The same goes for page 42, lines 31 and 32.	Accepted in the section (with one exception, which refers specifically to risk trade-offs of mitigation and adaptation objectives between sectors) as well as section corresponding to page 42 line 31, 32 in SOD.
24835	11	40		41		This section has a northern hemisphere focus and focuses only on forests. The potential for other vegetation types as carbon sinks is important and should be mentioned as a potential mitigation approach in this section. For example the issue of 'blue carbon' or carbon sinks in marine and coastal systems is a current topic of interest – examples include saltmarsh, mangrove, and seagrass. Suggested citations: Laffoley, D. d'A. & Grimmsditch, G. (eds). 2009. The management of natural coastal carbon sinks. IUCN, Gland, Switzerland. 53 pp. The management of natural coastal carbon sinks; Nellemann, C., Corcoran, E., Duarte, C. M., Valdés, L., De Young, C., Fonseca, L., Grimsditch, G. (Eds). 2009. Rapid Response Assessment – Blue carbon United Nations Environment Programme, GRID-Arendal, Blue Carbon).	Noted. Section 11.5 deals with climate change feedbacks and interaction with adaptation in the context of terrestrial carbon sinks only as presented in earlier sections of the chapter.
27371	11	40	34		34	editorial - landuse change by land-use change	Accepted and modified.
27372	11	40	37		37	editorial - landuse change by land-use change	Accepted and modified.
27373	11	40	38		38	editorial - landuse change by land-use change	Accepted and modified.
22934	11	40	39	40	41	This is largely scale-dependent. Models show different trends (i.e., sink vs. source) at different spatial scales even within a given region. Please specify the spatial dependency.	Noted. Text taken from WG II chapter 4, for details reference is made to WG II chapter.
37817	11	41	1	41	1	Remove 'a possibility that'	Accepted. Text modified.
19731	11	41	10	41	11	The study of Carnicer is not in the list of references, but the sentence is lifted from the abstract of the 2011 PNAS text of this author. Also, the study of Carnicer et al uses this sentence only as a general context statement and goes on to study forests in the Iberian peninsula. If you want a data-backed statement on the issue of increase in global forest dieback events, I would recommend using "Allen et al 2010. A global overview of drought and heat-induced tree mortality reveals emerging climate change risks for forests. For. Ecol. Managment 259: 660-684" as a reference.	Accepted. Carnicer reference replaced by Allen et al, 2010.
30374	11	41	10	41	10	I could not find Carnicer et al (2011) in the reference list.	Accepted. Carnicer reference replaced by Allen et al, 2010.
30373	11	41	10	41	11	This sentence relates closely to issues discussed in several chapters in WG1 (detection of drought trends, reduction of forest carbon sinks) and WG2 Chapter 4 (tree dieback). As a lead author on WG2 chapter 4 I suggest a discussion between ourselves and appropriate WG1 authors to ensure consistency in our final drafts).	Accepted. Carnicer reference replaced by Allen et al, 2010.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37820	11	41	10	41	10	Replace 'increasing' with 'causing'; and after 'events' add' to increase'	Accepted. Carnicer reference replaced by Allen et al, 2010.
37818	11	41	10	41	24	Given large discussion of anticipated tree mortality here, why no discussion on the implications of bioenergy or wood-product development to displace other GHG sources? E.g., if we are going to lose these landscape C-stocks anyways, wouldn't it be logical to use this material to offset fossil fuel emissions either through converting to the harvested wood product C-pool, and/or use as bioenergy?	Noted. The bioenergy issue is addressed in the Bioenergy annex.
37819	11	41	10	41	24	This paragraph is a collection of random statements.	Noted. Text modified by adding a new reference. In one paragraph, we had to cover many issues due to limited space for this section.
37821	11	41	11	41	11	Add 'thus' before 'causing' and replace 'and' with 'leading to'. Also pluralize 'reduction'; replace 'of' with'in'	Accepted. Carnicer reference replaced by Allen et al, 2010.
19730	11	41	12	41	14	The study of Ma et al is rather weak in its spatial representation and in the underlying number of data points. I would suggest refering instead to Michaelian et al 2011 Massive mortality of aspen following severe drought along the southern edge of the Canadian boreal forest Global Change Biology 17 (6) , pp. 2084-2094	Accepted. Michaelian reference added.
31017	11	41	12			Ma et al. (2012) is not in the list of references. Does this refer to Michaelian et al. (2011)? Michaelian,M.;Hogg,E.H.;Hall,R.J.;Arsenault,E.; 2011. Massive mortality of aspen following severe drought along the southern edge of the Canadian boreal forest. Global Change Biology 17: 2084-2094	Accepted. Ma et al (2012) deleted ; Michaelian reference added, text modified.
37822	11	41	12	41	12	Remove 'the' after 'provide'; remove 'of the'	Accepted. Ma et al replaced by Michaelian et al.
31018	11	41	14	41	14	Please edit incorrect spelling of the Canadian province "Saskachetwan" (should read "Saskatchewan").	Accepted. Ma et al replaced by Michaelian et al.
21242	11	41	15			Change term to "through the"	Noted. Existing sentence is correct; may not help adding 'through the.'
31019	11	41	21	41	24	The Hopkins et al. (2012) study indicates higher rates of decomposition, however the net change in soil C also depends on the detrital inputs to the soil. These will probably increase with temperature also and so the net effect on soil C may not be what is predicted by looking only at decomposition. This could be clarified.	Noted. Reference deleted.
31517	11	41	21	41	24	I disagree about assumptions on carbon pool cycling residence time in younger forests. Mature forests will likely have a greater % of carbon stored more protected pools that have longer residence time. However, in younger forests there is a significant percentage of carbon stored in pools with long residence time. The jury is still out how carbon pools will change under climate change in mature and young forests, but it is incorrect to say that there will be a high percentage of losses in young forests.	Noted. Reference deleted.
37823	11	41	22	41	24	Rewrite for clarity	Accepted. Text deleted.
37824	11	41	23	41	23	Pluralize 'decade'	Noted. Text deleted.
37825	11	41	26	41	26	Replace 'than' with 'relative to'	Accepted. Text modified.
27943	11	41	26	41	26	In the IPCC GPG and in the second order draft of the Wetlands supplement Peatlands are Wetlands. Here the opposite is the case Wetlands are part of peatlands. Please consult with IPCC GL expert to avoid inconsistencies. Furthermore add definitions for wetland and peatland to the Glossary.	Noted. Wetland supplement is not yet public. Wetlands are included under peatlands. So no inconsistency.
37826	11	41	29	41	29	Remove'(C)' which has already been defined and is why the entire document needs to be checked for 'carbon' versus 'C'	Accepted. C deleted.
21243	11	41	34	41	38	Provide space "land use"	Accepted land use corrected throughout the section

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31020	11	41	36	41	40	Regarding the potential for carbon losses from peatlands through increases in drought, recommend specifically mentioning the likelihood of large C losses from deep-burning fires in boreal peatlands under future projections of climatic warming and drying (e.g., see: FLANNIGAN, M., STOCKS, B., TURETSKY, M. and WOTTON, M. (2009), Impacts of climate change on fire activity and fire management in the circumboreal forest. Global Change Biology, 15: 549–560. doi: 10.1111/j.1365-2486.2008.01660.x).	Accepted. Text modified.
27944	11	41	45	41	45	The same problem occurs as for peat and wetlands, there is a definition for IPCC guidelines for grassland, pastures and ranelands are grasslands, consultation with IPCC GL experts is recommended and clear definitions in the Glossary are necessary.	Accepted. Grasslands include pastures and rangelands.
29780	11	41	45	42	4	Please, consider contributions on tropical savannas such as Grace, J., San José, J., Meir, P., Miranda, H. & Montes, R. 2006. Productivity and carbon fluxes of tropical savannas. J. Biogeogr. 33:387-400 and San José, J. & Montes, R. 2007. Resource apportionment and net primary production outcome across the Orinoco savanna-woodland continuum. Acta Oecol. 32:243-253.	Noted. Not directly relevant since the two references do not deal with Impact of climate change.
24836	11	41	48	41	49	This sentence should be further elaborated with supporting data or specific cited examples, rather than relying on generic supporting statements.	Accepted. Text deleted.
27945	11	41	48	41	49	Delete the sentence starting with "The" and ending with "productivity". It is not about the impact of climate change on rangelands.	Accepted. Text deleted.
22562	11	41	10	41	24	this may not be the right place to make this comment, however I don't remember a reference to the impact of mitigation measures, changing CO2 and changing climate on the quality (rather than quantity) of crop (and livestock) products. Pleijel, H. & Uddling, J. (2012). Global Change Biology. 18: 596–605. DOI: 10.1111/j.1365-2486.2011.2489 found that although elevated CO2 did increase overall wheat yields, there was a 'growth dilution' effect with the proportion of protein in grains reduced, because, under these conditions, the plant does not increase its nitrogen uptake at the same rate as its growth	Noted. Impacts of climate change and CO2 on quality of crop products is addressed in WG II.
29216	11	41	15	41	19	Perhaps these comments should be qualified somewhat - changes in termperature regimes as well as the amount, timing and intensity of rainfall will impact on both NPP and SOC concentrations. Plant physiological responses to increased CO2 concentrations, drought regimes and temperature may or may not moderate productivity response (depending on the "life history strategy of the plant" - e.g. some plants may reduce the number of stomata to reduce transpiration losses of water under drought conditions whilst maintianing overall productivity due to increased CO2 concentration.) I think it would be worth reflecting that such changes are highly uncertain.	Accepted. Text modified. Uncertainty involved is mentioned. The current text states the impacts can be 'either positive or negative', which clearly highlights the uncertainty.
27374	11	41	17		17	editorial - insert OF between because and increased	Accepted. Text modified.
33313	11	41	25			You may want to bring in the discussion of permafrost soils as a tipping element in the Earth's climate system (Lenton et al)	Accepted. Lenton Reference added.
31021	11	41	45	42	4	Increases of rainfall on grasslands/rangelands will not likely increase erosion risk or rates substantially (at least not in Canada)? This causal relationship seems to be overstated here.	Accepted. Text modified: Increased rainfall intensity will lead to increased soil erosion if poorly managed.
29473	11	41	48	41	49	This sentence should be further elaborated with supporting data or specific cited examples, rather than relying on generic supporting statements and one citation of limited relevance.	Accepted. Text modified: the generic statement deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21027	11	42	12	42	20	Please explain what you think is a "win:win" situation here. Who / what benefits? Adaptation and …? The list is also a rather chaotic sampling of policies and measures which might or might not be beneficial and might or might not be directed towards adaptation, depending on site and other conditions. For example, "thinning" is a normal forest management activity aimed at several aims, not necessarily adaptation. "Anticipatory planting of species" may reduce risks, but can decrease growth (C sequestration), so would this be "win-win"? I suggest to delete these lines as the quote is also taken out of context and shortened to a length that information is lacking. The topic is also included in 11.5.5.	Accepted. Text modified and win -win phrase deleted.
22155	11	42	21	42	30	Consideration of nitrogen and N2O would add value to this paragraph as N2O from soil is one of the major agriculatural emissions. There are several synergies between adaptation and mitigation and climate change will have an impact on this soil nitrogen cycle and soil microorganisms producing N2O.	Noted. N2O emission reduction is not directly linked to adaptation - unable to get reference.
20153	11	42	21	42	30	some consideration about nitrogen and N2O would add value to this paragraph, as N2O from soils is one of the major agricultural emissions. There are several synergies between adaptation and mitigation and climate change will have an impact on this soil nitrogen cycle and soil microorganisms producing N2O	Noted. N2O emission reduction is not directly linked to adaptation - unable to get reference.
37827	11	42	22	42	22	Replace 'and that also enhance' with 'while also enhancing'	Accepted. Text modified.
24838	11	42	33	42	37	It cannot be emphasized strongly enough that adaptive practices that reduce fire risk in mitigation projects are essential, rather than allowing the fuel load (especially of ground litter) to accumulate and place the anticipated abatement at risk. Suggest reword: “and GiZ, 2011). Management of fire risk in adaption projects (for example by managing the fuel load from ground litter accumulation) is essential if the anticipated abatement is not to be placed at unacceptable risk of loss."	Noted. Text deleted in response to earlier comments due to lack of published literature.
37828	11	42	34	42	34	What does "natural forests" have to do with anything here? Conservation actions could be for any existing ecosystem (including crop, grazing, or managed forest) that provide benefits. Delete paranthetical example.	Accepted. Text deleted in response to earlier comments due to lack of published literature.
37829	11	42	37	42	37	Replace 'fires and prevent' with 'fires, the release'	Accepted.
37830	11	42	38	42	38	Define CBD and GiZ	Accepted.
37831	11	42	45	42	47	Sentence on monoculture forest plantation is uncited and seemingly out of place in discussion. Afforesting degrading lands with a monoculture plantation could also have benefits, so implying its always negative is unsupported. Need citation support.	Accepted. Sentence deleted due to lack of reference.
31022	11	42	5	43	11	Recommend combining Section 11.5.4 and 11.5.5 to avoid repetition.	Noted: No action required. There is a slight difference of focus between the sections 11.5.4 and 11.5.5. The 11.5.4 focuses on potential adaptation measures which also lead to mitigation, while 11.5.5 highlights the synergy and tradeoff aspects.
27946	11	42	5	42	42	If the WGII report is finished, this subchapter should be cross checked with the respective chapter of WGII. It could than also be shortened and a reference to WGII chapters should be given.	Noted. WG II of AR5 gives details, while we wanted to give a flavour of the issue to WG III readers.
24837	11	42	2	42	4	Need a reference for this statement	Accepted. References added, WG I Chapter 12, text can be sourced to WG chapter 12.
22935	11	42	8	42	10	Suggest to revise the sentence as "Adaptation practice is basically a framework for managing future climate risks by accepting changes in the climate systems, leading to the potential of reducing future economic, social, and environmental hazards."	Accepted. Text modified.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22936	11	42	32	42	37	The statement needs supporting references and actual examples. I think the concept of ecosystem-based adaptation is still new and relevant policies are still very limited. Where is evidence of successful policies? International frameworks such as REDD and those reported by IUCN (www.iucn.org/dbtw-wpd/edocs/2010-050.pdf) may be the appropriate examples. However, even REDD+ is often criticized as insufficient to achieve multiple goals (Hein, L., van der Meer, P.J., 2012. Current Opinion in Environmental Sustainability).	Accepted. Statement deleted.
29474	11	42	33		37	Adaptive practices that reduce fire risk in mitigation projects are essential, to avoid the fuel load (especially of ground litter) accumulating and placing the anticipated abatement at risk. Suggested addition: "Management of fire risk in adaptation projects (for example by managing the fuel load from ground litter accumulation) is essential if the anticipated abatement is not to be placed at unacceptable risk of loss."	Noted. These lines deleted due to lack of references.
22937	11	42	37	42	38	Adaptive strategy does not primarily prevent those events (accepting changes, as stated above). This statement sounds more like mitigation strategy.	Noted. The existing statement based on reference to CBD.
22938	11	42	42	42	45	Very vague. What is vulnerability of forest ecosystems to climate change?	Accepted. Text modified by deleting vulnerability.
31024	11	43				Strong focus on agricultural systems. Refer to Ch 11 P 26 L 37-40 for better description of avoided emissions.	Accepted. Wording changed.
23663	11	43	12		23	A sentence here on the potential impacts of soil and vegetative sequestration on resilience to climate variability or other benefits of this despite the potential impermanance would be appreciated- even a diagram on feedback loops	Rejected. This is already discussed in section 11.5
31479	11	43	12			COMMENT: The bioenergy discussion in this chapter calls for several answers that might be given in this FAQ box? How (QUOTATION) “decisions in AFOLU affect GHG emissions over different timescales" is one question. Another question is whether temporal GHG emissions from the AFOLU sector are relevant for long term stabilization of the GHG concentration in the atmosphere? The overshoot discussion in chapter 6 shows that climate targets can be within reach even with a temporal overshoot. Temporal GHG emissions from the AFOLU sector (under the assumption that the carbon cycle is still intact) will be absorbed by photosynthesis in a timescale relevant for all the stabilization targets in chapter 6. Temporal “overshoot” from the AFOLU sector will in almost any forest region be reabsorbed by photosynthesis in a timeframe relevant for the climate targets (approximately 100 years).	Accepted. Wording of FAQ revised.
26089	11	43	12			*Observation: Need to talk about the adaptation-mitigation disconnect in more detail, i.e. where incremental adaptation to climate change leads to increased vulnerability. *Suggested text: However, an adaptation-mitigation disconnect can appear, where incremental adaptation to climate change leads to increased vulnerability, as documented in the Humla villages in Nepal where climate change-induced food shortages leading to over-harvest of increasingly scarce natural resources, diminishing attempts to mitigate climate change through protection of local forests, and threatening future capacity to respond to climate change (Thornton and Comberti, in press). *References: Thornton TF and Comberti C (in press). Synergies and trade-offs between adaptation, mitigation and development. Climatic Change.	Accepted. Section revised, though this example I not added as it is too specific

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37832	11	43	12			The box doesn't actually say much of substance about HOW decisions in the AFOLU sector effect GHGs over time. Other statements, e.g. statement that sequestration is time limited due to saturation, are simply wrong. Saturation is a capacity constraint, not a time constraint.... e.g., we can only do so much sequestration, but not that the benefits of our actions somehow stop after a certain time period (unless there is a reversal). Box needs either substantial revision/elaboration to discuss the real time impacts (e.g. discuss Cherubini, et. al. and other literature), or deletion overall.	Noted. This is a FAQ, not a box and is within the guidelines given to the author team.
27947	11	43	12	43	23	What is meant by decisions? Surely not UNFCCC decisions! Should it read "mitigation measure"? In line 14 "avoided" is to be deleted and "reduced" to be inserted, UNFCCC decisions are about reduced D. The message of that FAQ is unclear. Is it " anything is reversible lat it be"? It is hard to come up with improvements because it is quite confusing.	Accepted. Wording changed.
37833	11	43	13	43	13	Remove 'which are'	Accepted. Wording changed.
34013	11	43	17			'…others (such as some forms of biotechnology and livestock dietary additives) are still in development and may not be applicable for a number of years. Note that methodologies to account for mitigation options such as rewetting of peat, and peat conservation are on their way, and will be launched early next year. This should be added in the text.	Accepted. Ease of applicability now included in colour coding of Table 11.2
37834	11	43	17	43	17	Remove 'of the measures'	Accepted. Wording changed.
31023	11	43	25	43	41	The discussion of concepts of mitigation potential here seems to be somewhat different than presented in chapte 2 of AR4. If so, there should be some discussion of why the concepts are defined / presented in a different way.	Noted. The concepts are not different so no changes made.
37836	11	43	27	43	27	Add space after 'sequestration' and before'of'	Accepted. Wording changed.
37837	11	43	29	43	33	Beyond carbon price other demand measures should be taken into account, for example demand for more sustainably produced commodities	Accepted. Wording changed.
25819	11	43	34	43	41	The term "market potential" does not seem to fit in here. Market is but one of the many instruments for implementing policies and interventions. What is actually realizable potential is the sum of market-based reductions in GHG plus reductions realised through fiscal measures, regulatory interventions (e.g. environmental/ climate laws), etc. Some of the "economically" viable mitigation potential may remain unrealised because of barriers such as lack of political will, lack of institutional capacity, particular structure of the economy (marked by strong externalities), etc. Thus tehcnical > economic > feasible/utilitarian potential or some such categorization could be made, but "market" potential seems to be too restrictive a word to imply the pragmatic potential.	Noted. These terms are defined in the literature and are reported here. They are not invented by us for this chapter, so are retained.
37838	11	43	34	43	34	Abbreviate carbon dioxide equivalent price as per previous chapters	Accepted. Wording changed.
27268	11	43	14		14	replace avoided deforestation by forest conservation -more consistent with language in the chapter (see line 17, page 36; and line 5 in page 39 as examples)	Accepted.
27269	11	43	17		18	please revise this sentece: In terms of the mode of action of the measures, in common with other sectors, non-CO2 greenhouse gas emission reduction is immediate and permanent - may give the impression the CO2 emission reduction cannot be immediate and permanent... please explain	Accepted. Text modified.
27270	11	43	21		21	please rewrite as : MAY BE reversible and non-permanent	Accepted. Text modified in response to earlier comments.
33314	11	43	24			If the data is available, option-specific costs should be defined or quantified.	Accepted. Relative costs now included in Table 11.2

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37835	11	43	24	49	18	Costs and potentials section (11.6): In several studies, mitigation potential is estimated for a particular change in productivity, so total mitigation potential will be a function of productivity ambition. In some cases, the productivity change is related to a level of investment in R&D; for historical studies, the investment is based on past observation; for prospective simulations, a R&D elasticity of total factor productivity from the literature is assumed. Valin et al. (under review) is the most complete analysis (including demand side effects of lower costs, interactions between crops and livestock, and coverage of CO2 emissions from land use change and non-CO2 emissions from land and livestock management), to my knowledge. The authors estimate that a productivity scenario that closes 50 percent of the EPIC yield gap for crops and 50 percent of the ruminant efficiency gap could result in a reduction of -497 mt CO2-eq in 2050. For a more aggressive productivity scenario, Jones and Sands (2014 forthcoming) estimate a reduction of -1800 mt CO2-eq in 2040. Neither papers estimate the cost per mt abated. Two studies provide estimates of the cost per mt CO2-eq mitigated for historical R&D investments (during the Green Revolution), with the most reasonable estimates in the papers ranging from $9 per mt CO2e avoided (Burney David and Lobell 2010) to $19 - $27 per mt of CO2e avoided (calculations in Jones, Nickerson and Heisey (2012, in review) based on GHG mitigation estimates in Stevenson et al 2013 forthcoming). (Burney David and Lobell 2010 do not take into account the responsiveness of market supply and demand to price and income changes; consequently estimates of cost per mt avoided are based on what appear to be unrealistic estimates of land use conversion over the period for the two frozen technology scenarios: global cropland would double and triple, respectively, for their frozen and growing standard of living scenarios.) (See discussion in Jones, Nickerson and Heisey 2013) Finally, Lobell, Baldos and Hertel (2013) consider the global mitigation implications of additional R&D funding, beyond current baseline levels, sufficient to offset the negative yield impacts of temperature and precipitation changes and return TFP to no-climate change levels. They estimate that additional future global investments in agriculture could avoid CO2 emissions from global land use change associated with climate change (.25-.43Gt CO2 per year) at an effective cost of $11-22 per mt CO2e. Burney, J.A., S.J. Davis, and D.B. Lobell. 2010. Greenhouse Gas Mitigation by Agricultural Intensification. Proceedings of the National Academy of Sciences 107(26): 12052-12057. (this is for historical R&D) Jones, C. A., C. Nickerson, and P. Heisey, New Uses of Old Tools? An Assessment of Current and Potential Agricultural Greenhouse Gas Mitigation with Sector-based Policies, (2012 under review at AEPP). Lobell, D.B., U.R.C. Baldos and T.W. Hertel. 2013. Climate adaptation as mitigation: the case of agricultural investments. Environ. Res. Lett. 8:015012. Stevenson, J.R., N. Villoria, D. Byerlee, T. Kelley, and M. Maredia. 2013, forthcoming. Green Revolution research saved an estimated 18 to 27 million hectares from being brought into agricultural production. PNAS. (this is for historical R&D) Valin, H., P. HavlÃ-k, A. Mosnier, M. Herrero, E. Schmid and M. Obersteiner, Agricultural productivity and greenhouse gas emissions: trade-offs or synergies between mitigation and food security? (2013, Under review at Environ. Res. Lett.). (incorporates both CO2 emissions from land use change and non-CO2 emissions from land and livestock management)	Accepted. More discussion on reduction in emissions per unit of product has been added.
27375	11	43	25		26	editorial - (EMISSION RECUDCTION or sequestration OF carbon)	Accepted. Wording changed.
27376	11	43	36		36	editorial - TEND to	Accepted. Wording changed.
23787	11	44				The answer is not quite in line with what the question expects. It only states the obvious - that there is a time component to both mitigative and adaptive actions in forestry.	Accepted. Wording on FAQ changed
33315	11	44	1			Turn figure 90 degrees clockwise.	Accepted. Figure redrawn 90 degree rotated.
37839	11	44	10	44	10	Replace 'for example' with e.g.' after parenthesis	Accepted. Wording changed.
37840	11	44	11	44	11	Remove 'its'	Accepted. Wording changed.
37841	11	44	15	44	18	Demand for more sustainably produced commodities, services, etc are also key, not just demand for ERs.	Accepted. Wording changed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31025	11	44	19	44	20	What does "multiple gas emissions associated with a particular mitigation option" mean? Note also that there is a numbering error here ("6" is repeated)	Accepted. It means one mitigation option can affect more than one GHG. Clarified and numbering corrected.
37842	11	44	23	44	23	Add 'mitigation' to title	Rejected. No title on this line or close to it. Unable to locate focus of the comment. Wrong page or line number?
21244	11	44	26			Provide space "sequestration of"	Accepted. Wording changed.
31026	11	44	30	45	4	Suggest adding in information for bottom-up modeling for Forestry from Ch 9, WGIII, AR4 (Nabuurs, 2007).	Noted. These are added in section 11.6.2.
37843	11	44	34	44	36	The literature on achieving GHG mitigation benefits through changing livestock diets is not very convincing - particularly when one considers manure treament when the animal gets rid of the new diet (often higher in N) and the costs of the new diet (including additives) combined with the lack of additional products. The authors should cite additional literature here.	Noted. Relevant literature is cited.
25802	11	44	9	44	9	Actually, I expected more concrete data for this IPCC report for various of the measures mentioned. As this is not done, the statements remain very general (there are measures x, y and z) and no action may be taken based in this information (which measure is at least positive, unbelievably expensive, probably not adopted by the public) etc.	Noted. See section 11.3 and reference to IPCC AR4 - not repeated here since they have not changed substantively.
27377	11	44	4		4	editorial - in THE rest of	Accepted. Wording changed.
27271	11	44	9		9	the clarification that mitigation options are also called ‘measures’ came too late in the chapter - have to explain first time options are used as a synonym of measures	Accepted. Wording harmonised throughout the chapter.
31027	11	45				Could be removed to help shorten. Information is covered in text and is shown by region in Figure 11.17.	Noted. But figure retained t show uncertainty ranges. They have been redrawn for the FD (Pete ask TSU for support).
31028	11	45				Suggest compressing to 6 colour categories if possible. It is too difficult to distinguish 10 colour categories in this figure because the dominant categories change between regions.	Noted. But 10 colours retained - the reader I helped by the stacked bar being in the same order as shown in the key.
23788	11	45				This Figure provides very little value to the text - it does not make anything more clear that it already is to any aware reader. A fit case for deletion.	Noted. But figure retained and redrawn 90 degree rotated.
19108	11	45				The Forestry potential to 2030 in this table is about 32EJ. This represents about a 2% pa increase over present use (53.5 EJ). It is a very modest increase, since the maximum potential is given as 500 EJ (chaper 7).	Rejected. This is not an energy potential. It is a sequestration / avoided emissions potential.
37844	11	45	1	45	17	Citations here please, as there are none. Need to present a more balanced perspective so please include some of the drawbacks of top-down models	Accepted. Citations added.
37845	11	45	22	45	24	It would be helpful to have figures that correspond to carbon prices similar to current prices as well, to make the assessment more relevant.	Noted. Current prices are in the category "up to 20 USD/t CO2-eq."
19378	11	45	24	45	26	The estimates are different on page 4 row 49 (summary)	Rejected. There are no estimates on page 4, line 39. Wrong page or line number? No action possible.
22563	11	45	5	45	17	Top down models may not reflect the actual cost of the practical implementation of the mitigation measures in question. They ignore site specifity which is an important consideration in the cost and success of mitigation measures.	Noted. Limitations are discussed in section 11.9.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27272	11	45				error bars not at all clear	Accepted. They are incorrect - left over from previous figure. They have been redrawn for the FD (Pete ask TSU for support).
27378	11	45				editorial - change restore degraded lands and restore cultivated organic soils by restoration of degreaded lands and restoration of cultivated organic soils	Accepted. Wording changed.
27379	11	45				editorial - Setaside, LUC & agroforestry by set-aside or set aside	Accepted. Wording changed.
31029	11	46				Consider simplifying figure by removing "up to 50 US$/tCo2-eq" panel.	Noted. Considered, but panel retained for completeness.
21028	11	46				Please rework this figure. Giving all studies / sources makes the overview difficult and nobody not familiar with the studies has any chance at all to capture what is shown here. Collate information to one e.g. boxplot / cost level (minimum estimate, mean / median, range, ...). The information given in the text is well hidden, too.	Noted. Reworking the figure was considered, but ox plot cannot be used as the studies are too heterogeneous (see figure caption for details)
21029	11	46		47		Figure 11.16 and table 11.7 can be combined into one.	Noted. Table 11.7 is a numerical summary of all of the information shown in Figure 11.16. The figure is required for transparency, whilst the table is required so that total ranges do not need to be read off from the figure.
37847	11	46				The side by side of the demand-side measures with the supply-side measures is very misleading since the latter is technical potentials and the former economic potentails. Figures need to stand alone and so at a minimum a table note is needed clarifying that the demand side technical potentials would be significantly reduced if they were ajusted tio accommodate economic potentials. Alternatively a table could be constructed with technical potentials of both the supply- and demand- side measures.	Partially accepted. We want them to be compared, but we do not want the reader to think they are the same (supply-side are economic potentials; demand-side are technical potentials), so we have separated the last panel to make this clear, whilst still allowing a comparison in the same units
37848	11	46				The enormous variation between models and between carbon pricing costs needs to be further discussed in the text. Suggest a box highlighting hypothesized causes for this variation (from published literature) and point to solutions for policy makers to consider at various scales and in various contexts.	Accepted. Box discussing variation and uncertainty has been added.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40720	11	46				For Figure 11.6 , the premises given in each paper should be made clear and the descriptions provided in the figure should be rearranged to facilitate understanding.	Partially accepted. This comment presumably applies to Figure 11.16 rather than Figure 11.6. All assumptions in each study cannot be discussed in detail - the main inclusions and exclusions in each is noted in the figure legend and the text, and primary sources are provided to allow the reader to integrate the sources further. There simply is not space to discuss all methods and assumptions in all studies shown in the figure.
37846	11	46	12	46	14	McCarl or Adams et al can look at both so please cite here as an example of such.	Accepted. Citations added.
30283	11	46	21	46	23	Have the economic potentials of demand-side options been assessed? It seems that the analysis leaves something wanting with only the technical potentials for the demand-side measures evaluated, especially when the economic potentials are absent in Figures 11.16 and 11.17, and Table 11.7. Even if lower than the technical potentials, there is some evidence that pricing measures could be useful (Wirsenius et al., 2011), and therefore economic potential should be evaluated. That said, there could be negative implications for animal welfare with a shift towards monogastric farm animal production. Wirsenius S., F. Hedenhaus, and K. Mohlin (2011). Greenhouse gas taxes on animal food products: rationale, tax scheme and climate mitigation effects. Climatic Change 108(1-2), 159-84.	Noted. The economic potentials have not been assessed, so only technical potentials can be shown.
19109	11	47				Maximum forest potential give as abou 133 EJ, which is 4 times the amount given in Table 11.5! However, the minimum potential is given as 1EJ to 2030. This cannot be correct! For AFOLU the rang given is from 2.5 EJ to 108 EJ. The 2.5 EJ figure is much too low and the 108 EJ figure is less than the forestry potential. I think that a re-working of these figures is necessary.	Rejected. This is not an energy potential. It is a sequestration / avoided emissions potential.
19379	11	47	1	47	3	I don't see in the Table which potentials are from before, which from after AR4. In fact, the legend of the Table states that the figures are from studies SINCE AR4.	Noted. All are either from AR4 or since AR4. None of the range minima or maxima are from AR4 - all are published since AR4.
21030	11	47	10	47	13	There are more aspects to this: first, reduced deforestation means that comparably high C stocks are spared while afforestation means that C stocks have to built up, so an investment in REDD may be more efficient than in afforestation. Second, reducing deforestation can be done by stopping to invest money first whereas afforestation requires to invest. In economic theory, both ways may "cost" the same, but in practice there is a difference.	Noted. REDD+ dealt with in section 11.10
37849	11	47	14	47	14	Kindermann lays out the assumptions for what? That paper or all the papers above?	Noted. Wording clarified.
21245	11	47	26			Change term to "studies"	Rejected. Wrong page , line number? Not obvious which term should be changed to "studies" so no action can be taken.
31481	11	48				When summarizing the economic mitigation potentials in the different regions for a cost of < 100USD/t CO2-eq we get about 18 Gt CO2-eq/yrtonne. This figure is much higher than the estimate in table 11.7; 10,6 Gt CO2-ekv. Please cross-check for consistency.	Accepted. Incorrect values used in this figure and has now been corrected.
19110	11	48				Is planting of trees outside the forest included in afforestation?	Noted. Yes.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37852	11	48		48		Provide example(s) of how ASIA might mitigate its largest mitigation in both forestry and agriculture	Noted. The examples are shown in the stacked bars. Not clear what else is required.
37850	11	48	1			Set this information in the context of what we need to mitigate in order to retain a 2C rise within the time frame of this data set; what is the time frame of this data set and the resulting dollars (2007 dollars, 2010)?	Rejected. These aspects are not specific to the AFOLU sector and are dealt with in the framing issues chapters. The issue is cross-sectoral so the discussion does not belong in a sector chapter.
31480	11	48	10	48	19	Could it be made clear that the potentials in fig 11.17 originate from top down approach? The text in line 20-32 or p 48 seems to indicate this as an explanation for the big difference for the figures from a bottom-up approach,	Accepted. Incorrect values used in this figure and has now been corrected.
23789	11	48	10	48	13	The statement that "in forestry, in the short term, the economic potentials of carbon mitigation from reduced deforestation are expected to be greater than the economic potentials of afforestation" is entirely misplaced. If it were indeed so irrespective of the market value of carbon then reducing deforestation would have been an automatic choice everywhere. What drives deforestation is its economic attraction in the short term. A regionally disaggregated mimimum carbon price range (or, better, a mimimum compensation for the Ecological Services) should be added if this statement is to be retained.	Accepted. Wording removed.
37851	11	48	14			It would be helpful to have figures that correspond to carbon prices similar to current prices as well, to make this more relevant.	Noted. Current prices are in the category "up to 20 USD/t CO2-eq."
21246	11	48	27			Change term to "measures"	Accepted. Wording changed.
22491	11	48	28	48	32	More data of mitigation bottom-up estimation should be available between regions.	Noted. The literature on regional potentials is even more diverse in assumptions about what is included / excluded and is too extensive to include.
27380	11	48				editorial - change restore degraded lands and restore cultivated organic soils by restoration of degreaded lands and restoration of cultivated organic soils	Accepted. Wording changed.
19111	11	49				These are modest increases for non-energy forestry potential	Noted. We agree with the reviewers.
21031	11	49				Please consider reordering the columns (left to right: min., mean, high or min, high, mean) and set the numbers right-bound (they are easier to compare this way).	Accepted. Table 11.8 has been reordered.
19380	11	49	1			The legend says that the figures exclude bioenergy, but in the table a footnote is attached only to the global estimate as excluding bioenergy.	Noted. All global figures exclude bioenergy. We displaced the footnote to the label "Global."
37853	11	49	15	49	16	The change to a plant based diet is pitched as a "main" mitigation option in the AFOLU sector. The weight given to this option, is way out of proportion to its realistic potential, and the claimed mitgation potential is based on dubious logic at best.	Noted. In contrast to other options that had already been included in AR4, dietary change is new and contested so there is a need to treat this with a certain level of detail.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34368	11	49	20	49	22	Please consider replacing the first two sentences with an introductory paragraph with the following wording which will be suggested to each sector chapter to increase consistency and help the reader understand the underlying idea of this section and the links to other parts of the report: "Besides economic cost aspects, the final deployment of mitigation measures will depend on a variety of additional factors, including synergies and trade-offs across mitigation and other policy objectives. Co-benefits, risks and uncertainties associated with alternative mitigation measures and their reliability (11.7.1 and 11.7.2) as well as public perception thereof (11.7.3) can affect investment decisions, individual behavior as well as priority setting of policymakers. (footnote: Please refer to the respective sections in the framing chapters as well as to the glossary in Annex I for concepts and definitions – particularly 2.2, 3.5.3, and 4.8.) The extent to which co-benefits and risks actually materialize and their net effect on welfare will differ greatly across regions, and depend on local circumstances, implementation practices as well as the scale and pace of the deployment of the different measures. Table 11.9 provides an overview of the potential co-benefits and risks of the main mitigation measures that are assessed in this section, classified into economic, social (incl equity), and environmental (incl health) effects according to the three sustainable development pillars described in chapter 4."	Accepted. The missing text has been added.
34369	11	49	23			Please reword in the following way to better comply with the glossary definitions: "...and adverse side-effects of AFOLU measures on additional policy objectives, such as sustainable development concerns, is a ...".	Accepted. Change included
37854	11	49	29	49	29	The date on the reference is wrong or the bibliography entry is wrong.	Rejected. Could not decipher the reference to which the reviewer is referring.
25803	11	49	31	49	31	What about the countries in transition? Shouldn't their development in agriculture (best practices, best policies...) form an own chapter? There the most changes and increases in GHG emissions happen. Their sustainable development would be a key target to limit a further increase in GHG.	Rejected. These are general facts, and countries in transition fall within the general statement.
27948	11	49	31	50	45	It is not understandable why a special box is dedicated to LDCs, if co-benefits, risks and spill overs are clearly described. LDC experts and politians are of cause able to judge themselves what path to take. Furthermore, the box is more about mitigation (see Title) but chapter 11.7 not. unless there is a strong wish from LDC experts to have the box included it should be deleted.	Rejected. This is in FAQ 11.3 box.The reviewer suggests time horizon consistency. Unless we used another data source, this would be difficult.
31482	11	49	6	49	18	In the first part of the answer the economic mitigation potential is estimated for 2030. This applies for supply side mitigation. In the second part the demand side mitigation potential is given for 2050. This makes it harder to see these potentials in a context. Further, the economic potential in 2030 is estimated to 4,23 + 4,60= 8,83 Gt CO2-eq. This is lower than the 10,6 Gt in table 11.7 . This seems to be confusing.	Accepted. FAQ rewritten though the underlying data used still reflect different time horizon.
26435	11	49	13			Carbon prices for the economic mitigation potentials should be mentioned.	Rejected. The carbon prices are already mentioned.
26436	11	49	14	49	15	The description seems to be somewhat inconsistent with Figure 11.16. Based on Figure 11.16, estimates of demand-side options are regarded as technical potential, and can't be compared with estimations of economic potential on supply-side options.	Accepted. The fact that demand-side measures are technical potential estimates has been included
33269	11	49	19			Please check the co-benefits section 11.7 for consistency with the framing discussion in chapters 3 and 4.	Accepted.
33316	11	49	19			Section is sub-divided into 11.7.1 Socioeconomic effects and 11.7.2 Spillovers (should be 'Spillover effects'), while the latter, defined as 'spin-off benefits of Research & Development investments and technological change' also seem to be socioeconomic.	Accepted and done.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34379	11	49	19			Please renumber/rename the sub-sections in the following way: 11.7.1: Socio-economic effects; 11.7.2: Environmental and health effects; 11.7.3: Technological risks (and uncertainties); 11.7.4: Public perception; 11.7.5: Spillovers.	Accepted and done.
22492	11	49	19			This section should be shorten to be concise as the focus is not prominent.	Rejected. Structure and length of this section has been agreed upon/given. Other reviewers found this to be an extremely important section.
27381	11	49	31		31	editorial - are dependent upon natural assets and ARE highly vulnerable?	Accepted. Missing word included.
32644	11	5	1	5	1	given the massive uncertainty bars around the amount of sequestration possible, there also need to be huge uncertainty bars around the cost per tCO2-eq. there's a massive misplaced concreteness around any of these dollar figures, given the huge uncertainties outlined in the chapter. In fact, the executive summary really must contain a paragraph about the extraordinary uncertainty associated with estimating C emissions/sequestration in the AFOLU sector.	Rejected. The carbon prices are simply categories into which estimates of mitigation potential are collated. They are not independent estimates of carbon price so do not have separate uncertainty estimates. The large degree of uncertainty is threaded throughout the ES and the chapter and is dealt with objectively.
37623	11	5	1	5	3	This range is so large it is not very helpful/insightful. Can it broken into increments (20,50, 100) like is done on page 7?	Noted. The values on page 7 are for AR4. These are collated ranges from studies published since AR4. Ranges at different prices are given in table 11.7 and also have large ranges. Just the <100 USD/tCO2-eq. values are given in the ES for simplicity.
25145	11	5	11	5	12	“Critical factors” include “population (growth)” -- this predicate is unclear. Is this a statement concerning global population, or in proximity and interacting directly with the AFOLU land base? Second, “changes in behaviour” is meaningless without reference to market structure and incentives.	Accepted. It refers to population increase as a driver increasing competition for land. Reworded to improve clarity.
22119	11	5	11	5	17	Behaviour and behaviour changes depend to a large extent on cultural and normative backgrounds. This hardly get any consideration in the discussion of mitigation options and measures.	Noted. This is discussed in section 11.4.
20113	11	5	11	5	17	behaviour and behaviour changes depend to a large extent on cultural and normative backgrounds. This hardly get any consideration in the discussion of mitigation options and measures	Noted. This is discussed in section 11.4.
37626	11	5	11	5	11	Line 11 change"factors that are" to "inherently uncertain factors."	Accepted. Wording changed.
37627	11	5	13	5	13	Line 13 change "and development in the" to "as well as development in the."	Accepted. Wording changed.
37628	11	5	13	5	13	The authors should add 'fuel' here for completeness	Accepted. Fuel added to the list.
37629	11	5	14	5	14	Line 14 change"Other important" to "Other factors important to mitigation potential are"	Accepted. Wording changed.
37630	11	5	18	5	20	The content of this sentence is minimal and can, therefore, be removed.	Rejected. Necessary to avoid presenting an uncritical view of bioenergy potential.
37631	11	5	18	5	21	When what is 'implemented'? The sentence is discussing LULUC associated with bioenergy...presumably the implementation here is meant to reflect implementation of bioenergy policy or bioenergy production or bioenergy markets, all of the above? Please clarify.	Accepted. Bioenergy - wording changed to clarify.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23339	11	5	2			How can max range of 13000 Mt for forests exceed 10600 Mt for all AFOLU? Need to check	Noted. AFOLU estimates are only included when both agriculture and forestry potentials have been considered together. Separate studies cannot be added together as they may assume overlapping areas (double counting).
37632	11	5	21	5	22	Top-down estimates from where? Please add citation (which has been done in other chapters in the ES)	Noted. From Integrated Assessment models - referred to section 11.9 - references not given in the ES apart from to chapter sections.
37634	11	5	23	5	23	Lower values in regard to what? Lower value feedstocks or low levels of bioenergy production? Please clarify	Accepted. Lower levels of bioenergy implementation. Wording changed to clarify.
37633	11	5	23	5	25	The statement that "substantial LUC" may be induced needs a confidence statement and sourcing, as the various and projections models show the amount of induced LUC is highly dependent on the modeling assumptions about elasticity of land demand, productivity changes, local policies, and cultural preferences (e.g. a farmer is more likely to adopt soil carbon practices rather than plantation forestry, simply because he's a farmer, not a forester... this will dampen LUC impacts). Given the disparity in projections, such broad and potentially controversial statements need qualified or supported.	Accepted. Confidence and agreement statement added, as this is controversial.
23340	11	5	24			Replace "for land may" with "… for producing biomass from energy crops could induce substantial LUC and cause….."	Accepted. Wording changed.
37635	11	5	24	5	24	What does "LUC" mean?	Accepted. LUC = Land Use Change - now defined on first use.
21225	11	5	27			Change to "multi-functionality"	Rejected. Not clear what expression on page 5, line 27 should be changed to "multi-functionality" so no action can be taken.
37636	11	5	27	5	29	But can the smallholders be persuaded to change? This is a key question.	Noted. There are mechanisms to incentivise change and remove barriers (as discussed in sections 11.7 and 11.10). No change made here.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24776	11	5	29	5	30	Insert following new paragraph: "Appropriate management is critical to the greenhouse gas (GHG) balance of bioenergy systems. The GHG balance can change from positive to negative or vice versa depending on key management decisions such as: what the land was used for before the crop was planted; how the crop is harvested; when it is harvested and the way it is fertilised (Davis et al 2013). It is therefore feasible for one product to be either a source or a sink depending on the mode of production. The consequence for regulators is that rules need to allow both differentiation according to origin, and certification of production conditions. In relation to climate impacts of bioenergy, such rules should identify obvious boundaries, focus on outcomes rather than paradigms or ideology, ensure that management of bioenergy systems accounts for sustained production and sustainable management (e.g., soil health, displacement of C intensive products) and encompasses the primary production supply chain. Citation: Davis, S. C., Boddey, R. M., Alves, B. J. R., Cowie, A. L., George, B. H., Ogle, S. M., Smith, P., van Noordwijk, M. and van Wijk, M. T. (2013), Management swing potential for bioenergy crops. GCB Bioenergy. doi: 10.1111/gcbb.12042	Rejected. This level of detail on bioenergy (which is treated in the bioenergy appendix) is not appropriate in the ES of a chapter dealing with all AFOLU mitigation measures. Other reviewers suggest that bioenergy is already too prominent in the ES and adding this paragraph will exacerbate the issue. The argument (and the paper cited) is, however, included in the bioenergy appendix.
29817	11	5	3	5	6	“Demand-side measures have largely so far, only been assessed for their technical potential” could be written for more clarity: “So far, demand-side measures have largely only been assessed for their technical potential”	Accepted. Wording changed.
31458	11	5	3	5	5	To make the meaning more understandable we suggest to add some words so the sentence becomes: "Demand-side measures, like change towards a nutritionally sufficient low animal product diet have largely .....",	Accepted. Wording changed.
23341	11	5	30	5	37	Throughout chapter need to differentiate between "biomass for energy" -the feedstock and "bioenergy" the resulting heat and power produced. But I realise "biomass" used in the agricultural context is broader than just biomass used for energy as used in the Annex? Need to check glossary. Here it should be "biomass for energy" but also through chapter need to distinguish between biomass from residues and wastes - which have less or even zero impact on LUC than growing energy crops. Also suggest change "will" to "could" and merge whole paragraph with one above - seems repetitive.	Accepted. Wording changed.
32645	11	5	30	5	42	Osborne, Tracey. 2011. Carbon Forestry and Agrarian Change: Access and Land Control in a Mexican Rainforest. Journal of Peasant Studies, 38:4, 859-883.	Noted. Thank you for the reference - but not references are included in the ES.
37637	11	5	30	5	30	Conflating bioenergy production and sequestration (A/R) is very odd, as they have exactly opposite land use effects. Adding trees to unforested landscapes typically has higher landscape C stocking, cobenefits, reduced other pollutants, higher bioversity, etc. than cropped systems. Bioenergy on the other hand implies removing C from the landscape, etc. While both plantation A/R and bioenergy could compete with existing cropping systems or primary forests, they also compete with eachother and other less beneficial land uses.	Rejected. As stated, this sentence is about increasing competition for land, not about co-benefits arising from the land use change. Increasing the area used for one purpose (e.g. energy, sequestration) can exclude the possibility of using that land for other purposes (e.g. food production). Since land is finite, competition for land increases with any large scale exclusive use of land for a particular purpose.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37638	11	5	30	5	30	Please add 'avoided deforestation of existing forests' before afforestation.	Rejected. As stated, this sentence is about increasing competition for land. Avoided deforestation does not change the land use, whereas bioenergy, afforestation and reforestation do - so avoided deforestation does not belong in this list.
27879	11	5	30	5	33	More differentiation on the implications of large scale afforestation and bioenergy use on biodiversity, food security in relation to the timing and scale of action required in the different overshot and stabilization scenarios.	Rejected. As stated, this sentence is about increasing competition for land, not about co-benefits arising from the land use change. Increasing the area used for one purpose (e.g. energy, sequestration) can exclude the possibility of using that land for other purposes (e.g. food production). Since land is finite, competition for land increases with any large scale exclusive use of land for a particular purpose.
22531	11	5	33	5	33	Please, add after "aquatic biodiversity" the sentence "although some benefits may be observed"	Rejected. The following sentence does this.
24777	11	5	34	5	37	Reference should be made to the fact that these multifunctional outcomes should consider and address competition between uses.	Accepted. Wording changed.
27880	11	5	38	5	41	REDD as the most current policy option for a mitigation and adaptation approach is almost an invitation for Bolivia to demand a joint mitigation and adaptation mechanism. Please consider synergies and trade-offs or modify in another way so that the formulation is more balanced.	Noted. But no changes made as it is unclear what the reviewer wants to see added.
37639	11	5	39	5	39	Line 39 remove "the needs for"	Accepted. Wording changed.
20268	11	5	40	5	40	While mentioning 'REDD mechanisms and its variations', it would be advisable to be more explicit in recognizing 'REDD+' which, now, is the most understood comprehensive mechanism for undertaking mitigation actions in forest sector. It is advised that phrase in line 40 (Page 5) may be rewritten as 'REDD mechanisms and its variations including REDD+' instead of 'REDD mechanisms and its variations'. This will also be in tune with section 11.10 on Sectoral Policies which deals with the subject of REDD+ in detail. It will also be in the interest of consistency to use the term REDD+ instead of REDD in the relevant parts of the text of Chapter 11, until and unless the specific citation is meant to refer to REDD only.	Accepted. Text revised.
22532	11	5	40	5	40	Please,add "+" after "REDD"	Accepted. Text revised.
37640	11	5	40	5	40	Please use a common approach for acronyms such as REDD. Please spell it out at first use.	Accepted. Text revised.
22533	11	5	41	5	42	the paragraph talks about social and other environmental co-benefits. Economic benefits should also be mentioned.	Accepted. Wording changed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24778	11	5	42	5	42	Suggest that this could also include economic co-benefits. Noting that the executive summary doesn't include citations, suggest the following are considered for this text and the referring content in the main chapter: Angelsen, A., 2007, Forest cover change in space and time: combining the von Thünen and forest transition theories, World Bank Research Working Paper 4117, World Bank, Washington DC Chomitz, K.M., Buys, P., De Luca, G., Thomas, T.S. and S. Wertz-Kanounnikoff, 2007, At loggerheads? Agricultural expansion, poverty reduction, and environment in the tropical forests, World Bank Policy Research Report, The World Bank, Washington D.C.	Accepted. Change made.
31459	11	5	5	5	5	In the beginning of this paragraph it is stated for the economic potentials that only some of the potentials are additive. It is however unclear whether or how this applies to the technical potential of demand side measures. We suggest to insert the following sentence. "This technical potential will come partly in addition to the economical potential." If posible also an estimated interval of this combined effect.	Rejected. The suggested text is not the intended meaning. Technical and economic potential are defined in the glossary, so do not need to be redefined here.
31460	11	5	5	5	5	Nothing is said about the potential in 2050. We think it would be useful to add a sentence informing about 2050. There are a number of estimates in the text from p32 line 43 to p 33 l.12 for non CO2-emissions and in table 11.5 for CO2 emission reductions originating from C sequestration.	Rejected. The cited studies are for demand side measures in agriculture only, and do not reflect the entirety of the literature for supply side measures or for AFOLU in total. Including 2050 values here is not merited as there are fewer studies. These studies are dealt with in section 11.9.
37624	11	5	8	5	9	In most developing countries in Africa approximately 70% of the population live on farms or in small villages.	Noted. But no changes made as it is unclear what the reviewer wishes to see added.
37625	11	5	8	5	9	Lines 8 and 9 is the last sentence "in developing countries" germane to the rest of the paragraph? If so, recommend another sentence to anchor it better conceptually.	Noted. It is best placed where discussing regional differences in potential; not for global potentials earlier in the paragraph.
29204	11	5	1	5	9	It might be useful to reflect on the comparatively small (but necessary) role of increasing on farm production efficiency (i.e. Supply side mitigation) as compared with changing patterns of consumption and reducing waste on the demand side. From a policy perspective the latter is far more challenging, but should be addressed if meaningful progress is to be made on agricultural emissions.	Accepted. Production efficiency (sustainable intensification) now discussed more explicitly.
30277	11	5	16	5	17	Other important factors are sustainable development goals, food security, and animal welfare.	Rejected. These are important issues, but are not critical factors in determining the regional distribution of future mitigation potential, which is what this paragraph is about.
24161	11	5	17	5	18	Suggest add a paragraph on the barries . " There are social, economical, institutional, ecological and technological barries factors that could limit the implementation or effectiveness of AFOLU mitigation measures. The opporitunity costs need to be fuully covered by financing mechnism for the AFOLU SCTOR,especially in developing countries. otherwise, AFOLU mitigation measures would be less attractive compared to returns from other land uses. Ability to manage and use knolowledge for scientific communication, technological documentation and learning is lacking in many areas.FOOD SECURITY Could be threated if land previously used for food is devoted to forest for sequestration , and food price could increase if land normally used for food prodcution is devoted to bioenergy.	Accepted. These issues are dealt with in section 11.7 which was not referred to. New sentences have been included.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30278	11	5	25	5	26	Agricultural intensification could also lead to animal welfare issues.	Noted. But this is not the place to discuss it.
29414	11	5	34	5	37	Reference should be made to the fact that these multifunctional outcomes should consider and address competition between uses.	Accepted. Change made.
29415	11	5	42	5	42	Should also include economic co-benefits e.g. Angelsen, A., 2007, Forest cover change in space and time: combining the von Thünen and forest transition theories, World Bank Research Working Paper 4117, World Bank, Washington DC and Chomitz, K.M., Buys, P., De Luca, G., Thomas, T.S. and S. Wertz-Kanounnikoff, 2007, At loggerheads? Agricultural expansion, poverty reduction, and environment in the tropical forests, World Bank Policy Research Report, The World Bank, Washington D.C.	Accepted. Change made.
30520	11	5	39	5	42	AR-CDM projects should also be cited as an important policy mechanism to the AFOLU sector, since A/R CDM is currenlty the only operating market-based forestry mechanism under UNFCCC rules.	Noted. Covered in section 11.10. More details will be added.
34015	11	50				reduced peat degradation (rewetting, conservation) shall be added. This is suggestion throughout the document; when mitigation measures such as reforestation, reduced deforestation, revegetation etc. are being mentioned, in the same line also reduced peat degradation/rewetting/rehablitatie and conservation of peat shall be mentioned. E.g lines 9/10 on page 49.	Accepted. Implemented throughout.
31030	11	50	1	50	18	This paragraph is a little repetitious. Perhaps focus on the specific issues for LDC's rather than repeating general issues.	Rejected. We think that this paragraph actually focuses on LDC issues, and we do not really see where the repetition is.
37855	11	50	1	50	49	There is not a single reference on this page and there needs to be several.	Rejected. This is a box on LDC and is based on information from the whole chapter.
37857	11	50	15	50	18	This sentence is unclear.	Accepted. Sentence rewritten.
31031	11	50	19	50	29	This paragraph is not easy to understand and suggest including citations.	Accepted. Paragraph rewritten.
37858	11	50	19	50	28	What is needed are ideas on how to implement these thoughts.	Noted.
34370	11	50	19			Please use 'risk' as the antonym of 'co-benefit' instead of 'trade-offs' (also in line 29) if you discuss the risks of individual mitigation options. In a decision context, this might imply trade-offs between different objectives. Also applies to page 63, line 35 and page 64, line 19.	Rejected. We agree that risk should be opposed to co-benefits, but in this chapter we addressed the issues of trade-offs and co-benefits, based on the framing chapter of WGIII. We introduced the word risk in the indicated lines to make sure we cover all relevant concepts.
24839	11	50	25	50	28	Suggested additional text: Risks from expansion of industrial-scale bioenergy production have been recognized, and efforts to manage these are reflected in the emergence of sectoral, regional and global sustainability standards and certification schemes for bioenergy. However, sustainability standards must be applied to all land uses, in order to manage these issues.	Accepted. Text added further down for consistency.
37859	11	50	29	50	34	Ignores importance of energy access to food security. See extensive FAO work on the topic including: http://www.fao.org/docrep/015/an913e/an913e01.pdf	Noted. Energy-food interactions do not fit here - this chapter is about AFOLU mitigation rather than food security pre se. So we examine the impacts of mitigation on food security - not every possible factor affecting food security.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37860	11	50	29	50	39	The development of cropping systems for Bioenergy is going to be difficult when the average shareholder does not produce enough crop to support the family for more than a few months.	Noted.
29963	11	50	29	50	39	I think that the literature allows for a critical discussion on the realism of bio-energy projections, especially in the context of land-use in developing countries. A critical issue here is land-ownership, which should a least be mentioned in this paragraph	Accepted. Section has been improved and the issue of land ownership has been raised.
37856	11	50	3	50	4	Land conversion is also likely to be a major contributor to emissions, especially in the short term	Accepted. Land conversion has been added.
37861	11	50	33	50	33	This should specify both direct and indirect land use change	Accepted. Direct and indirect land use change have been added.
31483	11	50	36	50	37	"When bioenergy products are acquired through land use conversion, this process can lead to a loss of carbon stocks that negate the net positive GHG mitigation impacts". COMMENT: We think that this depend on to what extent the land use conversion is permanent and the carbon cycle is broken/degraded in a mitigation relevant timescale (e.g. 100 years) http://unfccc.int/essential_background/convention/background/items/1353.php	Accepted. We revised the sentence.
37862	11	50	40	50	45	The least developed countries have very little knowledge to share. A major point of Feed the Future in these countries is to develop resilience.	Noted. It depends on what you call knowledge. Local knowledge is very important, and AR5 will address this issue.
26091	11	50	46			*Observation: Table 11.9 mentions a number of risks/co-benefits that are specific to indigenous peoples and traditional knowledge - e.g for forestry these include changes in tenure and use rights for indigenous peoples and local communities (IPLCs), participation of IPLCs in relevant processes, recognition or denials of indigenous and local knowledge in managing forests, etc. These should also be addressed in the text of the report more specifically in the context of this vulnerable group - particularly the impacts of land tenure and legal status for these communities in realising potential co-benefits, or risks to loss of indigenous and local knowledge and consequent lack of resilience to climate change. The ability to solve such structural management problems impacts greatly on the certainty of the mitigation potential of any future projects, and particularly at-risk groups should be identified and highlighted when recommending further research.	Accepted. We also included the consideration of the impacts of land tenure change on local knowledge and mitigation actions, and the resilience of vulnerable communities.
37863	11	50	47	50	47	May have important impacts? In what sense?	Accepted. Reworded.
24840	11	50	49	50	49	Coordinated action to simultaneously pursue the objectives of the MEAs not only "helps to achieve", but can improve efficiency in achieving the objectives (Cowie et al 2007). Suggested revision: Maximising co-benefits of AFOLU mitigation options can improve efficiency in pursuing the objectives of other international agreements, including the United Nations Convention to Combat Desertification (UNCCD,2011) or Convention on Biological Diversity (CBD) (Cowie et al 2007), ... Reference: Cowie, AL Schneider UA and Montanarella L 2007 Potential synergies between existing multilateral environmental agreements in the implementation of land use, land-use change and forestry activities. Environmental Science and Policy 10, 335-352.	Accepted. Text reviewed, but other reference included (as these are newer and post-AR4).
29475	11	50	25	50	28	Suggested additional text: Risks from expansion of industrial-scale bioenergy production have been recognized, and efforts to manage these are reflected in the emergence of sectoral, regional and global sustainability standards and certification schemes for bioenergy. However, sustainability standards must be applied to all land uses, in order to manage these issues.	Accepted. The sentence has been included later in the LDC box in the bioenergy section.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29476	11	50	49	50	49	Coordinated action to simultaneously pursue the objectives of the MEAs not only "helps to achieve", but can improve efficiency in achieving the objectives (Cowie et al 2007). Suggested revision: Maximising co-benefits of AFOLU mitigation options can improve efficiency in pursuing the objectives of other international agreements, including the United Nations Convention to Combat Desertification (UNCCD,2011) or Convention on Biological Diversity (CBD) (Cowie et al 2007), ... Reference: Cowie, AL Schneider UA and Montanarella L 2007 Potential synergies between existing multilateral environmental agreements in the implementation of land use, land-use change and forestry activities. Environmental Science and Policy 10, 335-352.	Accepted. Reference added.
23790	11	51	1	51	18	Future increase in GHG emissions from LDCs shall also partly be caused by large displacement of food production, particularly fruits, cereals and meat, to these countries from recently industrialized countries like China. This needs to be highlighted in this para.	Accepted. The issue of increasing GHG emissions as a consequence of development/poverty reduction in developing countries has been included in section 11.7.
37865	11	51	17	51	21	Who pays for these realizations potentially/probably?	Accepted. Text edited.
23667	11	51	18			What you aren't mentioning here is the relationship between mitigation potential and population growth and the difficulties in reconciling these two	Accepted. Text edited.
37866	11	51	18	51	22	Economic co-benefits are not limited to carbon payments. Other economic benefits associated with more sustainable land use are possible 'more sustainably produced commodities, non-timber forest products, services'	Accepted. Text edited.
19573	11	51	22	51	30	Here a crucial issue is identified - land use rights. However, it is not clear in practice how this could be achieved. would add to the list of references Mustonen, Tero and Mustonen, Kaisu. Eastern Sámi Atlas. Kontiolahti: Snowchange Cooperative, 2011. This monograph, using 64 land use maps since pre-history, documents the Russian Indigenous Sámi land use using oral histories and toponymic place names - only by including elements of Indigenous knowledge on its own terms into a land use documentation a full picture will emerge.	Accepted. The text was edited. Nevertheless one should be aware that there is no one magical formula for solving tenure and use rights. This clarification on the need for clarification of the impacts of changes in tenure and use rights at sub-national and local levels is included too
37867	11	51	22	51	30	Land tenure is a very complicated and divisive area and much work is being done to get countries to address this issue. This problem will not be solved in the near future.	Noted. We agree that is difficult and that it requires time. However, if the problem is not addressed some AFOLU mitigation measures won't be used
37868	11	51	26	51	30	This is really the key point on much of the policy discussion, and needs expanded and highlighted. Mitigation actions, including bioenergy, are dependent on good land use policy... but the mitigation actions themselves do not create good/bad land use policy. Bad land use policy, and bad outcomes, will occur regardless of of whether we do or do not take mitigation actions, if those land use policy failures aren't addressed. The benefit of addressing these policy failures is simply highlighted by CC mitigation, because fixing those failures will ALSO help mitigate climate change.	Accepted. Text edited. However it is important to remained that there is a labor division between scientist and policy makers, and that we at the IPCC are not meant to be policy prescriptive, Thus we can not simply say what "is a good / bad policy"
37869	11	51	28	51	28	What are 'tenure forms'	Accepted. Explanation included.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37870	11	51	31	51	36	Finance is a critical issue in most LDCs. Smallholders will not be anxious to participate unless it is made clear to them that the risk has been mitigated. It is very difficult to even get them to use improved seeds because they view this as being risky.	Accepted. The importance of securing financial means for AFOLU measures in developing countries (as well as in developed countries) is discussed in section 11.7.
31032	11	51	34	51	34	What does "A/R CDM" signify? It is not defined earlier. CDM is presumably "Clean Development Mechanism" but it should be explained somewhere.	Accepted. A/R CDM is Afforestation /reforestation Clean Development Mechanisms. It is the common abbreviation for CDM projects on land use and using temporary credits. Clarification included. Further, CDM is explained in the Glossary.
37871	11	51	34	51	34	Define A/R CDM	Accepted. A/R CDM is Afforestation /reforestation Clean Development Mechanisms. It is the common abbreviation for CDM projects on land use and using temporary credits. Clarification included.
29898	11	51	42			Other food security should include food price volatility, change of diets (more meat consumption, for example).	Accepted. The issue of dietary change is addressed in sections 11.3 and 11.4.5 . Price volatility is certainly an issue about food security and depends on various factors along the food trade chain. Price volatility though is not necessarily an effect of AFOLU measures but a driver.
37872	11	51	42	51	45	it is incorrect to term "food security" an emerging issue. This has been a major concern and point of focus in climate change science, negotiations, policy, and discussions for years. It should have been a central underlying point of the chapter. This issue deserves better treatment here, along with cross-references to Chapter 2.	Partially accepted. The sentence says concerns about the impacts of AFOLU on food security is an emerging issue, not food security itself. "Emerging" considering that this discussion has gained relevance since AR4. Cross-reference to chapter 2 was made.
29897	11	51	43			It is not clear what is meant by "intensification of diets"	Accepted. Text edited.
27949	11	51	43	51	43	Add in front of "diet" "human" and/or "animal".	Accepted. Text edited.
37864	11	51	6	51	21	Exactly how are these to be implemented? The difficulties appear to be vastly underplayed.	Accepted. Text edited.
34376	11	51	8	51	9	Please consider editing in the following way: "...of these co-benefits (e.g. timber and non-timber forest products and/or water) provide additional cash-flow for land-holders." Using 'additional cash-flow' instead of 'economic co-benefits' (lines 11, 18) might be much easier to understand - raising the question why this issue is not treated in 11.6. The same goes for 'carbon payments' discussed in line 12. If you change this, this has implications for FAQ 11.4.	Accepted. Text edited, but differently than proposed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30284	11	51	46	51	46	A paragraph should be added here on animal welfare. Intensification of animal production in the form of industrialized animal production presents significant risks to animal welfare, small-holder farmers, food security, and the environment. Pew Commission on Industrial Farm Animal Production (2008). Putting meat on the table: industrial farm animal production in America, pp. vii, 6, 23. www.ncifap.org/bin/e/j/PCIFAPFin.pdf. Accessed April 20, 2013; Mirle C. (2012). The industrialization of animal agriculture: implications for small farmers, rural communities, the environment, and animals in the developing world. The 10th European International Farming Systems Association Symposium in Aarhus, Denmark, July 1-4. Workshop 1.3: Understanding agricultural structural changes and their impacts, to support inclusive policy dialogue and formulation. Available at: http://www.ifsa2012.dk/downloads/WS1_3/ChetanaMirle.pdf. This reinforces the need for comprehensive and cross-cutting a priori assessments of agricultural mitigation options. Additional animal welfare risks lie in consumption shifts to more monogastric species, both in terms of total animal numbers and in the negative animal welfare impacts posed by industrial production systems. Industrial systems now produce approximately two-thirds of the world's poultry meat and eggs, and more than half of all pork. Food and Agriculture Organization of the United Nations (2009). The state of food and agriculture: livestock in the balance (Rome, Italy: FAO, p. 27). Available at: http://www.fao.org/docrep/012/i0680e/i0680e.pdf.	Accepted. The issue is included with newer references
27273	11	51	5		5	(Tubiello et al.), please provide year	Accepted and fixed.
29833	11	52	14	52	15	"AFOLU mitigation options […] Biodiversity conservation can be improved both by reducing" could be cut and rephrased as "AFOLU mitigation options can promote conservation of biological diversity (Smith, Ashmore et al. 2013) though both reducing"	Accepted.
37874	11	52	14	52	15	There are other ways to promote biodiversity aside from reforestation. Preservation of grasslands/wetlands/other habitat also important. Also, alternative farimng practices like agroforestry might preserve biodiversity. These alternatives don't seem to be covered.	Accepted. Edits inserted.
37875	11	52	17	52	18	Reforestation or afforestation on farmland is exactly what is not needed. A major goal is bring as much land as possible into cultivation with improved crops so that here is some hope of food security. There is work that is not mentioned here on using trees in the fields to shade crops form the hot summer sun. This has been successful in some areas. See the work of Peter Gubbel.	Noted. A/R is one of the options for mitigation examined in this chapter. The comment ("...exactly what is not needed") suggests that it should not be considered at all, however does not present any literature to support this statement. Other parts of the chapter describe co-benefits and tradeoffs. Chapter is about climate mitigation using measures defined earlier. Can be suggested that shading of crops by trees is an adaptation measure
27950	11	52	23	52	25	Delete the sentences starting from "Some" until "White, 2012" it is not about environmental effects of mitigation but about effects of an additional measure namely paying for biodiversity conservation.	Accepted.
37877	11	52	26	52	27	What percent of stubble retention is needed to reduce effective wind and water erosion?	Rejected. Lal (2001) describes stubble retention; not considered necessary to describe the relationship between stubble retention and wind and water erosion control here. Response will be quite site specific.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37876	11	52	26	52	30	Zia pots which are used in various areas of the Sahel do exactly this.	Noted.
37873	11	52	3	52	3	Aalbedo and water balance are mentioned but not discussed in detail in section 11.5 - suggest using a different pair of examples	Accepted. Have deleted this paragraph.
31034	11	52	31	52	45	Regarding the positive environmental and health effects of afforestation/reforestation, recommend mentioning a much wider range of benefits, notably soil erosion control as well as wildlife conservation and outdoor recreation. An excellent example of this, describing the benefits of large-scale reforestation in South Korea since the 1970s, is given by Tak, K., Chun, Y., and Wood, P.M. (2007). The South Korean forest dilemma, International Forestry Review, Vol 9(1):548-557.	Partially accepted. Erosion affects on erosion are described on p. 52, lines 27-30. Reference to improved recreation and wildlife conservation added to text.
37878	11	52	33	52	36	There is also a considerable literature that says that eating animal products in moderation (as with everything else) is beneficial. The report / this chapter is heavily biased against the consumption of animal livestock products. What are the "known" negative health impacts of animal products - which include milk, cheese, poultry, fish, yogurt. The authors seem to take a broad statement as given and universally accepted as true with little supporting evidence. Furthermore, if it is so well known, why is more research needed?	Accepted. Text edited.
27951	11	52	33	52	36	Insert in front of "diet" "human" Furthermore more emphasis should be given to the health effect. It is not true that there is not enough knowledge about overweight and effects of false nutrition.	Accepted. Text edited.
29479	11	52	37	52	45	Insert "Furthermore, strategic placement of tree belts in lands affected by dryland salinity can remediate affected lands by reducing the water table (Robinson, N., Harper, R.J., Smettem, K.R.J., 2006. Soil water depletion by Eucalyptus spp. integrated into dryland agricultural systems. Plant Soil 286, 41–151.)"	Accepted.
24843	11	52	37	52	45	Insert "Furthermore, strategic placement of tree belts in lands affected by dryland salinity can remediate affected lands by reducing the water table (Robinson, N., Harper, R.J., Smettem, K.R.J., 2006. Soil water depletion by Eucalyptus spp. integrated into dryland agricultural systems. Plant Soil 286, 41–151.)"	Accepted. Text inserted.
21032	11	52	37	52	45	Afforestation of catchments can reduce flooding downstream and also prolong periods of water flow, because the discharge is steadied. So afforestation has benefits, too.	Accepted. Text inserted.
37879	11	52	38	52	39	Other studies have shown minimal decrease. Is the impact the same for reforestation (return to natural equilibrium, more or less) vs afforestation?	Accepted. This text added.
27952	11	52	38	52	45	To judge the findings presented it is necessary to know under which climate conditions afforestation hade taken place. Please add that information.	Rejected. Contrast between hydrological effects of reforestation and afforestation has not been studied.
29477	11	52	4	52	5	Reword. Nitrate leaching is not a fractionating pathway. Delete fractionating.	Accepted. Jackson et al (2005) was a review of several studies in different locations. This information has been added to the text.
31033	11	52	4	52	13	Are these arguments only for agricultural systems, or would they apply to short-rotation woody crops as well?	Accepted. Edited in text.
24841	11	52	4	52	5	Suggest delete the word 'fractionating'. Nitrate leaching is not a fractionating pathway	Rejected. Arguments are for agricultural systems. Similar analysis for short rotation wood crops are not available.
31035	11	52	46	52	48	This applies to agroforestry in particular, rather than afforestation/reforestation in general. Calfapietra et al. only studied certain types of short-rotation plantation crops. Suggest reviewing.	Accepted. Edited in text.
19112	11	52	46	52	47	"there is a risk of increased release into the atmosphere of volatile organic compounds (VOC)". What are these VOCs? I think the risk is much exaggerated. Examples should be given	Accepted. See comments below. This paragraph will be deleted

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37880	11	52	46	52	48	This claim about the poor air quality of trees is occassionally repeated, but how many trees would it really take to substantively impact the VOC concentration? Has there ever, in the history of the planet, been a region that has failed its VOC pollutant levels because it had too many trees? While this is an interesting theoretical problem that has been identified in academia, it seems to miss the forest for the trees in terms of real environmental concerns, and doesn't substantively help anyone make decisions about CC mitigation. Suggest deleting.	Accepted. Deleted.
37881	11	52	46	52	48	What VOCs are emitted in large amounts by commonly used spp and how?	Accepted. Deleted.
29478	11	52	9		13	Reword "multi-process practices" and line 13 - clumsy expression, meaning not clear. Suggestion: Substitute "combined strategies" or "simultaneous application of several strategies"	Accepted. Text edited.
24842	11	52	9	52	13	Suggest Substitute "multi-process practices" for "combined strategies" or "simultaneous application of several strategies" - the meaning of this expression is not clear.	Accepted. Text edited.
24844	11	52				Suggest this section should also mention the potential benefits to downstream systems such as freshwater/groundwater systems and marine ecosystems, resulting in benefits from biodiversity and improved ecosystem services. Suggested citations: Great Barrier Reef Marine Park Authority 2012, Informing the outlook for Great Barrier Reef coastal ecosystems, Great Barrier Reef Marine Park Authority, Townsville. Great Barrier Reef Marine Park Authority 2009, Great Barrier Reef Outlook Report 2009, Great Barrier Reef Marine Park Authority, Townsville	Rejected. Although agree in principle, suggested references are grey literature.
22939	11	52	18	52	19	Reforestation may also provide a mechanism to fund translocation of biodiverse communities in response to climate change. Where is evidence? Also, what is translocation? You include assisted colonization of species in response to climate change? If so, the issue is still under strong debate. In any case, this sentence is very unclear.	Accepted. Sentence has been deleted
30525	11	52	18	52	23	A/R CDM projects should also be cited as a mechanism to support AFOLU mitigation measures.	Accepted. A/R CDM as an instrument and the corresponding projects are discussed in section 11.10
30526	11	52	37	52	45	This comment addresses the whole paragraph. Eucalyptus plantations may only drain up soils if they are poorly managed and established on inappropriate areas. It is estimated that the evapotranspiration zone of a eucalyptus plantation is equivalent to 800-1200 mm of rain per year (FLELKEL, 2005). Calder, et.al., (1992) and Lima (1993) present similar results (800-1200 mm of rain per year, against 1000-2000 of rain per year from sugar cane plantations). However, water consumption indexes per se do not mean that eucalyptus planattions dry up the soil, neither that it negatively impacts ground water. The drying of lands depends on the average rainfal indexes in a given region (Vital 2007). Davidson (1993) and others also indicate that eucalyptus plantations would only dry up soils in regions with less than 400 mm of rainfall per year. Thus, substantive evidence indicates that well managed eucalyptus plantations do not lead to water scarcity or soil drainage. The paragraph needs to be revised and written in a more balanced manner.	Partially accepted. This comment is site specific; impact of eucalypt plantations will depend on water balance which will be affected by site and management effects. In some situations, Eucalypts are used to dry landscapes (e.g. salinity in Australia). Jackson et al. (2007) gives an overview of many studies.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29217	11	52	9	52	13	Interested in these comments - although I agree with the sentiment that we should focus on increasing N capture and reducing the losses of reactive n in general to the environment, research results in the UK indicate that nitrification inhibitors reduce nitrate leaching as well as N2O emissions with little impact on ammonia loss. Similarly the principal argument for the use of DCD in New Zealand is to reduce nitrate leaching. Under reduced N application rates yields will be lower, but N offtake will increase (as N supply increases crops generally become less efficient at uptake), proportionally reducing environemental losses of N. UK studies on chemical composition of N indicate that AN and urea have no significant difference in total N2O loss (when direct and indirect emissions are accounted for), but urea has far higher ammonia losses. There are agricultural management situations under which increasing the use of boilogically fixed N can increase leaching and N2O losses, especially where the mineralisation of organic N is poorly synchronised with crop demand. It might be worth interrogating the statement further.	Accepted. In the final draft, section 11.7.2 discusses the different aspects of impacts on N balance, considering the arguments provided by the reviewer.
31036	11	52				Suggest including environmental effects from forest biomass burning for energy or heat production, or include a pointer to annex Table A.2	Partially accepted. There are some references on the effects on human health. These are highlighted in the section
27953	11	53	12	53	18	Delete para, it repeats consideration made earlier on.	Rejected. We introduce the section explaining the different ways used in this section.
37883	11	53	17	53	18	This could be elaborated with a characterization of the literature with some indication of the rationale. Modern high tech agriculture appears to be given unfair treatment by noting certain biotechnologies and feed additives are banned in parts of the world. But why are they banned, are the bans based on scientifically proven (or shown to be highly likely linked to) human health risks. Often these bans are based on cultural factors or a desire to protect domestic industries. But again the discussion is negative in tone with little support or context.	Accepted. This sentence now deleted. The rationale behind the bans (public perception) was described in p53/29-32; this text has been retained.
37882	11	53	2	53	11	It seems GMOs should be referenced in text as a means of increasing productivity without increasing the land in cultivation.	Rejected. No specific papers in the formal literature on the impact of the introduction of GMOs on GHG balances.
34378	11	53	2	53	11	Please consider moving this paragraph to the section of socio-economic effects under the heading of 'productivity gains'.	Rejected. Technological consideration as a separate section has been agreed upon/given.
27954	11	53	24	53	24	"food" and "AFOLU" are not competing extremes, "food production" and "mitigation of GHG emissions and enhancement removals" are suggested to be inserted instead.	Rejected. The paragraph talks about the existing concerns. We don't say that AFOLU and food security are opposed; only that there are concerns about potential trade-offs
27955	11	53	27	53	32	Lack of clarity might be blocking politicians to go for a strong mitigation policy. But the public is skeptic because they don't see climate change as a problem. Delete from "further" to risks".	Partially accepted. The fact is that this uncertainty is slowing/difficulty. We need some references here
37884	11	53	30	53	30	There does not appear to be a reference back to 11.7.1.2. Please add one.	Rejected. This reference did exist to p53/17-18, however that text has now been deleted. See comment #37883.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37885	11	53	30	53	30	Give specific examples or remove this sentence.	Accepted. Examples given in text, these drawn from previous lines 29-32.
29834	11	53	31	53	31	“as important than” should be written either “as important as” or “more important than”	Accepted. Text edited.
24845	11	53	31	53	32	"Public perception is often as important as scientific evidence of 31 hazard / risk in considering government policy regarding such technologies". Text should be corrected to either "as important as" or "of more importance than".	Accepted. Text edited.
33317	11	53	33			11.7.2 refers to 11.4. for discussion of spillover effects, 11.4 refers to 11.7	Accepted. Reference deleted, paragraph edited.
37886	11	53	37	53	47	Should note the key problem with environmental markets is finding buyers. If you care to be more rigorous you could note that this is largely due to the public goods nature of the goods being marketed which highly incentivizes free riders. Additionally, the public goods nature of the goods provide the justification for government to take the a leading role in the development of these markets.	Partially accepted. The argument is interesting but there is no scientific prove of it. We mentioned difficulties in the markets though
23791	11	53	44		45	The statement "In other situations, reforestation can result in a restoration of water quality albeit with reduced water yield" conveys an impression that reforestation would always result in reduced water yield which is incorrect. Reforestation results in lowering of water yield only in specific situation where the transevaporation under reforestation exceeds the baseline without a commensurate increase in the percolation of water in it after reforestation.	Accepted. Text edited.
23792	11	53	46		48	The use of the word 'risk' in the sentence "in afforestation/reforestation activities there is a risk of increased release into the atmosphere of volatile organic compounds (VOC) emitted in large amounts by most of the commonly used species" is misplaced. It is by no means a risk in the sense of lowering of mitigation potential because the VOCs can actually enhance the mitigation effect.	Accepted. Reference to VOC has been removed.
30527	11	53	24	53	27	Concerns with land use competition are legitimate. However, in several countries land availability is not a problem. In Brazil, for instance, there are approximately 60 million ha of degraded pasture land that can be used for biofuel plantations and/or afforestation/reforestation (GOUVELLO, et al, 2010/World Bank Report). Hence it is important to adjust the paragraph towards a balanced approach regarding land availability and land-use competition.	Rejected. The fact that there is some land available in one place doesn't mean that there is not competition in other areas. This argument is acceptable only from a top-down perspective.
27274	11	53	13		14	maintenance of existing carbon stocks (e.g. by avoiding deforestation) - this chapter uses conservation, reducing deforestation, and avoiding deforestation interchangibly - would be important to revise to check where each one of these apply.	Accepted. Text edited.
19414	11	53	17	53	18	Suggest deletion of the following text: "A number of the technologies also present apparent risks; certain types of biotechnology and animal feed additives, for example, are banned in parts of the world." The claim that certain types of biotechnology "present apparent risks" is not supported by science. If certain countries have chosen to ban biotech products like genetically engineered (GE) crops, it is not necessarily for science-based reasons, and if countries that are WTO members adopt such bans without supporting evidence like risk assessment data, then those countries are potentially in violation of their WTO commitments.	Accepted. Text has been deleted.
29480	11	53	31	53	32	"Public perception is often as important than scientific evidence of 31 hazard / risk in considering government policy regarding such technologies". Text should be corrected to either "as important as" or "of more importance than".	Accepted. Text edited.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34381	11	53	33			I have not been able to find findings on spillovers as defined in the glossary in section 11.4. The material supplied here is not consistent with the definition either. While the first paragraph might be put into a box in an earlier section that actually discusses ecosystem markets (carbon markets discussed in 11.7.1 at the moment), the second paragraph is also interesting and might be moved to the introduction of section 11.7. In terms of the definition of spillovers, there might be some material on knowledge spillovers in AFOLU sectors, such as in cropping systems, farming equipment and managemant (e.g. page 60, lines 40-42) and irrigation technologies. Please assess the available literature.	Noted and accepted. Since the meeting in Wellington, we discussed with the Secretariat that in our chapter we need to discuss spill-overs in a different manner than in other chapters. After discussion with the Secretariat, the section was revised.
23793	11	54	10			The claim that reforestation can change the local climate is with little basis and may be deleted.	Accepted. Text edited.
33318	11	54	7			FAQ 11.4 on co-benefits and Table 11.9 on cobenefits and risks (should be: risk tradeoffs) seem misplaced at the end of the spillovers sub-section,	Accepted. The wording has been checked with the secretariat and improvements have been made.
37887	11	54	7	54	16	Repetitive of text elsewhere. Suggest to Delete.	Accepted. Text edited.
37888	11	54	7	54	16	Suggest deleting this - it adds nothing new and cutting will save space	Accepted. Text edited.
29481	11	55				What is the intended relationship between each of the elements in one row? In some cases they appear to be related, but others not (For example, why would albedo and evaporation impacts result from promoting or contradicting enforcement of forest policies?) Reformat, if they are not intended to be related.	Accepted. The structure of the table was improved.
29482	11	55				in the first column, does "forestry" refer only to A/R or also FM? Clarify.	Accepted. Clarification included.
29483	11	55				Delete "Monocultures can reduce (-) biodiversity". A/R of cropland will usually not decrease biodiversity compared with cropping. Eg Kavanagh et al., 2005. Kavanagh, R., Law, B., Lemckert, F., Stanton, M., Chidel, M., Brassil, T., Towerton, A., Herring, M., 2005. Biodiversity in Eucalypt Plantings Established to Reduce Salinity. Rural Industries Research and Development Corporation, Publication No 05/165, RIRDC Canberra, Australia.	Rejected. We say "can" and provide relevant references. The references mentioned in the comment predate the AR4.
31037	11	55		56		For the column entitled "Scale" in this table, please clarify the difference between "local" and "rather local".	Accepted. We only used "local."
31038	11	55		58		Column titles do not appear on all subsequent pages of the table - this makes it a little hard to follow	Accepted. The structure of the table was improved. Heads should appear in each page.
31039	11	55		58		The table could be moved to an appendix.	Rejected. Potential co-benefits and risks have been agreed upon as part of the structure of the whole report. We agreed to summarize these effects in a table because it saves space.
21033	11	55				Please explain the difference between "increase in economic activity and income" and "increase or decrease [of] income" (column: Economic). Under "institutional", "improvement of tenure", "harmonization of tenure" and "creation of participative mechanisms" all cover the same grounds, please consolidate.	Accepted. The structure of the table was improved.
20154	11	55		58		Table 11.9 requires more explanation. It is not clear how rows work and what mitigation option they relate to.	Accepted. The structure of the table was improved.
24846	11	55	1			Suggest delete "Monocultures can reduce (-) biodiversity". This is incorrect for A/R activities. Suggested Citation: Kavanagh et al., 2005. Kavanagh, R., Law, B., Lemckert, F., Stanton, M., Chidel, M., Brassil, T., Towerton, A., Herring, M., 2005. Biodiversity in Eucalypt Plantings Established to Reduce Salinity. Rural Industries Research and Development Corporation, Publication No 05/165, RIRDC Canberra, Australia	Rejected. We say "can" and provide relevant references. Reference mentioned predates the AR4.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24847	11	55	1			What is the intended relationship between each of the elements in one row? In some cases, they appear to be related, but others not (For example, why would albedo and evaporation impacts result from promoting or contradicting enforcement of forest policies?) Reformat, if they are not intended to be related.	Accepted. The structure of the table was improved.
24848	11	55	1			In the first column, does "forestry" refer only to A/R or also FM? Please clarify.	Accepted. The structure of the table was improved.
22156	11	55	1	58	1	Table requires more explanation. It is not clear how rows work and what mitigation options they relate to.	Accepted. The structure of the table was improved.
37889	11	55	1			what is 'rather local'; suggest organizing the table first according to Measures and then according to scale; retain column and row headers on each page of table.	Accepted. Only local used.
34374	11	55	1			Please make an attempt to adapt the discussed policy objectives to the wording used in other chapters (such as 'productivity', 'employment creation', 'technology transfer' etc. in place of similar objectives but different wording) to support the effort to facilitate greater synthesis across sectoral assessments in section 6.6.	Accepted. The structure of the table was improved. These terms were included as proposed by the reviewer.
29484	11	57				The vast majority of research shows either positive or nil effects or biochar on productivity. Negative effects are uncommon	Accepted. We got comments supporting and criticizing the statement on carbon mineralization priming effect. We then provided a more balanced text and newer references.
29485	11	57				Is this statement referring to the priming effect? Recent research shows negative rather than positive priming eg KEITH, A.; SINGH, B.; SINGH, B.P. Interactive priming of biochar and labile organic matter mineralization in a smectite□rich soil. Environmental Science and Technology, v.45, p.9611□9618, 2011. (Also Case et al 2013; Cross and Sohi 2011; Slavich et al 2012).	Accepted. We got comments supporting and criticizing the statement on carbon mineralization priming effect. We then provided a more balanced text and newer references.
24849	11	57				The vast majority of research shows either positive or nil effects of biochar on productivity. Negative effects are uncommon. Is this statement referring to the priming effect? Recent research shows negative rather than positive priming. Suggested citation: KEITH, A.; SINGH, B.; SINGH, B.P. Interactive priming of biochar and labile organic matter mineralization in a smectite□rich soil. Environmental Science and Technology, v.45, p.9611□9618, 2011. (Also Case et al 2013; Cross and Sohi 2011; Slavich et al 2012).	Accepted. We got comments supporting and criticizing the statement on carbon mineralization priming effect. We then provided a more balanced text and newer references.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30285	11	57		57		In the livestock section on social impacts, the cell on animal welfare should delete “the perception of” and “(due to cultural values)” so that the line simply reads “Changes in animal welfare.” Animal welfare science has broad support. Additionally, the scale should be local to global, not merely local, as animal welfare is something that is important globally. Additionally, people around the world care about the welfare of animals raised for food. World Society for the Protection of Animals (2007). WSPA International Farm Animal Survey (China & Brazil), Dec. 14; Zogby International (2003). Nationwide views on the treatment of farm animals. Poll for the Animal Welfare Trust; Lusk J.L., F. B. Norwood, and R.W. Prickett (2007). Consumer preferences for farm animal welfare: results of a nationwide telephone survey. Available at http://asp.okstate.edu/baileynorwood/AW2/InitialReporttoAFB.pdf; and Penn, Schoen & Berland Associates (2005). Poll for the Humane Society of the United States, Washington, DC. (Illustrating consumer concern for farm animal welfare in the United States of America.) This is further evidenced by the mission of the World Organization for Animal Health (OIE) (inter alia “to promote animal welfare”), which has 178 member countries. OIE. 2013. Objectives: food safety and animal welfare. http://www.oie.int/index.php?id=53#c203; OIE. 2013. Member countries. http://www.oie.int/about-us/our-members/member-countries/.	Accepted. Included in the new table. Some references were included.
30286	11	57		57		In the livestock section on social impacts, the cell on increasing the food supply focuses on just one aspect of food security. “Food security” rather than “food supply” should be used here, and there are potentially positive and negative impacts depending on the types of practices encouraged. Increased animal production in the form of industrial practices can pose risks to food security for a number of reasons. Those measures that support small-holders hold potential nutritional advantages, in addition to other socio-economic impacts. Mirle C. (2012). The industrialization of animal agriculture: implications for small farmers, rural communities, the environment, and animals in the developing world. The 10th European International Farming Systems Association Symposium in Aarhus, Denmark, July 1-4. Workshop 1.3: Understanding agricultural structural changes and their impacts, to support inclusive policy dialogue and formulation. Available at: http://www.ifsa2012.dk/downloads/WS1_3/ChetanaMirle.pdf	Accepted. The structure of the table was changed to avoid repetition. Food security is used instead of food supply. In the explanation of the issues, we used the terms "food availability" and "food access," as these are the two food security pillars.
30287	11	57		57		In the livestock section on social impacts, the cell on employment creation should also note negative potential employment impacts depending on the type of livestock measure. For example, support of industrialized production can decrease on-farm employment opportunities. Mirle C. (2012). The industrialization of animal agriculture: implications for small farmers, rural communities, the environment, and animals in the developing world. The 10th European International Farming Systems Association Symposium in Aarhus, Denmark, July 1-4. Workshop 1.3: Understanding agricultural structural changes and their impacts, to support inclusive policy dialogue and formulation. Available at: http://www.ifsa2012.dk/downloads/WS1_3/ChetanaMirle.pdf	Accepted. Wording improved. Scientific references included.
27956	11	57		57		Last row: there is no certainty about the positive effect of biochar for improved productivity for any conditions, delete old text in the box and insert " possibly improved agricultural productivity", add in the environmental box " chances of soil albedo", in the economic box add at the end "and if such payments will be established".	Accepted. We got comments supporting and criticizing the statement on carbon mineralization priming effect. We then provided a more balanced text and newer references.
37890	11	57	1			How is a "change in the perception of animal welfare" a co-benefit of AFOLU mitigation measures? "Animal welfare" is never defined in the text. It means very different things to different people.	Rejected. References explaining this are included.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30288	11	58		58		The cell on economic implications of “Changes in demand patterns” should be updated to include positive implications, as well. The potential impacts are not just negative. Expanding markets for both plant foods and animal source foods produced with high levels of animal welfare and environmental sustainability could be a positive benefit, as well.	Accepted. The structure of the table was improved.
20155	11	58				Table 11.9 Row: changes in demand patterns: please consider institutional measures: health policies, choice editing, labelling, …///technological measures: production of novel foods, e.g. quorn, artificial meat, …	Accepted. But included in section 11.8, where the enabling conditions for a given measure are discussed. Policies and technology promoting behavioural change belong to the enabling conditions. In section 11.10, the policy measures are included.
22157	11	58	1	58	1	Table 11.9 Row: changes in demand patterns: please consider institutional measures: health policies, choice editing, labelling, …///technological measures: production of novel foods, e.g. quorn, artificial meat, …	Accepted. But included in section 11.8, where the enabling conditions for a given measure are discussed. Policies and technology promoting behavioural change belong to the enabling conditions. In section 11.10, the policy measures are included.
37891	11	58	2	58	11	It is important to note that ceteris paribus likely does not hold. Intensification can lead to increased profit per hectare, which can increase pressure on non-cultivated lands unless intensification is combined with conservation	Accepted. We agreed, and the consideration is made in the text.
37892	11	59	1	61	18	This section has many flaws and is not critical to the content of the overall document. It should be rewritten or simply removed.	Rejected. Structure is given. Such a general comment can not be addressed. For other reviewers, the section seemed to be useful and clear.
19113	11	59	12	59	12	11.8.1 Socio-economic barriers and opportunities. Some important bariers are lack of training, lack of appropriate tools, land ownership and poor financial rewards. Government ministries not enthusiastic to AFOLU initiatives.	Partially accepted. Lack of land tenure and use rights as well as deficiencies in the financing mechanisms were already included. Lack of human capacity/training opportunities is now included as well as reduced political willingness. References are included as well.
31040	11	59	13	59	14	This sentence could be deleted.	Accepted.
37893	11	59	13	59	33	This section is a cursory treatment of a key aspect of promoting AFOLU mitigation measures - namely securing adequate financing.	Rejected. Although securing financing would be a key opportunity, it is certainly not the only one. The status of land tenure and use rights, the level of capacity, and the availability of land and water are also extremely relevant. Also, it is important to have the enabling policies in place.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27957	11	59	15	59	17	It is strange that this chapter deals only with financing possibilities under the UNFCCC/KP and voluntary markets What about ODA, national or regional subsidies, private credits and so on and their barriers and opportunities. For KP mechanism it should be noted that the financial stream is very limited especially for the upcoming commitment period as less Countries are willing to take part and commitments are not that ambitious to rise expectation for higher prices of the C market.	Accepted. A cross reference to section 11.10 has been included. This is the section that discusses these options in more detail.
37894	11	59	16	59	16	Define A/R CDM	Accepted.
31041	11	59	30	59	43	Suggest further elaboration of corruption as a barrier or deterrent to the provision of finance to developing countries. It is mentioned in 11.8.2 but a little more detail might be useful there or here in 11.8.1.	Partially accepted. More elaboration under 11.8.2, but avoided repetition in 11.8.1, including references.
34384	11	59	1			There is no sub-section on either cultural or financial barriers. Please add material if available.	Partially accepted. Some of these aspects are already considered in the socio-economic barriers/opportunities. New ones were included.
37642	11	6	12	6	13	It is not clear where the substitution is to take place. If this means to burn wood for fuel rather than to use fossil fuel the savings is not clear. It may be beneficial to the climate for humanity to change diets but just how is this going to be accomplished?	Rejected. Mitigation occurs through reduction in use of fossil fuels as the energy is instead generated through a renewable resource. Re: changing diets, we are reviewing the technical potential. There are a number of ways this could be achieved (e.g. carbon tax on GHG intensive foods to make GHG intensive foods more expensive relative to low GHG foods; Wirsenius et al. 2011 - Greenhouse gas taxes on animal food products: rationale, tax scheme and climate mitigation effects. Climatic Change 108:159–184, DOI 10.1007/s10584-010-9971-x), but it is not our job to determine which options policy makers may or may not choose. That would be policy prescriptive and is not within our remit.
27881	11	6	13	6	13	Insert before "diet" "human".	Accepted. Wording changed.
21003	11	6	14	6	14	How do you define "service"? For example, "decomposition" is a process and as such part of nutrient cycling, but what is the entity or group of entities that is serviced by it?	Noted. Services are defined in the original literature cited. There is not space for an expansive review of the ecosystem services literature - instead the reader is referred to the original definitions / studies / assessments.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37643	11	6	14			Like several other figures in the chapter, this figure is too complicated. For example,it's difficult to understand the meaning of the two boxes at the top. It seems as though the point trying to be conveyed is that there a lot of factors acting in the AFOLU sector, but this probably could have been done more simply. The authors should consider conveying this information in a table instead of a figure.	Rejected. Figure retained to show the multitude of services provided by land. Key part of the Ch11 narrative. A figure is more accessible than a table.
29818	11	6	16	6	16	“aim to enhance” should be written “aim at enhancing”	Rejected. The English in the original formulation is better.
23646	11	6	18			To shorten the length of this section you can omit the history of how these topics were covered in former versions	Rejected. We have a duty to report changes from the treatment of AFOLU in previous IPCC assessment reports.
24780	11	6	18	6	20	The two sentences beginning "In the IPCC…" and ending "…or forestry." are superfluous and should be deleted.	Rejected. We have a duty to report changes from the treatment of AFOLU in previous IPCC assessment reports.
20114	11	6	18	7	9	This paragraphs emphasis the importance of approaching mitigation from a whole system view and considering interaction between mitigations option as well as mitigation. This should be pointed out in the SPM	Accepted. But I think you mean the ES.
37641	11	6	2	6	5	The authors should consider replacing the text with "Land is a finite resource providing a multitude of goods and ecosystems services fundamental to human well-being (MEA, 2004). Human economies and quality of life are directly dependent on these services and the resources provided by land."	Accepted. Suggested text added.
33523	11	6	21			A reference for tourism in forest ecosystems is for example Gössling, S. and Hickler, T. 2005. Tourism in Forest Ecosystems. In Gössling, S. and Hall, C.M. (eds) 2005. Tourism and Global Environmental Change. Ecological, social, economic and political interrelationships. London: Routledge, pp. 95-106.	Noted. Thank you, but this level of detail is not included in the introduction. It will be considered in the co-benefits and trade-offs section.
37644	11	6	22	6	23	How does this justification square with excluding settlements, which are a major driver of LUC in some parts of the world? This lack of recognition of multiple drivers of land use change plays out throughout the document, where any LUC is attributed as negative effects of AFOLU mitigation activities.	Noted. Settlements are dealt with in their own chapter, as noted in the text.
24779	11	6	3	6	3	The conventional abbreviation of the Millennium Ecosystem Assessment is MA, as MEA is used to refer to the Multilateral Environmental Agreements. Suggest change to MA.	Accepted. Changed in the text and reference list.
32648	11	6	3	4		livelihoods should be included in the diagram	Rejected. Livelihoods are one of the goods and benefits and are discussed in the text.
27882	11	6	38	6	41	REDD as the most current policy option for a mitigation and adaptation approach is almost an invitation for Bolivia to demand a joint mitigation and adaptation mechanism. Please consider synergies and trade-offs or modify in another way so that the formulation is more balanced.	Noted. But no changes made as it is unclear what the reviewer wants to see added.
22534	11	6	39	6	40	this paragraph deals with non-CO2 emissions from agriculture in an AFOLU context. A reference to non-CO2 from other land uses should be added, for example, those emissions comming from N fertilization in forests, and drainage of lands under land uses other than agriculture.	Noted. Forest fertilization mentioned on page 10, lines 9-10. Wetland drainage in Box 11.2.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29205	11	6				Introduction: No mention is made of the mitigation potential of carbon storage in harvested wood products and indirect substitution of fossil fuel emissions. This is a major omission throughout the WGIII report and, as a result, it underplays the potential role of sustainable forest management in CC mitigation. The sole focus appears to be on biomass (particualrly forest biomass) as a renewable energy source, failing to recognise the wider uses of wood and the increase in average land based carbon stocks that arise from afforestation for energy forestry. The potential for sequestartion in forest biomass through aforestation and forest management is also largely ignored in the executive summary - and for this reason, they are also absent from both the SPM and TS reports. A greater focus should be given to mitigation options in forestry, which are not outlined in the SPM, TS or Executive Summary of Chapter 11.	Rejected. This is not correct. Material substitution of steel / concrete by timber is discussed in section 11.4 (page 34, line 14 to 41). Forestry options are reflected in the Ch11 ES.
33302	11	6	1			Structure could be changed to better follow order of sections. Currently: 11.5, 11.7, 11.8, 11.10, Annex, 11.4, 11.9, 11.2, 11.3, 11.6, 11.11	Rejected. Thank you, but the section order is determined by IPCC (and cannot be changed), but the narrative for the AFOLU sector does not follow the section order prescribed, so we develop the coherent narrative in section 11.1, and guide the reader to the relevant sections to read more about each particular issue.
29419	11	6	18	6	20	The two sentences beginning "In the IPCC…" and ending "…or forestry." are superfluous and should be deleted.	Rejected. We have a duty to report changes from the treatment of AFOLU in previous IPCC assessment reports.
24165	11	6	2	6	2	Suggest add sentence" AFOLU plays an central role for food security and sustainable development" before land is finite..... Because CHAPTER 11 is AFOLU,it include agriculture, foresty and other land use, SO The importance of ASOLU instead of Land should be emphassed.land is is critical in this chapter, but could not cover all the AFOLU ISSUES.	Accepted. Wording changed.
29418	11	6	3	6	3	The conventional abbreviation of the Millennium Ecosystem Assessment is MA, as MEA is used to refer to the Multilateral Environmental Agreements.	Accepted. Changed in the text and reference list.
27199	11	6	7		8	Regardig the sentence Mitigation options in the AFOLU sector need to be assessed for their potential impact on all of the other services provided by land, change to Mitigation options in the AFOLU sector may potentially affect other services provided by land.	Accepted. Wording changed.
27200	11	6	9		9	With regard to the e.g., avoided deforestation, note that it only constitutes a mitigation measure IF deforestation would undoubtely occur. Otherwise, it is not. So, one should be clearer here what avoided deforestation entails as a mitigation measure.	Accepted. Wording changed.
27343	11	6	10		10	replace increasing carbon stocks (by sequestration in soils and biomass...) with the increase in carbon stocks ...	Accepted. Wording changed.
27344	11	6	11		11	include e.g before by sequestration in soils...	Accepted. Wording changed.
27345	11	6	21		21	include an additional parenthesis after a) (AFOLU (IPCC, 2006a))	Accepted. Reference format error which has been corrected for the FD.
19114	11	60	1	60	1	11.8.2 Institutional barriers and opportunities. Some barriers include vested interests, and land tenure.	Partially accepted. Land tenure was already included. Vested interests are now included under socio-economic barriers or opportunities.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37895	11	60	1	60	3	Tone down this sentence. If it is true, we can quit discussing AFOLU mitigation measures right now.	Partially accepted. Governance of the agriculture and forest sectors is not only bad. There have been important improvements in the last decade, especially in developing countries. There is still much to do and in this sense, AFOLU mitigation can enhance governance improvement (and hopefully it does).
37898	11	60	10	61	18	The authors should consider deleting this FAQ as it really just reiterates last few subsections. Save space!	Noted. FAQs moved to end of chapter so distinct from section summary. It is a FAQ addressed by other sector chapters so is retained for cross chapter consistency as well as its importance.
25820	11	60	12	60	12	The term "social organisation" does not seem to fit in here. "Socioeconomic institutions/ instituional capacity" could perhaps be considered.	Accepted and improved.
37899	11	60	15	60	34	Remove 'have' with 'possess' Lines 15-34 much of this information seem redundant with earlier chapter sections	Accepted and improved.
37900	11	60	17	60	19	Rewrite for clarity	Accepted and improved.
37896	11	60	2	60	11	In the least developed countries land tenure is a very difficult problem. Yes, it should be corrected but it will not be done in the immediate future.	Noted.
37901	11	60	21	60	21	Remove 'mostly'	Accepted.
37902	11	60	22	60	22	Rpleace 'it' with 'them'	Accepted.
37903	11	60	25	60	25	Remove 'and'; add comma after 'variability'; remove 'the' before 'specific'.	Accepted.
23794	11	60	26		33	The sentence beginning with "Thus securing scale of financing sources……." has no place in this para. It only causes confusion without adding any value. This may be replaced by "An important element is ensuring accessibility to AFOLU financing for land dependent communities (e.g. agriculturalists, pastoralists or forest dependent communities)" from the next para.	Partially accepted. The sentence was rewritten for readability.
37904	11	60	26	60	26	Remove 'of each'; replace with 'option' with 'potential'	Accepted. Edited for readability.
19115	11	60	35	60	35	11.8.4 Technological barriers and opportunities. Again lack of training, poor seed source, few demonstration plots Lack of trained personnel.	Accepted.
37905	11	60	36	60	47	There is little scientific research that shows livestock have be bred for lower CH4 emissions. It is a logical possibility based on what we have accomplished with breeding through history. But until now there has been no reason what-so-ever to breed livestock for reduced emissions. More importantly, would lower CH4 emitting livestock produce less meat or milk? If so, it would be more difficult to get farmers to adopt the breeds. The text makes it appear this is a proven mitigation technology.	Rejected. It is written in the text that these technologies are still in the development stage.
37897	11	60	4	60	4	Add comma after 'tenure'; remove'and'; add comma after'regulations'	Accepted.
29835	11	60	43	60	43	“is” should be “are”	Accepted.
37906	11	60	43	60	43	add 'and' after 'ease-of-use'; replace 'is' with 'are'	Accepted.
23671	11	60	44			What dams and what rewetting? Great to provide an example but I don't understand it	Accepted. Edited.
37907	11	60	44	60	44	remove 'for instance'	Accepted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21034	11	60	15	60	34	Please check this section - you mix human weighing ("… need to be balanced") with ecological restraints. Either the human diemension is not warranted here - it is no ecological barrier - or you should state clearly that weighing and judging of ecological aspects is covered here, too. But then the whole section could be deleted because this is included in the other sections, too.	Partially accepted. The existing environmental conditions in a location (e.g. soil quality or availability of water) can enhance the implementation of an AFOLU measure, providing an opportunity. Lack of pre-existing enabling conditions could then become a barrier. This is what is discussed here: the existing conditions and how these are enabling conditions or not. What is discussed in section 11.7 is the impact of AFOLU measures on the environment. These impacts will be again on soil and water, but later in the future. We edited the text to avoid this confusion again.
22940	11	60	17	60	20	I agree with this notion. I also want to hear actual examples about "many ecosystem services" that are undervalued in the long-term context.	Noted. Unfortunately we don't have space for examples.
31042	11	60				Strong focus on agricultural systems. Suggest including forest effects - see P 40 L39.	Accepted. Text improved.
24850	11	61	1	61	9	There is discussion of MRV barriers on page 61 to the take up of opportunities in the agriculture sectors. The improvement of MRV approaches should be a focus of ongoing effort to decrease uncertainty of emissions estimates and increase the capacity of the sector to contribute to emissions reductions targets. In the discussion of barriers and opportunities in relation to MRV, a sentence could be included that notes that improving MRV provides the benefits of reducing the uncertainty of emissions estimates and increasing the capacity of the sector to contribute to emission reduction targets.	Partially accepted. Reference added and MRV discussed further in section 11.10
21035	11	61	1	61	9	Please rework this text. The IPCC NGGIG are not meant to be used on a project level (as REDD is) and the standard methodology included therein may be too coarse for this task. Also, methods for monitoring of C stocks do not offer a technical opportunity for implementing REDD, they allow for monitoring and controlling a project.	Accepted. Text revised.
37908	11	61	1	61	9	Create two sentences rather than one sentence paragraph	Accepted. Paragraph rewritten.
37912	11	61	12	61	12	Replace 'for' with 'due to'	Accepted. Sentence rewritten.
37913	11	61	13	61	13	Do the authors really think that "risk" is not an economic reason. Nobel Prizes in economics have been won for work done on risk.	Accepted. Statement removed.
37914	11	61	13	61	13	Add parenthesis in front of 'including'; replace including with 'e.g.'	Accepted. Rewritten.
37915	11	61	14	61	14	Add parenthesis after 'barriers'	Accepted. Rewritten.
37916	11	61	16	61	16	Add semicolon after 'institutions' and semicolon after 'education'	Accepted. Rewritten.
31484	11	61	19	65	20	COMMENT: In SPM page 16 it is stated: "Many scenarios focus on afforestation and reforestation, in which case the land use sector can become a carbon sink by mid-century. [6.3, 11.9]". COMMENT: Forest management strategies should be offered more explanation in Ch11. Such strategies are hardly mentioned in SOD of Ch 11. Such strategies are even offered more space in chapter 12.8.2 “Urban carbon sinks”.	Accepted. Forest management strategies are discussed in section 11.3 and numbers are discussed in section 11.6 rather than here.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37917	11	61	19	65	20	There are multiple mentions of models with almost no references. Without some knowledge of the models it is impossible to judge how well they be predicting. I am suspicious of statements that just say that a model has made this estimate.	Accepted. Added references to chapter 6 or specific papers where possible.
37909	11	61	2	61	2	Remove 'to' and 'here'	Accepted. Text revised.
37919	11	61	21	61	25	Rewrite for clarity	Accepted. See comment 37918 above.
29836	11	61	23	61	23	“not merely of” should be “not merely on”	Accepted.
19381	11	61	29	61	34	Could be reduced to one short sentence. Especially as your chapter is too long already. Wouldn't be a bad idea to start the whole paragraph with "Scenarios ignore…" on row 36.	Accepted with modification. The paragraph was rewritten and shortened.
37920	11	61	29	61	33	Rewrite for clarity	Accepted. See comment 19381 above.
23672	11	61	30			Not a sentence	Accepted. Unclear what the reviewer referred to but all sentences have been revised.
37921	11	61	34	61	34	Remove 'an'	Accepted.
23673	11	61	38			Talk about a feedback loop here- for mitigation options that also provide economic benefits or water benefits or food security benefits- if these other benefits can be highlighted or some type of compensation provided, wouldn't that reduce risks of improper reversals?	Accepted. The paragraph was extended to include the notion of the comment.
37922	11	61	38	61	38	After 'not' add 'fully'; remove 'completely'	Accepted.
37923	11	61	40	61	41	Rose and Lobowski (2013) is not in the list of references.	Accepted. The authors were reversed.
37924	11	61	42	61	47	What models?	Accepted. Reference added to table. See comment 37917 above.
37925	11	61	44	61	44	In many recent studies, biomass is largely deployed because it is considered carbon neutral and hence cost-effective mitigation option, please add this very important assumption here (the reason it is deployed).	Accepted. The sentence could be extended to include the notion of the comment.
37910	11	61	7	61	7	Remove 'Also' and capitalize 'field'. And replace 'show' with 'support'	Accepted. Rewritten.
37911	11	61	8	61	8	Remove 'that'	Accepted. Rewritten.
35294	11	61	9	61	10	Technology transfer from developed countries to developing countries can play a crucial role for developing countries in achieving emission reduction in the area of AFOLU. However, this chapter lacks discussion on such aspect. It is suggested to add one paragraph to discuss barriers and opportunities related to technology development, diffusion and transfer.	Accepted. Paragraph added at end of section 11.8
27275	11	61	6		6	only some DEVELOPED countries use the IPCC 2006 GLs - it wil be mandatory for these countries from 2015 onwards. Developing countries, except for one estimation or another, still broadly use the Revised 1996 IPCC Guidelines - make the para more precise	Rejected. The IPCC 2006 GLs are used as basis for some methodologies for carbon accounting in developing countries or as providers of default values (see FAO tool EXACT or VCS methods).
24164	11	61	9	61	10	Between line 9 and 10, please add one paragraph to describe Barriers and opportunities related to technology development, diffusion and transfer".	Accepted.
37918	11	61	19			11.9 needs to be rewritten for clarity and consistency. There are changes in 'tense' throughout. Another example is 'suggesting that models are cost-effectively keep N20 and CH4 emissions low.'	Accepted. We start the section with a brief introduction of the concept of transformation pathways and clearly refer to Chapter 6 where they are presented in more detail.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33270	11	61	28			In section 11.9.1 it is unclear what exactly you are referring to as transformational pathways. Could you specify?	Accepted. See comment 37918 above.
21037	11	61	28	63	23	The section is titled "characterisation of transformation pathways", but there are no pathways given or described. Instead, isolated aspects are given, and this in a redundant way. As ist is, the section could be deleted without loss of information. If you want to retain it, please give more thought on what pathways there are (types, groups or families of pathways, not single ones), where do they start, what are the assumptions, (where can the details be found), what are the relations with mitiogation, ...	Accepted with modification. See comment 37918 above.
29487	11	62		62		Needs explanation of the baseline	Accepted. Caption extended to be more comprehensive.
31045	11	62				Presumably negative values indicate increases? It would be good to mention that in the caption.	Accepted. Caption extended to be more comprehensive.
21036	11	62				Please clarify what is shown here. If you present emission reductions, and give negative values, this implies an increase in emissions. So it would be clearer to give emissions and reserve negative signs for true reductions.	Accepted. Caption extended to be more comprehensive.
37926	11	62	1	62	12	Citing the studies being referred to here would be helpful. It's rather meaningless without know the studies being drawn on for the points being made.	Accepted. Added references.
24852	11	62	12			Needs explanation of the baseline	Accepted. Caption extended to be more comprehensive.
37927	11	62	16	62	19	What is the bioenergy assumption - is it neutral? If not, why so lucrative? Please explain	Accepted. Add an explanation of accounting of bioenergy impacts on land emissions.
29837	11	62	2	62	2	“carbin” should be written “carbon”	Accepted.
31044	11	62	22	62	23	Are the "differences in modelling" indicative of different assumptions considered reasonable by the modellers, or are they indicative of errors in (some of) those assumptions? One would hope it is the former but that raises the question why they appear to differ so much?	Accepted. Text was revised.
19382	11	62	22	62	23	The sentence beginning with "For the most part" is of course true, but unnecessary and could be omitted.	Accepted with modification. Text was revised based on comment 31044 above.
19383	11	62	26	62	26	System abatement?	Accepted. Meant is "energy system GHG abatement" so GHG abatement within the energy system. Revised.
37928	11	62	27	62	35	This paragraph jumps around a lot (eg, in line 30, it seems like a transition is missing). Also what is 'modern bioenergy"? Please define. Basically it seems like the point is - modeling bioenergy is hard, esp in conjunction with mitigation efforts, lots of uncertainty - correct? Please make that explicit	Accepted. Paragraph was revised accordingly. Split into two, term "modern bioenergy" is now explained.
31487	11	62	28	62	28	The figure 250 EJ from modern bioenergy in 2050 differs from the 15-225 EJ in the Executive Sumary on p.5 l 21. This difference seems confusing, please clarify.	Accepted. Numbers revised - no modern bioenergy number now in ES
31486	11	62	28	63	35	Refernce to figures 6.9, 6.19 and 6.35 and a discussion of the figures would be helpful, in addition to the table 11.10.	Accepted. Referencing changed throughout the section.
19384	11	62	33	62	35	This sentence could be omitted, states an obvious fact.	Rejected. Just because mitigation is lower does not necessary mean that there is less land conversion. Anyway important to emphasize here.
24851	11	62	4	62	5	“… suggesting that models are cost-effectively keeping N2O and CH4 emissions low. Reword - meaning not clear	Accepted. Sentence was revised. Same comment as 29486 above.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31043	11	62	5	62	7	"Land emissions reductions only increase slightly with the stringency of the target as energy and emissions reductions increase faster with target stringency." If this is correct, it could be clearer; as it stands it seems self-contradictory. Perhaps the words "total global" should be inserted before "energy and emissions reductions"? Or is there actually an error?	Accepted with modification. The term "industry" was added to give the sentence more sense.
19119	11	62	8	62	8	Sequestration and use is more beneficial than just sequestration. Also on page 63 line 31 it is stated that harvesting could be reduced to increase carbon storage. This could occur, but due to competition some of the annual increment will die and in older trees the current annual increment is near or at zero.	Accepted. This statement was differentiated. Sentence on page 63 line 31 revised.
31485	11	62	9			The table seems difficult to understand and needs more explanationi	Accepted. Caption extended and text about table revised slightly. See comments on Table 11.10 above.
33319	11	62	9			Table could be presented as figure with reviewed numbers.	Rejected. Figures were attempted during drafting but considered less effective and comprehensive than the table.
29486	11	62	4		5	… suggesting that models are cost-effectively keeping N2O and CH4 emissions low. Reword - meaning not clear	Accepted. Sentence was revised.
27958	11	63	1	63	14	Please elaborate more on the effects of a fragmented policy context on the institutional and socioeconomic structure and on the mitigation potential.	Accepted. These aspects are discussed further in section 11.10 rather than section 11.9.
27959	11	63	14	63	17	Please provide more information (cause and effect chain) how delayed policies on REDD impacts on deforestation. Also provide information how a phased implementation of emissions reductions in the different land sectors could look like thereby avoiding adverse side-effects.	Accepted. These aspects are discussed further in section 11.10 rather than section 11.9.
21247	11	63	2			Should the term be "carbon"	Accepted. Comment refers to wrong place. Comment 29837 above pointed to the correct page 62.
31046	11	63	20	63	23	"and offset supplier voluntary participation incentives may affect the net GHG benefits of mitigation (Rose et al., 2013a)". The phrase "offset supplier voluntary participation incentives" is difficult to unravel. Perhaps "offset" should be "offsetting"? (though it still confusing).	Accepted. Sentence revised.
31047	11	63	25	63	26	Something is wrong with this sentence. Should "forest" in L. 25 should be "in forest cover" or "forested" ?	Accepted. Sentence revised.
27960	11	63	25	63	26	A late response and high levels of GHG in the atmosphere leave lesser options for mitigation in balance with biodiversity conservation and development. Please sensitize more here!	Noted. Comment unclear so not clear what action to take.
31488	11	63	26	63	27	QUOTATION: "Implications of transformation pathway scenarios that have large areas forest for C sequestration in given regions (e.g. see Figure 11.18) depend upon how the forest area increases." COMMENT: Please consider to insert the word "partly" (depend partly upon). Forest management will e.g. have the same effect.	Accepted. Sentence revised.
21038	11	63	26	63	27	Natural forest area can remain stable or decrease, it cannot increase. That could only be if you counted second-generation succession forests on formerly deforested lands as "natural".	Accepted. Sentence revised.
31048	11	63	30	63	31	It is stated "…unless wood harvest is reduced to enhance carbon storage". This seems like an example of not considering the full system impacts of possible mitigation activities. Wood harvest could be reduced to increase ecosystem carbon storage, but it will mean that 1) carbon stored in forest products will decline, and 2) more emission-intensive products might need to be used in place of wood. So reducing wood harvest would enhance ecosystem carbon storage (but not ecosystem sinks) though the net effect may or may not be positive in terms of mitigation.	Accepted. Sentence revised.
29838	11	63	32	63	32	The sentence should be ended by a full stop, the dot is missing.	Accepted. Added dot.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21039	11	63	24	64	20	This section is redundant with text earlier in this chapter, can be deleted completely as figure 11.18 is not legible, too. If you need to retain it the section needs thorough revision. The different models in figure 11.18 attribute e.g. "forest" and "other arable lands" in Asia differently, not only by magnitude, but by sign. In line 4 - 5 you reference "transformation pathway scenarios" to the figure, but how should the reader know what model uses which scenarios? Are the land cover changes part of the scenario or results from modeling? Showing the figure the way you do - without exploring and explaining the differences between models - just gives a very desastrous message to the readers. So please explain why the attribution differs, which model represends what pathway(-s) etc.	Accepted. Revised Figure 11.18 for readability and added explanatory text for to figure.
30528	11	63	28	63	30	There are several cases where large-scale plantations may also enhance biodiversity, water resources and strenghten ecosystems, provided good management practices are adopted (for example, various successful cases may be found in Forest Stewardship Council Certification and in different countries as a result of proper domestic legislation) Useful References: SCOLFORO, 2008, ALCIDES, Felipe Rodrigues, Considerações Ecológicas Sobre Plantios de Eucalipto – Anais do VIII Congresso de Ecologia do Brasil, September 23rd to 28th, 2007, MG, etc.)	Noted.
31049	11	64				The three model results are so different that one cannot interpret the anticipated change in forested areas, biomass feedstock areas or agricultural areas with reductions in non-Co2 GHGs. Please simplify the figure to match the associated text.	Rejected. Figure was not changed, non-CO2 GHGs are not discussed in associated text.
19385	11	64	1			Impossible Figure to read. Should be as a Table. In most cases the "Baseline" and 550 ppm are the same. Maybe it is self-explanatory as the scenario only goes to 2030? 550 ppm we get without any measures anyway? So why put it here?	Noted. Figure is complex, but more accessible than a table because it helps comparisons, also between subtle differences between baseline and 550 ppm scenarios.
37929	11	64	1			It is disappointing to see only three models in Figure 11.18, given that 18 models participate in EMF-27 (no CGE models are represented in Figure 11.18). Further, there must be better ways of presenting land use results than the format of Figure 11.18.	Accepted. Revised Figure 11.18 for readability and added explanatory text for to figure. Results are illustrative and limited to the model comparison of Popp et al.
37930	11	64	1			This graph is only mentioned twice in the text and is not well integrated with those comments. In addition the enormous variation represented by the three models is not addressed and needs to be	Accepted. Revised Figure 11.18 for readability and added explanatory text for to figure.
37932	11	64	12	64	12	Change second 'of' to 'on'	Accepted.
37935	11	64	17	64	17	Remove "the' and 'of'	Accepted. But comments refers to line 14 - action taken there.
37933	11	64	17	64	20	Large scale agriculture can employ "best management practices" (what you mean by this). Second, the world will soon need to feed 10-12 billion people. Trying to feed today's population - let alone the people who will arrive over the next couple of decades without "large scale industrial agriculture" would likely require every scrap of land on the planet that is not in urban use. What would be the implications of this for ecosystem services? The authors need to be more objective and balanced when it comes to modern agribusiness.	Partially accepted. Accepted first part. "Best management practices" can be explained in an example. Rejected second part. The matter is presented in a balanced way. It is made clear that mitigation in agriculture can lead to trade-offs regarding other sustainability issues.
37934	11	64	17	64	20	Wouldn't more industrialized production practices also imply higher per acre productivity, which would reduce pressure to LUC etc.? Looking at this only for the particular acre under consideration misses the big picture, and creates a biased view on how to best move the global AFOLU system towards mitiagation and sustainability outcomes.	Noted. But metric retained.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21040	11	64	2			What are "the four pathways"? If there are only 4 used as reference cases here, are the same ones used in 11.9.1 and 11.9.2? If yes, please reference them / explain them in 11.9.1. If tehre are more than 4 delete "the four".	Accepted. Pathways are now defined in the first paragraph of the section.
19386	11	64	4	64	11	Could be omitted, has already been said.	Rejected. Figure 11.18 revised and text added related to figure.
37931	11	64	4	64	20	This seems to be somewaht repetitive from earlier text on food. The general logic is valid - but only to a point. If production of the food can simply move to other land food prices may not increase. And what if rising food prices cause a shift in demand toward lower GHG intensive foods and - in developed - countries lower food consumption?	Rejected. This text discussed the same topic but from the context of IAMS simulating transformation pathways, so text retained.
31489	11	64	6			QUOTATION: "If natural forest or other natural land is used for bioenergy, ecosystem services provided by these natural lands could be lost and initial GHG emissions from land use change could be high." COMMENT: It seems reasonable that the initial GHG emissions could be high, but if the carbon cycle is maintained it is unclear how this will negatively affect the stabilization concentration in the atmosphere in the relevant long term. Could you please clarify?	Accepted. Text rewritten.
21041	11	64	6			Do you mean section 6.6. or 11.6?	Rejected. Reference to 6.6 is correct.
30289	11	64	19	64	19	Add “and animal welfare” after “ecosystem services.” As previously stated, industrial farm animal production poses numerous risks, including to animal welfare. Pew Commission on Industrial Farm Animal Production. 2008. Putting meat on the table: industrial farm animal production in America, pp. vii, 6, 23. www.ncifap.org/bin/e/j/PCIFAPFin.pdf. April 20, 2013.	Rejected. Reference is not peer-reviewed and cannot be included.
37936	11	65	1	65	20	The section makes it seem like the document is a report on sustainability - it never mentions mitigation. The section needs to be reframed in its entirety to more clearly address mitigation.	Noted. Important to reinforce that the mitigation actions for the AFOLU are strongly related to increase of sustainability of the sector.
29840	11	65	13	65	13	“agricultre” should be “agriculture”	Accepted. Text revised.
37938	11	65	13	68	21	The tradeable permit market discussion is dated. In addition to dated references, no mention of the second largest cap and trade market (after EU, which does not include ag and forestry under cap or in offsets) is California, which does include ag and forestry offsets - including development of REDD projects. Also New Zealand includes forestry under the cap, and has developed a scheme for including ag under the cap, though has delayed implementation due to "lagging international commitments."	Accepted. Suggested markets are now mentioned in text.
19387	11	65	2	65	2	Which four pathways? Couldn't find them in earlier text, even though tried very hard.	Noted. Has been deleted.
37937	11	65	2	65	2	What four pathways? Were 4 specific ones laid out somewhere? Not explicit - please explain	Noted. Has been deleted.
31052	11	65	22	65	22	What does "the most diverse" imply here?	Noted. Text revised to become clearer, i.e., different policies with diverse objectives could affect mitigation responses.
22158	11	65	22	65	36	Please consider social justice and equality in your discussion. It should also be kept in mind that policies have an impact on people first. The outcome of this impact can significantly determine success/failure of the policy.	Noted. The revision considers the safeguards that include social aspects.
20156	11	65	22	65	36	please consider in you discussion social justice and equality. Moreover it should be kept in mind that policies first of all have an impact on people. The outcome of this impact can significantly determine the success/failure of the policy.	Noted. The revision considers the safeguards that include social aspects.
37939	11	65	23	65	23	Remove 'that are'	Accepted. Text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37940	11	65	28	65	30	This seems to be rather repetitive with elsewhere in the text. Consider deleting.	Rejected. It is important to stress that interactions between policies can be positive or negative.
29841	11	65	30	65	30	“in some case” should be “in some cases”	Accepted. Text revised.
37941	11	65	30	65	32	This presents a nice couple of things to do but the link to mitigation is assumed; pleasy clarify.	Accepted. Text revised to indicate the link with mitigation.
29842	11	65	34	65	34	“economics incentives” should be “economic incentives”	Accepted. Text revised.
37942	11	65	35	65	36	Explain why briefly.	Noted. Sentence was rewritten to highlight the substantial advances in the international discussions on REDD+.
21042	11	65	37	65	43	Please give the attribution of the missing "%"-values (3.48% of what were A/R or Agric. Projects, the rest: ?)	Accepted. Text revised to clarify these relative values.
37943	11	65	37	68	21	Somewhere in the section, add a reference to R&D investments in productivity enhancement as a mitigation policy - perhaps as a separate section at the end.	Accepted. A subsection on R&D investments was added.
37944	11	65	38	65	40	So have the mitigation goals of the KP been reached at the least economic cost? Please explain.	Rejected. This analysis is beyond the scope of this section.
27961	11	65	40	65	43	Add in line 40 after "cost." and before "The CDM" the sentence "Finance streams coming from CDM LULUCF Projects are marginal."	Accepted. Sentence was included in the text.
25821	11	65	41	65	42	The term "emission reduction instruments" can perhaps be replaced by "emission reduction units (Kyoto units)". Also, emission trading under the Kyoto Protocol is not limited to CDM/JI units, the assigned amount units can also be traded.	Accepted. Text revised.
31053	11	65	43	66	3	This sentence is long and confusing. Consider revising	Accepted. Text revised.
37945	11	65	44	65	44	Please define 'successful' in this context.	Accepted. Definition added and text revised (see also comment 1590).
29839	11	65	7	65	7	“in future” should be “in the future”	Accepted. Text revised.
33320	11	65	9	65	20	Summary of 11.9.3 could be turned into table to clearly discern opportunities and concerns.	Partially accepted. Section 11.9.3 has been drastically reduced.
31051	11	65	21	72	22	Suggest striving for a more equitable treatment of different sectors in consideration of Sectoral Policies. The structure is good: it presents a ranges of policy options and examples; it presents a list of international organizations involved in assisting in the development and implementation and improvement of such policies; and it presents some considerations in the development and implementation of such policies. This last aspect appears to be the weakest part of this section, e.g. risks and/or barriers to effective sectoral mitigation policy.	Accepted. Section revised and improved.
33321	11	65	21			The section remains rather descriptive. It provides an overview without systematically assessing success or shortcomings of various policy approaches.	Noted. Unfortunately the available literature presents few cases where effectiveness of the policies are deeply evaluated.
33323	11	65	21			This section should discuss how policies facilitate sector specific behavioural change.	Accepted. Now included in section 11.10.
21043	11	65	37	66	5	Please check what is meant by "voluntary markets". If this denotes programmes of e.g. companies to offer "zero emission transport" to their customers by supporting afforestation projects, these "credits" are often outside the ET of the KP and not reglemented in any way. In this case, they should not be treated as CERs or other tradable C credits (that are traded on markets created by policy decisions - the KP, for example). Frankly, they are not C-related, but part of PR / marketing.	Accepted. Text has been revised to clarify these aspects.
31050	11	65	20	65	20	Tech transfer opportunities also exist to contribute to sustainable development through forest management and monitoring. This could be added.	Accepted. A comment has been added.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37946	11	66	1	66	1	The first word of REDD+ is ReducING, not ReducED.	Accepted. Text revised.
26088	11	66	12			*Observation: Recent research suggests that the WALFA experience is also applicable in other regions, including southern Africa and South America. *Suggested Text: Explorations of the potential applicability of savanna burning as an emissions reduction strategy in countries such as Namibia and Venezuela suggest that community-based, emissions abatement savanna fire management opportunities are likely to be applicable across many fire prone savanna landscapes of southern Africa, South America and Asia as well as Australia (Russell-Smith et al, in press). *References: Russell-Smith J, Monagle CM, Jacobsohn M, Beatty RL, Bilbao B, Millan A, Vessuri H and Sanchez-Rose I. (in press) Can savanna burning projects deliver measurable greenhouse emissions reductions, and sustainable livelihood opportunities for indigenous and local communities, in fireprone settings? Climatic Change	Noted. Comment will be added if a published reference can be found.
21248	11	66	13			Change term to "agriculture"	Accepted. Text revised.
19388	11	66	18	66	18	REDD means Reducing Emissions from Deforestation and forest Degradation, not like is said here. In addition, the abbreviation came already earlier (in Summary and then on p. 41 row 2) in text and should be explained there. Please then, explain right!	Accepted. Text revised.
19116	11	66	18	66	18	Reduced emissions by deforestation and forest degradation (REDD+). The REDD initiative should be successful in tackling degradation, but unless agricultural productivity increases, especially in the subsistence sector, deforestation may occur at the rate of population increase, despite REDDs efforts.	Noted.
37948	11	66	18	66	33	The most significant aspect of REDD+ policy, that it is targeted at governing/institutional scale action (e.g. national or provincial/state) is ignored. REDD+ is not a "project" mechanism, and that is the most important part of the policy. As pointed out throughout the document, good AFOLU mitigation outcomes will require good local governance. As such, the UNFCCC policies have been heavily tilted towards institutional/national accounting, policy, etc... it specifically has been designed DIFFERENT from CDM A/R (which occurs at the project scale) to build the necessary governance and institutional ownership to enable positive outcomes. Any discussion of REDD+ that ignores this significant policy design completely misses the point.	Noted. The text on REDD+ was revised, and scale is mentioned in the framing paragraph.
27963	11	66	18	67	20	This should be shortened.	Rejected. The text on REDD+ was revised, however the discussion on REDD+ is one of the key aspects for the sectoral policies, thus the reduction of the text is very difficult.
20270	11	66	22	66	22	The term used in the context of REDD+ in UNFCCC is ‘sustainable management of forest’ (SMF) and not ‘sustainable forest management’ (SFM) as used in the text here. SMF is now being increasingly understood by the international community as a set of management practices that does not allow conversion of natural forests into plantations, thus conserving biodiversity, and also respects the rights of local communities over forest resource. In view of this, it will be advisable to use the phrase SMF (and not SFM) only in the context of REDD+.	Accepted. Text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37949	11	66	22	66	24	"The mechanism will finance not only forest conservation and avoided deforestation but also sustainable forest management and enhancement of carbon stocks restoration / afforestation / reforestation." This is not entirely correct. REDD+ includes five activities (paragraph 70/1/CP16), which include reducing emissions from deforestation, reducing emissions from degradation, conservation, sustainable management of forests, and enhanced forest carbon stocks. Countries may use REDD+ financing for a host of different actions with the goal of achieving one or more of these activities; ultimately it is expected that incentives will also include payments for emissions reductions.	Noted. The text on REDD+ was revised and the five activities were mentioned in the framing paragraph.
27964	11	66	26	66	26	Delete "avoided" and insert "reduced" this is the term used also in international negotiations, "avoided" was refused because especially in projects "avoided" would not guarantee reduction. As same emissions could occur outside the project.	Accepted. Text revised.
37950	11	66	27	66	30	"Although the UNFCCC consider market-based instruments to support REDD+ activities, several issues (like environmental integrity, risk of leakage, non-permanence and excess supply of credits, difference in views on the use of private finance) have so far prevented the development of compensatory mechanisms in these activities supported under the UNFCCC." The UNFCCC has noted it COULD consider both market and non-market-based approaches. Though the issues listed are important, they have not been major stumbling blocks in advancing REDD+ negotiations.	Accepted. Text revised.
19389	11	66	29	66	29	Are we talking about private or public finance here? I don't see how there could be differences in views of using PRIVATE finance?	Accepted. Text revised.
37947	11	66	3	66	5	The Peters-Stanley citation looks like a newspaper article. If so this is pretty weak support for a scientific assessment of this magnitude.	Rejected. The document is a report that compiles information from different experts and countries.
31056	11	66	32	66	32	Change cross-reference to Table 11.11.	Accepted. Text revised.
37951	11	66	32	66	32	Table reference is wrong - it should be 11.11	Accepted. Text revised.
37952	11	66	37	66	37	MRV in a REDD+ context refers to MEASURING, reporting and verifying.	Accepted. Text revised.
37953	11	66	40	66	40	Add a space after '(2009)'	Accepted. Text revised.
29843	11	66	5	66	5	“of them” should be “of which”	Accepted. Text revised.
24853	11	66	6	66	12	This paragraph has important references to Australia's Carbon Farming Initiative (CFI) and Western Arnhem Fire Abatement Project (WALFA)- suggest important to keep if the chapter is shortened	Noted. References were maintained.
24854	11	66	6	66	7	Suggest Insert this text at line 79 after "2012": The area of agricultural land that is economically viable for reforestation between 2012 and 2050 (550pm global action scenario) and that is likely to be taken up in the CFI is estimated at 0.35 million hectares, representing about 0.1 per cent of agricultural land in Australia. Citation: Burns, K, Hug, B, Lawson, K, Ahammad, H and Zhang, K 2011, Abatement potential from reforestation under selected carbon price scenarios, ABARES Special Report, Canberra, July 2011.	Rejected. The additional information is not essential for the subject of the section.
27962	11	66	9	66	17	Shorten the Australian example.	Rejected. There is no justification to shorten the text that is already concise.
31054	11	66	12	66	15	Alberta's C-offset system does not focus exclusively on N2O emission protocols - it is one of many (http://carbonoffsetsolutions.climatechangecentral.com/offset-protocols/approved-alberta-protocols)	Noted. Text revised.
26994	11	66	24			Consider add some other references on the cost of REDD as a mitigation option (NEPSTAD, et al. 2009. The end of deforestation in the Brazilian Amazon. Science 326: 1350-1351.	Noted. This is considered in the cost and potentials section.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31055	11	66	29	66	30	Compensatory mechanisms under the UNFCCC that would include REDD+ activities are being developed under the negotiations for a post-2020 regime. These include development of the Green Climate Fund as part of the financial mechanism and a new market mechanism or framework of market-based approaches. While it remains unclear whether Parties will include international offsets from REDD+ towards their 2020 targets, the possibility remains and would improve with the finalization of an agreement on the methodological rules and guidance.	Noted. Text revised.
31057	11	66	36	66	36	Suggest qualifying purpose of crediting here. E.g. "...requires [for using towards emissions reductions targets under the UNFCCC]…"	Accepted. Text revised.
29488	11	66	6	66	7	Insert at line 79: The area of agricultural land that is economically viable for reforestation between 2012 and 2050 (550pm global action scenario) and that is likely to be taken up in the CFI is estimated at 0.35 million hectares, representing about 0.1 per cent of agricultural land in Australia. Ref: Burns, K, Hug, B, Lawson, K, Ahammad, H and Zhang, K 2011, Abatement potential from reforestation under selected carbon price scenarios, ABARES Special Report, Canberra, July 2011.	Rejected. The additional information is not essential for the subject of the section.
19391	11	67	1			Were the negotiation in the beginning after all RED negotioations and not REDD+ -negotiations? This is also said at the bottom square of the COP-11 Montreal point in the timeline.	Accepted. Figure revised.
37954	11	67	1			Figure should be updated to include 2012 Doha meetings.	Noted. Figure will be revised and edited. If possible (due to space limitation), the decisions of the 2012 meeting will be included.
37955	11	67	1			The Durban decision noted that we could CONSIDER both market and NON-MARKET approaches	Accepted. Figure revised.
37956	11	67	1			Define COP in the caption; 'RED' in the second box under 2005' - is this correct or should be REDD?	Accepted. Figure revised.
19390	11	67	14	67	15	What are "Climate community" and "Conservation community"?	Noted. Text revised.
37959	11	67	21	67	21	The Amazon Fund is not national.	Rejected. Although the fund receives funds from international donors, the administration is entirely under Brazil´s responsibility.
27965	11	67	21	68	9	Delete the box and insert an sentence instead which gives reference to those and other projects (e.g. the FCPF) instead.	Rejected. The three examples cover areas with large forest cover. Other projects and programs were included in table 11.11
23675	11	67	23			Some quantitative information on this would be helpful- # of ha impacted, monetary contributions..	Accepted. Information added.
37960	11	67	30	67	30	Spell out FCPC as it is the only place mentioned in this chapter	Accepted. Text revised FCPC is also mentioned (and also spelled out in Table 11.11)
21249	11	67	32			Change term to "readiness"	Accepted. Text revised.
23797	11	67	37		47	The authors of this para have relied on old, and very limited, information base.	Rejected. Most of the references included cover the period between 2007 and 2013 (i.e. since AR4).
23795	11	67	42		44	The claim by Agrawal et al., 2008 that effectiveness of forest governance is increasingly independent of formal ownership is merely an ideological position and has little to do with the ground realities. These researchers failed to examine the vast data available from north eastern India where tribal communities own large extents of forest lands as also in southern India which had substantial extent of forest lands under private ownership and in the hill state of Uttrakhand under the system of Van Panchayats. These examples suggest that the governance of forests outside of public ownership in deveoping countries is almost always poorer.	Noted. Text was revised with more focus on the safeguards discussed under the UNFCCC.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23796	11	67	44		47	These lines are unnecessary because protection of stakeholders rights, including rights to continue sustainable traditional land use practices, as a precondition for REDD+ has already been incorporated as REDD safeguards under the COP decisions at Durban.	Noted. Text was revised with more focus on the safeguards discussed under the UNFCCC.
37957	11	67	7	67	9	The authors should explain why an international leakage threat would remain	Noted. Additional information was added.
37958	11	67	8	67	20	Such international leakage is true for the entire UNFCCC accounting/accountability system, and is not unique to AFOLU. Highlighting it here biases against AFOLU mitigation options, and then is further biased by pointing out scary hypotheticals (e.g. Putz & Redford 2009) that have no basis in actual experience, and ignore the institutional barriers that have led those intact forest areas to remain as such to date. The authors should make a concerted efforts to show how this issues is being addressed in the literature?	Rejected. Emission displacement is an issue relevant for the AFOLU and should then be treated in this section.
31058	11	67	1	67	1	In the final box (on the right side), the notes on the Durban decisions fail to recognize that REDD+ market-based finance is being considered under the general structure of market mechanism(s) that is under negotiation at this time.	Accepted. Text was revised to be consisted with UNFCCC discussions and decisions.
26996	11	67	11			Biodiversity is only affected if REDD is based on a project-by-project approach. REDD operating in a subnational or national scales with a appropriated system of benefits sharing (for example those based on the stock and flux approach) can avoid biodiversity losses (see Moutinho et al. 2011. REDD in Brazil. http://www.ipam.org.br/download/livro/REDD-in-Brazil-A-focus-on-the-Amazon/583)	Noted. Biodiversity aspects related to REDD+ are reported together with the other safeguards discussed inside UNFCCC. A detailed discussion is not possible considering space limitations.
26997	11	67	21			There are others REDD initiatives that should be cited in the Box 11.6. For example those initiatives promoted by Amazon Brazilian states (Acre, particularly) or through agreements among states like those under the Governors' Climate and Forests Task Force (GCF).	Rejected. Examples were selected based on the geographical scales.
26995	11	67	8			International leakage is also a problem of sectors related to fossil fuel and not exclusive of REDD. So, please consider make this comment in the section.	Rejected. Topic is treated in the different sectoral chapter.
23798	11	68				This Figure dealing with historical evolution of REDD+ provides very little value to the text . A fit case for deletion.	Rejected. Due to space limitation, the figure is a way to present condensed information and was a demand of the previous review round.
21371	11	68	10		21	Is there room here to consider implications of removing subsidies on fossil fuels? This would increase prices of fuels and energy intensive products/systems and hence have a positive impact on the relative cost of biomaterials and local/seasonal production systems.	Rejected. This aspect is considered in other chapters.
37962	11	68	10	68	21	Subsidies include agri-environmental policies that promote the adoption of best management practices on working lands (as well as set-asides). This is currently discussed under the next section on regulatory and control approaches and could use some expansion. (See Jones, Nickerson and Heisey for a discussion in US context.)	Noted.
27966	11	68	11	68	11	It is not clear what "pollution control " means? The examples provided suggest that "pollution control" should be replaced by "GHG and their precursors emissions control".	Accepted. Text revised.
31059	11	68	16	68	16	Consider inserting: "was" before "abolished" ?	Accepted. Text revised.
37963	11	68	17	68	17	The Mahlin 2012 citation is not in the list of references.	Accepted. Reference was included.
19392	11	68	18	68	21	This sentence doesn't seem to belong here.	Rejected. Low interest loans that require the adoption of mitigation practices is a strategy included in Economic incentives.
37964	11	68	19	68	20	The presentation implies that "sustainable agricultural practices" and "Low Carbon Agriculture" in Brazil are equivalent. Is this the case?	Accepted. Text revised to clarify this point.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37965	11	68	28	68	36	This is a very cursory treatment of such a potentially major AFOLU GHG mitigation case study. The recent drop in deforestation in Brazil is the result of unprecedented changes in how Brazlian society views the Amazon forest the willingness of producer groupsto participate; the rise in political will to slow down deforestation; increase intensification of Brazilian agriculture, and a number of other factors. The story of how all these factors evolved to a state where the progress seen recently was possible should be a major case study of the chapter.	Rejected. The Brazilian case was highlighted in a box a special case. However, due to space limitation and the need to cover different policies instruments it was not possible to expand the text.Q1669
27383	11	68	29		30	The data contained in "www.obt.inpe.br/prodes" has been updated: Deforestation rates in Brazilian Amazon decreased by 83% from 2004-2012 (from 27,772 km2 to 4,656 km2 /year)	Accepted. Text revised.
37961	11	68	3	68	3	Correct misspelling in bolded title	Accepted. Text revised.
27384	11	68	36		36	Please, replace "deforestation legislation" by "legislation on deforestation control"	Accepted. Text revised.
22408	11	68	37	68	43	This option may not be valid or not feasible for poor countries particularly sub Saharan Africa.	Accepted. Text revised.
30207	11	68	39	68	40	See comment for pg. 36, ln 27-28.	Noted. Text on land-sparing revised to mention possible short-comings.
30290	11	68	10	68	21	This section should specifically discuss farm animal production. For this sector, the FAO has indicated the need to correct market distortions that incentivize environmental damage while using other market-based policies to internalize externalities. Food and Agriculture Organization of the United Nations (2009). The state of food and agriculture: livestock in the balance (Rome, Italy: FAO, p. 74). Available at: http://www.fao.org/docrep/012/i0680e/i0680e.pdf. Further, Wirsenius et al. (2011) should be discussed here, as it is the only study I know of that analyzes the impacts of a tax on animal products. Wirsenius S., F. Hedenhaus, and K. Mohlin (2011). Greenhouse gas taxes on animal food products: rationale, tax scheme and climate mitigation effects. Climatic Change 108(1-2), 159-84. Additionally, it has been argued that simply removing animal product subsidies can improve health outcomes. Akhtar AZ, Greger M, Ferdowsian H, and Frank E (2009). Health professionals' roles in animal agriculture, climate change, and human health. American Journal of Preventative Medicine 36(2), 182-7.	Accepted. Considerations about animal production were included.
27276	11	68	21		21	provide reference	Accepted. Text revised.
26998	11	68	28			Consider add reference on the effect of credit restriction on deforestation reduction (http://climatepolicyinitiative.org/brazil/publication/does-credit-affect-deforestation-evidence-from-a-rural-credit-policy-in-the-brazilian-amazon-3/).	Noted. This aspect is already mentioned in box 11.7.
27000	11	68	33			The international low price for commodities (soy and beef) must be include as a factor reducing deforestation in Brazilian amazon as demonstrated by Soares Filho et al. 2010.	Rejected. The purpose of the section was not include an extended revision of the Brazilian case, but to present some policy instruments that were effective to curb deforestation.
30291	11	68	37	68	43	There are serious questions as to the viability of agricultural intensification as it relates to cattle, which should be mentioned here. Cohn A, Bowman M, Zilberman D, and O'Neill K (2011). The viability of cattle ranching intensification in Brazil as a strategy to spare land and mitigate greenhouse gas emissions. Working Paper No. 11, CGIAR Research Program on Climate Change, Agriculture and Food Security. Available at: http://cgspace.cgiar.org/bitstream/handle/10568/10722/ccafs-wp-11-the-viability-of-cattle-ranching-intensification.pdf?sequence=6.	Noted. This paragraph was revised to include examples from developing countries and this aspect mentioned.
37966	11	69	10	69	10	Please define NAMA.	Rejected. Definition is included in the glossary of WGIII report.
37967	11	69	13	69	23	What about the GHG mitgation related to fossil fuel replacement. It seems like the authors are citing a very partial treatment of biofuels.	Rejected. This will be considered in other chapters.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37968	11	69	13	69	23	The claimed impacts of biofuels on commodity markets and trade disputes certainly need more careful treatment than simply being stated and linked to what appears to be an introduction to a special edition of a journal. The negative presentation makes one question the authors' objectivity.	Noted. Additional references were added but the point was kept as it has an impact on policies for the sector.
23352	11	69	15			A 2008 reference quoting number of targets is well out-dated. Update (eg REN 21 Global Status Report 2013 - out in June 2013). Does "bioenergy" targets here also include targets for biofuels for transport? Need to differentiate by quoting number of targets/mandates for both.	Accepted. Updated reference was included.
31490	11	69	20			QUOTATION: "A recent study analyzed the consequences of renewable targets of EU member states on the CO2 sink for the EU forests and indicated a decrease in the forest sink by 4–11% (Böttcher et al., 2012)". COMMENT: If the forest carbon stocks are maintained, a temporal reduced sink (temporal overshoot) has to be seen in relation to the implications on the long term stabilization of the GHG concentration in the atmosphere.	Noted. Too detailed for discussion here.
19393	11	69	21	69	23	Why would global trade of biofuels result in long trade disputes?	Noted. The text is: Global trade in biofuels might have a major impact on other commodity markets (e.g. vegetable oils or animal fodder) and result in long trade disputes(Zah and Ruddy, 2009). Additionally, biofuels trade may offer interesting export opportunities for tropical countries who can produce biomass more efficiently, but whether this effectively leads to increasing exports depends to a large extent on the conditions that prevail in the major biofuel markets.
22159	11	69	24	70	2	This section lacks a critical discussion of certifications and the political use of sustainability. Using Rainforest Alliance as an examples highlights this. The number of certificates is as broad as their conditions to receive them. These types of certificates lack international, unified and transparent standards and can hardly be seen as a mitigation measure. It needs to be considered that certification bodies are enterprises depending on the income from fees giving out certificates. Several certification bodies have provably given out certificates for endangered species and unethical species.	Accepted. A short discussion on short-coming of certification schemes was included.
20157	11	69	24	70	2	This chapter lacks a critical discussion of certifications and the political use of sustainability. Using Rainforest Alliance as example underlines this. The number of certificates is as broad as their conditions to receive them. These type of certificates lack international, unified and transparent standards and can hardly be seen as mitigation measure. It needs to be considered that certification bodies are enterprises depending on the income from fees giving out their certificates. Several of the certification bodies have provably given out certificates for endanger species and unethical practices.	Accepted. A short discussion on short-coming of certification schemes was included.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25822	11	69	25	69	48	In these sections, different themes have got mixed up. First, the heading of section 11.10.3 "Information Schemes" does not fit in well; it is perhaps intended to say "Information, Communication and Outreach"? Yet under this section "implementation" costs have been mentioned. This does not fit in. Implementation costs are the main costs and are among the main economic factors discussed elsewhere. Here perhaps "education and communication" costs can fit in better. Secondly, certification has been mixed up with information and communication activities which is not the same thing. Certification concerns with the co-benefits. Usually certification activities link the climate benefits to sustainability benefits of climate actions. These are not merely information schemes. Again, certification has been mixed with voluntary action (voluntary systems/standards/ markets). Most known certification schemes are operated in the volunatry sector, true, but these are different from volunatry standards in carbon market.	Accepted. Sections and correspondent headings were revised.
23799	11	69	28		36	In Box 11.7 the FAO figures for decline of deforestation in Brazil may be used from FAO statistics FRA 2010.	Rejected. Data used are from the Brazilian monitoring system that is a fundamental part of the national effort for reducing deforestation.
31064	11	69	33	69	38	A lot more work has been done on sustainable forest management (SFM) adaptation and information sharing since 2008. This includes Canada, USA, Mexico, in addition to the tropical regions listed here. A lot of material has been published and can easily be found on the Web.	Accepted. Additional references were added but the text was not largely extended due to space limitation
19394	11	69	35	69	38	Tell where we could find info of these processes and what are they, e.g. what is Tarapoto?	Accepted. Text revised (part of the Peruvian Amazon).
21044	11	69	35	69	38	Please give a source for this statement.	Accepted. Reference was included.
23800	11	69	37		43	Example of sparing of land from agriculture from USA is not really relevant because land sparing in highly developed countries like US, Canada and EU often occur for reasons other than persuasion by governments. It might be useful to provide examples from China under their SLOPE and Grain for Green programs as also from similar attempts in Vietnam.	Partially accepted. Examples of land sparing programs in developing countries were included in addition to the example from a developed country,
31065	11	69	40	69	48	Many Canadian companies have obtained FSC certification for meeting SFM criteria--with many of these operating in boreal forests. Ways of incorporating climate change adaptation of SFM into Canadian certification standards are being pursued.	Noted.
19395	11	69	40	69	40	What other markets are there? Forced markets?	Rejected. The expression is commonly used (compliance markets and voluntary markets).
27967	11	69	41	69	41	Delete "avoided" and insert "reduced". This is the term used also in international negotiations, "avoided" was refused because especially in projects "avoided" would not guarantee reduction. As same emissions could occur outside the project.	Accepted. Text revised.
31060	11	69	6	69	6	Delete "that".	Accepted. Text revised.
31062	11	69	9	69	11	These two sentences should be joined, but the percentages need to be explained. Perhaps they refer to land area? E.g.: "Forty-three countries have proposed NAMAs [define] to the UNFCCC (as of December 2010), of which the agriculture and forestry sectors represented 59% and 91% of [define], respectively."	Accepted. Text revised to become clearer.
31061	11	69	9	69	9	Suggest defining "NAMA".	Rejected. Definition is included in the glossary of WGIII report.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25149	11	69	9	69	10	It is unclear what kind of “NAMA” is being referred to here. NAMAs have a precise technical meaning within the UNFCCC. It would be helpful to have a specific reference to where the “forty three countries” made their submissions. The new Registry has very few.	Noted. The text is considering the list of submissions available on the UNFCCC webpage. The Registry is quite recent and do not contain all the submissions.
31063	11	69	9	69	12	The last two sentences in this paragraph are important may be more appropriately included in the introduction to this Section 11.10.2 as opposed to limiting it to the Environmental Regulation section only.	Noted. The suggestion will be evaluated after the revision of this section.
26999	11	69	9			Consider add Brazil on the list of country with an emission target established.	Rejected. This is include in the list of NAMAs submitted by different countries.
30292	11	69	24	69	38	Consumer education for demand-side changes should be included here. See for example, the Sustainable Consumption Roundtable’s first recommendation on food concerning education in “nutritious and sustainable diets.” Sustainable Consumption Roundtable. 2006. I will if you will: towards sustainable consumption. Available at: http://www.sd-commission.org.uk/data/files/publications/I_Will_If_You_Will.pdf.	Noted. Information schemes are also related to consumer education.
37647	11	7	10	7	17	Join this with lines 18- 23; rewriting the start of line 18 accordingly; thus, one paragraph instead of two.	Accepted. Paragraphs joined.
37646	11	7	10	7	23	Shorten or delete these paragraphs as this is largely "methodological" and not substantive results, and a bit repetitive of earlier paragraphs.	Accepted. Paragraphs joined. Important to retain to show the reader what has changed since AR4.
37648	11	7	10	7	23	Suggest moving nearer to the beginning of the Introduction section	Accepted. Position changed in edit for FD.
32649	11	7	11	7	11	livelihoods are not a "service". Given that we are talking about 2 billion+ people, livelihoods should really be more prominent. "services and livelihoods"	Accepted. Wording changed.
24781	11	7	15	7	15	The term aquaculture includes fish farming by definition. The phrase "(=fish farming)" should be deleted.	Accepted. Wording changed.
24782	11	7	15	7	15	The phrase ”which often compete" should be replaced with "which may compete" unless examples which demonstrate the frequency of competition that supports use of "often" can be cited.	Accepted. Wording changed.
29894	11	7	15			Were freshwater fishereis and aquaculture really explicitly considered? It is not clear at all by reading the chapter because it is not mentioned anywhere but the last section 11.11	Accepted. Discussed more in FD, section 11.4.
37649	11	7	15	7	15	Change "(= fish farming)" to "(e.g. fish farming)"	Accepted. Wording changed.
37650	11	7	16	7	16	Change "through their requirements for land" to "through their land and/or water requirements". Remove comma after "indirectly"	Accepted. Wording changed.
37651	11	7	18	7	18	Change "deal with" to"we integrate AFOLU with respect to"	Accepted. Wording changed.
22481	11	7	18	7	20	In this chapter AFOLU was dealt with in an integrated way in different scenario projections:population growth, economic growth, land use change and cost of mitigation. So the data of implications and potentials should be given in these scenarios.	Accepted. They are given, but in sections 11.6 and 11.9, not in the introduction.
22120	11	7	19	7	19	Dietary changes could be considered as lifestyle changes which emphasises the complexity of the problem and makes understanding of knock-on effects and interactions clearer.	Accepted. Wording changed.
20115	11	7	19	7	19	Dietary changes could be considered as lifestyle changes which emphasises the complexity of the problem and makes and under standing of knock-on effects and interactions clearer.	Accepted. Wording changed.
37652	11	7	19	7	19	Remove "e.g.' before population growth	Accepted. Wording changed.
37653	11	7	20	7	23	Rewrite last sentence for clarity "We attemp"system response"	Accepted. Wording changed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24783	11	7	24	7	28	Unless the updated figs are also included, citing AR4 figures is not meaningful to the reader. Delete text or include summary of where AR5 results differ.	Rejected. We have a duty to report changes from the treatment of AFOLU in previous IPCC assessment reports. These numbered are updated in the chapter - and should not appear in the introduction.
22667	11	7	24			How about the mitigation potentials in the agricultural sector in this AR5?	Noted. These numbered are updated in the chapter - and should not appear in the introduction.
37654	11	7	24	7	26	Is the data in the first sentence necessary to the Introduction section?	Noted. We have a duty to report changes from the treatment of AFOLU in previous IPCC assessment reports. These numbered are updated in the chapter - and should not appear in the introduction.
27883	11	7	24	7	29	Please give here or where applicable an explanation why the estimation of GHG mitigation potential between AR4 and AR5 differ especially with regard to the range. This should also become part of the executive summary.	Accepted. Details to be added here and ES.
23342	11	7	29			Is this "Annex 1" the Bioenergy annex? Need to clarify	Accepted. Wording changed.
23775	11	7	3	7	4	Delete "Humans……worldwide" as it adds no scientific and aesthetic value to the para. The phrase 'human well being' in the preceding sentence is sufficient.	Rejected. Important to tell the reader that the land provides livelihoods and is not just a source of mitigation potential - competing needs have to be balanced.
37645	11	7	3	7	3	The authors should remove after "phenomena" the words "that are"	Accepted. Wording changed.
30956	11	7	34	7	34	The phrase "and the preenting an Annex" doesn't make sense.	Accepted. Wording changed.
37655	11	7	34	7	34	The sentence with the word "preenting" does not make sense.	Accepted. Wording changed.
37656	11	7	34	7	34	Correct misspelling of presenting	Accepted. Wording changed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20905	11	7	37	7	43	Non-CO2 emissions due to changes in land use or cover should be also considered in this section. It has been observed increases in CH4 uptake and decreases in N2O emissions after afforestation (Merino, A., Pérez-Batallón, P., Macías, F. 2004. Responses of soil organic matter and greenhouse gas fluxes to soil management and land use changes in a humid temperate region of southern Europe. Soil Biology and Biochemistry, 36, 917-925).	Accepted with modification. Non-CO2 fluxes due to land use in terms of agriculture are covered. Non-CO2 fluxes related to forestry and change in forest cover are orders of magnitude smaller than CO2 flux and there is a lack of globally aggregated data which is the focus of this section. Reduction in N2O emissions when a cropland is converted to a forest would be reflected in lower agricultural N20 emissions. Where CO2 flux is based on inventory measurements of soil and biomass carbon, changes in total soil carbon will reflect carbon uptake both as CO2 and as CH4. Global estimates and trends in non-CO2 emissions in forest systems have not been calculated, except for emissions f rom forest fires by EDGAR and FAO. These are now added to fig 11.2 and section 11.2.3. We have added text to 11.2.3 to explain that we only deal with the most significant and globally aggregated numbers. We have changed the section heading to reflect GHG from FOLU not just CO2.
33996	11	7	38			'…management of land (cropslands, forests, grasslands, wetlands) and changes in land or cover…': to increase compliancy within the document it would be good to use this categories also in table 11.3 and then subdivide them in subcategories.	Rejected. Table 11.3 covers more than the land uses so is divided first by land cover type and then by land use, whereas here we are referring specifically to land use activities. (to note, this text now moved to the start of the chapter).

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30957	11	7	41	7	42	The text refers to figure 11.2, stating that it shows total GHG emissions from AFOLU activities. However, the figure 11.2 caption says that FOLU includes fires. Fires affecting lands can be either the result of human activities (accidental, arson, management practices) or natural. Natural fires, which have significant emissions in some regions, are not the result of AFOLU activities. Suggest re-wording of line 41 to read "Global trends in total GHG emissions from AFOLU activities and fires ..."	Accepted with modification. Agree with reviewer in that EDGAR data on emissions is from fires is all fires (AFOLU and otherwise); this is why we don't use it for fig 11.2. Instead we use the Houghton book-keeping model that includes only deforestation and degradation emissions (by fires and mechanical clearing). We still rely on EDGAR for non-CO2 fire emissions as this is the only available data. However, we now explain this more explicitly in the text of 11.3.2. Also, figure legend and caption changed to clarify.
20259	11	7	42	7	42	Figure 11.3 should be deleted, and the absolute quantities of land area changes, use of N fertilizers, and increase in livestock and poultry should be incorporated in the corresponding text on the subject in paragraph 11.2.1 on 'Supply and consumption trends in agriculture and forestry' on pages 8 to 10.	Rejected. Figure is helpful in both illustrating critical trends and in saving significant amount of text.
23776	11	7	5	7	7	Please replace the existing line with "Figure 11.1 shows the many provisioning, regulating, cultural and supporting services provided by land of which climate regulation is just one" for reducing length of this chapter.	Accepted. Wording changed.
27201	11	7	10		11	This paragraph may convey the idea that there are always conflicting uses of land for mitigation and for providing other services, and this is not generally true. One possible way to fix this is to rephrase the sentence indicating POTENTIALLY conflicting uses ...	Accepted. Wording changed.
27202	11	7	11		11	include before impacts, positive and negative since the word impact is normally has a negative connotation	Accepted. Wording changed.
27203	11	7	11		12	why to have an specific annex focusing on bioenergy when there are other land based mitigation measures that could be considered, e.g., fossil fuels, geothermal, hidropower; wind; etc. Delete the annex or balance the annex with other mitigation measures in addition to bioenergy	Noted. Bioenergy annex deletion needs to be discussed with TSU.
29420	11	7	15	7	15	The term aquaculture includes fish farming by definition. The phrase "(=fish farming)" should be deleted.	Accepted. Wording changed.
29421	11	7	15	7	15	Unsupported statement. Phrase "which often compete" should be replaced with "which may compete" unless examples which demonstrate the frequency of competition that supports use of "often" can be cited.	Accepted. Wording changed.
29422	11	7	24	7	28	Why cite the AR4 figures here? Unless the updated figs are included also this is not meaningful to the reader. Delete text or include summary showing where AR5 results differ.	Rejected. We have a duty to report changes from the treatment of AFOLU in previous IPCC assessment reports. These numbered are updated in the chapter - and should not appear in the introduction.
27204	11	7	34		34	why to have an specific annex focusing on bioenergy when there are other land based mitigation measures that could be considered, e.g., fossil fuels, geothermal, hidropower; wind; etc. Delete the annex or balance the annex with other mitigation measures in addition to bioenergy	Noted. Bioenergy annex deletion needs to be discussed with TSU.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26993	11	7	5			Consider add some other references on co-benefits (e.g. STICKLER, C.M., et al. 2009. Global Change Biology 15: 2803-2824).	Noted. Thank you, but this level of detail is not included in the introduction. It will be considered in the co-benefits and trade-offs section.
24166	11	7	37	8	11	the figure 11.2 provide the emission trends, but it is difficult to get exact data on the total AFOLU emissions, so Suggest to add 1-2 sentence on the summary of of AFOLU emissios ".	Accepted. Sentence added.
31069	11	70		71		There is no reference to this table in the text. Presumably it should have been referred to in 11.10.1 "Economic Incentives", under one or more of the subheadings.	Accepted. Text revised.
19117	11	70				Illegal logging. Some logging is undertake by local people for their own use. It is usually difficult to obtain a permit for this and it is generally the local population that is managing the wood resource. Regarding logging both leagal and illegal, only about 10% of non-energy wood products are exported, the other 90% are used internally (and 100% for fuelwood and charcoal). In my opinion, it is far better to use the local people to monitor, manage (and police) their forests. Law enforcement by outside bodies may be resented and resisted.	Noted. Table is now referenced in the text. The table is a compilation of some programs but has not intention to discuss in a greater extent the different situations that can be classified as illegal logging.
19396	11	70	1			Could www-addresses be added to Program/Institution column?	Accepted. Text revised.
37970	11	70	1			The REDD+ Partnership has 75 partners, not 50. The FCPF Carbon Fund will also buy emissions reductions from approximately five large-scale ER Programs.	Accepted. Text revised.
37969	11	70	1			The table does not appear to be referenced in the text. row 1, column 2: The authors should aknowledge that "illegal" logging is often only illegal in name. Addressing illegal logging systemn that have local support, legal protection, and political support will be a much different animal than a couple of small groups of people truely stealing trees from society's forest resource. Also, should define "appropriate" forest governance.	Partially accepted. Table is now referenced in the text. The table is a compilation of some programs but has not intention to discuss in a greater extent the different situations that can be classified as illegal logging.
31066	11	70	1	70	1	Suggest adding reference to the Global Environment Facility's SFM/REDD+ program (relevant info can be found at: http://www.thegef.org/gef/SFM_REDD_Incentives).	Accepted. Text revised.
31067	11	70	1	70	1	Regarding UNREDD row: Suggest omitting $ amounts or otherwise listing for all. Consider providing links to websites for additional information.	Accepted. Text revised.
31068	11	70	1	70	1	Regarding REDD+Partnership row, 2nd column. Suggest revising/correcting from "As a consequence..." with "In response, donors and REDD countries joined in launching an interim partnership platform to facilitate the delivery of fast-start finance for REDD+ following pledges by major donors in Copenhagen at COP15."	Accepted. Text revised.
19397	11	72	1	72	9	This paragraph is already on page 69 rows 13-23.	Accepted. Text revised.
24855	11	72	1	72	9	Duplicates text that has already included in an earlier part of the document. Suggest delete the duplicate text.	Accepted. Text revised.
21045	11	72	1	72	12	Can be deleted, is redundant to text from page 69.	Accepted. Text revised.
37971	11	72	1	72	9	This exact same paragraph is on page 69, 13-23. Please delete one of them.	Accepted. Text revised.
31071	11	72	10	72	12	This paragraph is a repeat of text that occurred earlier (P.69, line 26-27 and P.69, line 43-44). It can be deleted.	Accepted. Text revised.
19398	11	72	10	72	12	This paragraph is made of two sentences, the first of which is already on page 69, rows 26-27, and the second one on page 69, rows 43-44.	Accepted. Text revised.
27968	11	72	10	72	12	Delete the para. It is not core for voluntary mitigation actions.	Accepted. Text revised.
37972	11	72	16	73	16	This is not missing data but missing modeling.	Rejected. This is included in missing knowledge.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31491	11	72	23			COMMENT: As stated in chapter 6.1.3, it is important that decision makers understand the possible pathways to meet different concentration stabilization levels. This topic should be better covered in Chapter 11, since renewable bioenergy to a large extent affect the different countries pledges and mitigation strategies. It would be useful if AR5 concludes more precisely on what will be the best mitigation strategy in this sector.	Accepted. Section 11.9 text fully revised and updated - and bioenergy aspects covered in Appendix I (Bioenergy).
25804	11	72	23	73	16	I suggest to add a list/database/manual of expected efficiencies (reducing potential under farm practice conditions…), costs and side-effects of implementing individual measures in mitigation of agricultural GHG	Accepted. Ease of implementation, cost and availability of all technologies now provided by three new columns in Table 11.2
19118	11	72	23	72	23	11.11 Gaps in knowledge and data. One very important gap is a good knowledge of stock and yield of trees on all land use types.	Noted. Section 11.11 has been reduced in length to cover only headline issues.
21048	11	72	23	73	16	This list could be shortened considerably: you ask for better data on and understanding of the global carbon cycle, including direct and indirect interactions, interdependencies and trade-offs with social and economic aspects.	Noted. Section 11.11 has been reduced in length to cover only headline issues.
37973	11	72	23	73	16	With one exception (next to last bullet), all of the stated knowledge and data (k&d) gaps refer to biological processes or current conditions of land resources. The authors found no need to improve knowledge and data related to the economic factors affecting local, national, and regional land use chance? No k&d gaps in the costs of mitigating climate change though changing land use and land use policies?	Noted. Section 11.11 has been reduced in length to cover only headline issues.
31073	11	72	25	72	25	The bullet is unclear. Does this mean that a database of global land use change area and fate of area is needed?	Noted. Section 11.11 has been reduced in length to cover only headline issues.
31074	11	72	25	72	25	Perhaps expand this bullet to include knowledge of the pre- and post-change ecosystem, and knowledge of the change-causing activity.	Noted. Section 11.11 has been reduced in length to cover only headline issues.
31072	11	72	25	72	26	Such databases need some kind of baseline date to be valuable. Can they be constructed retroactively? If not, need to specify "present-day (circa 2010)" or something similar.	Noted. Section 11.11 has been reduced in length to cover only headline issues.
37974	11	72	25	73	16	Many of the data gaps highlighted (e.g. a global fisheries database, global high resolution LUC database, etc.) imply the need for top-down international data systems. The point is that we need to augment - not necessarily replace data and policy systems. This entire chapter has highlighted the critical need for LOCAL data and policy systems to get good AFOLU outcomes. As such, the best international data sets in the world could exist, but would only help academics, and probably not substantively change the on-the-ground land use and mitigation decisions/outcomes. This entire list needsto be revised to reflect the policy decision-maker and local land use practitioner point of view. As it is, it reflects an academic scientist view of the world, but misses the point of what we need to successfully tackle climate change.	Noted. Section 11.11 has been reduced in length to cover only headline issues.
31075	11	72	26	72	26	Is the high-resolution attribute spatial or temporal, or both?	Noted. Section 11.11 has been reduced in length to cover only headline issues.
31076	11	72	36	72	36	Please also include the fire severity, and the proportion of biomass burned as well as the amount and proportion of DOM and soil C burned.	Noted. Section 11.11 has been reduced in length to cover only headline issues.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21046	11	72	43	72	44	Most other points are about higher resolution data, why do you call for standardized and homogenized (i.e., usually coarser) data?	Noted. Section 11.11 has been reduced in length to cover only headline issues.
29844	11	72	8	72	9	A sentence seems to have been cut at the end of the paragraph. It doesn't make sense as it is.	Accepted. Wording revised.
31070	11	72	8	72	9	"vegetable oils or animal fodder and result in long trade disputes (Zah and Ruddy, 2009)." is an incomplete sentence. Suggest deleting or reincorporating elsewhere.	Accepted. Wording revised.
24856	11	72	8	72	9	Sentence out of place - suggest delete	Accepted. Wording revised.
29489	11	72	1	72	9	Duplicate text - repeated from page 69. Delete here or there.	Accepted. Text revised.
29490	11	72	8	72	9	Sentence out of place - delete or move	Accepted. Text revised.
31077	11	72				A data and knowledge gap that should be mentioned is better understanding of the biophysical effects (e.g. albedo) of possible AFOLU mitigation actions, and how mitigation activities can be adjusted to reduce biophysica effects that are adverse for climate.	Noted. Data gaps reduced to 4 bullet points so no space to list this.
33322	11	72	23			The section lists many data gaps or need for specific databases, that could be part of one integrated global land (and water) use database, including LUC, management practices, C-stocks, fires, GHG fluxes, soil, forest degradation, bioenergy.	Accepted. Now bullet point 1 of the revised section.
29218	11	72	24	73	16	These are sensible and well specified, I would also think that better information on the impact of cultivation practice on SOC on a regional basis is required - at present we have little confidence in the C sequestration benefits of no/min-till, it's impact on soils structure, weed control or N2O fluxes from agricultural soils. Innovative soil management practices such as strip tillage or controlled traffic farming may offer benefits but there is little hard evidence on GHG fluxes.	Noted. Data gaps reduced to 4 bullet points, so no space to list this level of detail - but need for improved understanding is noted.
31078	11	73	1			Selective logging is not always degradation. It can be a viable sustainable forest management practice. Consider revising to "selective logging not done in accordance with sustainable forest management".	Accepted. Text removed in FD
19399	11	73	1	73	1	Selective logging is hardly forest degradation!	Accepted. Text removed in FD
21047	11	73	1	73	3	Do you want to imply that the management practices listed here always constitute forest degradation?	Accepted. Text removed in FD
24857	11	73	17			Additional dot point could be included: "A better understanding of the interactions between implementing various mitigation policies and programs on national, regional and global scales." The document refers throughout to the importance of interactions between types of land use, abatement choices and the need to adopt a multifunctional approach exploit synergies and optimise benefits, yet this is not identified as a knowledge gap.	Noted. Section 11.11 has been reduced in length to cover only headline issues.
37975	11	73	23	73	23	This is not missing data but missing modeling.	Noted. Section 11.11 has been reduced in length to cover only headline issues.
37976	11	73	23	74	16	Also need a global database of biodiversity estimates as well as a better understanding of the linkages between climate and biodiversity in different ecosystems	Noted. Section 11.11 has been reduced in length to cover only headline issues.
21250	11	73	31			Change term to "geo-referenced"	Noted. Section 11.11 has been reduced in length to cover only headline issues.
31079	11	73	8	73	8	Change "current" to "past and projected future".	Noted. Section 11.11 has been reduced in length to cover only headline issues.
27969	11	73	8	73	9	The text of this bullet point is fine. Please complete it by adding at the end "taking limiting factors such as limitations in nutrient and water availability as well as rising levels of tropospheric ozone into account".	Noted. Section 11.11 has been reduced in length to cover only headline issues.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29491	11	73				Additional dot point: "A better understanding of the interactions between implementing various mitigation policies and programs on national, regional and global scales." The document refers throughout to the importance of interactions between types of land use, abatement choices and the need to adopt a multifunctional approach exploit synergies and optimise benefits, yet this is not identified as a knowledge gap.	Noted. Section 11.11 has been reduced in length to cover only headline issues.
30529	11	73	1	73	3	As this section discusses gaps in knowledge and data, please refer to the reference below for further information regarding charcoal production and its uses in industrial processes. CGEE - Centro de Gestão e Estudos Estratégicos. Incremento do uso do Carvão Vegetal Renovável na Siderurgia Brasileira. April, 2010.	Noted. Section 11.11 has been reduced in length to cover only headline issues.
30293	11	73	14	73	15	This line on better understanding should be broadened to encompass the full range of additional analysis necessary to understanding potential co-benefits and risks. Consider re-wording as: "A better understanding of potential co-benefits and risks of different mitigation options on social, economic, and environmental development goals, including on the conditions of poor people, in particular those living largely in subsistence conditions, as well as animal welfare." I specifically included animal welfare because there is a paucity of research analyzing the co-effects of mitigation options in agriculture on animal welfare, despite there being clear connections.	Noted. Section 11.11 has been reduced in length to cover only headline issues, but the importance of local approaches are discussed in detail in sections 11.7 and 11.8.
22564	11	74		91		A generic comment on the bioenergy annex. The content and discussion is sound but the conclusions, which could have been said 20 years ago, did not reflect the breadth of the preceding discussion.Bioenergy clearly has an important role to play and it's a shame that the chapter did not end on a more upbeat note	Thanks : Accepted, we keep the conclusion to the substantial statements we can make. Normative statements are not made.
22411	11	74		91		Charcaol conversion technologies are not addressed. Deployment of energy efficient technologies may have an impact on GHG but also on the livelihood of people involved in the charcoal value chain. Stat are available from the FAO.	Thanks : Accepted Charcoal is mentioned; due to space contraints only as an example.
23621	11	74		91		Concerns the general content of Annex Bioenergy: 1) You state that you only concentrate on new developments since the publication of the SRREN and the GEA. However much of the actual content is already part of either publication. I.e. you do not stick to your promises. So either take this statement out or adapt the content. I suggest the latter. 2) The "new" additions to the literature discussed within the Annex (since the SRREN and GEA) have an overly high ratio of contributions by the authors of the chapter/Annex (often also only "in press" or "submitted"). I hope that the AR5 is not meant to be a means to promote the authors respectible achievements but rather a means to compile a comprehensive set of literature on the topic. 3) I miss a more elaborate discussion on the actual implications of biomass for energy use on overall GHG emissions. This contains largely a discussion on C neutrality, or C debt (esp. regarding forestry). This is a highly debated item and a lot of new literature is available on the matter since the publication of the SRREN and GEA (see below for suggestions). Only after discussing this fundamental question, I think, one should go into more details about bioenergy deployment potentials.	Accepted. Text was re-written; especially the literature has been updated, focus on the most recent contributions. The C neutrality discussion is kept short because of space constraints.
30190	11	74		76		Typos: SRREN instead of SREEN	Thanks : Accepted

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27158	11	74		91		The Annex 'Bioenergy: Climate effects, mitigation options, potential and sustainability implications' has a clear negative undertone towards bioenergy. Possible negative aspects are emphasized, while positive implications are mitigated or not at all considered. Bioenergy is recognized as an important energy alternative that can provide significant reductions of GHG emissions thus contibuting to climate change mitigation. In Brazil, the second largest producer of biofuels, there is a large body of evidence indicating that sugarcane ethanol and soybean biodiesel contribute to significant reductions in GHGs emissions which was completely ignored by the authors in this assessment report. This Annex on Bioenergy seems as a biased initative from its very origin, since it focuses on the review of a single technology that was assessed during the SRREN. There is no legitimate reason for analysing only bioenergy climate effects; moreover, it would be essential to provide a basis for comparison with a report on the fossil alternative. Mainly, the Annex does not reflect a balanced science-based approach since its conclusions extrapolates the review of the literature that is presented. The text discusses aspects of the bioenergy productions systems that are not directly related to the task of assessing the contribution of bioenergy to climate change mitigation, such as social and economic aspects (and, even so, it emphasizes on the negative implications, mostly ignoring the manifold positive externalities). One could also argue that, given the fact that there is no new scientific evidence that alters the conclusions of the SRREN on renewable energy, there is no place for this Annex. For all of the abovementioned reasons, the Annex on Bioenergy should be suppressed. The comments that follow this note shall be interpreted as examples of erros or misjudgments in the text of the Annex, providing argument for the complete exclusion of the Annex, which fails to provide a balanced and scientific analysis.	Reject. Bioenergy Appendix was approved in Batume. Also the text was entirely revised to provide a balanced viewed on the different issues based on existing mostly post-SRREN literature
27159	11	74		91		The Figure 11.A.3. “Ranges of life-cycle direct global climate impacts” is extremely confusing and no clear conclusion concerning can be made concerning the mitigation potential of any particular bioenergy source from these data. Likewise the Figure 11.A.4 “Estimates of GHGLUC emissions - GHG emissions from biofuel production-induced LUC” exhibits data in a way that does not allow any clear conclusion’s to be made. The discussion of liquid biofuels is very limited. The largest biofuel programs today are the rape methyl ester (RME biodiesel from canola) in Europe, the US ethanol from maize and the Brazilian ethanol from sugar cane. The RME and Brazilian bioethanol programs are not mentioned at all directly, and even the US ethanol program from maize.	Accept. Figure was revised
23169	11	74		91		This Bioenergy Annex is a key part of the Assessment. It has to be accurate and provide a fair and unbiased view of the literature. I am not sure this is currently the case. There are certainly some forms of utilising biomass that are questionable from a cost or sustainability view - but other forms can result in multi-benefits. The overview of this Annex, including the wording used in the conclusions, tends to show a bias against biomass and not a balanced assessment.	The appendix clearly points to the positive potential and the chance for multiple benefits in the SD section. The conclusion has been removed. Additional emphasis has been put on demonstrating what one can do right (e.g. in ILUC cases). It should be also noted that some authors understand the text to underemphasize risks.
23170	11	74		91		The terminology used throughout this section needs to be reviewed and be made consistent. This will need liaison with the Glossary. For example "biomass" is the term generally used to describe the feedstock - not "bioenergy" which is the useful energy carrier resulting from conversion of the biomass. Hence it is confusing, and incorrect, for example, to use the terms "bioenergy farmers" or "bioenergy crops". The whole section will need reviewing to be consistent.	Partially accepted. Bioenergy crops is an established term in parts of the literature (=crops used to produce bioenergy).
23171	11	74		91		There are relatively few cross-references used in the text - eg to Chapters 7, 8 and 10 - or to the LCA Annex.	Crossreferences were now introduced.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
37988	11	74		74		The annex could be substantially condensed, and may be incorporated into the chapter.	Rejected. The Appendix was accepted at the IPCC Plenary in Batumi
31492	11	74	1	91	1	It seems a bit unusual to have a comprehensive Annex in a Chapter, and especially having a section with conslusions in an Annex. The status of this Annex is unclear, including how this is related to the rest of the Chapter. We note that this Annex was not a part of the FOD.	The appendix is now without conclusion. Chapter 6, 7, 8 and 11 contain messages on bioenergy, referencing to the appendix.
26056	11	74	1	91	11	Bioenergy should preferably not be put into separate Annex, which diminishes its weighting.	REJECT. See Batumi decision.
27970	11	74	1	91	10	As more and more environmental and social risks associated with large scale bioenergy expansions without proper policy frameworks are becoming more and more visible (Chum et al., 2011), it seems appropriate to put these risks at the very beginning of this whole section, in order to point out clearly the utmost importance of a stringent and effective regulation.	Accepted: A new paragraph has been included in the introduction highlightig these risks in developing coutries. Further the issues have been covered in section 11.A.5 in more detail
27974	11	74	11	74	11	There is a lot of empirical evidence that these negative effects are "likely" to result if larger quantities of agricultural production are absorbed for energy purposes. Therefore add "likely" before "result ".	Thanks : Accepted Action: Modify
20158	11	74	18	74	28	please add references.	Accept. Text was revised
27975	11	74	19	74	28	To give a number of 500 EJ bioenergy potential to decision makers is inappropriate. These are the upper bound of technical potentials (see SRREN) and would mean a tenfold(!) increase of current use of bioenergy. Furthermore the SRREN experts had a reason to limit the numbers to 300-500 EJ in their review; It is not acceptable to replace the expert review with a simple calculation. That is why I would argue for deleting lines 24-28. As there are already so many negative effects caused by large scale bioenergy extension visible and the various - very optimistic -assumptions for a designation of such a potential, it is in my view irresponsible to give the message "there are incredible potentials to be tapped". The following SRREN paragraph is more balanced and differentiating and fully sufficient.	Accepted. Only ranges are provided now, and no final figure is stated
24858	11	74	20	74	22	This sentence should also refer to the implications of the displaced energy source. Suggest Insert this text at line 22 after "cost of the resource " ", savings from displaced fossil fuel emissions"	Accept. Text was revised
27976	11	74	20	74	22	Biomass "availability" is not determined by these factors per se (as an internal restriction); otherwise we would not face the problem of rising food prices caused by bioenergy, but it should be determined by these restriction. This is a normative statement and not a descriptive, which should be clear. Therefore delete "is" in line 20 and insert "should".	Accept. Text was revised
37977	11	74	21	74	21	Add comma after 'quality'	Thanks : Accepted
37978	11	74	22	74	22	Line 22 remove 'and'	Thanks : Accepted
37979	11	74	23	74	23	Annex: please define and explain what is included in the term 'unutilized forest growth'. Does this include whole trees and/or merchantable timber? If not, explain why not	Thanks : Accepted . It is now explained in the text: "This may include harvesting low productive mature forests that are at higher risk of disturbance, and, if the goal is biomass for bioenergy, shortening forest management cycles (Davis et al., 2009, Nabuurs et al., 2013). "
37980	11	74	24	74	25	Why is this the most important in terms of resource base? Do you mean, most important in terms of potential impacts on the land resource base/use?	The wording has been changed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24859	11	74	25	74	26	Suggest sentence could be made more clear: "It is estimated that dedicated biomass plantations have the greatest potential to produce bioenergy, with deployment levels ranging from 26-675 EJ/yr"	Accepted. Text was revised. Ranges are shown in the Figure.
21256	11	74	25	74	28	We suggest including the average bioenergy potential across studies in which sustainability criteria are explicitly considered. Reporting only an average value of 500 EJ/yr across all studies is misleading since a number of the high end studies included in this calculation are based on the extrapolation of unrealistic yield potentials that do not take into account biophysical constraints and/or limits to agricultural inputs (Smith, Zhao, and Running, 2012). Using high-resolution, spatially-explicit, satellite-derived measurements of global plant productivity, we estimate the technical global primary bioenergy potential to realistically range from roughly 50 - 180 EJ/yr (Smith, Zhao, and Running, 2012). While Haberl et al. (2010) shows that the average technical global primary bioenergy potential across all studies that consider sustainability criteria is reduced to 160-270 EJ/yr. Smith, W. K., Zhao, M., & Running, S. W. (2012). Global Bioenergy Capacity as Constrained by Observed Biospheric Productivity Rates. BioScience, 62(10), 911–922. doi:10.1525/bio.2012.62.10.11. Haberl, H., Beringer, T., Bhattacharya, S. C., Erb, K.-H., & Hoogwijk, M. (2010). The global technical potential of bio-energy in 2050 considering sustainability constraints. Current Opinion in Environmental Sustainability, 2(5-6), 394–403. doi:10.1016/j.cosust.2010.10.007.	REJECT We cannot give averages. There is no agreement in the literature.
23172	11	74	25	74	28	Why not just say "The total global biomass technical potential is estimated to be around 500 EJ/yr, though there are wide ranges in the literature, for example, 26-675 EJ/yr from dedicated biomass plantations (Table 11 .A.1)	The wording now focuses on ranges.
37982	11	74	25	74	25	Dedicated biomass plantation is estimated to have the largest potential for what?	The wording has been changed.
37981	11	74	25	74	26	The largest potential what? Land use conversion? Net flux? This is not clear.	Has been rewritten.
31081	11	74	26	74	28	This is an extremely "wide range". This uncertainty in the potential from dedicated biomass plantations needs to be explained. Note there are no sources cited for this range, either here or in Table 11.A.1.	Accepted. The text is rewritten to better explain this uncertainty. The lower range is certainly possibly in a sustainable manner. But studies diverge whether a larger range is possible. The important studies are cited.
37983	11	74	26	74	28	Summing up over what data? Please use citations.	Has been rewritten.
20159	11	74	28	74	28	it is misleading putting here 500EJ/yr without critical comment. Even though it is discussed later on, such numbers should not be mentioned without raising sustainability concerns.	Accepted. The text discusses the sustainability concerns.
37984	11	74	30	74	30	What is 'biomass resource potential? Potential supply?	Accepted. Has been rewritten to specify that this section deals with technical potential.
37985	11	74	30	74	31	recommend change â€˜â€¦concluded thatâ€¦physical, technicalâ€¦; to â€˜â€¦and concluded a this wide range was a consequence of biophysical, technicalâ€¦	Has been rewritten.
37986	11	74	33	74	33	Remove 'and' (don't use with e.g.)	Accepted.
37987	11	74	33	74	35	Rewrite for clarity	Accepted.
19400	11	74	34	74	34	SRREN is written as SREEN. Another point: how does development TRANSLATE into fibre, fodder or food demand?	Noted . obvious Action: No action
23353	11	74	35			Fibre is not the only relevant organic substance that is used to produce materials; many others such as starch, oil, sugar etc. are also important feedstocks for the production of biomaterials, chemicals etc. So add “materials” before “fibre”.	That is right. But that sentence has been removed entirely.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19401	11	74	38	74	38	DIET was important here!	Thanks : Accepted Action: Include diet
31080	11	74	5	74	5	Suggest deleting "including cooking" or expand the list. "wide range of uses" already covers everything.	Accept. We give more examples
23622	11	74	5	74	6	revise grammar	Noted
31493	11	74	6			QUOTATION: "Bioenergy systems can have either positive or negative GHG mitigation implications. " COMMENT: Please consider to specify what is included in a bioenergy system, for instance in the glossary bioenergy and AFOLU sector combined? or combustion and photosynthesis combined?	Accept. Text was revised
26150	11	74	6	74	10	The sentence should be reformulated to: "…could deliver climate change mitigation and other environmental and social benefits, and help reduce negative effects".	The starting paragraph has been rewritten.
27971	11	74	7	74	7	Meaning of "relevant governance"? Suggestion: "effective governance".	Thanks : Accepted . Editorial Action: Change
33095	11	74	87			These comments address the bioenergy appendix of the WGIII. I also ask that it be considered in any other parts of the AR5 that address bioenergy, including the synthesis. The appendix demonstrates a great deal of hard work by the panel, and it shows effort to present the conflicting literature regarding bioenergy in an evenhanded way. Nonetheless, and while there is much to commend in the draft, by skirting the most fundamental issues related to bioenergy, the draft in the end provides a misleading impression of the capacity and means by which bioenergy can contribute to greenhouse gas mitigation. The estimates of bioenergy potential are nearly all based on double counting of biomass carbon that, but for its use for bioenergy, would either already remained stored in the terrestrial ecosystem and reduce greenhouse gas emissions or would be consumed for food, timber and other human needs. The estimates of potential greenhouse gas reductions from these sources of biomass are therefore also based on double counting, as is much of the additional discussion of greenhouse gases.	Noted. We are citing the different views and estimates. The technical potential is not a climate change mitigation potential.
33096	11	74	87			These accounting errors lead to a number of implausible results. Most importantly, despite acknowledging the wide range of estimates, the draft puts the central estimate of sustainable bioenergy at 500 EJ, which is close to total human consumption of energy today. As of 2000, the entire human harvest of vegetation including crops, crop residues, trees, and grasses consumed by livestock contained roughly 225-235 EJ (Haberl 2012). To generate this harvest, people have extensively manipulated roughly 75% of the world's vegetated lands (roughly half for agriculture, and a quarter for timber products) (Haberl 2012), and that manipulation has led to roughly one third of the increase in carbon in the atmosphere at least as of 2000 (Malhi 2002; Houghton 2008). This manipulation of land has also led to the great bulk of the world's loss of biodiversity and accounts for 80-90% of its water consumption (Foley 2011). The production of bioenergy crops does have the potential to be somewhat more land and water efficient than our existing harvest of crops, timber and grasses, so it might require somewhat less land and water and emit somewhat fewer greenhouse gas emissions per EJ of energy in biomass. But the idea that production at anything remotely this scale would be carbon neutral and broadly "sustainable" is implausible. The claim that it does is based on double counting of biomass.	Noted. Limitations of the potentials are briefly explained, studies that show higher and lower potential are cited, and reasons for the divergence are mentioned.
33097	11	74	87			I. Proper Carbon Accounting for Biomass	Rejected. Incomplete comment.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33098	11	74	87			Biomass is not inherently carbon neutral. Although never directly expressed, the assumption behind the existing chapter is that biomass is carbon neutral in the sense that the carbon emitted that was contained in the biomass itself does not increase global warming. This assumption is what gives bioenergy its potential GHG advantages over fossil energy. It is incorrect as an issue of basic accounting and stems from a misinterpretation of national greenhouse gas reporting advice by the IPCC and its predecessor. The following discussion is a summary of this point in several published papers (Haberl 2012; Searchinger et al. 2009; Searchinger 2010; Smith 2011). The point has also been expressed in reports by a science advisory board of the U.S. Environmental Protection Agency and the Science Committee of the European Environmental Agency.	The text is very clear that the accounting can't rely on a carbon neutral discussion.
33099	11	74	87			When biomass is burned, carbon is emitted. In fact, the amount of carbon emitted must be greater than that involved in using fossil fuels because the energy to carbon ratio of biomass is higher. (There are a variety of additional efficiency issues that raise those direct emissions from combustion per unit of delivered energy yet more compared to fossil fuels.) No matter how much bioenergy is consumed, the carbon emitted by combustion will not decline.	The total life cycle emissions are varying substantially. It is clear that the assessment doesn't assume carbon neutrality. The variation is life-cycle emissions are provided in two figures.
33100	11	74	87			For bioenergy to reduce greenhouse gas emissions, somewhere other than the point of combustion there must be either a reduction in some kind of emissions or an increase in a sink as a result of the bioenergy. Put another way, when bioenergy reduces greenhouse gas emissions, it does so by offsetting those emissions through some other means. That can be by additional plant growth, such as by planting a hectare of land that would otherwise remain barren (an unusual alternative). It could also be by reducing emissions from the decomposition or oxidation of biomass, as when bioenergy uses a waste product that would otherwise be burned (e.g., burning agricultural residues), or primarily decomposed by microorganisms (e.g., crop or timber harvest residues left in the field), or consumed by people (e.g., food that is not replaced). In reality, then, the reduction in greenhouse gas emissions occurs where the biomass is produced or harvested, e.g., the field. And the key requirement, as for any other offset, is that the offset must be additional. In general, in the case of a waste product, that offset will be additional because the waste by definition would otherwise be thrown away and decompose. But if the offset is to result from plant growth, it can only result from additional plant growth beyond what would occur without bioenergy. Thus the mere consumption for bioenergy of any plant that would grow anyway, be it a tree or a crop, does not absorb additional carbon and therefore does not offset the emissions from burning that tree or crop.	Noted . Text book information Action: No action required
33101	11	74	87			It is true that if that tree or crop were otherwise going to be consumed by people, and the diverted tree or crop is not replaced by some other tree or crop, there is a greenhouse gas benefit. It results physically from the reduced emissions from human timber or crop consumption through human or livestock respiration and waste (and subsequent decomposition) or perhaps burning of timber products. (The loss of the timber product may also lead to increased consumption of alternative products, such as concrete, and therefore increase emissions in another way.) But reducing consumption in these ways is generally not considered a desirable or sustainable strategy for reducing greenhouse gas emissions. Reduced consumption is appropriately not counted in the estimates of sustainable bioenergy potential in the appendix. (It is, however, implicitly counted in the discussion of ILUC, as I explain below.)	Noted Action: No action required

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33102	11	74	87			Put simply, and putting aside waste, bioenergy is one way of using land to achieve carbon offsets. Assuming some preexisting barren land, a power plant can offset its emissions of carbon from coal by planting a new forest. Alternatively, it could plant a new forest and instead of leaving the carbon standing, burn it. That would still use the increased carbon to store more carbon except in that case, by displacing coal or natural gas, it would leave more carbon underground. But if all the power plant does is take carbon otherwise stored above ground in a forest and put it in the air rather than take carbon otherwise stored below ground and put it in the air, the power plant has not reduced emissions at all.	Noted Action: No action required
33103	11	74	87			The source of the error lies in the initial scientific guidance offered to countries for national greenhouse gas reporting (Searchinger et al. 2009). The key guidance, as summarized in a 2000 IPCC report and contained in every version of the national greenhouse gas reporting guidance, is not that emissions from biomass do not count but rather than those emissions are to be counted in the land use account (Watson 2000 p. 35). In essence, this guidance is designed to prevent double-counting of biomass emissions in national reporting, and can be summarized this way. The national GHG reporting guidelines require that countries report energy emissions in an energy account, and require that they report emissions from land use in a land use account. That normally works well. If coal is burned, or if a tree is cut down, the emissions are counted. But what happens if the tree is subsequently burned for energy? Because those emissions must already be counted as soon as the tree is cut down in the land use account, it would be double-counting to count the carbon again from the powerplant even though the carbon is actually emitted there. For that reason, the guidance recommended that biomass carbon not be counted in the energy count but instead be counted as part of a land use emission.	Noted Action: No action required
33104	11	74	87			This system works so long as both energy and land use emissions “count.” This system also works globally so long as all countries participate and count both energy and land use emissions. A tree cut in the United States and burned in Europe actually emits carbon in Europe but the U.S. reports it (at least in theory). Both conditions are satisfied by the UNFCCC in the sense that all must be reported.	Noted Action: No action required
33105	11	74	87			The problem occurred when the same accounting principles were inappropriately and without discussion incorporated into accounting under the Kyoto Protocol, and through it into cap and trade systems such as the European Emissions Trading System. Under both, most potential global land use emissions do not “count” toward any cap. In these contexts, there is therefore no general justification for ignoring the carbon emitted by burning the biomass. Continuing to ignore these very real emissions from smokestacks and exhaust pipes therefore does not merely avoid double counting; it actually results in no counting at all.	Noted Action: No action required
33106	11	74	87			The simplest way to count emissions properly would be to count the very real carbon emitted by bioenergy, but then to provide it a credit in those contexts in which the use of bioenergy results in an offset either from additional plant growth or reduced respiration. Instead, by ignoring all emissions of carbon from biomass itself, both the Kyoto Protocol and the ETS treat bioenergy as automatically carbon neutral. Under both, for example, in theory, a powerplant could buy part of the Amazon, harvest all the trees, turn it into a parking lot, and burn the trees in Europe instead of coal, and count this activity as a 100% greenhouse gas reduction compared to burning coal. This incorrect assumption that biomass is always carbon neutral then became incorporated into lifecycle analyses without further justification (Johnson 2008).	Noted Action: No action required

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33107	11	74	87			One reason this error was possible is that it seemed supported to some by an alternative justification for carbon neutrality, which is that biomass contains recently sequestered carbon compared to the old sequestered carbon of fossil fuels. But the age of the carbon removed from the atmosphere before it is put back cannot possibly alter the radiative forcing of that carbon. What matters is the quantity of carbon in the atmosphere.	Noted Action: No action required
33108	11	74	87			What is true is that in many contexts, the harvest of biomass results in an increase in the capacity of the terrestrial ecosystem to absorb additional carbon in the future. This increase in capacity results from the fact that that ecosystems eventually come close to a carbon equilibrium whereby they stop adding carbon to their stores. For biomass to be generate greenhouse gas reductions, its harvest must both result in a faster rate of growth of biomass, and that additional growth must make up for the loss of carbon from the orinal conversion of that land or harvest of its timber for bioenergy. This potential does imply that bioenergy can be carbon neutral over long periods.	Noted Action: No action required
33109	11	74	87			But that is not how national greenhouse gas reporting works under the UNFCCC. It requires that countries report their land-based emissions, including from the harvest of trees, in the years they occur. Biomass would only be carbon neutral if time were unimportant. Moreover, if time were not important, then the harvest of trees should also not count as a greenhouse gas emission (but it does under the UNFCCC, and if it did not, then the "degradation" of forests should not be considered a carbon concern under REDD). I discuss the issue of time below.	Noted Action: No action required
33110	11	74	87			Relationship of carbon neutrality to changes in terrestrial carbon stocks: Straightforward mathematics would count the emissions from bioenergy as the point of combustion and then credit those emissions with an offset to the extent they result in additional plant growth or reduced biomass decomposition elsewhere. As the UNFCCC accounting guidelines imply, the same mathematical result can be achieved by ignoring the carbon from combustion and by instead counting the emissions from the change in carbon on land due to bioenergy. The reason is logical. If biomass is used and it does not result in a reduction in terrestrial carbon, that is only physically possible in one of two ways: one, it could have resulted in additional plant growth, or two, it could have reduced decomposition or consumption of biomass by people. So long as bioenergy accounting truly counts any reduction in terrestrial carbon compared to the carbon that would be stored without bioenergy , it ultimately gets the carbon accounting correct. (The math is that the emissions from biomass combustion minus the change in carbon stocks equals the increase in carbon uptake or the decrease in carbon decomposition.) Implicitly, however, this method of analysis is getting the accounting right backwards.	Noted. The text clearly refers to the accounting challenge, and the need to account for default land carbon stock dynamics. Due to space limitations, the text cannot discuss all details.
33111	11	74	87			The reason to highlight the forward calculation is that the alternative can lead to conceptual and mathematical errors:	Noted Action: No action required
33112	11	74	87			First, this alternative approach can lead to a conceptualization that biomass inherently reduces greenhouse gas emissions, and then to treat changes in land-based carbon as some kind of linked but independent activity subject to its own controls. As shown below, that thinking can lead to double-counting. Any real reduction in atmospheric carbon is due precisely to an increase in plant growth (or reduced decomposition).	Noted Action: No action required
33113	11	74	87			Second, this alternative approach can result in miscounting by assuming that the change in carbon stocks should be by comparison with present carbon stocks. The math is only correct if the reduction in carbon stocks is compared to the stocks that would occur absent the consumption of bioenergy. Not only on specific lands, but globally, carbon stocks are increasing. The loss of such carbon accumulation is the loss of a sink and is equivalent to an increased emission.	Noted Action: No action required

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33114	11	74	87			Third, this approach can lead to the assumption that any bioenergy that does not reduce carbon stocks is desirable. But that greenhouse gas reduction can result from reduced consumption of timber products, which hold down emissions by displacing other energy-intensive products, or alternatively, it can result from reduced consumption of food. In general, those pathways of reducing greenhouse gas emissions are not considered desirable.	Noted Action: No action required
33115	11	74	87			II. Double-counting in Estimates of Bioenergy Potential	Noted Action: No action required
33116	11	74	87			This background makes it easier to examine why the estimates of bioenergy potential are based overwhelmingly on double-counting. I emphasize, however, that this explanation of double-counting does not depend on this explanation. So long as Working Group III accepts the principle that bioenergy should not count biomass and carbon that either would be stored if not used for biomass or consumed by people, then the double-counting is equally clear.	Noted. Text was revised
33117	11	74	87			Table 11.A.1 does an excellent job of summarizing biomass that has been claimed to be part of sustainable bioenergy potential. The legend indicates that its potential for mitigation is based on the discussion in section 11.A.4., which offers multiple, competing perspectives. Yet even so, given that the focus of Working Group III is greenhouse gas mitigation, the appendix creates the ultimate impression that these estimates are of mitigation potential. Some are, but many are not, and I address the main areas of double-counting.	Noted Table has been removed
33118	11	74	87			Unutilized forest growth: This estimate is based on the increase in forest biomass beyond those levels projected to be harvested for forest products. By definition, this biomass is biomass and carbon that would be added to the forest stocks in the absence bioenergy harvest. The estimate is based on the assumption that merely maintaining existing forest carbon stocks is enough to make biomass carbon neutral (Smeets 2007). In doing so it ignores both the net terrestrial carbon sink globally, of something on the order of 1 Gt of carbon (Pan 2011). In theory it could even justify harvesting of any particular forest area that, as demarcated, is increasing carbon stocks, even if the increase in forest stocks in that area is only helping to offset the decline in carbon stocks of other forests. Viewed that way, this view could justify harvesting up to 4 Gt of forest carbon believed to be part of the gross forest carbon sink (Pan 2011).	Noted. The text now incorporates the diferent perspectives in this discussion Action: No action required
33119	11	74	87			The problem is that the forest carbon sink, by definition, is already holding down climate change. Part of it results from the regrowth of previously cut forests, and part from the regeneration of abandoned agricultural lands (Pan 2011). What matters is that this forest growth would occur anyway, and is not caused by bioenergy, so the effect of bioenergy is only to reduce this growth and carbon accumulation. However, it is also true, that this forest growth is counted in land use accounting used by the IPCC and used to net out the emissions of ongoing timber harvest and gross deforestation (Houghton 2008). If this carbon were attributed to bioenergy, then the emissions from land use change would have to be increased by the same amount.	Noted Action: No action required
33120	11	74	87			Part of this carbon is also the carbon accumulation considered to result from CO2 fertilization (Mahli 2010). Again, the important point is that this carbon accumulation would occur without bioenergy, and by reducing the net increase in carbon accumulation, bioenergy increases carbon in the atmosphere. What is important is what physically would happen without bioenergy.	Noted Action: No action required

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33121	11	74	87			However, it is also true that the carbon uptake by forests due to CO2 fertilization is counted implicitly throughout every part of the IPCC's work because that carbon uptake plays a major role in the fundamental estimate that only some of the carbon dioxide emitted by people remains in the atmosphere. Very roughly speaking, roughly half of this carbon is believed to be taken up quickly by the terrestrial biosphere, and roughly half of that is by the ocean with the other half by forests (Solomon 2009; Pan 2011). (In reality, the true uptake of carbon is subject to active scientific inquiry.) The estimated uptake of this carbon is counted in estimates of the 100-year radiative forcing of carbon dioxide emissions. Counting this biomass as carbon free is equivalent to increasing the radiative forcing of all emissions of carbon dioxide emissions by a comparable amount. Or put another way, this carbon uptake is already spoken for.	Noted Action: No action required
33122	11	74	87			Dedicated biomass plantations: Although the estimates vary from 0 to 700EJ, the result is a middle estimate of energy from biomass plantations of 350 EJ. The references for these large estimates are primarily papers using the IMAGE model Hoogwijk 2005; Van Vuuren et al. 2009 and an estimate that adds bioenergy potential based on potential agricultural yield intensification by Smeets et al. 2007. (These papers are cited in the bioenergy appendix.) These estimates incorporate several forms of double-counting depending on the land assumed to be available.	Noted.Section was revised
33123	11	74	87			In general, these studies exclude a variety of areas, such as existing cropland, intensive pastures, denser forests and protected areas, but then assume that the remaining land is available for carbon-neutral bioenergy. The remainder consists overwhelmingly of tropical savannas, and wetter pastures that are not intensively managed according to some generally vague criterion. However, tropical savannas hold large quantities of carbon and many include substantial tree cover. None of these studies compared the carbon savings from the use of such lands for bioenergy with the carbon losses from their conversion. The only paper that has done so to my knowledge is Beringer 2011, and it finds large carbon debts for the vast bulk of such lands. It does so despite assuming high biomass yields and incorrectly assuming that 100% of the carbon in biomass offsets carbon in fossil fuels while a more accurate assessment would be roughly 50%.	Noted.Section was revised
33125	11	74	87			The largest estimates of energy crop potential also double-count yield gains. The assumption in Smeets 2007 is that if yields grow at enormous rates and free up existing agricultural land, then that land is available to provide carbon neutral bioenergy. Of course, that is based on assumptions that are contrary to those of nearly every study including the projections of the FAO (Alexandratos 2012). But more fundamentally, this analysis does not assume that bioenergy is the cause of these extra yield gains; those yield gains are the cause of other human activity. If yields were to grow in this way, agricultural land would be abandoned and would regenerate carbon. The only gain from the use of this land for bioenergy would be t the extent, if any, that bioenergy generated larger gains than the land's alternative carbon sequestration. Indeed, a proper comparison would assess bioenergy against the carbon gains that could be achieved with the same expenditures and effort to regenerate carbon on these lands. It is possible there might be net gains in some circumstances through the use of bioenergy for such theoretically abandoned agricultural lands, but the papers cited count all the benefits of using the land for bioenergy, not merely any net gains.	Noted.Section was revised
33126	11	74	87			The same error is possibly made on page 84 with the statement, "[I]t can be concluded that land-intensive diets, lower agricultural yields . . . and livestock feeding efficiencies, stronger climate impacts and higher energy crop production levels can result in higher LUC-related GHG emissions and visa versa." It is true that if crop yields are higher, then each ton of crop diverted for biofuels or displaced for biofuel production should result in less land use change. However, if the implication is that changed yields or diets that reduce land use demands would open up carbon-free lands for bioenergy, then that is incorrect for the reasons explained above.	Noted. The section was revised

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33127	11	74	87			Crop residues: Crop residues are a potential source of truly additional biomass because only a small portion of residues would be stored in the soil more than a few years. But that truly available source is highly questionable and the estimates given are inappropriate. To start, all but Haberl 2011 ignore the large quantity of crop residues that are already harvested and used for animal feed, and bedding. These are valuable uses. Yes it is true that these estimates exist in the literature, but they are transparently wrong. In addition, none of these estimates include any effort to analyze the potential implications of the loss of crop residues for soil fertility. Even Haberl 2011 merely assumes that half of all unused residues worldwide can be harvested, while adding the caveat that doing so would depend on soil fertility. In most of the world, the return of soil residues is critical for productivity (Smil 1999), and even in highly producing regions with large quantities of residue such as the U.S. corn belt, there is serious reason to believe that loss of crop residues reduces yield significantly. (Blanco-Canqui 2009). Rather than starting from the assumption that soil residues are generally waste, the assumption should be the opposite. Some residues may be legitimately available, but that has yet to be demonstrated.	Noted. Potential problems with excessive harvesting are now cited. Action: No action required
33128	11	74	87			Integrated model assessments: Although the main estimates of bioenergy potential are presented in Table 11.A.1, section 11.A.4.3 presents separate estimates of often large bioenergy potential based on integrated assessment models. The problem is simple. To my understanding, all of the models cited assume that bioenergy is inherently carbon neutral. Moreover, to the extent they then assess emissions from land use change, these emissions are presented as somehow a separate phenomenon, perhaps conceptually linked but presented as separate from the benefits from bioenergy. The related problem with many IAMS: changes in land use are not shown only due to the bioenergy. They are estimated based on a range of other assumptions that affect land use. Some IAM model runs appear to avoid land use change because the model projects large yield gains or in some other manner estimates a decline in land use demands absent bioenergy. Even though the model would probably itself estimate large land use changes due to bioenergy, the effect of the bioenergy is often not segregated, so those discrete impacts are lost. These IAMS therefore do not properly indicate the levels of bioenergy that would reduce greenhouse gas emissions if their discrete impacts on land-based carbon were counted.	Noted Action: No action required
33129	11	74	87			Another problem is that many of these IAMS are deliberately focusing only on emissions at a particular future point in time. They therefore may implicitly credit bioenergy that has large carbon payback periods. As noted elsewhere, that is a discrete policy question but most government policies today would reject it and those policies are appropriate.	Noted Action: No action required
33130	11	74	87			BECCS: The problem with these models carries over to BECCS. In general, the reason IAMS call for substantia BECCS is that they too assume that biomass is carbon neutral. The use of biomass therefore generates large greenhouse gas mitigation compared to fossil fuels, and carbon capture and storage turns that into negative emissions. But there is nothing magical about BECCS. Carbon capture and storage of one ton of carbon from any source generates one ton of reductions in emissions (ignoring inefficiencies and losses). Biomass from a truly additional, carbon free source (ignoring other complexities) generates a ton of carbon reductions to the extent it replaces one ton of fossil carbon. Putting the two together generates two tons of carbon reduction, but so would using one ton of biomass without CCS and applying one ton of CCS to fossil carbon. (To the extent the models do count in the land use implications and focus on long-term changes, as suggested by the citations to Rose and Popp in review, those would not be based on this error but their merits would depend on timing issues.)	Noted Action: No action required

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33131	11	74	87			ILUC: The discussion of ILUC implicitly starts from the perspective that biomass from existing cropland should be viewed as carbon neutral and then asks if it leads to indirect emissions that reduce or eliminate those benefits The implication of the discussion above is that is not true. The direct consequence of using biomass is only to change the source of fuel emissions from fossil carbon to biomass carbon. The examination of indirect effects is in actuality an analysis of whether those emissions – emissions that actually occur from the vehicle and during fermentation of biomass in the case of ethanol – eW offset by some kind of economically induced change in land use. That change could include price-induced yield gains, which result in additional carbon uptake, or price-induced reductions in food consumption, which result in greenhouse gas benefits from reduced human and animal respiration (Smith 2011).	Noted Action: No action required
33132	11	74	87			The significance of this distinction lies first in the relevance of uncertainty. The implication of the present discussion in the appendix is that ILUC is highly uncertain and therefore perhaps should be ignored in favor of recognition of the direct benefits of biofuels. But if biofuel carbon emitted by vehicles counts, and indirect effects are the source of the potential offsets, then the implications of uncertainty are different. If the indirect effects are too uncertain to count, then the carbon emitted by the biomass should count and biofuels that only divert existing crops or cropland should not be viewed as generating greenhouse gas benefits. This is the error of assuming carbon neutrality.	Noted Action: No action required
33133	11	74	87			The other significance is that the ILUC discussion implicitly leads to a form of double-counting. In the discussion of bioenergy potential, the analysis is based on the premise that biofuels should not be allowed to displace food production. But in the case of ILUC, ILUC emissions are lower, and biofuel GHG benefits greater, if the model assumes that much of the food diverted to biofuels is not replaced (Smith 2011). The result is an unknowing counting of greenhouse gas benefits from reduced food consumption. In addition, in the papers that estimate bioenergy potential, the assumption that cropland could become available is based on yield gains that exceed those required to meet growing food demands. (I explain above why that is also wrong but at least it explicitly acknowledges that yield gains for bioenergy must be those in excess of yield gains to meet food demands.) But in the ILUC models, the yield gains induced by biofuels are not based on calculations of yield gains in excess of those needed for growing food demand. To my knowledge, not a single ILUC estimate quoted is based on a model run that attempts to examine the likelihood that biofuels will generate yield increases in excess of those requirements, for food alone. Yet the estimated increases in crop yields do to biofuels is a large and critical factor in those model estimates with low ILUC. As virtually all strategies for stabilizing climate assume the elimination of land use change by 2050, biofuels should only be assumed to reduce greenhouse gas emissions through yield gains to the extent they stimulate higher yield gains than those needed to provide food without land use expansion. And that would be a tall order as the quantities of increased crop production implicit in the FAO projections in Alexandratos 2012 would require that yields gains grow at 125% of their rates from 1962 to 2006. (That is based on this author's calculations of datasheets provided by that FAO report and recognizes that yield growth is linear not exponential).	Noted Action: No action required
33134	11	74	87			Time: The greenhouse gas implications of biofuels depend on how time is assessed. Over long enough periods of time, any source of bioergy could be carbon neutral. Government policymakers to date have used 20 years and 30 years as an amortization period for carbon debt and assessed bioenergy based on the change in emissions in one of those periods. The appendix includes one quick reference to the possibility of using global warming potential.	Noted Action: No action required

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33135	11	74	87			This is a very large topic, however, the use of global warming potentials (i.e., the assessment of emissions over 100 years or 20 years depending on the time chosen) is woefully simplistic and not consistent with most of the IPCC's analysis of climate change. Any proper accounting of time would need to consider a very wide range of factors. Those factors would include in particular any need for short-term emissions reductions by 2050 to keep warming below a certain threshold, a variety of potential feedback effects on emissions (including many such as forest dieback and melting permafrost that are not considered in most climate models that have examined emissions trajectories), changing costs of mitigation over timem and the need to give clear market signals to assure some early mitigation, option value, and several other factors. I will separately send to the IPCC a letter written by several researchers to a panel of the science advisory board for the U.S. Environmental Protection Agency based on a draft that flirted with endorsement of long-term time accounting but that it ultimately did not endorse in the final report (Moomaw et al. 2012). The academic treatment of global warming potential is almost entirely negative because it fails to account for almost any of these factors. Its primary strength is that it has limited real world applicability – as its purpose is mainly to consider trade-offs among different pollutants. Most countries have at least nominally endorsed climate policies that favor large-scale immediate greenhouse gas reductions. Bioenergy by contrast with long payback periods involves large increases in greenhouse gas emissions for decades and would not comply with those goals.	Rejected. The use of the factors is standard throughout the report
33136	11	74	87			Electricity from Biomass: Page 78 appears to include an endorsement of the use of woody biomass as a substitute for coal on the grounds of its greenhouse gas reductions although it could also be read as simply noting that relatively speaking, use of biomass for combined heat and electricity is preferable to other uses, which is equally true of fossil fuels. The analysis of GHG reductions from biomass is based on the incorrect assumption that biomass is carbon neutral. Analyses that have examined the carbon debt from the harvest of whole trees have found otherwise (Bernier 2012; Hudiburg 2011, Holtsmark 2011; McKechnie 2011; Mitchel 2012; Schulze 2012).	Noted. Text was revised
33137	11	74	87			References	Rejected. Incomplete comment.
33138	11	74	87			Alexandratos, N., Bruinsma J. (2012). World agriculture towards 2030/2050: The 2012 revision (FAO, Rome)	Noted Action: No action required
33139	11	74	87			Bernier, P., Pare D. (2012), Using ecosystem CO2 measurements to estimate	Noted Action: No action required
33140	11	74	87			the timing and magnitude of greenhouse gas mitigation potential of forest	Noted Action: No action required
33141	11	74	87			bioenergy, Global Change Biology Bioenergy (advance online publication	Noted Action: No action required
33142	11	74	87			July 16, 2012) DOI: 10.1111/j.1757-1707.2012.01197.x;	Noted Action: No action required
33143	11	74	87			Blanco-Canqui, H. and R. Lal. 2009. Crop residue removal effects on soil, productivity and environmental quality. Crit. Rev. Plant Sci. 28:139-163.	Considered.
33144	11	74	87			Erb K, Gaube V, Krausmann F, Plutzar C, Bondeau A, Haberl H (2007) A comphrensive 1051 global 5 min resolution land-use data set for the year 2000 consistent with national census 1052 data. J Land Use Sci 2:191–224	Considered.

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33145	11	74	87			Haberl H, Erb K H, Kruasmann F, Gaube V, Bondeau A,Plutzar C, Gingrich S, Lucht W and Fischer-Kowalski M 2007 Quantifying and mapping the human appropriation of net primary production in the earth's terrestrial ecosystems Proc. Natl Acad. Sci. USA 104 12492–47	Considered.
33146	11	74	87			Haberl et al., (2012), Correcting a fundamental error in greenhouse gas accounting related to bioenergy. Energy Policy 45:18-23	Considered.
33147	11	74	87			Holtsmark B (2011) Harvesting in boreal forests and the biofuel carbon dept.	Considered.
33148	11	74	87			Climatic Change, DOI: 10.1007/s10584-011-0222-6;	Considered.
33149	11	74	87			Hoogwijk M, Faaij A, Eickhout B, de Vries B and TurkenburgW 2005 Potential of biomass energy out to 2100 for four IPCC SRES land-use scenarios Biomass Bioenergy 29 225–57	Considered.
33150	11	74	87			Hudiburg, T. et al. 2011. Regional carbon dioxide implications of forest	Considered.
33151	11	74	87			bioenergyproduction, Nature Climate Change 1:419-423	Considered.
33152	11	74	87			Houghton RE (2008) Carbon flux to the atmosphere from land-use changes: 1850–2005. In: 1073 TRENDS: A compendium of data on global change oak ridge. Carbon Dioxide Information 1074 Analysis Center, Oak Ridge National Laboratory, TN	Considered.
33153	11	74	87			1075 27. IEA (2008) Energy technology perspectives: scenarios	Considered.
33154	11	74	87			Hurtt G. et al. 2006. The underpinnings of land-use history: three centuries of global gridded land-use transitions, wood-harvest activity, and resulting secondary lands. Global Change Biology 12:1208-1229	Considered.
33155	11	74	87			Johnson E. (2009), Goodbye to carbon neutral: Getting biomass footprints right. Env. Impact Assess. Rev. 29:165-168.	Considered.
33156	11	74	87			Malhi Y, Meir P and Brown S 2002 Forests and global climate	Considered.
33157	11	74	87			Phil. Trans. R. Soc. 360 1567–91	Considered.
33158	11	74	87			Malhi, Y., Meir P., Brown S. 2002. Forests, carbon, and global climate (Phil. Trans. R. Soc. 360:1567-1591	Considered.
33159	11	74	87			Malhi,Y. 2010. The carbon balance of tropical forest regions, 1990-2005. Current Op. Env. Sustain. 2:237-244	Considered.
33160	11	74	87			Mckechnie J, Colombo S, Chen J, Mabee W, Maclean H (2011) Forest	Considered.
33161	11	74	87			Bioenergy or Forest Carbon? Assessing Trade-Offs in Greenhouse Gas	Considered.
33162	11	74	87			Mitigation with Wood-Based Fuels. Environmental Science & Technology,	Considered.
33163	11	74	87			45, 789-79;	Considered.
33164	11	74	87			Mitchell, S., Harmon, M., K. O'Connell (2012), Carbon debt and carbon	Considered.
33165	11	74	87			sequestration parity in forest bioenergy production, Global Change Biology,	Considered.
33166	11	74	87			Bioenergy	Considered.
33167	11	74	87			Moomaw et al. (2012), Comments on timing of emissions to the advisory panel on biogenic emissions of the US EPA	Considered.
33168	11	74	87			Pan Y et al (2011) A large and persistent carbon sink in the world's forests. Science	Considered.
33169	11	74	87			333:988–993	Considered.
33170	11	74	87			Schulze E.D. 2012. Large-scale bioenergy from additional harvest of forest biomass is neither sustainable nor greenhouse gas neutral GCB Bioenergy	Considered.
33171	11	74	87			Searchinger T. et al. (2009), Fixing a critical climate accounting error, Science 326:527-528	Considered.
33172	11	74	87			Searchinger T. (2010) Biofuels and the need for additional carbon, Environ. Res. Ltt. 5, 024007	Considered.
33173	11	74	87			Smith K.A., Searchinger T.D. (2012), Crop-based biofuels and associated environmental concerns. GCB Bioenergy 4:479-484.	Considered.
33174	11	74	87			Smeets E, Faaij A (2007) Bioenergy potentials from forestry in 2050. Climatic Change 1125 81:353–390	Considered.
33175	11	74	87			Smil V (1999) Crop residues: agriculture's largest harvest. Bioscience 49:299–308	Considered.
33176	11	74	87			Solomon S. et al., Irreversible climate change due to carbon dioxide emissions, PNAS 106:1704-1709.	Considered.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33177	11	74	87			Watson R. et al., Eds., Land Use, Land-Use Change, and Forestry (IPCC, Cambridge Univ. Press, Cambridge, 2000).	Considered.
33178	11	74	87			Walker T. et al.,2010. Biomass sustainability and carbon policy study.	Considered.
33179	11	74	87			Manomet Center for Conservation Sciences, Brunswick Maine;	Considered.
33180	11	74	87			Zanchi G.A. et al. (2011), Is woody biomass carbon neutral? A comparative	Considered.
33181	11	74	87			assessment of emissions from consumption of woody bioenergy and fossil	Considered.
33182	11	74	87			fuel. Global Ch. Biol. DOI doi: 10.1111/j.1757-1707.2011.01149.x	Considered.
27972	11	74	9	74	10	The statement "could help to reduce negative effects" should be completed with: "…negative effects of bioenergy production" to clarify the proposition.	Accept
27973	11	74	9	74	10	Whether bioenergy (regulation) is truly capable of realizing the anticipated positive effects or if it is - more or less inevitably - compensated by negative side and indirect effects is a hot debate between scientists. E.g. it is still not proven, whether the food and water issue can be resolved through certification schemes and the like as it is a problem of scale and displacement not (only) of production quality. Therefore, I would suggest to delete the last part "and deliver climate change...benefits" (line 9 to line10) and leave it at the opportunity to reduce the negative effects of bioenergy production, which is certainly true.	Noted. Text was revised to include different perspectives
29283	11	74				This appendix contains very important information concerning the bioenergy production and the various impacts related to it. This section should not be shortened.	Thanks : Accepted
33324	11	74	1			Section should be named 'appendix' to distinguish it from annexes. Heading structure should be revisited to enhance accessibility.	Thanks : Accepted
33325	11	74	1			Wording choices referring to potentials, resources, climate forcing effects or tradeoffs and synergies should be revisited and checked carefully to avoid ambiguities.	Noted
33327	11	74	1			LCA of bioenergy incl. biofuels are dealt with in the bioenergy x-cut, but comparison to fossil systems missing, Figures 11.A.3 and 4 are hard to access.	LCAs are site, pathway and technology specific and don't result into straightforward messages. The graphs represent the state of knowledge. Specifically, a one-to-one comparison with fossile fuel systems a misleading GHG savings metric: savings could be higher or lower depending on economic dynamics. LCA results depend on specific assumptions taken; interpretation is delicate.
22865	11	74	1			The annex does a good job of discussing the many aspects related to bioenergy and sustainability. It correctly points out that there are opportunities as well as risks. However, the risk side is heavily emphasized in many parts of the annex whereas the opportunity side is often down-played. Especially, little attention is given to recommendations for how to leverage opportunities (e.g. for small-holder farmers) and to avoid or mitigate risks. It may be beyond the scope of the chapter to give recommendations but it is recommended that the authors carefully considers the balance of the annex (risks vs. opportunities). It is very important not to see biofuels in isolation but always to keep in mind the alternative (usually petrochemical) fuel replaced.	Accepted: Two new paragraphs were included at the beginning of the annex, highlighting the issues mentioned in this comment

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22866	11	74	1			The annex carefully considers energy potentials from bioenergy but is not very explicit on land availability. It is suggested to include global studies like 'Fritz et al. (2012): Downgrading Recent Estimates of Land Available for Biofuel Production' (Environ. Sci. Technol 47, 1688−1694) as well as studies with a more regional scope like Gelfand et al. (2013): Sustainable bioenergy production from marginal lands in the US Midwest (doi:10.1038/nature11811)	Accepted: land availability / competition is mentioned now in several sections including the introduciton and 11.A.5 where sustainable development as well as co-benefits and potential adverse side effects are discussed
22868	11	74	1			The issue of time scales is only briefly addressed here and there in the annex on bioenergy. It is recommended to include a specific section on this aspect highlighting its importance for the conclusions on GHG mitigation from biofuels. It should also be stressed that this issue is still subject to scientific debate, see e.g. Kløverpris and Mueller (2013): Baseline time accounting: Considering global land use dynamics when estimating the climate impact of indirect land use change caused by biofuels, Int J Life Cycle Asses 18:319-330 (and related publications cited in this paper). It should also be stressed that there is in fact no scientfic basis for deciding on a given time perspective. Despite of that, it is important to strive for consistency in GHG analysis and, from my point of view, it is some times much better to display results over time instead of looking at one result based on a fixed (and basically arbitrary) time horizon. Such a discussion would add much value to the annex.	We agree with that comment. There are tough space constraints, and other factors are equally important. Two sentences are now explicit about the time dimension: 1. "Accounting always depends on the time horizon adopted when assessing climate change impacts and is hence not purely science-based but includes value judgements (Brandao et al., 2013; Kløverpris and Mueller, 2013)". 2. "Causes of the great uncertainty include: ..... and the treatment of emissions over time (O' Hare et al., 2009; Khanna et al., 2011; Wicke et al., 2012)."
22856	11	74	3			It is mentioned that bioenergy systems can have 'negative effects GHG mitigation implications' and that 'net global warming' can result. While this is indeed correct in the short term, all studies that I am aware of indicate that, in the longer term, bioenergy projects will provide climate benefits from continued displacement of fossil energy use (or charcoal for cooking). I therefore suggest to revise the sections and bring in the time aspect to get a more nuanced introductcion to the annex on bioenergy.	Noted. Section was revised.
29492	11	74	20	74	22	This sentence should also make reference to the implications of the displaced energy source. Ie Insert at line 22 after "cost of the resource" ", savings from displaced fossil fuel emissions"	The section on the potentials has been shortened to focus on the technical potentials only; that sentence has been deleted.
29493	11	74	25	74	26	Sentence should be re-written for clarification eg "It is estimated that dedicated biomass plantations have the greatest potential to produce bioenergy, with deployment levels ranging from 26-675 EJ/yr"	Thanks : Accepted . (Minor issue) . Action: Modify
29494	11	74	27	74	28	"rounding to the nearest ten" please clarify	Accept. Text was revised
29274	11	74	34			The IPCC Special Report on Renewable Energy Resources and Climate Change Mitigation (SRREN) has been cited as SREEN. This should be SRREN.	Thanks : Accepted

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29495	11	75		75		1. The forest residue near term trade-off is insignificant, particularly when the risk of fire and the more immediate benefit of fossil fuel displacement are considered. Insert after "being used for energy" "This trade-off may be negligible in circumstances where losses of C from ground litter due to fire or the more immediate benefits of displacement of fossil fuel GHGs are considered. "	Noted .Introductory para . Correct but lack of space Action: No action
29496	11	75		75		Unutilized forest growth would be better expressed as "unharvested". To avoid negative effects of reduciton in C stock, cf the baseline of continued growth, this assessments should be based on the additional biomass that could be made available by keeping forests in active growth stage, through harvest and regrowth rather than leaving them to reach natural carbon carrying capacity	Accepted, a new term is used now Action: No action required
31082	11	75				Under "2. Unutilized forest growth", it is possible to have other (non-timber) forest products which could continue to be produced even when there is no excess wood available for bioenergy. Suggest rewording this as: "The part of sustainable wood harvest levels (often set equal to net annual increment) in forests judged available for extraction, that exceeds the projected demand for other wood products."	Thanks : Accepted Action: Rewording
31083	11	75				Under "3. Agriculture residues", mention of variations in collection and processing costs are referred to forestry as well. This reference should be deleted here. If necessary, make an appropriate analogous reference under "1. Forest residues".	Accepted Action: Textwas revised
31084	11	75				The sustainability implications and carbon footprint of industrial residues (which were previously traditionally burned on site or left to rot) is generally significantly different from other harvest residues, so suggest reviewing and being careful about lumping them together and making general statements about "residues" that do not pertain to both types of residues. In Canada, the economics of using harvest residues is pretty poor, and as such the vast majority of domestic bioenergy production currently comes from industrial residues.	Noted We distinguish between agricultural residues and industrial residues
29275	11	75				The IPCC Special Report on Renewable Energy Resources and Climate Change Mitigation (SRREN) has been cited as SREEN. This should be SRREN.	Thanks : Accepted Action: Correct
19120	11	75				Unutilized forest growth: 64-74 EJ/y. These estimates are on the low side. My qick assessment of accessible annual yield is 343 EJ of which 66EJ is presently consumed. The 'surplus' in developing countries is an estimated 148 EJ and in developed countries 129 EJ. Some of this annual increment will add to the tree capital, but most will die and be returned to the atmosphere through decay (or wild fires) etc. (Openshaw K, 2011. Supply of woody biomass, especially in the tropics: is demand outstripping supply? International Forestry Review Vol.13(4).	Noted .Good to be on conservative side Action: No action required
20160	11	75				Table 11.A.1: Table only describes options which are somehow all based on commercial or developed systems and ignores the traditional use of bioenergy by many households in rural developing regions. Even though it get a little paragraph below and is difficult to assess, but it should be at least be in here considered as it is applicable for a large share of the global population. Especially as bioenergy is used in a traditional context in regions with considerable current/future pressures (population growth, poverty, urbanisation, changing lifestyles, land degradation, severe climate change impacts). Additionally, these are regions emitting the main share of non-CO2 GHG from agriculture, the sustainable and efficient use of bioenergy on a domestic/small scale level will be an important mitigation option.	Thanks : Accepted Traditional biomass use included

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23173	11	75				Why no ranges quoted in Category 2 - yet there is a range in the sub-total. Suggest for the "Forest biomass' row, add the sub-total for Categories 1 and 2 above the SRREN sub-total as in categories below.	Table was removed
29219	11	75				Under 'unutilised forest growth', at the end of the paragraph the following is required: To ensure that the bioenergy from 'unutilised forest growth' causes net carbon savings, it is important to determine changes in forest carbon stocks caused by increased wood demand by bioenergy, and compare to the carbon stock of the forest that would exist without the bioenergy demand.	Thanks : Accepted . Section was re-written and the issue was incorporated
29220	11	75				Under 'Forest Residues', the definition of a forest resiude needs to be better defined. For example, here silvicultural thinnings are classified as 'residues', but in reality, thinnings are a key product from forest management and should not be considered as 'residues'. Suggest: Forest residues are woody materials which do not have alternative uses and would otherwise be left to decay in a forest. Sources include by-products from logging; wood processing residues such as sawdust, bark and black liquor; dead wood from natural disturbances such as storms and insect outbreaks (irregular source).	REJECT Thinnings in many situations are residues Action: No action required
19402	11	75	13			SRREN is written wrong all over the table	Noted
24860	11	75	13	75		The forest residue near term trade-off is insignificant, particularly when the risk of fire and the more immediate benefit of fossil fuel displacement are considered. Suggest insert after "being used for energy."- "This trade-off may be negligible in circumstances of losses of C from ground litter due to fire or the more immediate benefits of displacement of fossil fuel GHGs are considered. "	Noted. Text was revised
24861	11	75	13	75		Unutilized forest growth would be better expressed as "unharvested". To avoid negative effects of reduction in C stock, cf the baseline of continued growth, this assessments should be based on the additional biomass that could be made available by keeping forests in active growth stage, through harvest and regrowth rather than leaving them to reach natural carbon carrying capacity	Noted. We revised the text and now use a different term
26058	11	75	13	76	1	Table 11.A.1: Add sentence to resource category 2: Taking the unutilized forest growth into use may cut off the existing C sink, having a similar impact on the global C balance as increased emissions.	Noted .Too detailed Action: No action required
37989	11	75	2	75	2	Rewrite 'landscape structures, biodiversity.' To 'landscape structures beneficial for biodiversity conservation (Berndes)'	That section has been shortened to focus on the potentials only.
21251	11	75	34			Term "SREEN" is used for first time in the chapter and should be defined / elaborated in the sentence.	Thanks : Accepted
37990	11	75	34	75	34	Correct SREEN.	Thanks : Accepted
21252	11	75	41			Change term to "ligno-cellulosic"	Thanks : Accepted
33326	11	75	7			Supply potential numbers don't add up.	Thanks : Accepted and revised. Note that the table stucture has been changed.
33328	11	75	7			SRREN, not SREEN	Thanks : Accepted
33329	11	75	7			It needs to be made more transparent, why studies assessed in the SRREN where not considered. The restrictions should be specified.	The appendix aimed at focusing on post SRREN studies. The SRREN results are referenced. The LCA tables are not directly comparable, because the SRREN also added credits for substituting fossil fuels. The AR5 didn't replicate that practice to avoid double counting.
21049	11	75	7	76	9	Please check - do you mean SRREN or SREEN?	Thanks : Accepted

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21257	11	75	7			We suggest further partitioning of this table to show the average bioenergy potential across only studies in which sustainability criteria are considered. Again, reporting only an average value of 500 EJ/yr across all studies is misleading since a number of the high end studies included in this calculation are based on the extrapolation of unrealistic yield potentials that do not take into account biophysical constraints and/or limits to agricultural inputs (Smith, Zhao, and Running, 2012). Using high-resolution, spatially-explicit, satellite-derived measurements of global plant productivity, we estimate the technical global primary bioenergy potential to realistically range from roughly 50 - 180 EJ/yr (Smith, Zhao, and Running, 2012). Haberl et al. (2010) shows that the global technical primary bioenergy potential is reduced significantly to 160-270 EJ/yr when only studies that factor in sustainability criteria are considered. Smith, W. K., Zhao, M., & Running, S. W. (2012). Global Bioenergy Capacity as Constrained by Observed Biospheric Productivity Rates. BioScience, 62(10), 911–922. doi:10.1525/bio.2012.62.10.11. Haberl, H., Beringer, T., Bhattacharya, S. C., Erb, K.-H., & Hoogwijk, M. (2010). The global technical potential of bio-energy in 2050 considering sustainability constraints. Current Opinion in Environmental Sustainability, 2(5-6), 394–403. doi:10.1016/j.cosust.2010.10.007.	Accepted. Average value is not considered anymore.
31085	11	76				Under "4. Dedicated biomass plantations", the sentence "Higher end estimates presume favourable agriculture development concerning land use efficiency - especially for livestock production - releasing agriculture lands for bioenergy." is puzzling. Regardless of how livestock are fed, land will still need to be devoted to feed production. The greatest gains in LUE could be achieved by reducing livestock production and shifting human diets to a higher proportion of plant products. The following sentence vaguely suggests this. Perhaps these two sentences could be combined and clarified? E.g., "Higher end estimates presume greatly increased land use efficiency, through (1) increasing land use efficiency for livestock production and/or (2) reducing total livestock production, and shifting human diets to higher proportions of edible plant products."	Noted. Text was revised
31086	11	76				Why provide ranges for each of the biomass resource categories and then only show their averages when presenting the totals in the "Total Potential" section? Does this mean that the max value for each category is not cumulative? Presenting the range in the totals would be more consistent with the rest of the table.	Accept Table was removed, now a graphs with ranges is presented
31087	11	76				The supply potential for "Dedicated biomass plantations" has a very large range. Is it possible to include the value that was used in the "Total potential" for each region?	Table was removed

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27182	11	76		76		Differently from annual crops, sugarcane is harvested every year, but is replanted only after 5 or 6 years. Harris et al (2009) stated that it is important to distinguish sugarcane from annual crops when calculating land use related GHG emissions for biofuels and considered that sugarcane as a perennial crop. Above and below ground carbon stocks for sugarcane are significantly higher than those for annual crops, and similar to perennial crops (Lisboa et al., 2011; Galdos et al., 2010; Amaral et al., 2009). Ignoring this features from sugarcane leads to huge errors in estimation of GHG emissions due to land use change. Particularly in Brazil, displacement of pasturelands by sugarcane tends to be a carbon sink (sugarcane being considered a perennial or semi-perennial crop), and not a carbon source (if sugarcane were an annual crop). A study from the Center for Sugarcane Technology (CTC), for instance, have quantified the carbon stock in the soil for sugarcane fields in the Brazilian Center-South and the findings showed values for carbon stored in the soil with sugarcane compatible with soil under forestry. The absence of this discussion deeply jeopardizes the scientific approach of the Assessment Report. REFERENCES: (1) Harris, Nancy; Grimland, Sean; Brown, Sandra. 2009. Land Use Change and Emission Factors: Updates since the RFS Proposed Rule. Report submitted to EPA. (2) Lisboa, Carolina Cardoso, Butterbach–Bahl, Klaus , Mauder, Matthias and Kiese, Ralf. Bioethanol production from sugarcane and emissions of greenhouse gases – known and unknowns Department of Bio-Geo-Chemical Processes, Institute for Meteorology and Climate Research, Atmospheric Environmental Research (IMK-IFU), Karlsruhe Institute of Technology (KIT), Kreuzeckbahnstrasse 19, 82467 Garmisch-Partenkirchen, Germany. (3) Galdos, Marcelo Valadares; Cerri, Carlos Clemente; Lal, Rattan; Bernoux,Martial; Feigl, Brigitte; And Cerri, Carlos Eduardo P. Net greenhouse gas fluxes in Brazilian ethanol production Systems. Centro de Energia Nuclear na Agricultura, Universidade de São Paulo. GCB Bioenergy (2010) 2, 37–44, doi: 10.1111/j.1757--1707.2010.01037 (4) AMARAL, W. A. N.; MARINHO, J.P.; TARASANTCHI, R.; BEBER, A.; GUILIANI, E. (2008). Environmental sustainability of sugarcane ethanol in Brazil. In: Zuurbier and Vooren (coord.), Sugarcane ethanol: contributions to climate change mitigation and the environment. Wageningen: Wageningen Academic Publishers. (5) Joaquim, AC, et al. Organic Carbon Stocks in Soils Planted to Sugarcane in the Mid-South Region of Brazil: A Summary of CTC´s Data, 1990-2009. Centro de Tecnologia Canavieira [Centre for Sugarcane Technology]. Technical Report, Piracicaba, São Paulo, 2011. Available at: http://www.unica.com.br/download.php?idSecao=17&id=18105453	Noted. We have addressed the sugarcane situation several times in the text and added many of the refs suggested
23354	11	76				Are industrial processing wastes (e.g. from meatworks) also considered here as organic wastes?	Yes
29221	11	76				Dedicated biomass plantations. Include at the end of paragraph: Abandoned land, freed up by crop yield increases, dietry changes and improvemens to agricultural efficiencies, may be available to establish such plantations. To determine the GHG impacts of bioenergy from these plantations, the change in carbon stock of the soils and above ground biomass should be compared to how they would change if the plantation was not established (land counterfactual), such as leaving the land to revert to its native state, or using the land to maximise carbon stock (e.g. afforestation).	Noted .No space to add all scenarios and situations Action: No action required

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26437	11	76	4	76	7	Recent studies should be also referred to and added. For example, Beringer et al. (2011) present 26~174 EJ/yr and Hayashi et al. (in review) report ~130-140 EJ/yr, as potential for "category 4; Dedicated biomass plantations". T. Beringer, W. Lucht, S. Schapoff (2011) "Bioenergy production potential of global biomass plantations under environmental and agricultural constraints", GCB Bioenergy;3: 299-312. A. Hayashi, K. Akimoto, F. Sano ,T. Tomoda, "Global evaluation of energy-crop production potential by level of conditions for yield and land accessibility", (in review) (be sent via e-mail).	Noted .Will try and include Action: try include
31090	11	77				Please define the acronyms "MSW" and "AD".	Thanks : Accepted Action: Define
19121	11	77				Methanol (wood alcohol) missing from liquid fuels and Gengas missing from gaseous fules.	A new figure has been introduced, reviewing the relevant pathways.
26059	11	77				Table 11.A.1: Resource category 4 may cause emissions if established on C-rich lands or cause indirect land-use change emissions due to competition with e.g. farmland.	Thanks : Accepted .GHG issue is covered Action: No action required
21050	11	77				Please give the footnotes with the figure and explain the abbreviations (MSW, AD) and please explain the difference between "biodiesel" and "renewable diesel".	Thanks : Accepted Action: Add footnotes
23174	11	77				Replace "Oil crops" with "Oils and fats" and follow with "Vegetable oil crops, waste cooking oil and fats." This then includes palm oil, soybean etc etc. Replace "Energy Crop" with "Vegetative grasses" since not all energy crops are ligno-cellulosics (eg sugarcane). Replace "Biodegradable MSW" with "Organic wastes". Put "AD" in full	Figure has been replaced.
24862	11	77	13	77	13	To strengthen this critical point, suggested additional reference: Keating, B.A., Carberry, P.S. and Dixon, J. (2013) Agricultural intensification and the food security challenge in Sub Saharan Africa. In; 'Agro-ecological intensification of agricultural systems in the African Highlands'; edited by Vanlauwe B, Van Asten P, Blomme G; Earthscan, UK; 2013	Section 2 has been rewritten. Not applicable.
24863	11	77	16	77	16	Does "biofuel" refer only to liquid transport fuels, or all bioenergy products? Please clarify terminology up front and then use consistently.	Thanks : Accepted. Is clarified in the Glossary.
30209	11	77	17	77	18	See comment for pg. 36, ln 27-28.	Noted
31088	11	77	17	77	17	Suggest "greater" or "increased" be inserted before "agricultural productivity".	Thanks : Accepted Action: Insert
30208	11	77	18	77	19	"Yield increase is also often associated with increased GHG emissions from N20 and from production of inputs." Yield increases are also associated with environmental impacts as mentioned on pg. 36 ln. 29-31 and pg. 36 34-35. These should be mentioned here again.	Noted .Too detailed information for the annex Action: No action
27978	11	77	18	77	19	Here, it might be indicated to distinguish between low productivity systems, which allow intensifications without undue environmental costs and already input intensive systems, where further intensification would bring high environmental costs along. Furthermore, negative effects are not only limited to an increase in N2O emissions and those from increased input production - but are caused predominantly by their application, which means a threat to agrarian biodiversity, water and soil contamination and degradation, and - especially in Brazil, India, SSA etc. - poisonings directly or via water sources contaminations.	Noted . The section has been rewritten. However, because of space constraints, country specific details cannot be mentioned.
23175	11	77	2			Replace "transportation" with "transport" and throughout the text - to conform with Chapter 8.	Accepted and replaced.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31089	11	77	20	77	24	Could possibly mention here that these technologies generally contribute to more efficient use of fertilizers and water and therefore bring co-benefits.	Noted .Obvious, no need for explanation Action: No action
23355	11	77	20		24	A range of “low tech” options to improve agricultural practices such as no/low tillage conservation, agroforestry etc., have potential to increase yields (e.g. in sub-Saharan Africa), while also providing a range of co-benefits such as increased soil organic matter. Such low-tech options require a much lower level of investment and inputs and are thus more readily applicable in developing countries, while also holding a low risk of increased GHG emissions.	Thanks. Recommendation of wording has been taken up.
19403	11	77	24	77	26	Aquatic biomass production in arid lands?	Clarified
24864	11	77	24	77	26	Macro-algae are also aquatic biomass. If this comment applies only to microalgae then delete “aquatic biomass production” and just say microalgae. This statement needs further qualification, recognising need for water, greatly improved energy balance, and reduction in costs.	Thanks : Accepted Deleted.
21051	11	77	24	77	26	Please check: Aquatic biomass production in arid lands - that sounds quite sub-optimal …	Thanks : Accepted Action: Delete
27979	11	77	24	77	28	Algae: Their cropping in arid land or brackish water is the precondition for the non-competing effect with regard to other land use options. Therefore, the statement should reformulated: "Aquatic biomass production […] could avoid competition with agricultural lands if it succeeds to grow algae in arid lands and brackish waters, or at sea."	Thanks : Accepted Deleted.
26775	11	77	26			It is important to also note algae can also be grown in former industrial land, including contaminated land, which would be totally unsuitable for crops - thus deffinitely not been part of the food v fuel issues	Thanks : Accepted Action: Delete
20161	11	77	26	77	26	arid lands': Arid areas will face severe climate change impacts in the future. Productions on such land will be an technological challenge not to degrade soils (what it is already today) under intensive use. Arid soils are sensitive and fragile growing environments and with climate change even more. Such a statement needs a critical discussion of environmental impacts, soil carbon, soil related N2O emissions as well as infrastructures, socio-economic and socio-cultural consequences for people living in such regions and basing their livelihood on them	Thanks : Accepted Action: Delete
23356	11	77	35		36	What about options for gaseous biofuels for transport?	Accepted and referenced.
24865	11	77	36	78	1	This is a generalisation and should be qualified. Not all biofuels are fully compatible with petroleum infrastructure globally. Neither can they be used in all applications and in some instances e.g. general aviation, almost no application. Civil aviation biofuels are only at experimental stage. For general aviation, there is to all intents and purposes no application because >99% of the GA fleet engines in service cannot use biofuel - only 1 engine type can use ethanol but it is not in widespread use. One other GA type can use jeta1 as per the civil aviation fleet but, as noted, biofuel jeta1 is experimental only. Suggest at line 36 insert "experimental" before "jet fuels" and delete the phrase "fully compatible with petroleum infrastructure" as this is yet unproven. Citation: discussion on experimental jet fuel in- Flight Safety Australia Magazine - May 2008, Civil Aviation Safety Authority, Canberra - pp20-26	Accepted. That sentence has been deleted.
22857	11	77	4			Suggest to add an arrow from 'Lignocellulosic Biomass' to '(Hydrolysis) + Fermentation' as this process has been running for several years in several demo plants around the world and is now coming online at industrial scale, e.g. in Crescentino, Italy.	Thanks : Accepted Diagram is modified.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23625	11	77	8	79	9	What is new in this segment that has not been covered by the SRREN and GEA? I believe within the AR5 the bioenergy section should concentrate on the actual/expected GHG mitigation role of biomass for energy	Noted .New references added, all aspects of bioenergy need to be covered Action: No action
37991	11	77	9	77	10	This list does not include the unutilized forest increment (whatever that includes, since not explicit above).	Accepted. The section has been rewritten.
27977	11	77	9	78	5	This whole paragraph is very one sided suggestive in terms of a "pro intensification" in agriculture as only 1,5 sentences mention some (by far not all) negative effects of (further) intensification. E.g. that rising N20 emissions associated with intensification could compensate any GHG advantage of bioenergy (Meyer-Aurich et al, 2012; DOI 10.1007/s11027-012-9399-x) is not mentioned. Or extension of agricultural activities could lead to degradation of water sources and soil, threats to biodiversity and natural C-storages and the like. Furthermore, intensification does not belong in a Chapter "Production and Conversion technologies", but rather in Chapter 4. Therefore, It is suggested to list sources and conversion technologies without discussing potential yield increases here and .	Accepted. The section is been completely rewritten.
27183	11	77	1	77	7	It is not clear how sugarcane bagasse is treated in the figure. According to the figure, it seems that sugarcane crops can only be used to produce ethanol or biomethane. In reality sugarcane bagasse is already widely used to produce electricity, accounting for a significant portion of Brazilian energy matrix (EPE, 2012). Macedo et al (2008) shows huge environmental benefits from sugarcane bagasse use. REFERENCES: (1) Empresa Brasileira de Energia. BALANÇO ENERGÉTICO NACIONAL 2012. (2) Macedo IC, Seabra JEAS, Silva JEAR. Green house gases emissions in the production and use of ethanol from sugarcane in Brazil: The 2005/2006 averages and a prediction for 2020. Biomass Bioenergy 2008; 32:582-595. Renewable diesel can also be produced by sugar and starch crops. This pathway should also be included in the Figure. The technology is already being adopted in Brazil, where a modified yeast is used in fermentation, allowing for the conversion of sugars into a hydrocarbon that is similar to diesel. This fuel is currently being used by approximately 300 public buses in the Brazilian cities of São Paulo and Rio de Janeiro.	Accept. Figure was revised
29223	11	77	11	77	11	Should say 'up to 50%' rather than 20-50%, as for some crops yields may increase but be 0-20%.	Noted Section was re-written Action: No action required
29497	11	77	13	77	13	To strengthen this critical point, cite additional references eg Keating, B.A., Carberry, P.S. and Dixon, J. (2013) Agricultural intensification and the food security challenge in Sub Saharan Africa. In; 'Agro-ecological intensification of agricultural systems in the African Highlands'; edited by Vanlauwe B, Van Asten P, Blomme G; Earthscan, UK; 2013	That section has been written. The useful reference has been cited now at the end of 11.A.3 where citing the yield possibilites in developing countries.
29498	11	77	16	77	16	Does "biofuel" refer only to liquid transport fuels, or all bioenergy products? Please clarify terminology up front and then use consistently.	Accepted. See glossary.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27185	11	77	16	77	18	It is mentioned that agricultural productivity can increase the profitability of production and therefore may result in increased land conversion. This statement must be carefully made so it does not lead to erroneous conclusions. It is known that lower (and not higher) agricultural yields may lead to higher LUC in the sense that it requires a greater amount of land for production. The text itself affirms this in page 84 (see quote from Chum et al). In this context, increasing productivity would be clearly beneficial in the sense that it reduces the need for land conversion. In addition to that, greater yields may lead to an increase in supply, which in theory can reduce prices. In this scenario there will be no incentives for land conversion. This dynamics should also be taken into account.	Accepted. That sentence has been deleted (not enough space to discuss different views here).
27186	11	77	18	77	19	The statement that yield increase is often associated with higher GHG from N2O emissions is not correct for sugarcane. This trend might be well-founded for developed countries, where alternative technologies for increasing productivity might be already in place. In developing countries, however, improvements in existing technologies that are not associated with increased emissions can still be implemented to achieve productivity gains (e.g. adoption of best agricultural practices such as no-tillage; deployment of more efficient feedstock varieties; optimized breeding and others). As shown in MACEDO et al (2008), yield improvements in sugarcane yield is expected to come with less (and better) use of N fertilizers. REFERENCE: Macedo IC, Seabra JEAS, Silva JEAR. Green house gases emissions in the production and use of ethanol from sugarcane in Brazil: The 2005/2006 averages and a prediction for 2020. Biomass Bioenergy 2008; 32:582-595.	Accepted. The statement in question has simply been deleted. The Macedo et al, 2008 reference is still taken up as a helpful support for a later sentence, pointing to low sugarcane related N2O emissions.
29499	11	77	24	77	26	Macroalgae are also aquatic biomass. If this comment applies only to microalgae then delete “aquatic biomass production” and just say microalgae. This statement needs further qualification, recognising need for water, greatly improved energy balance, and reducion in costs.	Accepted on both accounts
29224	11	77	24	77	24	Should be mentioned that these high productivities may rely on cultivation using a concentrated form of CO2 (e.g. flue gas from a power station), which may limit where the algae can be grown.	Noted .Too detailed Action: No action required
29500	11	77	36	78	1	This is a generalsation and should be qualified. Not all biofuels are fully compatible with petroleum infrastructure globally. Neither can they be used in all applications and in some instances e.g. general aviation, almost no application. Civil aviation biofuels are only at experimental stage. For general aviation, there is to all intents and purposes no application because >99% of the ga fleet engines in service cannot use biofuel - only 1 engine type can use ethanol but it is not in widespread use. One other ga type can use jeta1 as per the civil aviation fleet but as noted, biofuel jeta1 is experimental only. Suggest line 36 insert "experimental" before "jet fuels" and delete the phrase "fully compaible with petroleum infrastructure" as this is as yet unproven. See discussion on experimental jet fuel in Flight Safety Australia Magazine - May 2008, Civial Aviation Safety Authority, Canberra - pp20-26	Accepted. The corresponding sentence has been deleted.
27184	11	77	8	78	5	The section does not mention mechanized harvesting of sugarcane, which is an important innovational that is set to dominate close to 90% of sugarcane area in Brazil by 2017. According to CERRI (2011), this type of harvesting leaves greater soil coverage after harvesting than the traditional burning practice, leading to a mean annual C accumulation of 1.5 Mg/ha.year at 30cm depth. REFERENCE: Cerri,C. C.; Galdos,M. V.; Maia, S. M. F.; Bernoux,M.; Feigla, B. J.; Powlson, D. & Cerri, C. E. P. 2011. Effect of sugarcane harvesting systems on soil carbon stocks in Brazil: an Examination of existing data. European Journal of Soil Science, February 2011, 62, 23–28	The corresponding section has been rewritten, focussing on processing and end-use now. The advantages of sugar cane are pointed out in the LCA graphs, and in the SD section 11A5.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29222	11	77	9	77	19	Should emphasise the uncertainty in crop yield predictions - in particular that unpredictable climate change patterns may affect crop yields and counteract increased productivity from using advanced techniques. Also, should mention that changing diet, agricultural efficiency and intensity of livestock production are also important factors in determining land availability for bioenergy.	Noted .Too detailed . Not feasible to cover all factors responsible for crop yields Action: No action required
29737	11	77 of 14	24		28	DELETE: "Aquatic biomass production, i.e. microalgae potentially offers productivity levels above those of terrestrial plants and can avoid competition with agricultural lands since they can grow in arid lands and in brackish waters, or at sea. Its deployment depends on technological breakthroughs, and its market potential depends on the co-use of products for food, fodder, highervalue products, and fuel markets (Chum, Faaij, Moreira, Berndes, Dhamija, Dong, et al., 2011)." It is untrue that growing of microalgae on arid lands avoids competition with agriculture since pond-based and bioreactor-based algal production systems require extensive addition of fertilizer resources that would otherwise have been applied to food production. (For science review on fertilizer requirements of algae see Andres F Clarens, Eleazer P Resurreccion, Mark A White and Lisa M Colosi, "Environmental Life cycle Comparison of Algae to other Bioenergy Feedstocks," _Environmental Science and Technology_, 2010 100119091456057 DOI: 10.1021/es902838n.) This intensive use of fertilizer for algae biofuel either directly diverts limited stocks of P and K away from food production systems or indirectly may impact availability of food by pushing up fertilizer prices. Growth of microalgae for fuels in brackish waters or at sea is poorly demonstrated and highly experimental at this point and competes with coastal food production, particularly seafood harvesting by local and artisanal fishers and may impact key ecosystem services that support seafood production -- e.g., by impact on mangroves.	Thanks : Accepted Deleted.
37994	11	78		79		The flow of this page (into page 79) is very odd... It should be rewritten to better lump various end use technologies... e.g., they have aviation biofuels as part of the combined heat and power/district heating paragraph, etc.	Accepted. The section has been rewritten.
23176	11	78	1			Drop-in fuels not mentioned - Cross reference to Chapter 8	Crossreferenced to chapter 8 now within section 11A3.
37992	11	78	1	78	2	This sentence implies that cellulosic will move to more productive lands. More productive land is attractive for any produced commodity, not just cellulosic feedstocks. In fact, the benefits of cellulosics are that they are better able to marginal lands than are food crops or many ag bioenergy feedstocks. As food crops, saw timber, etc. have higher unit prices than does bulk bioenergy feedstock, there is little likelyhood that cellulosic feedstocks will ever displace more economically valuable food crops, etc. As such, development of cellulosic feedstocks is likely to lead to LESS encroachment on highly productive lands.	Thanks : Accepted Action: Delete "productive land"
27980	11	78	1	78	3	As direct land use change effects are associated with previously unused land, in the case of use of "more productive land, which is more likely associated with induced land use emissions" in my view points to indirect land use change effects and should be named as such to avoid confusion.	That sentence has been deleted to save space.
22409	11	78	10	78	11	Changing to biogas is not obvious. It is assumed that feedstock and water are available for a massive switch which is obviously not the case in most Sub Saharan Africa	The sentence has been changed. In general, a switch to biogas where feedstock/ water is available is reasonable.
23177	11	78	20	78	49	Following on from the sub-heading "Traditional biomass" [NOT "bioenergy"], split this section into four more parts "Heat and industrial applications". "Electricity and CHP" [why is this not included here?]. "Transport biofuels". "Bio-refineries"	Thanks : Accepted Action: Restructure sentence

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32191	11	78	21	78	21	...with coal in the near-term, fixed wood gas electrical plants and large….	Noted .Such detail may not be necessary Action: No action
27981	11	78	21	78	21	Co-firing cannot be regarded as an effective measure for GHG reduction per se as it depends largely on the type of biomass which is used. Especially trunk wood used for co-firing can be associated with large "carbon debts" in a time scale (depending on forest management practices). See: Haberl et al., 2012, DOI 10.1016/j.enpol.2012.02.051; Holtsmark, 2010: Use of wood fuels from boreal forests will create a biofuel carbon debt with a long payback time; EEA SC 2011; Schulze et al., 2012, do: 10.1111/j.1757-1707.2012.01169.x; etc. pp.). Furthermore, studies conducted by the German Thünen Institut (Sebastian Rüter) have shown a x-fold GHG mitigation potential in relation to wood energy when wood is used in products to substitute other materials.	Noted .Co-firing is an option in some locations. Too difficult that every sentence is applicable to all regions of the world Action: No action
26322	11	78	24	78	27	To my knowledge, IEA does not engage in making projections. The reference is misplaced here. One should not discuss the potentials of technologies or applications here with reference to scenarios that are produced based on information such as those this annex is supposed to unsurface. This way, the results arising from unknown assumptions and input data of IEA are treated as evidence here.	Agreed. Rewritten.
29502	11	78	28	78	28	"GWP effects" GWP is a term used by IPCC and UNFCCC to denote the unitless metric ("characterisation factor"in LCA terminology) that quantifies the relative radiative forcing, over a specified time period, of a GHG compared with that of CO2. Replace with "global warming effect"	Accepted.
24867	11	78	28	78	28	"GWP effects" GWP is a term used by IPCC and UNFCCC to denote the unitless metric (characterisation factor in LCA terminology) that quantifies the relative radiative forcing, over a specified time period, of a GHG compared with that of CO2. Replace with "global warming effect"	Accepted. That sentence has been deleted.
21253	11	78	29			Change term to "ligno-cellulosic"	Not clear
32192	11	78	32	78	32	…Geyer et al., 2013) apart with wood gas vehicules when wood is cheap, such as in certain developping countries and in OCDE agriculture (FAO, 1986, Vaitilingom et al., 2012). FAO 1986 Wood gas as engine fuel. FAO Forestry Paper 72, 132 pp. www.fao.org/docrep/T0512E/T0512e00.htm Vaitilingom G, Agier Y , Lacour S, 2012, Un carburant spécifique pour les engins agricoles : étude de quatre filières de production de biocarburants agricole. Ecotechnologie, 54-60. cemadoc.cemagref.fr	Noted .only illustrations . Not feasible to include all Action: No action
30210	11	78	38	78	39	"As there are no other low-carbon intensity fuel options for aviation (see Chapter 8.3) and biofuels may be the best option for GHG emissions reductions within aviation, but costs need to be reduced significantly and life-cycle emissions need to be low". There needs to be soem recognition here that the amount of biofuels for aviation is very large. Combining the demand for biofuels from aviation with domestics cars is likely to exceed most estimates of available (certainly for sustainbly-available) bioenergy.	Noted .We are not suggesting biofuels for cars and aviation Action: No action
26148	11	78	38	78	41	The sentence is very long. It should be split into two to make it more understandable.	Accepted.
31091	11	78	39	78	39	Delete "and".	Thanks : Accepted Action: Delete
19404	11	78	43	78	43	Bio-products or Bio-energy-products? All biomass harvested results in bio-products, sugar is also a bio-product, as is food.	Accepted. Bioproducts.
19405	11	78	45	78	47	Local energy could be applied also in developed countries, not just developing.	Noted .It is more in developing countries Action: No action

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34024	11	78	6	78	8	It is stated that traditional biomass represents approximately 15% of total global energy use. This data should be checked because in the report of the cited authors it is stated that Biomass provided about 10.2% (50.3 EJ) of global total primary energy supply (TPES) in 2008. This should be clarified.	Noted .It is based on quoted reference Action: Check 10% or 15%
22858	11	78	6	78	19	The text correctly mentions the option of using biogas for household cooking but fails to mention that bioethanol can also be used for household cooking thereby replacing charcoal (and associated deforestation) and reducing in-door air pollution (and related health problems). For one example, plase see www.cleanstarmozambique.com.	Noted .We are not listing all options Action: No action required
24866	11	78	7	78	9	Does this statement apply only to "traditional use" in developing countries or also to use for space heating in developed countries?	Noted .Largely in developing countries Action: No action required
25904	11	78	7	78	19	It would be important to mention the need for a better assessment of the contribution of traditional biomass combustion to climate change (and the corresponding emissions should be added in the energy models, which usually poorly include these emissions). Amonsgt the information to be enhanced: - Real CO2 emissions associated to the combustion of traditional and modern biomass (the usual assumption is that biomass is CO2-free at the combustion level); - Other forcing contributors (black carbon, aerosols, etc.)	Noted .Due to space constraint unable to add
37993	11	78	8	78	9	What part of bioenergy use will rise from 2.7 to 2.8 billion people between now and 2030? What ever it is, why bother dealing with it here? 100,000 people is a neighborhood or two in a major city, and this increase will occur over 17 years.	Accepted. That sentence has been removed.
19122	11	78	9	78	10	"Cooking is done in open fires and rudimentary stoves, with only 10-20% conversion efficiency". If biomass is redily available, cooking efficiency is not a problem, and besides heat may also be required. However, as soon as people pay for the fuel, or it becomes scarce, then even with an open fire, the cook takes measures to improve the efficiency by shielding the fire, removing wood after the cooking is finished etc.	Noted ; space restrictions prohibit a detailed discussion here.
27187	11	78	1	78	1	The statement that “more productive land is also economically more attractive” is imprecise and disconnected from reality in Brazil. Using satellite images, ADAMI (2012) shows that the great majority (69.7%) of sugarcane expansion in Brazil converted pasture areas. On the contrary of the statement, pasture in Brazil is considered a low productive area. The major reason for the selection of this type of area is that it is cheaper and, making it economically more interesting than areas with high competition with food crops and higher prices. REFERENCE: Adami, M.; Rudorff, B. F. T.; Freitas, R. M.; Aguiar, D. A.; Sugawara, L. M.; Mello, M. P. (2012). Remote Sensing Time Series to Evaluate Direct Land Use Change of Recent Expanded Sugarcane Crop in Brazil. Sustainability 2012, 4, 574-585 (doi:10.3390/su4040574).	The corresponding section has been rewritten, and the statement referred does not exist anymore.
30530	11	78	20	79	9	The sub-section "Bioenergy for district heating, transportation and industrial applications" should also include charcoal usage in the iron/steel industry. For instance, in Brazil around 30% of the iron and steel production is based on charcoal as a thermo-reducing agent.	Noted. Text was revised
29225	11	78	20	78	41	Little information on using biomass for district heating, industrial use or CHP, even though this is in the heading.	Thanks : Noted Action: Section was revised, however difficult to include refs to each of the different applications of bioenergy

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29226	11	78	21	78	24	Must say 'sustainable woody biomass', and state at the end of the sentence, 'provided that it does not cause land use change with high carbon impacts.'	Thanks : Accepted Action: The section was revised
27188	11	78	27	78	30	The statement that “electric cars with electricity from biomass has higher land-use efficiency and lower GWP effects than the usage of bioethanol from biofuel crops” creates a false impression of opposition between electricity or ethanol production from biomass. By focusing only on switchgrass and corn, Campbel et al (2009) clearly ignores the case of sugarcane that produces both types of energy in the same pathway. Macedo et al (2008) shows that one ton of cane produced 1926.4MJ of ethanol and 9.2 kWh in 2005 and is expected to produce 2060.3 MJ and 135kWh in 2020. Of course, in the case of sugarcane, liquid fuels and electricity are complementary.	Accepted. A footnote has been added, clarifying that one feedstock can promote both pathways simultaneously.
29227	11	78	27	78	31	Here it says that in specific cases, using biopower has advantages over liquid fuels, however it leaves the reader thinking 'is this under most scenarios, or only a few scenarios'. Needs more detail.	Thanks : Accepted Action: Need to modify sentence
29228	11	78	31	78	31	Why is it relevant that biopower would substitute for power and not gasoline? Need to put this in context.	Noted .We are talking about biopower replacing gasoline Action: No action
29229	11	78	35	78	35	Isobutanol is stated to be a drop-in fuel. However, it is different to kerosene and would require a different engine if run on 100%, therefore is not a drop in fuel.	Thanks : Accepted Action: Delete
29501	11	78	7	78	9	Does this statement apply only to "traditional use" in developing countries or also to use for space heating in developed countries?	Noted .Largely in developing countries Action: No action
25905	11	79			11	This section should distinguish between the traditional uses of biomass (cookstoves) and the modern uses of biomass (production of liquid biofuels, gasification, etc.).	Accepted.
31494	11	79	1			Please consider to elaborate more extensively on negative GHG emission technologies (BECCS and biochar) since much relay on this technology in AR 5.	Thanks : Accepted Now 2 pages on BECCS. Biochar should be in Chapter 11.
30211	11	79	1	79	11	Negative GHG emission technologies. The uncertianties with CCS either need to be menetioend here or reference given to that dicsussion elsewhere either in AR5 or in the IPCC special report.	Thanks : Accepted Action: Refer to relevant chapters of AR5 - WG III
29524	11	79	1		9	The potential for biochar as a " negative emissions technology" should also be mentioned, especially as this is disussed in relation to bioenergy. Suggested text, insert line 6: Biochar systems that stabilise organic carbon in recalcitrant form and capture syngas for renewable energy products can be considered a "negative emissions technology" (see 11.A.3.2).	Biochar is treated in Ch.11 main body.
26323	11	79	1	79	9	Engineering-type studies on BECCS should be considered here. If you do not have to say more about these technologies, shorten the paragraph. Acknowledge that the issue has not yet been researched.	The final draft has now 2 pages on BECCS, due to the importance for stabilization scenarios. Details are provided.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25773	11	79	1	79	6	This part should explain that it is uncertain whether BECCS can be utilized in the future, as described in the section TS.3.3 (page 21, line 37). Safety confirmation, affordability and public acceptance are indispensable in CCS site selection. There is a much higher barrier to adopt BECCS than CCS because BECCS requires stable biomass supply for generation at reasonable cost. Since feasibility for BECCS has not been established so far, it is not appropriate to expect huge potential for BECCS in the future, as described in (Rhodes, 2008, page323). This literature is listed in the No7 line of this table.	Thanks : Accepted Action: Refer to chapter 6 & 7
29276	11	79	1	79	9	When CCS is used for example for wood based bioenergy production, the carbon storage is only changed from a forest to an artificial carbon storage. This means that the emissions are not negative but the system might be carbon neutral, considering the dynamics of biomass growth and combustion. This should be clarified in the text. Also, from the point of view of the atmosphere it is not important if the CCS technology is used with bioenergy production or with fossil energy production, as the carbon released from biomass or fossil fuel combustion has the same warming effect in the atmosphere. It would be more important to use CCS technologies with fossil energy systems in order to make them responsible of the costs of CCS instead of renewable energy systems.	BECCS is not discussed in detail over 2 pages, including LCA effects.
19715	11	79	1	79	9	Bio-fuel production needs large areas of land which otherwise could be used for human food production. Estimates of land available for BECCS are needed taking into account growing global population.	Noted .Land use issue is covered in later section and crossreferenced.
23178	11	79	1			CCS is more correctly "carbon dioxide capture and storage"	Accepted.
23179	11	79	1	79	9	Why no mention of Biochar here? Is a growing literature that should be acknowledged.	Biochar is considered in the main body of Chapter 11.
27982	11	79	1	79	9	Whether BECCS can truly lead to negative emissions is certainly depending on the GHG emissions caused by the extraction, production or opportunity use of biomass (and their fully accounting). E.g. if biomass production altogether (including indirect effects) causes more GHG than contained in the bioenergy product, the balance can not be "negative". In my view, a differentiating statement with a disclosure of premises and restrictions would be appropriated.	Accept. Text was revised
23626	11	79	11	82	47	I have a strong feeling that comments I have to the FOD were not taken into account in this section. WHY? And what is the purpose of commenting when comments are neglected?	We aim to address all comments.
23180	11	79	11	79	23	Suggest delete the two sub-headings - don't add anything	Subheadings changed.
25823	11	79	12	79	12	Replace "GHG emissions" with "displacement of GHG emissions"	Unclear.
23464	11	79	17	79	17	The degree of fossil fuel displacement is not an effect through which the biomass system affects the climate and should not be included in this list.	Has been moved to 8.7
27983	11	79	21	79	22	There is not only "some caution" to note for an intensification strategy as mentioned above, but a massive trade off between a couple of environmental costs caused by intensified agricultural management and gaining biomass potentials without indirect land use change effects (see also EMPA, 2012: Harmonisation and extension of the bioenergy inventories and assessment: "Although biofuels can allow the reduction of fossil fuel use and of greenhouse gas emissions, they often shift environmental burdens towards land use-related impacts [i.e. eutrophication, acidification, water depletion, ecotoxicity, land use]" add this finding and the reference add the end of line 22.	Partially accepted. That section is concerned with the mitigation effects. Wider effects are discussed in 11A5. Here the statement is reflected.
21055	11	79	23			"Accounting" is a specific term from e.g. the Kyoto Protocoll and should be avoided here. It refers to the legal attribution of emissions and removals to Parties (countries) within certain bounds and does not necessarily have a direct link to actual emissions.	Thanks : Accepted Accounting has been removed.
26325	11	79	24	79	28	This difference can never be measured and thus remains hypothetical. It is not an empirical quantity.	The sentence has been removed.
30212	11	79	26	79	26	iLUC is mentioned here. It would helpful to the reader to direct them at this point to the substantial discussion later in the Annex 81-83, e.g. "see Systemic Effects of Bioenergy Systems". Else, it can appear as if iluc is not realy considered here.	Thanks : Accepted Action: Refer to later sections

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31093	11	79	26	79	26	This definition of iLUC should come earlier. Perhaps on P. 75 in the caption to Table 11.A.1. or somewhere in the text before Table 11.A.1 is referenced.	Noted Action: Refer to later section
31092	11	79	3	79	5	"Early deployment of CCS in the biofuels area is expected in ethanol production from sugar fermentation as the gas is of high purity, and already used in several markets…" This is confusing. Which gas is of high purity? If it refers to CO2 then how is CO2 "used in several markets" and how does this align with CCS? Or does it mean some gaseous end-product of ethanol? (methane perhaps?). Please clarify.	Accepted. Has been rewritten.
19406	11	79	3	79	4	Ethanol will be deployed, because gas is of high purity and already used in several markets? Meaning?	Deleted.
26060	11	79	3			BECCS basically just puts C from one pool to another. Add sentence after word "deployed": "However, the actual carbon balance depends highly on the dynamics of the biomass resource."	BECCS is not discussed in detail over 2 pages, including LCA effects.
19123	11	79	31	80	14	Life cycle assessments (LCA). The assessments by Searchinger and McKechnie (see below) are partial assessments. They only consider 'regrowth' of the trees that have been felled and future fellings. If only regrowth is considered, then of course it will take many decades in temperate countries for the regererated or replanted trees to capture the CO2 emissions when the wood is used for bioenergy. A full LCA should examine the annual growth of the whole population and then compares it to annual removals for all uses. If the increment is greater than the removals, then there is no carbon debt. This is true for the Searcvhinger article, whereas he claims there is a carbon debit by just counting 'regrowth'.There are two references for Searchinger in 2009 (a&b). Both refer to the same article. Likewise for Searchinger 2008 a & b These should be adjusted.	Accepted. The landscape perspective argument has now been introduced. The overall discussion is well represented in the annex.
23181	11	79	31	79	40	"LCA" in full first time and refer to the LCA Annex II.	Accepted.
26324	11	79	7	79	9	This perspective is flawed. Even if we use a 100yr GWP to compare GHG, it does not mean we should ignore emissions that occur after 100 yrs, especially in the context of CCS. Delete.	Accepted. Removed.
37995	11	79	7	79	9	What is the citation to support the need for undisturbed for 100years? Also note that this is characterized as an offset but not exclusively an offset provision.	Accepted. Removed.
37996	11	79	7	79	9	Please include a citation to support this statement.	That paragraph has been morphed into two pages on BECCS that are supported by references.
27189	11	79	1	79	9	The paragraph completely ignores non burning pre-harvesting techniques for sugarcane. According to CERRI et al (2011), unburnt cane harvesting leaves greater soil coverage after harvesting than the traditional burning practice, leading to a mean annual C accumulation of 1.5 Mg/ha.year at 30cm depth. REFERENCE: Cerri,C. C.; Galdos,M. V.; Maia, S. M. F.; Bernoux,M.; Feigla, B. J.; Powlson, D. & Cerri, C. E. P. 2011. Effect of sugarcane harvesting systems on soil carbon stocks in Brazil: an Examination of existing data. European Journal of Soil Science, February 2011, 62, 23–28.	The corresponding section has been rewritten, focussing on processing and end-use now. The advantages of sugar cane are pointed out in the LCA graphs, and in the SD section 11A5.
29230	11	79	1	79	9	Biochar is also a negative emissions technology which should be mentioned here.	Thanks : Accepted Action: Add biochar

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27190	11	79	21	79	22	This sentence should be reviewed after consideration of previous comment regarding page 77 (lines 18 and 19) that reads as follows: "The statement that yield increase is often associated with higher GHG from N2O emissions is not correct for sugarcane. This trend might be well-founded for developed countries, where alternative technologies for increasing productivity might be already in place. In developing countries, however, improvements in existing technologies that are not associated with increased emissions can still be implemented to achieve productivity gains (e.g. adoption of best agricultural practices such as no-tillage; deployment of more efficient feedstock varieties; optimized breeding and others). As shown in MACEDO et al (2008), yield improvements in sugarcane yield is expected to come with less (and better) use of N fertilizers. REFERENCE: Macedo IC, Seabra JEAS, Silva JEAR. Green house gases emissions in the production and use of ethanol from sugarcane in Brazil: The 2005/2006 averages and a prediction for 2020. Biomass Bioenergy 2008; 32:582-595."	Accepted. The statement in question has simply been deleted. The Macedo et al, 2008 reference is still taken up as a helpful support for a later sentence, pointing to low sugarcane related N2O emissions.
31094	11	79				This section does not sufficiently differentiate industrial residues from other feedstock types. In Canada, the vast majority of domestic bioenergy production is based on forest industry industrial residues. Assume that the economics that make this true would also hold in many other jurisdictions. Suggest reviewing.	Noted .This section deals with GHG emission accounts . Need not cover all residues/ biomass types
29231	11	79	24	79	26	Should also state that the land system between both cases should be compared. Suggest: the net effect of harnessing the bioenergy potential on climate change mitigation is the difference between total climate forcing of the bioenergy and land system and that of the energy and land system displaced.	Noted .Climate forcing includes the land system also Action: no action
27160	11	79	26	79	26	"considering also indirect effects, such as indirect Land Use Change (iLUC)" - iLUC should be considered only if accurate methodologies are available to MEASURE it and produce precise results, with consistent causal effect and a clear method to allocate emissions to all supply chain operators. Otherwise, it is not irrefutable as it is based on mere assumptions, databases and methodologies and can be questioned. So, this very important reservation should be added to this line.	REJECT. If no method available to measure, that does not mean to Ignore Action: No action required
19614	11	8				Please give a detailed tracking sources for all data in this figure, and described the figure very shortly in the main text. The (FAO, 2012a) can not support any data in this figures, since it is talking about fisheries and aquaculture.	Accepted. Reference corrected to FAOSTAT, 2012.
27205	11	8				please clarify if emissions from fire in land use change and forestry include fire in peatlands; otherwise it may read that the emissions are from fire associated with deforestation; also, if land use change and forestry includes deforestation and fire, provide separate figures from these, as was provided for N2O emissions from manure: manure emissions on pasture, manure management, manure applied to soils. If not possible to separate, then mention so. Note that line 25 on page 12 mentions CO2 emissions from deforestation and OTHER fires)	Accepted. Text modified. In fig 11.2 this is just emissions from deforestation and degradation. Emissions from peat fires added, "other fires" deleted.
20116	11	8				Does this figure (11.2) include CO2 emissions from field activities (machinery use, harvest, irrigation, …)?	Noted. It does not. It is specified in 11.2.2 that emissions from these sources are about 500MtCO2eqyr-1 but are reported in the energy sector.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29206	11	8				Why is land management apart from forestry broken down into component sections, but land use change lumped with forestry? This approach is inappropriate.	Accepted with modification. The model results used to generate the global and regional numbers have not published emissions separated into forest management and afforestation, reforestation and deforestation, or other land cover changes, so it is not possible to show separate global numbers for these categories. For many of the models, it is in fact not possible to output these numbers separately for technical reasons. The numbers are disaggregated for the tropics based on the Houghton bookkeeping model as presented in Baccini et al (2011) and shown in figure 11.8. (formerly data was in table 11.2). We have added disaggregated estimates from FAO (2013) to the text of 11.2.3, but these only go back to 1990, so are not suitable for this figure.
20906	11	8	1			In the legend, cultivated organic soils could be also a significant source of CO2.	Noted. CO2 from organic soils (peatlands) are included.
33303	11	8	1			Figure 11.2 could be more accessible as different, proportional size pie charts of cumulative emissions instead of stacked bar charts of yearly averages. This may enhance the differences and bring out trends more clearly.	Rejected. Showing cumulative emissions would make it harder to see trends. It would be harder to see change in emissions from different categories in the last decade compared to previous decades.
19352	11	8	1			CO2 emissions apply to most emissions sources, also other than land use change and forestry, e.g. burning and cultivation of organic soils do produce CO2 emissions.	Accepted. Category of drained and burned peatlands added. CO2 emissions in agriculture are largely balanced by uptake, so very small net emissions and not globally estimated. Added text to make this clear.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24784	11	8	1			In this figure “Land Use Change and Forestry, deforestation and fire (CO2)” are all represented together in the same bar. This is detrimental to the forestry sector as it fails to show the positive contribution by sustainably harvested forests. Suggest represent "Forestry" in a separate bar.	Accepted with modification. The model results used to generate the global and regional numbers have not published emissions separated into forest management and afforestation, reforestation and deforestation, or other land cover changes, so it is not possible to show separate global numbers for these categories. For many of the models, it is in fact not possible to output these numbers separately for technical reasons. The numbers are disaggregated for the tropics based on the Houghton bookkeeping model as presented in Baccini et al (2011) and shown in figure 11.8. (formerly data was in table 11.2). We have added disaggregated estimates from FAO (2013) to the text of 11.2.3, but these only go back to 1990 so are not suitable for this figure. Afforestation/reforestation establishment of managed forests is reflected in the regional numbers in fig 11.7 with sinks in OECD and REF countries.
22668	11	8	1			If the authors could explain the changes (in percentage and numbers) of each categories for the last four decades will be appreciated. This information will be very helpful for readers citation.	Accepted with modification. Added numbers to bars, readers can work out percentages.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21004	11	8	1	8	11	Please rework this figure. You combine LUC and Forestry in one class despite their very differing nature, whereas crop residues and manure application, each contributing very little to the overall amount of emissions when compared with LUC are given seperately. In addition, it is near impossible to detect trends of these small categories from this figure. The text to this figure could be shortened considerably (delete "The data ..." til end of paragraph / line 11) because the explanation concerning data sources should be placed in the text. (EDGAR is not explained anyway, and it is missing in the Glossary)	Accepted with modification. Numbers added to bars to help detect trends. Not necessary to shorten text, as figure should stand on its own without having to read all of text, but improved for clarity. Re: showing LUC and forestry separately - Rejected. Establishment of sustainably managed production forests (Afforestation/reforestation) represents a sink that is captured in the land use change numbers. Managed forests that have been established for many years are usually in balance between harvest and regrowth in the long term unless there has been a change in management to encourage carbon sinks. Managed forests are taking up slightly more carbon due to CO2 and climate effects, but this is not reflected in the data in fig 11.2. In many places forest management results in forest degradation and net emissions. Forest management fluxes are an order of magnitude smaller than forest area change fluxes and would therefore be difficult to see in the global numbers. Sinks due to afforestation/reforestation establishment of managed forests are reflected in the regional numbers in fig 11.7 with sinks in OECD and REF countries. Finally, the model results used to generate the global and regional numbers do not output forest management separately from afforestation, reforestation and deforestation, or other land cover changes, so it is not possible to show separate global numbers for these categories.
37658	11	8	12	8	15	These sentences are confusing, as they appear to give contradictory statistics. The authors should consider saying In 2010 world agricultural land occupied 4889 Mha, an increase of 7% (311 Mha) since 1970 13 (FAOSTAT, 2012), THOUGH from 2000, the agricultural land area has decreased by 53 Mha due to a decline of 14 the cropland area.	Accepted. Changed in accordance.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27884	11	8	13	8	18	What are the underlying reasons for the increase of agricultural land since 1970 and the decrease since 2000? Please give reasons for the decrease of cropland, meadows and pastures since 2000.	Rejected. The scope of this section is only on changes in supply and consumption trends, as well as related drivers in agricultural/forestry statistics. It was not intended to discuss economical reasons for these changes.
37659	11	8	14	8	15	Provide a brief explanation as to why there has been a decline of cropland area	Rejected. The scope of this section is only on changes in supply and consumption trends, as well as related drivers in agricultural/forestry statistics. It was not intended to discuss economical reasons for these changes.
31461	11	8	2			In the text legend "Forestry" is included as a source of emission. Is that correct? Forestry in this respect must be understood as forest management practices on forest land remaining forest. Forestry (sustainable Forest management) is recognized be a sink, not a source? Please see residual terrestrial sink in table 11.1	Accepted with modification. "Forestry" or forest management is not all sustainable. Much forestry results in forest degradation compared to natural forests or old growth forests it may replace, e.g. selective logging or shifting cultivation in developing countries. See new figure 11.8 and text on forest degradation in 11.2.3 The residual terrestrial sink in table 11.1 is not anthropogenic management, in fact it is uptake due primarily to climate change and CO2 and N fertilisation effects. This affects both managed and unmanaged lands, as it is calculated as the residual after land use change emissions - it reflects uptake in unmanaged lands. Changed figure text to say "net" emissions from FOLU. Added text to be able to make clear that this residual flux is primarily due to environmental effects in un-managed land.
30958	11	8	2			Figure 11.2: The FOLU data include fire. Fires affecting lands can be either the result of human activities (accidental, arson, management practices) or natural. Natural fires, which have significant emissions in some regions, are not the result of AFOLU activities. Should make clear if the fire emissions are both anthropogenic in origin and natural.	Accepted. Text changed to make it clear this is deforestation and degradation only, but that the EDGAR data on non-CO2 fires mixes AFOLU plus non AFOLU. Also added text to section 11.2.3.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22121	11	8	2	8	11	Does this figure include CO2 emissions from field activities (machinery use, harvest, irrigation etc.)?	Noted. It does not. It is specified in 11.2.2 that emissions from these sources are about 500MtCO2eqyr-1 but are reported in the energy sector.
37660	11	8	22	8	25	For cereals why has the "production per unit of nitrogen fertilizers consumed, has decreased globally"? Overapplication? Please briefly explain, it is interesting.	Noted. This is considered an arithmetic anomaly - there is a base yield without applied N and even though the yield response to applied N is positive, the yield per unit of applied N will always go down as N application increases. Sentences were deleted completely.
27885	11	8	23	8	25	The production per unit nitrogen fertilizer has decreased from 37,6 to 23,2 dry matter/tonne of N. What are the main reasons?	Noted. This is considered an arithmetic anomaly - there is a base yield without applied N and even though the yield response to applied N is positive the yield per unit of applied N will always go down as N application increases. Sentences were deleted completely.
22122	11	8	28	8	30	Please give values and references	Partially accepted. The reference to figure 11.3 b) is given, which contains values and respective references.
20117	11	8	28	8	30	Please give values and also references.	Partially accepted. The reference to figure 11.3 b) is given, which contains values and respective references.
22123	11	8	31	8	32	Value in kcal instead of kJ would make it easier to compare with existing literature as kcal is more common as unit.	Accepted. Data in kcal are provided in addition to kJ.
20118	11	8	31	8	32	values in kcal instead of kJ would make it easier to compare with existing literature as kcal as unit is more common	Accepted. Data in kcal are provided in addition to kJ.
37661	11	8	32	8	32	The paper referenced was published in 2005 and is being used to give result for 1970-2010. The paper was probably written before 2004.	Accepted. (Supposed to be line 22 on page 8). Exact number from FAOSTAT, 2012 is given (increase by 73% from 1970 to 2010).
21226	11	8	34			Term "SRREN" is used for first time in the chapter and should be defined / elaborated in the sentence.	Accepted. Wording changed.
21227	11	8	34			Should the term be "presenting" instead of "preenting"	Accepted. Wording changed.
37657	11	8	4	8	4	Make sure FOLU has been previously defined in the document	Accepted with modification. Removed FOLU from here; it is described later in the chapter.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29423	11	8	1	8	1	In this figure “Land Use Change and Forestry, deforestation and fire (CO2)” are all represented together in the same bar. This masks the positive contribution by sustainably managed production forests. Forestry should be shown separately.	Accepted with modification. Establishment of sustainably managed production forests (Afforestation/reforestation) represents a sink that is captured in the" land use change and forestry" numbers. The global models studies mostly include this, but do not publish the disaggregated numbers. This has only been published for the Houghton bookkeeping model as used in the Baccini et al. paper, and this is for the tropics only, and is not global. However, we have a figure 11.8 that disaggregates these numbers in the tropics. In our regional breakdown, figure 11.7, you see the effects of forest management as a sink in some of the model results for OECD and REF regions. Managed forests are in part a sink due to past afforestation that is captured in the models, but also sometimes to management practices not captured in the models such as those to which the reviewer may be referring. We added the reference to Erb et al (2013) to reflect this. However, we cannot show numbers for what is not included in the models. Managed forests are also taking up additional carbon due to CO2 and climate effects. This is included in the model results, but it is not possible to separate out for the process model results in many cases.
19615	11	8	22	8	22	To my understanding in the context, Foley et al (2005) mentioned a 70% increase in the irrigated cropland area from 1970 to 2010. If the authors can not find exact figures during the period, please delete the sentence.	Accepted. Exact number from FAOSTAT, 2012 is given (increase by 73% from 1970 to 2010).
19616	11	8	22	8	25	If the authors can not give citation of all the figures in this sentences, please deleted the sentence. I assumed all figures came from (FAOSTAT, 2012)	Accepted. Reference to all numbers is given (FAOSTAT, 2012).
29207	11	8				Why is there no mention of the changes in forest land area of timber production in the narrative? The section title includes forestry, but the sector is absent from the narrative.	Noted. Changes in forest area discussed on the page 9 and 10. More information provided in the section 11.2.3.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33304	11	8	12			Supply and consumption trends could be tied more closely to the emission trends, e.g. by naming the main emissions for trends (CH4 for cattle, etc.).	Partially accepted. Most activity data, such as areas, food supply values, etc. are drivers for all GHG emissions in different relations. It is described in 11.2.2 and 11.2.3. For animals populations the note about main emissions of CH4 is provided.
25793	11	8	16	8	18	Is it possible that both cropland and pasture land reduced by 42%? Please doublecheck this data? Since cropland and pasture have different characteristics, it is hard to believe they have same reduction rate.	Noted. Data checked and are correct. Cropland per capita reduced globally by 41.7% and pasture per capita reduced by 42%. The starting year has been corrected from 1990 to 1970 and sentence has been edited.
27346	11	8	21		21	change During these years by Between this period ...	Accepted.
29504	11	80				Refer to Annex II for further clarification of ALCA and CLCA	Accepted.
24868	11	80	1			Suggest cross-reference to Annex II for further clarification of ALCA and CLCA	Accepted.
22859	11	80	1			Defining consequential LCA as only policy-focused is too narrow. The consequential approach can be used for any LCA, also related to a consumer's choice to buy a given product. See e.g. Ekvall and Weidema (2004): System Boundaries and Input Data in Consequential Life Cycle Inventory Analysis, Int J Life Cycle Asses 9 (3) 161-171.	Accepted. Wording is modified.
23182	11	80	1	80	7	Move figures 11.A.3 and 11.A.4 to near here. Is Fig 11.A.2 necessary? Not clear why iLUC is linked to Consequential LCA.	11A2 is deleted. ILUC is consequential, as consequence of action (change in deployment), rather of static deployment itself.
31495	11	80	13	80	42	Please consider to discuss the terms “Climate neutrality”, “carbon debt”, “temporal climate forcing” and “stock dynamics” also in a relation to timescales and the stabilization of the GHG concentration in the atmosphere. Ch 11 could also consider to include more text on differences between biogenic and fossil CO2 emissions as described by Cherubini et al 2012 (already in the reference list of Ch 11).	We explicitly considered the difference between biogenic and fossil CO2 emissions now, and discuss the role of timescales. The term "biogenic" CO2 emissions is however contested in the literature; that discussion is now displayed in the text.
29503	11	80	13	80	15	The statement about climate neutrality requires more detailed explanation from the cited references, and others (eg Pingoud et al, which disagrees with the solution proposed by Searchinger). Clarify the basis for the "carbon neutrality" assumption (ie an accounting convention, proposed to avoid double counting, as C stock change in forest was intended to be counted in the LULUCF sector), and the problems with application of this approach. 20. Pingoud, Kim, Annette Cowie, Neil Bird, Leif Gustavsson, Sebastian Rüter, Roger Sathre, Sampo Soimakallio, Andreas Türk, Susanne Woess-Gallasch (2010) Bioenergy: Counting on Incentives. Science Vol 327 1199-1200	Accepted. Detailed discussion and references now provided.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24869	11	80	13	80	15	The statement about climate neutrality requires more detailed explanation from the cited references, and others (e.g. Pingoud et al, which disagrees with the solution proposed by Searchinger). Clarify the basis for the "carbon neutrality" assumption (i.e. an accounting convention, proposed to avoid double counting, as C stock change in forest was intended to be counted in the LULUCF sector), and the problems with application of this approach. Citation: Pingoud, Kim, Annette Cowie, Neil Bird, Leif Gustavsson, Sebastian Rüter, Roger Sathre, Sampo Soimakallio, Andreas Türk, Susanne Woess-Gallasch (2010) Bioenergy: Counting on Incentives. Science Vol 327 1199-1200	Accepted. Has been done.
27985	11	80	13	80	14	The assumption of carbon neutrality has not only been questioned, but falsified. See also Scientific Committee of EEA. The current phrase does not meet the point as questioning is no rebuttal. Add after " 2010)" line15 : EEA has even falsified the theses of climate neutrality."	Accepted. EEA has not been cited, but other peer-reviewed literature supports that claim, too.
23183	11	80	14			Searchinger 2009a same reference as 2009b. Also 2008a same as 2008b.	Thanks. Accepted.
29505	11	80	15	80	17	Non-CO2 emissions are included in LCA studies of bioenergy, so should not be considered as separate factors here.	Accepted. The text does not imply otherwise.
24870	11	80	15	80	17	Suggest that non-CO2 emissions are included in LCA studies of bioenergy, so should not be considered as separate factors	Accepted. But the wording does not suggest otherwise.
29278	11	80	15	80	15	A reference "Pingoud et al. 2012" should be added with Cherubini and Courchesne. Whole reference: Pingoud K, Ekholm T, Savolainen I (2012) Global warming potential factors and warming payback time as climate indicators of forest biomass use. Mitigation and Adaptation Strategies for Global Change, 17, 369-386.	Accepted.
23465	11	80	17	80	17	Black carbon is a type of aerosol, please reword.	Accepted.
37998	11	80	19	80	34	Rewrite for clarity.	Accepted. Has been rewritten.
21054	11	80	20	80	23	This approach is directed towards a single piece of land and not suited for assessing landscape level aspects. The system of a forest consists of a multitude of parcels of land, of which e.g. one may be harvested in a given year and 99 others just grow. So the system can also be defined as the whole forest under management and then, if managment is done in a sustainable manner, the "pulse" occurs each and every year and the approach of a "carbon debt" fails.	The landscape level and holistic forest management is addressed in another paragraph.
37999	11	80	20	80	23	Rewrite for clarity; provide example.	Accepted. Has been rewritten.
26146	11	80	23	80	24	Bio-GWP should be explained somewhere.	Accepted. A paragraph deals now with the methodological motivation behind bioenergic CO2/GWP and the divergent opinions on this.
23466	11	80	24	80	26	In addition to GWP, it is also important to acknowledge other metrics like GTP or IGTP, as well as the impact from sustained emissions. The impact of biological CO2 emissions show interesting insights when temperature is taken as an end point instead of cumulative radiative forcing, and such aspects cannot be overlooked given the growing interest towards mitigation targets based on temperature.	Agreed. But space constraints limit methodological discussions.
26327	11	80	27			Please cite specific sections of the WGI report	Done.
26328	11	80	28	80	42	Changes in soil carbon and standing biomass are important; however, these issues are covered in the main body of Ch.11 and again under "systemic effects of bioenergy systems"; this can be addressed in less space with appropriate cross-references	The text has been modified, in some cases shortened, but also recent 2013 literature added.
23628	11	80	28	80	42	Make more explicit that these are all modeling studies. This is not empirical forest C analysis!	Has been clarified.
27986	11	80	28	80	42	As this paragraph contains an outmost important information, its headline should be more explanatory; e.g. "Decrease of terrestrial carbon reservoirs as a consequence of bioenergy use".	Accepted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23467	11	80	29	80	34	The literature of papers summing CO2 flows and showing the C debt can be expanded with the following two papers: 1) Sathre, R. and L. Gustavsson (2011). "Time-dependent climate benefits of using forest residues to substitute fossil fuels." Biomass and Bioenergy 35(7): 2506-2516. 2) Kim, H., et al. (2009). "Biofuels, Land Use Change, and Greenhouse Gas Emissions: Some Unexplored Variables." Environmental Science & Technology 43(3): 961-967.	Noted.
19124	11	80	29	80	30	"Removing biomass from forests affects the dynamics of stocks across the landscape over time (Schlamadinger and Marland, 1996; Hudiburg et al., 2011b; McKechnie et al., 2011)". As mentioned above, McKechnie only considers tree regrowth when assessing 'carbon stock' He examined managed forests in Ontario's Great Lakes/St. Lawrence (GLSL) forests. He looked at the potential for bioenergy from areas that at present are not utilized. He concluded that it will take decades for the regrowth to recoup the CO2 lost when the wood is burnt for bioenergy. His article is entitled Forest Bioenergy or Forest Carbon? I have written a rebuttal to this article ,which I am sending to the Journal of Environmental Science and Technology, where his article was printed. I used a full LCA and compared annual increment of the whole management area to the removals of wood for alluses, especially bioenergy. The estimated annual increment from 4.46 million ha in the managed forests of GLSL is 21 million m3, whereas the total present and potential demand is an estimated 10.5 million m3. Thus, much more wood could be extracted without reducing the forest carbon stock as he claims. I have been in touch with McKechnie, but while recognizing annual increment, he limits this to regrowth. If you are interested I can send you a copy of my article.	The essential question is about the assumed baseline. That has been clarified in the discussion.
26061	11	80	33			Add sentence after "… fossil fulels.":"The payback time of the carbon debt depends both on the forest biomass dynamics and the efficiency of the bioenergy process to displace fossil fuels. "	Detailed discussion on carbon debt is sufficient.
23468	11	80	34	80	35	The duration of the C debt can be reduced when sound cropping management practices are applied, see: Kim et al. (2009) (full ref in the comment above).	Noted.
38000	11	80	34	80	34	GWP has not been defined in this chapter	Accepted. Has been defined now and linked to glossary.
23629	11	80	37			Next to Zanchi et al., this has also been shown by Lamers, P., M. Junginger, C. C. Dymond and A. P. C. Faaij (2013). "Damaged forests provide an opportunity to mitigate climate change." GCB Bioenergy online early view. DOI: 10.1111/gcbb.12055	Thanks. Is cited.
29507	11	80	39	80	39	Before the sentence beginning 'A related problem….' is an opportunity to expand on the previous issues outlined in the paragraph. The discussion regarding use of biomass and GHG effects needs to have a holistic view of the displacement of C intensive product and 'leakage' - that is, a holistic GHG perspective. Therefore the following is suggested: "The mitigation impact of biomass needs to account for use as well as respective product replacement and a holistic understanding of the relationship, and appropriate management, necessary to ensure that the implications of removal, use and timing of regroth considered. An example of managed forests and their potential role is discussed by Ximenes et al 2012. [FA Ximenes, George BH, Cowie AL, Williams J, Kelly G: Greenhouse gas balance of native forests in New South Wales, Australia. Forests 3, 653-683 (2012).]	Accepted. Ximenes is now referenced.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24871	11	80	39	80	39	Before the sentence beginning 'A related problem….' is an opportunity to expand on the previous issues outlined in the paragraph. The discussion regarding use of biomass and GHG effects needs to have a holistic view of the displacement of C intensive product and 'leakage' - that is, a holistic GHG perspective. Therefore the following is suggested: "The mitigation impact of biomass needs to account for use as well as respective product replacement and a holistic understanding of the relationship, and appropriate management, necessary to ensure that the implications of removal, use and timing of regrowth considered. An example of managed forests and their potential role is discussed by Ximenes et al 2012. Citation: FA Ximenes, George BH, Cowie AL, Williams J, Kelly G: Greenhouse gas balance of native forests in New South Wales, Australia. Forests 3, 653-683 (2012).	Accepted. Similar content is now provided, and the useful reference is included.
24872	11	80	39	80	41	Some discussion of the relative permanence of these residues and their alternate fate compared with that of displaced fossil fuel emissions would be useful to provide a comparative context here.	Space is too limited to go into details here.
22860	11	80	39	80	41	The text discusses the alternative fate of land on which biomass is produced. I suggest adding the following reference because it deals with this issue exactly: Kløverpris and Mueller (2013): Baseline time accounting: Considering global land use dynamics when estimating the climate impact of indirect land use change caused by biofuels, Int J Life Cycle Asses 18:319-330	The suggested paper is included.
26062	11	80	39			Add after"...Repo et al., 2011).": The carbon payback time of the bioenergy emissions with respect to the fossil energy system depends on the residue diameter and the displaced fossil fuel and it could be several decades. The payback time is even longer when the relative climate impacts are described by the GWP metrics (Pingoud et al. 2012). Reference: Pingoud, K.; Ekholm, T.; Savolainen, I. 2012. Global warming potential factors and warming payback time as climate indicators of forest biomass use. Mitigation and Adaptation Strategies for Global Change 17: 369–386. Springer. doi-link: 10.1007/s11027-011-9331-9.	Pingoud et al is referenced. But the text needed to become shorter on methodology. Hence, the sentence is not taken over.
21052	11	80	39	80	41	The alternate fate of biomass NOT used is - quite often - to die due to natural disturbances and e.g. self-thinning in forests, then to decompose transferring some C to SOM and releasing C to the atmosphere, all the time causing emissions from fossil fuels because this biomass is not used to generate services for humans (material, bioenergy). Letting wood decay has the "climate-related" costs of forgone replacements.	Accepted. Is taken up.
29279	11	80	41	80	41	A reference "Helin et al. 2012" should be added. Whole reference: Helin, T., Sokka, L., Soimakallio, S., Pingoud, K., Pajula, T. 2012. Approaches for inclusion of forest carbon cycle in life cycle assessment – A review. GCB Bioenergy. Article first published online: 16 OCT 2012. DOI: 10.1111/gcbb.12016	Noted.
29280	11	80	41	80	42	The phrase "Such dynamics are discussed in the section on systematics effects" does not seem to refer anywhere as in the section 11.A.2 no dynamics of the land use baseline setting are discussed. A discussion on the baseline setting should be added directly to line 42. "In order to assess the climate impacts related to a bioenergy chain, a baseline for land use describing the development in the absence of the studied system should be defined appropriately (Helin et al. 2012)." Whole reference: Helin, T., Sokka, L., Soimakallio, S., Pingoud, K., Pajula, T. 2012. Approaches for inclusion of forest carbon cycle in life cycle assessment – A review. GCB Bioenergy. Article first published online: 16 OCT 2012. DOI: 10.1111/gcbb.12016.	Accepted. The reference is taken up where the baseline statement is given.
21053	11	80	41	80	42	Delete sentence, these dynamics were not discussed in 11.A.2!	Accepted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26147	11	80	7	80	9	The expressions "positive ILUC" and "negative ILUC" should be explained.	The literature previously didn't support the claim as originally written. Instead the more specific sentence clarifies the issue: "Producing biofuels from wastes and sustainably harvested residues, and replacing first generation biofuel feedstocks with lignocellulosic crops (e.g. grasses) would induce little or no ILUC (Davis et al. 2012; Scown et al. 2012). "
26326	11	80	8	80	19	Strong paragraph, please keep.	The content is kept.
23627	11	80	8	80	19	This is a highly relevant topic and should be extended. The current text provides an OK overview but Imiss an "outcome" of the discussion which is referred to or a more conclusive ending to the section. This topic has been reviewed by: Agostini, A., J. Giuntoli and A. Boulamanti (2013). Carbon accounting of forest bioenergy. JRC Technical Reports. L. Marelli. Ispra, Italy, European Commission, Joint Research Centre, Institute for Energy and Transport. from http://iet.jrc.ec.europa.eu/bf-ca/sites/bf-ca/files/files/documents/eur25354en_online-final.pdf, retrieved 29 March 2013. Lamers, P. and M. Junginger (2013). "The 'debt' is in the detail: a synthesis of recent temporal forest carbon analyses on woody biomass for energy." Biofuels, Bioproducts and Biorefining online early view. DOI: 10.1002/bbb.1407	References and details added. Space constraints prohibit even more discussion.
37997	11	80	8	80	19	The authors can cite the EPA Science Advisory Board Advisory from Sept 2012 on this subject.	Noted.
27984	11	80	8	80	8	The consequence that N2O emissions matter and need to be integrated is missing and should be stressed directly following the first sentence. Another literature hint for N2O effects of bioenergy systems, might not be missed: Meyer-Aurich et al, 2012: DOI 10.1007/s11027-012-9399-x Add at the end of this para in line 12: Furthermore, N2O as a long living GHG disturbs the climate neutrality too(Meyer-Aurich et al. , 2012)"	Accepted.
31504	11	80	8	80	27	Additionally, in those cases where "carbon neutrality" can be demonstrated, the emission impact of non-CO2 but C-based GHGs (CH4, CO) is regularly estimated incorrectly. See [Whitman, T. & Lehmann, J. (2011) Systematic under- and overestimation of GHG reductions in renewable biomass systems. Climatic Change, 104(2): 415-422.]	Too specific.
32428	11	80	26	80	27	Please provide a more specific reference to the WGI AR5 contribution, i.e., chapter/section.	Has been introduced now.
29506	11	80	39	39	41	Some discussion of the relative permanence of these residues and their alternate fate compared with that of displaced fossil fuel emissions would be useful to provide a comparative context here.	Space constraints prohibit this dicussion.
29232	11	80	41	80	42	This sentence states that the dynamics described are detailed in systemic effects section 11.A.2. Suggest including the discussion here, otherwise it is hard to read.	Accepted. The sentences have been slightly modified to make the point transparent; there is no pointer to another section anymore.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27161	11	81	10		11	7. N2O emissions are clearly closely related to the amount of N fertilizer applied. There is the statement on page 81 (line 10-11) “Other non-first-generation bioenergy crops, such as short rotation coppice and Miscanthus, require minimal or zero N fertilization and can reduce GHG emissions relative to the former land use where they replace conventional food crops”. There is no published data to show that Miscanthus can sustainably produce biomass without N fertilizer. If this is so then it must be assumed that there are very significant inputs from biological N2 fixation for which as yet there is no direct evidence (Davis et al, 2010). In this respect direct evidence exists that sugarcane (Urquiaga et al., 1992; 2012) and elephant grass (Morais et al., 2012) are able to benefit considerably from biological N2 fixation. With respect to liquid biofuels the yields of RME, ethanol from maize and ethanol from sugar cane are respectively 2000, 3400 and 6500 litres ha-1 for mean annual N fertilizer inputs of 200, 150 and 80 kg N ha-1 (see studies on LCA) clearly indicating that the emission of N2O per litre of product is almost certainly to be far lower for sugarcane compared to the RME or ethanol from maize. Reference: DAVIS, S.C.; PARTON, W.J.; DOHLEMAN, F.G.; SMITH, C.M.; DEL GROSSO, S.J.; KENT, A.D.; DELUCIA, E.H. Comparative biogeochemical cycles of bioenergy crops reveal nitrogen-fixation and low greenhouse gas emissions in a Miscanthus giganteus agro-ecosystem. Ecosystems, v.13, p.144-156, 2012. URQUIAGA, S.; CRUZ, K.H.S.; BODDEY, R.M. Contribution of nitrogen fixation to sugar cane: Nitrogen-15 and nitrogen-balance estimates. Soil Science Society of America Journal, v.56, n.1,p.105-114, 1992. URQUIAGA, S.; XAVIER, R.P.; DE MORAIS, R.F.; BATISTA, R.B.; SCHULTZ, N.; LEITE, J.M.; MAIA E SÁ, J.; BARBOSA, K.P.; DE RESENDE, A.S.; ALVES, B.J.R.; BODDEY, R.M. Evidence from field nitrogen balance and 15N natural abundance data for the contribution of biological N2 fixation to Brazilian sugarcane varieties. Plant and Soil, v.366, n.1-2,p.5-21, 2012.	Accept
19125	11	81	11	81	11	"Miscanthus, require minimal or zero N fertilization". This plant is a grass and does not fix nitrogen. Continual cropping will requir N,P, K to maintain productivity.	Agreed. Has been removed.
23184	11	81	11			Why do short rotation coppice and miscanthus need zero N? If N is removed at harvest - eg in coppice eucalyptus, then has to be replaced like any other crop.	Agreed. Has been removed.
38001	11	81	12	81	13	This point has been made repeatedly throughout the chapter - there may be ILUC that needs accounted for. This has been stated numerous times before and does not need repeated in every paragraph, and creates a biased negative impression on the practice (as it is still highly debateable about the magnitude, or even the net effect +/, of that ILUC). The authors should delete the text after the Clair 2008 citation.	Accepted.
23469	11	81	14	81	28	If albedo contributions can be so strong, and stronger than the warming from CO2, it should be better acknowledged in many other sections of the text as well, rather than constraining this crucial aspect to this single paragraph.	Noted.
31095	11	81	20	81	28	It is not clear here how "geophysical effects" differ from "biogeophysical effects". Moreover the examples cited at line 26 are about albedo, so there appears to be some repetition of the previous text. Suggest reorganizing (and shortening) this a bit, using albedo change as an explicit example of biogeophysical effects of LUC.	Accepted. Has been reorganized.
25824	11	81	26	81	26	Replace "offset forcings" with "offset reduction in forcing"	We find that the existing wording is sound. No need to replace

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26063	11	81	29	84	10	Under Systemic effects of bioenergy systems should be necessarily mentioned the effects where there is no actual change in land-use. Consequences of increased use of forest biomass, for instance: 1) use of forest harvest residues leads lower overall carbon pools, i.e. smaller dead wood and soil carbon pools and it can have a negative impact of the future growth rate of the stand; 2) taking into use the unutilized forest growth is sustainable, but it cuts off the net carbon sink which otherwise could have lasted for several decades.	This is discussed on the bottom of p. 80 (Consequential perspective …)
26064	11	81	29	84	10	Under Systemic effects of bioenergy systems should be necessarily mentioned the effects where there is no actual change in land-use. Consequences of increased use of forest biomass, for instance: 1) use of forest harvest residues leads lower overall carbon pools, i.e. smaller dead wood and soil carbon pools and it can have a negative impact of the future growth rate of the stand; 2) taking into use the unutilized forest growth is sustainable, but it cuts off the net carbon sink which otherwise could have lasted for several decades.	Noted, needs discussion
31096	11	81	30	81	30	It is not clear here to what "the latter" refers.	Has been reworded.
22861	11	81	30	81	33	Suggest to add the following two references: Kløverpris et al. (2008): Life Cycle Inventory Modelling of Land Use Induced by Crop Consumption Part 1: Conceptual Analysis and Methodological Proposal, Int J Life Cycle Asses 13 (1) 13-21 + Kløverpris et al. (2010): Life Cycle Inventory Modelling of Land Use Induced by Crop Consumption Part 2: Example of wheat consumption in Brazil, China, Denmark and the USA, Int J Life Cycle Asses 15:90-103	The first reference is included.
27987	11	81	30	82	20	Indirect effects are not restricted to indirect GHG effects of production of biomass in agricultural systems; there are also indirect (market mediated) effects of wood energy, but also effects in terms of biodiversity threats, environmental degradation, external social costs and the like. Add at least a sentence that other effects exist too but are not considered here.	Accepted.
29525	11	81	4		5	Don et al is not the original source of this information. They cite Kaiser and Ruser (2000). Cite the original study.	Accepted.
31097	11	81	42	81	44	This is repetitious of L. 25-28 with many of the same citations. Could it be deleted?	Thanks : Accepted Action: delete repetition
27191	11	81	1	81	13	Researchers have been including N2O emissions in LCA of biofuels for some years and the findings have not always been consistent with what is implied in this section. Although it may be a significant source of emission in some production cycles, it does not call the GHG benefits of bioenergy into question. For example, Seabra et al. took N2O emissions into account when calculating life cycle GHG emissions of sugarcane ethanol and the results confirmed the comparative advantage of sugarcane products. It is also worth mentioning that N2O emissions are also associated with the burning of crop trash on the soil surface. At least for Brazilian sugarcane ethanol, this source of emission will no longer exist with the mechanization of the harvest. Ending the burning of crop trash should also be mentioned in the text as a measure to reduce N2O emissions. REFERENCES: (1) Seabra, J. E. A., Macedo, I. C., Chum, H. L., Faroni, C. E. and Sarto, C. A. (2011), Life cycle assessment of Brazilian sugarcane products: GHG emissions and energy use. Biofuels, Bioprod. Bioref., 5: 519–532. doi: 10.1002/bbb.289 (2) Khatiwada, Dilip & Seabra, Joaquim & Silveira, Semida & Walter, Arnaldo, 2012. "Accounting greenhouse gas emissions in the lifecycle of Brazilian sugarcane bioethanol: Methodological references in European and American regulations," Energy Policy, Elsevier, vol. 47(C), pages 384-397.	Accepted. We included now a statement, referring to Seabra et al, specifying that for sugarcane, N20 emissions can also be low. The full statement reads: "For some specific crops, such as sugarcane, N2O emissions can be low (Seabra, Macedo, Chum, Faroni, & Sarto, 2011; Macedo et al., 2008) or high (Lisboa, Butterbach-Bahl, Mauder, & Kiese, 2011)."

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27168	11	81	13	88	13	"Emissions from indirect land use change also need to be considered". As we have already pointed out, references to indirect land use change must be followed by a reference to the currently insuficient scientific estimates. Therefore, this sentence should be followed by "but this still requires scientific development".	That sentence has been deleted.
27162	11	81	31	81	31	"displace other crops or pastures or forests, while iLUC" - as iLUC is based on an assumption of a displacement of food crops caused by increased land use for bioenergy crops, it is not something verifiable and this condition should be clearly stated.	Reject. This is a definition of the term. Whether the magnitude is verifiable is not relevant here. No action required.
27192	11	81	33	81	36	Unlike what is stated in the text, growing certain types of biomass cropping systems over grasslands can result in neutral or positive carbon balance. A study from the Center for Sugarcane Technology (CTC) have quantified the carbon stock in the soil for sugarcane fields in the Brazilian Center-South and the findings showed values for carbon stored in the soil with sugarcane compatible with soil under forestry. REFERENCE: Joaquim, AC, et al. Organic Carbon Stocks in Soils Planted to Sugarcane in the Mid-South Region of Brazil: A Summary of CTC´s Data, 1990-2009. Centro de Tecnologia Canavieira [Centre for Sugarcane Technology]. Technical Report, Piracicaba, São Paulo, 2011. Available at: http://www.unica.com.br/download.php?idSecao=17&id=18105453	Accept. The reference provided is not from a sicentific source, though.
27193	11	81	38	81	40	It should be noted that replacing annual crops by semi-perennial crops (e.g. sugarcane, which is harvested every year but replanted only after 5 or 6 years) also result in beneficial LUC effects. A study from the Center for Sugarcane Technology (CTC) have quantified the carbon stock in the soil for sugarcane fields in the Brazilian Center-South and the findings showed values for carbon stored in the soil with sugarcane compatible with soil under forestry. The sentence should be rewritten as follows: "Beneficial LUC effects can also be observed, for example when SEMI-PERENNIAL CROPS, perennial grasses or woody plants replace annual crops (...)" REFERENCE: Joaquim, AC, et al. Organic Carbon Stocks in Soils Planted to Sugarcane in the Mid-South Region of Brazil: A Summary of CTC´s Data, 1990-2009. Centro de Tecnologia Canavieira [Centre for Sugarcane Technology]. Technical Report, Piracicaba, São Paulo, 2011. Available at: http://www.unica.com.br/download.php?idSecao=17&id=18105453	See above.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27163	11	81	45	82	9	Regarding the sentence "However, ignoring iLUC is equivalent to assigning the value of zero to iLUC, which is probably almost always wrong", it must be kept in mind that iLUC estimates are quite sensitive to assumptions, databases and methodologies and can be positive or negative. It should be noticed that ILUC can be positive or negative but, anyway, attributing values for bioenergy based on this very uncertain variable is not adequate. This is because bioenergy can be mistakenly presented with a emission much higher than actual emissions and, in the end, be considered inadequate. This may also imply serious negative consequences for developing producing countries or for countries with a high production potential and, consequently, for rural producers in these places". Moreover, the conclusion of the paragraph ([…] The modeling studies all find net positive emissions from iLUC […]) does not respect the findings of at least two of the cited references. Kim and Dale (2011) reported significant statistical difficulties to link corn ethanol production to deforestation. Wallington et all, 2012, conclude that "U.S. The lack of information concerning the magnitude of intensification effects renders assessments of the indirect land use change associated with corn ethanol highly uncertain". Further, if iLUC is assumed to be positive, a set of articles and regulations constantly founds that some crops (ie sugarcane) have much lower emission than other crops (ICCT, 2013). The following models and study groups are essential: GTAP, EPA, BLUM, and IFPRI. Exclusion of those findings constitutes a major gap. REFERENCE: ICCT- International Council on Clean Transportation. The iLUC debate-Addressing the iLUC problem. Workshop on Sustainable Biofuels: addressing Indirect Land Use Change. Brussels, February 2013.	Accepted. That sentence ("However, ignoring iLUC is equivalent to assigning the value of zero to iLUC, which is probably almost always wrong") has been deleted. Other sentences now specify that ILUC can be avoided or kept low.
38002	11	82	13	82	13	The authors should explain why assumptions about fuel prices impacts expected magnitudes of emissions.	That sentence has been deleted to save space.
22862	11	82	15	82	16	It is stated that ILUC has mostly been studied for liquid biofuels but is equally an issue for biopower and biomaterials. I would expand this. ILUC is an issue for all land-based products, see e.g. Kløverpris et al. (2008): Life Cycle Inventory Modelling of Land Use Induced by Crop Consumption Part 1: Conceptual Analysis and Methodological Proposal, Int J Life Cycle Asses 13 (1) 13-21	The focus of this text is on bioenergy.
26151	11	82	16	82	16	Please check whether Weiss et al (2012) consider biopower in the study. If not, we suggest either to add references to studies that consider biopower and conclude that iLUC is an issue or to delete the word biopower	Accepted. Has been removed.
23471	11	82	21	82	43	I don't think that it is correct to associate the lower degree in fossil fuel displacement to the bioenergy system in question, either directly or indirectly. This is an issue that affect all forms of new energy systems, efficiency improvements, or new marketable products in general. This section can misguide analysts and policy makers, and give them the idea that bioenergy is responsible for those emissions. This section should be better elaborated addresing this comment.	Noted .Line 26-27 clearly states that " the sign and magnitude…"
26331	11	82	21	82	47	This section should be deleted. The climate effect of biofuels without a climate policy is irrelevant to this report. The question is whether biofuels should form part of a climate policy strategy. The effects discussed here are effects that are taken into account in the energy market models discussed first in Ch.6 and then throughout the report.	This section has been moved to Ch8.7. Chapter 6 report on deployment under the assumption that fossil fuels are replaced. As there is no globally enforced cap, fossil fuel replacement effects are highly relevant to discuss, as these are applicable to the real world.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22863	11	82	21	82	43	This part of the text addresses the rebound effect and its possible implications for the GHG emission reductions achieved with biofuels. Another issue of importance in this respect is the future development in the GHG intensity of fossil fuels, especially the increasing share of unconventional fossil fuels in the fuel mix (e.g. oil from Canadian tar sands). For the sake of completeness, this issue also needs to be addressed here (or elsewhere). One insightful reference on this topic (among other) is the following report: The impact of fossil fuels - Greenhouse gas emissions, environmental consequences and socio socio-economic effects, energy research architecture, 2009 (available online)	Accepted. Unconventional oils are mentioned now. The text has been moved to 8.7
21056	11	82	21	82	23	Although this Annex is on biofuels, it should at least be mentioned that there is also indirect fossil fuel replacement by the use of biomass as material in e.g. construction etc. Otherwise, the connection between all possible uses of biomass (solid first, biofuel later) are easily overlooked.	Noted .This section is about energy aspect of biomass mitigation - clear from introduction para .Other biomass use is dealt in Ch 11
21061	11	82	21	82	43	Here, two perspectives are mixed. One is replacement, the other is market effects in case supply is enlarged. The first case is clear - the "exchange rates" are given by technology and feedstocks -, the second depends on how much the demand for bioenergy is driven by the demand for energy as such or the demand that this energy be "green" (in any way). I suggest to clarify this in the text.	Noted .Focus on displacement Action: Focus on displacement
38003	11	82	21	82	21	The text says energy but perhaps should be bioenergy?	Accepted.
34236	11	82	26	82	32	Implies OPECs' supply response might have an effect on biofuel's ability to replace fossil fuels. We believe this statement is not correct since OPEC is not the only oil producer and indeed it produces far less than half of the global oil supply (Chapter 7 page 11 line 11-12 mention OPEC's share of total global supply at 42.4% in 2011). The majority of oil production comes from producers that are outside of OPEC and their supply response could have an effect on biofuel's ability to replace fossil fuel. Therefore we suggest instead of singling out "OPEC's supply response" the statement should say "oil producers' supply response".	Thanks: accepted OPEC is not specifically referenced anymore
38004	11	82	34	82	34	The authors should cross check this with rebound effect section in Chapter 5	Accepted.The paragraph has been removed and is now located in Ch. 8.7. Ch 5 is mainly about rebound w.r.t. energy efficiency. Here's we're concerned with the question of how much fossil energy is actually displaced by increasing energy supply.
31098	11	82	45	82	45	Insert "are" before "correspondingly low".	Thanks: accepted Action: insert
38005	11	82	45	82	45	Add "are" after 'emissions.'	Accepted.
25969	11	82	46	82	47	The quote Eriksson and Gustavsson (2011) is missing in the reference list.	Thanks: accepted Action: include
27988	11	82	8	82	8	"theoretical possible" but not realistic negative iLUC values should not be stated here as it swallows the statement of the relevance of iLUC which should be avoided. Therefore: deletion of the last part of the sentence seems adequate. And: is there any reason of ignoring the Laborde (IFPRI) study?	Accepted. Text was re-written
29233	11	82	44	82	47	This sentence is about GHG emissions from processing biomass, rather than the heading of Fossil Fuel Displacement.	Accepted. Section was deleted
31099	11	83				Suggest defining "SWRC", "BG", "WCO" (they are on the fig. but too small to read). Also "SOC" in the legend and "GWP TH" in the caption.	Agreed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31100	11	83				Shouldn't there be a bar for SOC in the "Forestry" category? Possibly there should be bars for SOC for the Corn, Oil crops, Sugarcane and Palm oil categories too.	Agreed: either include SOC change for all feedstocks as separate bar, or include this in "feedstock" for all.
31101	11	83				The colour scheme on the bars is inconsistent in the SRWC portion of the figure. The heat should be coloured RED, power ORANGE and transportation YELLOW in order to match the format of the other bars.	Agreed.
31102	11	83				Please include definitions for SRWC, WCO, and BC. Colour-bars are using a different colour convention for SRWC. Please discuss or reference this figure in the text.	Agreed,
21372	11	83				The figure would benefit from clarification of 'impacts' ie sink or source? It is not clear whether the impact of conversion efficiencies is included since the impact of each is quantified per MJ of energy output rather than related to the MJ of feedstock produced.	Per MJ output.
23470	11	83		84		Figure 11.A.3 and 11.A.4: these figures are very interesting but they seem to be disconnected from the rest of the text. A better link between these figures and the corresponding insights in the text should be elaborated.	Agreed.
29281	11	83				The black line indicating the arithmetic mean is not easy to see in the bars with dark colours. The line weight should be added. The explanations indicated with stars for SRWC, BG, and WCO are impossible to see and should be clarified.	Accepted.
19127	11	83				The footnote explaining the various acronyms cannot be read. There will be sequestration in below ground biomass which will continue if the above-grown tree stump regenerates, which is usual in the tropics.	Agree that footnote needs to be legible.
23185	11	83				Need to quote specific references used. Caption too long. Put some details in text.	References quoted now.
23187	11	83				Given the "Please note" on page 85, why include this figure at all. Is little value comparing one reference with another over LUC emissions from say ethanol if the specific crop is not mentioned. Reassessing the literature on a crop basis might be more useful, but then this is largely covered in Fig. 11.A.3. The point being made by the figure could be stated in 2 lines of text quoting some broad ranges.	ILUC emissions are consquential emisisons, and cannot be simply added to ALCA emissions. Hence, emissions should be represented in different graphs.
29236	11	83				The graph should include comparisons to fossil fuels.	Comparisons to fossil fuels can be misleading, as these comparisons suggest substitition effects.
29235	11	83		85		The text does not refer to the figures 11.A.3 and 11.A.4. Need these figures to be discussed in the text, otherwise they shouldn't be there.	Accepted
23472	11	83	2			Figure 11.A.3: references and/or sources for this graph are not specified. Please add them.	Agreed.
38007	11	83	2			The authors should define SRWC, GB, WCO in the caption. Increase for readability. This graph is not well described in the caption. If the goal is to make complex information relatively accessible for policy makers and discussion across broad disciplines then this graph, as described, falls far short of that goal.	Accepted. Has been made much more legible.
38006	11	83	2	83	29	This figure and the accompanying text require more citations than 'work in progress'. Please bolster the discussion and figure with more references.	Accepted. Is now fully referenced.
23186	11	83	23			Guess it is emissions from "1MJ" of gaseous or liquid transport fuels [Not "trasnportation']	Accepted (paragraph rewritten).
27989	11	83	30	84	6	This paragraph on iLUC is displaced and a repetition and therewith redundant. Delete it.	Noted. Section was re-written
19407	11	83	36	83	36	ceteris paribus was used earlier, why now in English?	Deleted.
21254	11	83	47			Provide full stop i.e. "2010)."	Not clear what this refers to. There is no line 47 on p. 83.
29234	11	83	30	85	9	This section is about ILUC again, but seems to repeat information from above under the Direct and indirect land use change heading. Seems out of place here. Also does not refer to the graphs shown.	Accepted. The whole section was revised
31103	11	84				Suggest discussing or referencing this figure in the text. The figure would also benefit from further simplification.	Noted. References to figure added and discussed in text.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29282	11	84				The title of y-axis is now CO2eq/MJ and should be gCO2eq/MJ.	Agreed. If the figure is kept, this will be fixed.
19126	11	84				As the results in this figure are highly uncertain, I would delete it!	Uncertainty is not a reason to delete this: showing that there is a wide range of results is quite important.
21057	11	84				With the caveats given with this figure, and it being overly complicated, too small and to crowded, I suggest to delete it and to include a more concise, collated way to present the results. Without the intimate knowledge of the assumptions made in the various studies, showing them in such detail is pointless.	The figure has been simplified in presentation.
27990	11	84				This is a quite complex, detailed figure, which needs to be analyzed or commented, e.g. that outcomes for Biodiesel vary around xy with a mean of … otherwise it will be hardly useful for non-scientists.	Accept. Figure was revised
38008	11	84	2	84	6	Should diets get the top billing as a driver of LUC related emissions? Please consider revising the text accordingly.	Accepted. The order has been changed. Diets are however crucial (see Haberl et al., 2011; Stehfest et al., 2009; Popp et al., 2010).
22864	11	84	7			I was a bit surprised to find my own name in the figure attached to some results that i do not immediately recognize. A clarification of any possible extrapolation from my own research would be helpful along with a proper reference.	The source of the figure is cited. For clarifications see that paper.
38009	11	84	7			The authors should make this figure bigger or somehow more legible - or perhaps even delete	Accepted. Has been made more legible.
23630	11	85	10	86	40	This section is too long and also reports research which has been covered by the SRREN and GEA. The current length is in a strong imbalance to other sections in the Bioenergy Annex, e.g. on C Neutrality, and therefore should be but in order to provide more space for the benefit of the aforementioned. Also, I find it more logic to first extend the discussion whether bioenergy can contribute to climate change mitigation before we talk about bioenergy deployment potential.	The section has been shortened, made more concise.
21058	11	85	10	90	26	This text contains many redundant passages and repetitions and can be shortend considerably.	Accepted.
27992	11	85	10	85	24	Please mention explicitly that only internal production costs are listed and external environmental and social costs are not considered.	Accepted. Text was re-written
27993	11	85	10	85	24	This paragraph is strictly about (internalized) production costs which should be clarified. I am wondering why production costs are communicated as something rather easy and certain to forecast, whereas there is a massive critique and disclaiming on iLUC-modelling. This is in my eyes inconsistent as both rely on the same assumptions and their uncertainty. Therefore add in line 17 before "coarse" "very" and after "estimates" "of internalized production costs".	Thanks : accepted Text was re-written
27994	11	85	10	86	40	This whole paragraph seems partly confusing (due to the unsorted listing of the different potentials in different studies/ scenarios), redundant (as potentials were already discussed at the beginning of the section), with an unclear focus.	Thanks : accepted Text was re-written
31104	11	85	11	85	24	This paragraph is difficult to follow. Suggest revising.	Thanks : accepted Action:Revise
19128	11	85	13	85	16	"With such projections of supplies (amounts of biomass at a cost), adding conversion costs to final energy biomass products for similar scenarios resulted in a potential range of 108 to 310 EJ/yr of liquid biomass fuels that could be derived at $12 to $20/GJ 15 and 200–300PWh/yr under $0.10/kWh," According to my calculation the cost will range from $0.04 to $0.07 per kWh, which on average is about half $0.10/kWh!	The appendix does not add to the cost discussion available in SRREN.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31105	11	85	15	85	17	The cost information is confusing. $0.10/kWh is $27.78 / GJ. The production of 108 to 310 EJ / yr is equivalent to 30 to ~86 PWh / yr; conversely 200-300 PWh / yr is 72-96 EJ / yr. Consider using one unit of energy to compare production potentials and relative costs. Given the earlier use, consider using EJ/yr for energy, (but could note that 1 EJ ~= 0.277778 PWh). If the point is that a combination of liquid fuels and power generation is possible, with separate costs, then please state this clearly.	Thanks : accepted Action: Clarification needed
19408	11	85	17	85	17	… for the two products… Which two?	Has been rewritten.
25774	11	85	25	85	31	This part should explain that it is uncertain whether BECCS can be utilized in the future, as described in the section TS.3.3 (page 21, line 37). Safety confirmation, affordability and public acceptance are indispensable in CCS site selection. There is a much higher barrier to adopt BECCS than CCS because BECCS requires stable biomass supply for generation at reasonable cost. Since feasibility for BECCS has not been established so far, it is not appropriate to expect huge potential for BECCS in the future, as described in (Rhodes, 2008, page323). This literature is listed in the No7 line of this table.	Thanks : accepted Action: Given the importance of BECCS , agree to explain
38012	11	85	27	85	27	Why extensive ag crop and dedicated? Is there eligiblity restrictions on forest/woody feedstocks?	Accepted. The sentence reports the results from the GEA report, which provedes potential numbers that aim to minimize adverse impacts of LUC. The sentence has been changed to "second generation bioenergy" to also include woody feedstocks.
38010	11	85	3	85	9	Given the caveat on line 3-9, recommend removing figure	It is exactly the purpose of the figure and the caption to demonstrate the large uncertainties and conditionalities behind these sort of analyses.
38011	11	85	3	85	9	Is this note helpful given the plethora of caveats?	It is exactly the purpose of the figure and the caption to demonstrate the large uncertainties and conditionalities behind these sort of analyses.
27991	11	85	3	85	9	Why this note? It might suggest that iLUC might not exist or are to uncertain for taking political action which needs to be avoided. Especially that in several UNFCCC workshops in relation to the REDD discussions scientist gave some figures and proved that there are data available from landsat images. Delete the note or repeated it when bioenergy potential estimations are discussed!	Noted. Section was re-written
26149	11	85	30			It should be emphasised that the "sustainability regulations" refer to the EU RED.	Noted .So many regulations exsist why quote EU-RED Action: No action required
27995	11	85	30	85	31	This last sentence on sustainability concerns is a politically crucial information and should be highlighted.	Noted Action: No action required

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22410	11	85	32	85	32	True but with certainly huge disparities between continent. This needs to be highlighted.	Accepted. We now report the usage of traditional biomass and the differences across countries (in 11A2, reduced traditional biomass demand).
19129	11	85	32	85	32	"Traditional biomass demand is steady or declines in most scenarios from 30EJ/yr." At present what you refer to as 'traditional biomass' is an estimated 36EJ/yr. In the next decade or so, it should increase at about 2% per year. By 2030, the demand should be about 54EJ/yr.	The text reports model results. Would require other literature for writing a contradictory statement.
23188	11	85	32	85	39	This appears to hop from primary energy (as in paragraph above) to end-use energy here. What does "Modern heat and industry doubles their contributions" mean exactly?	That sentence has been deleted.
38013	11	85	43	85	44	What accounts for the enormous variation?	There are many different scenario runs with many different assumptions. The range has been slightly narrowed.
31106	11	85	46	85	46	What is meant by "Models project increased dependence,…."? Does this refer to global energy security meaning that some portion of the world (varying region to region) will be dependent to some extent on bioenergy sources? Some clarification would be good.	Noted .Text is very clear Action: No action required
19412	11	85	49	86	1	This is the same text as can be found in Ch 6, page 35, rows 11-25. There, there was a reference to Rose et al. 2012, here in Ch 11, there is no reference. Is inter-chapter plagiation allowed in AR5? It is also odd that in Ch 11 you refer to many more Rose articles than you have put in the reference list, while in Ch 6 all of them seem to be nicely in the list. I can see that Rose is an author in both chapters, which explains a lot, but please do check the references!	Thanks : accepted .Cross reference to chapter 6
31108	11	86	10	86	10	What is "(6.3.5)" ? Is this referring to another section?	Noted Action: No action required
29508	11	86	18	86	37	The paragraph beginning "Bioenergy deployment also involves risks" summarises some of the issues in relation to management, but the discussion is limited and confused At a global and national level the challenge will be (as identified) the approapriate mix of land use (and product utilisation) that accounts for reduced C emissions and increased sequestration. However, this needs to be applied at a local level and it is in this context the management options need to be considered and implemented. This discussion needs to be carried to the Executive Summary	Accepted. Has been rewritten.
26332	11	86	18			The mention of top-down models here is flawed. I guess you mean IAM. Note that many of them are classified as bottom-up.	Thanks, accepted. Sentence is rewritten.
24873	11	86	18	86	37	The paragraph beginning "Bioenergy deployment also involves risks" does summarise some of the issues in relation to management, but the discussion is limited and mixed. At a global and national level, the challenge will be (as identified) the appropriate mix of land use (and product utilisation) that accounts for reduced C emissions and increased sequestration. However, this needs to be applied at a local level and it is in this context the management options need to be considered and implemented. Suggest this discussion needs to be expanded and carried to the Executive Summary	Already addressed
27997	11	86	18	86	37	There are important studies that found a strong link between large transnational land deals and bioenergy projects e.g. reports from the World Bank like that from Deininger/ Byerlee or from Anseeuw et al. (2011). Leaving that ou would constitute an major lack. Add these papers to the references.	Accepted. Issue of land "grabbing" discussed in the SD section

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27998	11	86	18	86	37	This paragraph about risks of expanding bioenergy cropping is one of the most important information and should be - with an appropriate headline - shifted to the very beginning of the Annex 1. Furthermore, within the paragraph, the part on other risks than GHG ("Large-scale energy crop production will likely increase competition for land, water, and other inputs, potentially affecting food security, deforestation, water use and biodiversity loss.") should stand at the beginning of the paragraph and be highlighted, as this sentence is a key message!	Noted Action: needs discussion
38014	11	86	27	86	27	Please define "idealized participation"	Accepted. The wording has been changed.
38015	11	86	27	86	27	Change 'assuming' to â€˜assume'	Thanks: Accepted
38016	11	86	28	86	28	Change period after citation to semicolon and remove 'among other things'	Thanks: Accepted
31107	11	86	3	86	17	Suggest commenting on how many of these systems currently exist, along with the relative cost (particularly in carbon abatement terms) and generally feasibility of these systems.	Noted .No significant scale systems exsist Action: We can state the statement
25775	11	86	3	86	17	This part should explain that it is uncertain whether BECCS can be utilized in the future, as described in the section TS.3.3 (page 21, line 37). Safety confirmation, affordability and public acceptance are indispensable in CCS site selection. There is a much higher barrier to adopt BECCS than CCS because BECCS requires stable biomass supply for generation at reasonable cost. Since feasibility for BECCS has not been established so far, it is not appropriate to expect huge potential for BECCS in the future, as described in (Rhodes, 2008, page323). This literature is listed in the No7 line of this table.	BECCS is now discussed in detail over 2 pages, including LCA effects.
29277	11	86	3	86	17	See comment 3	Noted. Paragraph focuses on BECCS in transformation scenarios, GHG emission estimates of bioenergy production systems are discussed in section 11.13.4.
19130	11	86	3	86	3	"Bioenergy with Carbon Capture and Storage (BECCS) features prominently in transformation scenarios". I am sceptical about all of CCS. The cost of BECCS is not given, but I think it is cheaper to use the money to expand bioenergy plantations and store the CO2 emissions in the trees and soil.	BECCS is uncertain, both in potential and costs. That is now discussed in detail.
22519	11	86	3	17		If BECCS is applied to slow rotation bioenergy like temperate or boreal forest biomass, slow stock dynamics (discussed in Ch 11, page 80, lines 28…42) decreases the amount of negative emissions reached. The CO2 is not rapidly removed from atmosphere but through a slow process of accumulation in growing three biomass.	Noted .Text stays at generalities and not specific regional variation Action: No action required required
27996	11	86	3	86	17	BECCS: as only very few (1-2?) projects are realized recently and therefore no long-term assessment on risks and side effects could be conducted, the communication about BECCS should be much more subjunctive and in a "optimists assume"-style. The paragraph as it is now sounds like an advertisement of a stakeholder. I think, it is dispensable here at all, but if it shall be included, it is to be reformulated in a much more balanced manner. If not deleted add in line 4 after "scenarios" " However, BECCS is in an early stage. Two projects only are being to be realized. The following findings are highly uncertain."	Accept. Text was revised
27999	11	86	34	86	36	It is not only theoretically thinkable that the anticipated use of marginal lands turns out to become a use of productive land in reality, but observed in the case of Jatropha in India.	Noted Action: No action required
38017	11	86	38	86	40	Might mention that economic factors (e.g., the price of natural gas) and government policies might affect deployment also.	The appendix refrains from discussing policy issues and focuses on feasibility and trade-offs.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28000	11	86	42	86	49	The message of this paragraph is basically: social costs and benefits are varying locally and depending on circumstances. This could be condensed in a short sentence and preferably shift to the end of this subchapter as it is basically self evident.	Accepted: text reduced and cross-reference to 11.4.5 added
19409	11	86	9	86	9	Reference to Figure should be 6.19.	Accepted.
29238	11	86	18	86	37	This paragraph feels like it is in the wrong place and should be under Land Use Change heading, p81	Accepted. Section was modified
27170	11	86	19	86	22	It is stressed that increasing scarcity of productive land may incur substantial LUC; however, it is not assessed how scarce productive land really is. Currently, the land used for biofuels (around 30 million ha) occupy less than 1% of the world's total cultivated land (1.5 billion ha). According to IEA, in 2050, biofuels production will require 100 million hectares. In Brazil alone, the sugarcane agroecological zoning identified 64 million hectares suitable for the sustainable expansion of sugarcane production. It is also worth noting that Brazil has over 170 million hectares of pasture land allocated for livestock production, with an average density of just one head per hectare. Studies show that this very low average can be increased to up to 5 heads per hectare. The current process of intensification of livestock production is releasing several millions of hectares of pasture land for agriculture, including biofuels production, without competition for new land or displacement of other crops. Therefore, the premise of scarcity of productive land is likely to be false.	Noted. Text was revised. We address an issue applicable to many countries not only to Brazil
29237	11	86	3	86	17	This paragraph looks like it should be under p79, Negative Emissions heading	Accepted. Section was modified
27169	11	86	31	86	33	"Large-scale energy crop production will likely increase competition for...". Brazil's experience with large scale energy crop production proves that, with appropriate policies and agroecological practices, there is no competition with food crops but rather a complementation (as food/energy crops are planted alternatively for land management. Moreover, there has been a simutaneous growth in energy and food production). Hence, the sentence should read as follows: "Large-scale energy crop production could increase competition...(see next section), depending on the environmental and agricultural management "	Accept. Text was revised
27194	11	86	34	86	36	It is stressed that commercial bioenergy farmers may not choose to grow bioenergy crops on degraded land, as it is likely to be relatively unprofitable (Johansson and Azar, 2007). This statement, however, is highly questionable. A study by Adami et. al shows that from 2000 to 2009, almost 70% of the sugarcane expansion in the south-central region of Brazil took place over pasture lands, of which a significant share is actually degraded. In addition to that, public policies can also play an important role in restoring degraded lands. One of the targets of the Brazilian National Policy on Climate Change, for instance, is to recover 15 million hectares of degraded pastures by 2020. This goal is established in the Brazilian Low Carbon Agricultural Plan. REFERENCE: Adami, M., Freidrich, B., Rudorff, T., Freitas, R.M., Aguiar, D.A., Sugaware, L.M., and M.P. Mello, “Remote Sensing Time Series to Evaluate Direct Land Use Change of Recent Expanded Sugarcane Crop in Brazil,” Sustainability, 4 (2012): 574-585.	Noted. The case of sugarcane is only one among many other biofuels in which the statement is true. In any case the text was revised.
38018	11	87	12	87	15	Deploying almost anything could have these results. That is the nature of economic activity, technical progress, innovation, new ideas, etc. - some people/communities are made better off, other worse off.	That statement is specific for bioenergy; referenced accordingly. It is not a trivial result, and is indeed often overlooked.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30191	11	87	25	87	37	It has been shown in a model comparison study with five global economic models (Lotze-Campen et al., in review) that the aggregate food price effect of large-scale ligno-cellulosic bioenergy deployment (i.e. 100 EJ globally by the year 2050) is significantly lower (+5% on average across models) than the potential price effects induced by climate impacts on crop yields (+25% on average across models). From this exercise a tentative conclusion can be drawn that ambitious climate change mitigation need not drive up global food prices much, if the extra land required for bioenergy production is accessible or if the feedstock, e.g. from forests, does not directly compete for agricultural land. (Source: Lotze-Campen, H., von Lampe, M., Kyle, P., Fujimori, S., Havlík, P., v. Meijl, H., Hasegawa, T., Popp, A., Schmitz, C., Tabeau, A., Valin, H., Willenbockel, D., Wise, M.: Impacts of increased bioenergy demand on global food markets: an AgMIP economic model intercomparison. Agricultural Economics, in review.)	Accepted. Has been included in 11A5
19131	11	87	3	87	6	"The establishment of large-scale biofuels feedstock production can also cause smallholders, tenants and herders to lose access to productive land, while other social groups such as workers, investors, company owners, biofuels consumers, and populations who are more responsible for GHG emission reductions enjoy the benefits of this production". This is a negative statement. Smallholders can be employed and raise plants in nurseries. Herders, can benefit from trees which provide feed and shade. It should be a 'win-win' scenario all round.	The SD paragraphs are balanced and point abundantly to positive examples.
20162	11	87	3	87	17	Needs a critical discussion of land grabs.	Noted Action: If any reference exsists , will be addressed
20163	11	87	38	87	43	see comment 46	Noted. Potential social implications of bioenergy options and their impact on people are listed in table 11.12 and in the text in that section.
28001	11	87	9	87	9	Land use expansion is not only driven by first generation fuels, but also by SRC (willow, eucalyptus) projects.	Accept. Text was revised
27165	11	87	18	87	24	This paragraph should also consider the benefits of a increased use of underutilized and degraded lands, as this result in production without any displacement of other crops.	Thanks: Accepted. Text was revised
27166	11	87	38	87	43	This paragraph should also consider the benefits of outreach for rural producers, as this increases yields and reduces demand for land.	Thanks: Accepted. Text was revised
27164	11	87	9	87	11	"Furthermore, increasing demand for first-generation biofuels is partly driving the expansion of crops like soy and oil palm, which in turn contribute to promote large-scale agribusinesses at the expense of family and community-based agriculture, in some cases (Wilkinson and Herrera, 2010)." - This sentence has some misconceptions and should be deleted. Biofuels promote also diversification of raw materials (such as better use of bovine fats in Brazil) and smallholder agriculture (such as in the South region of Brazil).	REJECT .Reference clearly states 'in some cases' Action: No action required

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30294	11	87	12	87	15	One additional concern for livelihood considerations should be added after the sentence ending "…collective responsibilities (Mingorría et al., 2010)." Current market mechanism support for biogas appears to support larger-scale operations based on the bundling and viability threshold of animals. This could further disadvantage small-scale producers. Lokey E. (2009). The status and future of methane destruction projects in Mexico. Renewable Energy 34, 556-69. This is borne out by the functioning of the CDM. A number of projects in the agriculture sector are going to large-scale anaerobic digesters, including a project in Brazil for a nearly 50-hectare pig CAFO with 13 animal facility buildings and three lagoons. United Nations Framework Convention on Climate Change (2004). Granja Becker GHG mitigation project. Clean Development Mechanism project design document form, Version 02, July 1, pp. 3, 6, 7. Even a "small-scale project" under the CDM has an operation with 88,000 pigs. United Nations Framework Convention on Climate Change, CDM Executive Board (2006). Project design document form (CDM-SSC-PDD) – Version 03, p. 3, December 22. Issuing carbon credits or other supports for large, industrial operations such as this adds further incentives to raise animals in a way that has been shown to push small farmers out of local markets and harm communities and food security. Small farmers who try to directly compete with large animal agribusiness are at risk of being pushed out of the market, as they lack the political and economic power of the larger companies, or the ability to exploit economies of scale. McLeod A, Thieme O, and Mack SD (2009). Structural changes in the poultry sector: will there be smallholder poultry development in 2030? World's Poultry Science Journal 65:191-200.	Due to space constraints, the valuable comment is not taken up.
27195	11	87	30	87	37	The main co-benefits and risks should be reviewed taking into consideration the comments submitted regarding table 11.A.2.	Thanks: Accepted Action: Modify text
30295	11	87	32	87	37	As stated above, a major livelihood risk for bioenergy appears to be large-scale operations gaining further advantage over smallholder operations, which could have similar consequential impacts on food security as mentioned here. Additionally, in some cases it may promote more intensive confinement systems in the case of small farmers, with negative animal welfare impacts and possible local environmental impacts.	Noted Action: No action required
20226	11	88		89		Reflect risks due to large scale dependence on bioenergy	Noted. Risks are covered in 11A4 and 11A5.
31496	11	88				QUOTATION: "May or may not reduce GHG emissions when substituted for fossil fuels, depending on the specific technology and development context" COMMENT: Please check this statement for consistency with figures (fig 6.9,6.15, 6.19) and text presented in chapter 6 .Top-down models suggest that dedicated bioenergy crops are seen as an important and cost effective component of the energy system, especially in scenarios with ambitious climate stabilization targets. In summary, top-down scenarios project as much as between 15-225 EJ/yr bioenergy deployments in 2050.	Partially accepted: Even if that would be true at the golbal level (which is also contested in the scientific literature), there are still some doubts at the level of national accountings or at the project level. This comments shows the different understandings about the potential of bioenergy whic is also discussed in other sections of this annex. However we considered that this discussion doesn't belong to a table on co-benefits and negative side-effects but to the very central question onf the potnential of bioenergy in mitigating climate change

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27171	11	88		88		In the Social implications section, 3rd item, it should be mentioned that bioenergy may also have positive effects on traditional practices, by allowing small communities to develop their local energy access.	Accept. Text was revised
27172	11	88		88		The Social implications section fails to include the following positive implications: Promote local jobs (considered in the economic dimension but could also be mentioned here); Promote energy access; Avoid health impacts from traditional biomass consumptions; and Small scale farmers integration" (as has been proven by the Brazilian experience with the Biodiesel Social Fuel Seal)	Rejected: as stated in the comment, the mentioned effects were considered in the table already. For the further 2 the reviewer didn't provide any reference. However the writing team was looking for relevant scientific information that could give more insights about the two last arguments and completed the table
27173	11	88		88		In the Environmental implications section, the first implication should be rewritten as follows: 'Unsustainable biofuels plantations may promote deforestation and/or forest degradation'	Accepted. Wording improved.
27174	11	88		88		In the Environmental implications section, 'increase in use of fertilizers' is not a direct implication of bioenergy use, as the production of many food crops may also require an increase in use of fertilizers . Therefore this correlation is weak and misguided. Moreover, N fertilizer use in sugarcane tends to reduce along time (Macedo et al 2008). The "–" signal should be replaced by a "+/-" signal.	Partially accepted. The argument shouldn't be reduced to a only one biofuel crop. Nevertheless the fact that it doesn't happen in one site does'n imply that there is not POTENTIAL adverse side-effetcs (as for the site studied inBrazil). Please be aware that increments in fertilizers and corresponding impacts on soil and water due to intensification in agriculture are already discusse in 11.7 Furthermore Wording improved
27175	11	88		88		In the Environmental implications section, the fourth implication should be rewritten as follows: 'May cause displacement of activities or other land uses'. As originally written, it fails to account that a large part of biofuels expansion occurs on degraded or abandoned pasture land, which can have positive outcomes	Thanks: Accepted.
27176	11	88		88		In the Environmental implications section, the fifth implication can also have a positive transboundary effect.	Accepted

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27177	11	88		88		In the Environmental implications section, the 6th item can also have positive effects, considering it may reduce GHG emissions. There should be a positive sign ("+") since bioenergy may reduce GHG emissions when replacing fossil fuels. It is possible that, for some crops, bioenergy can have a negative impact in climate objectives. However, all major legislations, including the RED, LCFS, RFS2 and several other studies finds that biofuels made from sugarcane have a positive impact in (reducing GHG compared to fossil) either iLUC is included in LCA studies or not. The signal (-) ignores a tremendous amount of literature published on the topic, including the literature already cited in the 5th AR (Nassar et al 2011). OTHER REFERENCES: (1) Isaias C. Macedo, Joaquim E.A. Seabra, João E.A.R. Silva. Green house gases emissions in the production and use of ethanol from sugarcane in Brazil: The 2005/2006 averages and a prediction for 2020 Biomass and Bioenergy, Volume 32, Issue 7, July 2008, Pages 582–595 (2) Seabra, J. E. A., Macedo, I. C., Chum, H. L., Faroni, C. E. and Sarto, C. A. (2011), Life cycle assessment of Brazilian sugarcane products: GHG emissions and energy use. Biofuels, Bioprod. Bioref., 5: 519–532. doi: 10.1002/bbb.289	Partially accepted. All these references suggested are looking only to sugarcane. However the table considers all bioenergy crops. The comment is partially accepted because we include the discussion on benefits from sugarcane in a Box and also in other parts of the Table
27196	11	88		88		Social implications - 1st item: The first item should make reference to "local food availability" instead of "food security". The impact should mention both negative and positive effects (+/-). Rationale: The balance of scientific evidence so far does not suggest that there is a negative impact of bioenegy production on food security. Some studies have indicated that bioenergy may have a direct impact in local food production, which, by consequence, may affect one of the dimensions of food security (food availability). On the other hand, there are studies indicating that food availability may be enhanced by bioenergy projects that incorporate better land management for smallholders, for example, by promoting intercropping and the use of fertilizers from residues. (p.21) The following item should also be added: "May increase access to food as a result of increased household income (+)" REFERENCE: Clancy, J., & Lovett, J. (2011). Biofuels and Rural Poverty. Earthscan Publishing.	Partially accepted: There are several scientific publications on the impacts of bioenergy production and food security. It is right that food availability is one major concern, but also food accesibility (due to negative impacts as a consequence of pice volatility) and the final impacts on food stability. There are also some studies looking at the impacts on food usage (e.g. impacts on maiz preferences, consumption). Thus looking at all 4 pillars of food security. However the comment is accepted because it showed the need for clarification. The writing team has included more lines looking at the links between food security and biofuel)
27197	11	88		88		Social implications - 7th item: Health impacts from bioenergy production can also be positive. A study from Saldiva et al. shows that a partial substitution of petroleum derivatives by sugarcane ethanol in São Paulo, Brazil, would reduce ozone formation and particulate emissions and could save hundreds of lives and prevent thousands of hospitalizations. A positive ("+") sign should also be added to this item and the following reference should be made: Saldiva et al. Ethanol and Health. In: Ethanol and bioelectricity: sugarcane in the future of the energy matrix / [coordination and supervision Eduardo Leão de Sousa e Isaias de Carvalho Macedo; English translation Brian School . -- São Paulo : Unica, 2011.	Rejected: There is far more literature reporting on negative impacts. However we took the comment and the reference into account, but unfortunatelly the reference is not a scientific one.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27198	11	88		88		Environmental implications - 4th item: the displacement of other land uses may also have positive environmental implications, for example by increasing the carbon balance when semi-perennial or perennial crops replaces annual crops or degraded pastures. A positive ("+") sign should also be added to this item. REFERENCES: (1) AMARAL et al. Environmental Sustainability of sugarcane ethanol in Brazil. In. Sugarcane Ethanol - Contributions to Climate Change Mitigation and the Environment. Ed by Zuurbier and Vooren. Wageningen Academic Publishers. The Netherlands, 2008. Chapter 5. p 113-138. 6. (2) Joaquim, AC, et al. Organic Carbon Stocks in Soils Planted to Sugarcane in the Mid-South Region of Brazil: A Summary of CTC´s Data, 1990-2009. Centro de Tecnologia Canavieira [Centre for Sugarcane Technology]. Technical Report, Piracicaba, São Paulo, 2011. http://www.unica.com.br/download.php?idSecao=17&id=18105453	Rejected. The next line looks exactely at this positive effect. Also the second referencesuggested is unfortunaltely not a scientific one, but a report from a private organization dedicated to research and technology transfer to the agro-industrial sector of sugarcane.
19132	11	88		88		"Environmental concerns (Global). May or may not reduce GHG emissions when substituted for fossil fuels, depending on the specific technology and development context (Fargione et al 2008, Haberl et al 2012b, Searchinger et al 2009b, Smith and Searchinger 2012." The articles by Searchinger et all are only a partial analysis of LCA. They do not reflect the true situation and should not be quoted. This may be true of the other articles.	Rejected. The article is not the only one cited. For the argument this article is still relevant. Hoewver due to other comments the writing team deleted this line and move the discussion for the section on potentials
30296	11	88		88		Animal welfare should be listed as an additional social implication here in terms of bioenergy, particularly as large scale industrial operations may be advantaged by market mechanisms such as the CDM. This is a negative impact and at local to global scales. Lokey E. (2009). The status and future of methane destruction projects in Mexico. Renewable Energy 34, 556-69. The Humane Society of the United States. An HSUS report: the implications of farm animal-based bioenergy production. http://www.humanesociety.org/assets/pdfs/farm/hsus-the-implications-of-farm-animal-based-bioenergy-production.pdf. Accessed April 20, 2013.	Partially accepted. Although the issue is interesting the creation of large scale industrial operations can not be attributed to the bioenergy production and then the corresponding co-benefits and potential adverse side-effects are not to be discussed here. Please be aware that the potential impacts of AFOLU measures on animal welfare were extensivly considered in section 11.7

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23189	11	88		89		This table needs careful reviewing. The caption needs to have added "….. options, either positive or negative at various scales." Under Social there is nothing on health benefits, only a negative sign. There is much literature on reduced smoke inhalation from cooking using new stoves and new fuels (eg ethanol gels) as well as reduced local air pollution - including emissions from vehicles. The last row under environmental states "May or may not reduce" so surely there should be a +/- symbol. The last row of the table under technological on reducing labour demand is Social surely - and could again be taken to be positive (cost savings) or negative (unemployment). In my view the table needs careful reveiwing. Often a "negative" can have other "positive " benefits that seem to have been overlooked. There is nothing listed on waste disposal avoidance - a positive - and soil carbon - also a positive. Overall the Table seems to be biased against the use of bioenergy and needs greater balancing of the literature.“Biofuel plantations can promote deforestation and/or forest degradation”: In some sub-Saharan countries, the unsustainable harvest of woodfuels from largely unmanaged natural forests is a major contributor to deforestation and forest degradation. If purpose-grown biomass plantations could meet some of the demand for woodfuels in those countries, this might actually decrease deforestation. However, in most regions regulations would probably be needed since plantation biomass may be less competitive.	Thanks: Accepted The table has received careful review by many authors, and various items have been added or reconsidered. It is now very comprehensive.
30531	11	88		89		Please add the following references under, "Creating bio-energy plantations on degraded land can have positive impacts on soil and biodiversity". References: DESJARDINS, T.; ANDREUX, F.; VOKOFF, B.; CERRI, C.C.. Organic carbon and 13 C contents in soils and soil size-fractions, and their changes due to deforestation and pasture installation in eastern Amazonia. Geoderma 61, 103-118. 1994. DETWILE, R.P. Land use change and the global carbon cycle: the role of tropical soils. Biogeochemistry 2, 67-93. 1986. FEARNSIDE, P.M; BARBOSA, R.I.. Soil carbon changes from conservation of forest to pasture in Brazilian Amazonia. Forest Ecology and Management 108, 147-166. 1998. Modify the sub-item "Large scale bio-energy crops can have negative impacts on soil quality, water pollution and biodiversity" to "Large scale bio-energy crops can have negative and POSITIVE impacts on soil quality, water pollution and biodiversity". References: SCOLFORO, 2008	Rejected: For the first part of the comment on inlcuding new references on positive impacts on soil and biodiversity: All references mentioned are previous to 2007 when the last AR (4AR) was published. This report is an update on the progress in science since then. Moreover, the annex on bioenergy is mainly dealing with references after late 2011 when the drafting process of the SREEN was closed. For the second part of the comment: two lines after the positive impacts of bio-fuel plantations on biodiversity are already included
29239	11	88	2	88	2	It has been cliamed that by diversifying the markets that farmers can sell into (food, fuel, fibre) bioenergy may enhance the viability of farm businesses, contributing to business sustainability and safeguarding food production e.g. If crops fial to meet specification for one market they can be sold into another. Therefore it has been argued that diversification into fuel markets could contribute to food security by keeping farmers in business. It is not an argument I am personally convinced by, but it may have some merit.	Partially accepted: Markets diversification is discussed for all AFOLU measures. In the case of biofiels crops this is true only if a) the produced crops are accepted in various markets (e.g. maiz) or if integrated systems are used. The potential co-benefit of income diversification in included in the table as well as the concern on negative impacts on food availability

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27178	11	89		89		In the economic implications section, like in the previous sections of this table, there is a clear biased perspective against bioenergy. It should be considered that bioenergy production may also increase local wealth and wealth distribution, as in the case of sugarcane production in Brazil. Therefore, there should also be "may promote income generation and distribution", with positive outcomes. It is well known that bioenergy production may also decrease poverty and promote distribution of income. The implications could be positive or negative depending o the region, feedstock and context. A study from Azanha et al. showed that in addition to job creation and income levels, Brazilian sugarcane provides an important social contribution in terms of geographical income distribution. No less than 1,042 municipalities produce sugarcane and/or ethanol, six times higher than the number of municipalities producing petroleum and/or processing its derivatives in the country. REFERENCE: Azanha, M., et. al. Social Externalities of Fuels. In. Ethanol and bioelectricity: Sugarcane in the future of the energy matrix / [coordination and supervision Eduardo L. de Sousa and Isaias de Carvalho Macedo; English translation Brian Nicholson]. – São Paulo: Unica, 2011.	Rejected: The table alread include these positive impacts. Just for clarification to the reviewer: The following positive potential economic effects are considered: Increase in economic activity, increase in income generataion, income diversification. increase in market opportunities, potenitial positise change in prices of feeedstock, employment creation and the use of waste and residues ans en economic and ecological cost-effective options. This is certainly not a "clear biased perspective against bioenergy". We also include the concerns on the economic side as these are treated in the scientific literature
27179	11	89		89		In the economic implications section, the sixth implication is very questionable. As in any other agro-economic field, bioenergy production may have difficulty in predicting long-term revenues. However, it should be highlighted that an increasingly large number of countries are adopting mandates to increase consumption of renewable energies. Bioenergy has a strategic role in this cenario, providing economically viable alternative solutions in many sectors, such as transport, heat and power. Considering that the demand for bioenergy is expected to grow over the next decades, revenues are most likely to keep up.	Rejected. As the reviewer states, the concern is real. The table and the text include many potential co-benefits. And certainly one need to consider bioenergy as a promisin option (under specific sitations).
27180	11	89		89		In the technological implications section, the third implication is a clear fallacy. Given that technological change generally increases productivity, it is an established principle of economics that technological change, although it disrupts the careers of individuals, cannot cause systemic unemployment. Mechanization, automation, and process improvement increase productivity, thus reducing the amount of land required for biofuels production as well as decreasing production costs. Technology also requires a more skilled labor force, promoting capacity building efforts and improvements on education.	Rejected: The issue is that it can (and there are relevant references on it can reduce labour demand at the local level (even if not systematic unemployment, term that was not used in the table)
27277	11	89		89		Economic implications - 6th item: A positive ("+") sign is missing as bioenergy may contribute to increased revenues in the mid and long term. REFERENCE: Azanha, M., et. al. Social Externalities of Fuels. In. Ethanol and bioelectricity: Sugarcane in the future of the energy matrix / [coordination and supervision Eduardo L. de Sousa and Isaias de Carvalho Macedo; English translation Brian Nicholson]. – São Paulo: Unica, 2011.	Noted. The point is very interesting. Unfortunaltely the reference is weak (no scientific, report from the private sector and looking only to one bioenergy crop). The writing team was looking for references. The table highlights the increase of economic activity as a positive impact (and the first in the economic section of the table)

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19133	11	89		89		"May promote concentration of income and /or increase poverty". The opposite effect should happen, local people will have more employment opportunities.	The writing team has included references where the issue of potential concentration of income is analised. Concentration (of income) is a well documented factor in overall poverty increase. If income is distributed or not depends on varios factors including access to capital, knowledge and technologies
30297	11	89		89		The section on technological implications should include that biogas technology on a large scale can pose serious functional challenges. Lokey E. (2009). The status and future of methane destruction projects in Mexico. Renewable Energy 34, 556-69.	Rejected: First what is mentioned here is more a barrier thatn a negative impact. Second, the table is aimed to give a overview and not to present detailed barriers/opportunities from specific technologies. Furthermore the table already consideres the potential dependency of technologies and other potenital adverse side-effects of using technologies in AFOLU
19134	11	89	14	89	16	"Likewise, assumptions on future food/feed crop yields have large implications for assessments of the degree of land competition between biofuels and these land uses". There are abandoned irrigated lands, land with elephant grass, abandoned former mangrove ares etc. These can be reclaimed with appropriate (tree) species. Proper land-use planning may be key. Another important initiative is to manage existing crops much better.	In this section we do not talk about land availability. We state here that higher yields in general can reduce the pressure on land. Therefore, we did not follow the suggestion of the reviewer as land availability (including degraded land) is not discussed here.
28002	11	89	17	89	19	That many prognoses assume bioenergy to become an important component of future energy supply is mentioned several times and this sentence is redundant here. The subsequent paragraph could be tightened to enhance expressiveness.	Thanks: Accept Action: Section was re-written
28003	11	89	22	89	24	This formulation as non-normative "if (Biodiversity protection)-then(less bioenergy cropping sites)"-logic is not appropriate as biodiversity is an important protected good/ value and should be formulated as a restriction to be . This whole issue should be dealt with more prominence and not be hidden as done here.	Noted: - Biodiversity not relavent here, it is delt in a different section
19410	11	89	23	89	24	Why pricing emissions from LUC would help reduce forest losses especially from LAM, Asia and Africa? Wouldn't it be as efficient in Europe and Northern America? I think here is artificial division into "developing" and "developed", although the issues are really the same all over the world.	Thanks: Accept Action: Modify Text-Implication can be relevant in other area AP: We did not change the text as this are model outcomes that show that w/o carbon prices deforestation happens mainly in the tropical regions - and a carbon price strongly reduces th epressure on forests in these regions.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31109	11	89	25	89	25	What is "(6.3.5)" ? Is this referring to another section?	Yes. Here we are referring to Chapter 6.3.5 of WG III
23190	11	89	3	89	7	Two examples of were "biomass" should replace "bioenergy" in the text and "for bioenergy" should be deleted after "land demand".	Action: Accept We modified the text as suggested by the reviewer by replacing the term bioenergy.
37662	11	9				The small inset graph is barely legible.	Accepted.
37663	11	9		9		In (a), why is there no forestland reported for 1970, lack of data? If so, please add this to the figure caption for completeness	Accepted. Changed to "forest land available only from 1990."
24785	11	9	1	9	6	This paragraph would be more informative if it clearly identified (with data) anthropogenic and non-anthropogenic sources in the comparison between regions.	Noted. The first paragraph on page 9 discusses share of animal products in per capita food consumption, which does not relate to anthropogenic or non-anthropogenic sources. All data refer to anthropogenic emissions only - the focus of chapter is anthropogenic.
22124	11	9	1	9	1	Number has value in kJ but unit is kcal.	Accepted. Corrected.
20119	11	9	1	9	1	number has value of kJ but unit is kcal.	Accepted. Corrected.
22482	11	9	1	9	6	The quantity of animal products in per capita food consumption of different regions should be displayed in this sentence. Just listing the percentage can not reveal all the facts. In most of Asian countries, people eat more meat than before just to avoid hungry but people in Europe countries eat less meat just to have a healthy diet. The most important thing is that people in Europe may eat more meat than people in Asian. Therefore, without discussing the total amount, percentage could make a big misunderstanding.	Accepted. Absolute values are provided.
27887	11	9	12	9	13	Preferably the small figures should become bigger.	Accepted. See also comment #37662.
30959	11	9	13			The figure caption says the IPCC category of grassland include unmanaged natural grassland systems. This seems unlikely as the IPCC GHG inventory guidelines (e.g. IPCC 2006 in the references for this Chapter) focus on managed lands. Suggest reviewing.	Accepted. The IPCC category "grassland" includes unmanaged grasslands by its definition, though reporting in national GHG inventories for these territories is not mandatory. FAO "permanent meadows and pastures" therefore is a part of IPCC category. The explanation is provided as follows: ‘’Permanent meadows and pasture’’ are a subset of IPCC category ‘’grassland’’ (IPCC, 2003) as the latter BY DEFINITION also includes unmanaged natural grassland ecosystems.
30960	11	9	13			The global trends and country-group breakdowns are quite different for the “sheep and goats” category and the “horses, mules, assess, and camels” category. Are the bars correct, or have these two categories been switched in the inset?	Accepted. Global data for sheep and goats has been corrected.

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27888	11	9	16	9	16	Does REF concern the same countries as those called former CEIT (countries with economies in transition), e.g. the former socialist countries? Please, define in the Glossary.	Noted. REF is defined in the framing chapters and is used throughout the volume
22125	11	9	3	9	3	Provide reference for decrease in meat consumption. FAO numbers show no decrease. Consumption is levelling off but could not be called a decrease. A small decrease in 2009 can be linked to the economic breakdown but this will recover with 2010 and following data.	Noted. The reference is given and is correct (FAOSTAT, 2012). The increase of animal products (not meat consumption) is in Asia and Africa regions. Decrease (not absolute consumption, but percentage in total consumption) is in developed countries.
20120	11	9	3	9	3	give prove that meat/animal consumption decreased. FAO number show no decrease. Consumption is levelling off but could not be called a decrease. A small decrease in 2009 can be linked to the economic breakdown but this will recover with 2010 and following data.	Noted. The reference is given and is correct (FAOSTAT, 2012). The increase of animal products (not meat consumption) is in Asia and Africa regions. Decrease (not absolute consumption, but percentage of total consumption) is in developed countries.
27886	11	9	4	9	4	Please insert before "diet" "human".	Accepted. Changed to "human dietary preferences."
21005	11	9	9	9	12	Please check your data. In Panel a), there is almost no LUC from forest to other LU which does not fit to reports on area extend of deforestation in Asia. Have plantations of e.g. oil palms be included as "forests"? In panel b) the insert is missing sheeps and goats.	Partially accepted. Data for sheep and goats in panel b) are corrected. For panel a), area of forest corresponds to FAO data in accordance to FAO definition of forests (that is clearly stated in the text below figure). By FAO definition plantations are included.
29424	11	9	1	9	6	This paragraph would be more informative if it clearly identfied (with data) anthropogenic and non-anthropogenic sources in the comparison between regions.	Noted. The first paragraph on page 9 discusses share of animal products in per capita food consumption, which does not relate to anthropogenic or non-anthropogenic sources. All data refer to anthropogenic emissions only - focus of chapter is anthropogenic emissions only.
27207	11	9	19		19	could provide the reference IPCC Good Practice Guidance on Land Use, Land-Use Change and Forestry (2003) for the definition of cropland	Accepted. Reference to IPCC, 2003 provided.
27208	11	9	21		21	Please note that IPCC includes the reporting of unmanaged natural grassland area - no emissions are estimated for unmanaged ecosystems until land-use change occurs; also, reference to IPCC grassland definition can be found in the IPCC Good Practice Guidance for Land Use, land-Use Change and Forestry (IPCC, 2003)	Accepted. Reference to IPCC, 2003 provided. See also a comment #30959.
27347	11	9	15		15	poultry birds - throughout the text only poultry was used	Accepted. Changed to "poultry."

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27206	11	9	7		7	what does it mean In comparison with 2005/2007? Between 2005 and 2007?	Accepted. Changed to 2005-2007 average.
30279	11	9	10	9	10	Given the focus here, it would be appropriate to add a line explaining Pelletier and Tyedmers (2010), which estimated animal agriculture's impacts on several sustainability measures by 2050, including a 39% increase in GHGs over 2000, as well as discussing the sector's projected impacts on other sustainability boundaries. Pelletier N. and P. Tyedmers (2010). Forecasting potential global environmental costs of livestock production 2000-2050. Proceedings of the National Academy of Sciences of the United States of America 107(43), 18371-74. Available at: http://www.pnas.org/content/early/2010/09/27/1004659107.full.pdf+html	Accepted. Data and reference are provided.
38019	11	90	20	90	22	Reduce by 17% - this is an example of what omitting economics from an analysis can do. Economic factors will naturally limit bioenergy production in arid areas.	We did not take action to modify the text as this is rather a comment.
21258	11	90	22	90	24	We suggest that the reduction of 9-32% due to landcover exclusion be extended to include all wilderness land. The conversion of wilderness areas to bioenergy systems would require large energy inputs which would ultimately undermine the bioenergy potential of these regions. Thus, wilderness areas should remain a last resort for bioenergy production. In Smith, Zhao, and Running (2012), we show that the exclusion of all wilderness areas alone reduced the technical global bioenergy potential by ~30%. Smith, W. K., Zhao, M., & Running, S. W. (2012). Global Bioenergy Capacity as Constrained by Observed Biospheric Productivity Rates. BioScience, 62(10), 911–922. doi:10.1525/bio.2012.62.10.11.	As suggested by the reviewer we now included the publication of Smith et al 2012 as well as the issue of wilderness.
29509	11	90	24	90	26	Again a very negative perspective that fails to recognise positive alternate enviormental outcomes that may be achieved through appropriate management regimes.	Thanks: Accept As suggested by the reviewer we now text on potential positive enviornmmental outcomes from dedicated bioenergy crops.
24874	11	90	24	90	26	This perspective fails to recognise positive alternate environmental outcomes that may be achieved through appropriate management regimes. Suggest insert at end of line 26 "Implementing appropriate management, such as establishing bioenergy crops in already degraded ecosystems or depauperate areas , represents an opportunity where bioenergy can be used to achieve positive environmental outcomes"	Thanks: Accept As suggested by the reviewer we now text on potential positive enviornmmental outcomes from dedicated bioenergy crops.
31497	11	90	27	91	1	It seems inappropriate to include definite conclusions in an Annex to a Chapter in an IPCC Report. Please consider whether this is in-line with IPCC Procedures. We note that this Annex primarily considers the findings from research after the publication of SRREN (2011). In order for these conclutions to be a part of the AR5 Report, all research, including findings from the SRREN should be considered befor concluding.	Noted. The Appendix was aproved in Batumi and no conclusions added to the document
21059	11	90	28	90	34	Please check (delete the doubled sentence) and rephrase.	Accepted
28004	11	90	28	90	28	Change the words "myriad factors" to "large amount of factors".	Thanks: Accept Action: Replace
31111	11	90	30	90	30	"The average technical potential estimated here is around 500 EJ": this statement gets repeated two lines later. Suggest using "theoretical" as used the second time.	That statement has been deleted now.
19411	11	90	30	90	32	Why would theoretical and technical potentials be the same?	Accept. Text was revised

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21259	11	90	30	90	34	Again, we suggest reporting the average technical bioenergy potential across only studies in which sustainability criteria are considered (160-270 EJ; Haberl et al. 2010). This would significantly reduce the total range, currently reported to be <50 to >1000 EJ or <10% to >200% of global primary energy demand. Reporting only a range that includes extreme scenarios is misleading, since these extreme scenarios have been shown to assume unrealistic yield potentials that do not adequately consider biophysical constraints and/or limits to agricultural inputs (Haberl et al. 2010; Smith, Zhao, and Running, 2012). Smith, W. K., Zhao, M., & Running, S. W. (2012). Global Bioenergy Capacity as Constrained by Observed Biospheric Productivity Rates. BioScience, 62(10), 911–922. doi:10.1525/bio.2012.62.10.11. Haberl, H., Beringer, T., Bhattacharya, S. C., Erb, K.-H., & Hoogwijk, M. (2010). The global technical potential of bio-energy in 2050 considering sustainability constraints. Current Opinion in Environmental Sustainability, 2(5-6), 394–403. doi:10.1016/j.cosust.2010.10.007.	Rejected. The section is about technical potential, which may or not include sustainability concerns. However we make clear which studies do so.
23191	11	90	30	90	32	Technical or theoretical potential? The former I think. Delete "beneficial"	That part has been deleted.
28005	11	90	30	90	32	Please combine the two sentences in lines 30 till 32 they are partly redundant.	Thanks: Accept
28006	11	90	30	90	33	The SRREN calculated thoroughly a average technical potential in a range of 100 - 300 EJ as determined by the SRREN expert review. We would strongly advise to use only this potential range. There are no reasons given for deviating from the SRREN number and there are no developments known which could justify this new number. For policy reasons to give theoretical potentials is rather misleading and hence should not be listed in the conclusion part.	Noted : We do not include a final number now, but the figures found in major reviews after SRREN
19135	11	90	31	90	34	Conclusions. "The average theoretical potential estimated here is around 500 EJ. Top-down scenarios project 15-225 EJ/yr deployment in 2050. Sustainability and livelihood concerns might constrain beneficial deployment to lower values". The net prirary production for above-ground biomass is of the order of 2ZJ, four times the technical potential and 8 times the upper 'top-down' scenario. The potential is there to expand bioenergy and other wood products substantially. What is required is to better manage the existing forest areas and trees outside the forest, expand plantations and woodlots, give more training and ensure markets etc. This should be advantageous both socially and from an economic standpoint. Above all it will be environmentally beneficial.	Agreed. Conclusions were deleted from the appendix, as decided by the IPCC plenary.
31498	11	90	35	90	37	We do not understand the message in this sentence. This will have to be rephrased, if it is still to be mainained in this Annex to Chapter 11.	Thanks: Accept Action: Section was re-written
19136	11	90	35	90	37	"A large body of recent research indicates the potential for some bioenergy systems to trigger emissions and biogeophysical climate forcings from land-use change, though the magnitude of the market induced effect is highly uncertain". Corn ethanol and ligno-celulosic ethanol could come under this category as could some palm oil production, but the wrtings by Serchinger and McKechnie regarding woody biomass for bioenergy are based on a false premise and should not be used as an arguement in this chapter.	It is the mandate of the IPCC to represent disagreement in the scientific debate. Searchinger and McKechnie are represented as well as other opinions that disagree.
23192	11	90	35			Begin the sentence "Some bioenergy systems could trigger…."	Conclusions have been deleted, as requested by the IPCC plenary.
28007	11	90	35	91	10	Well done!	Noted
31499	11	90	37	90	39	QUOTATION: "Whether bioenergy systems mitigate climate change is uncertain in many cases and the answer depends on whether short or long time scales are considered." COMMENT: Since this conclusion deals with mitigation of climate change, many factors will have relevant implications, not only the time-scale. One example is the albedo effect. We therefor question whether this conlusion focusing only on time-scales is appropriate. This sentence also seems to mix up effects on temporal GHG emissions with climate forcing and mitigation effect? Like stated in SPM page 6, line 22, CO2 emissions related to LULUCF have significant uncertainties.	Thanks: Accept Action: Section was re-written to include these considerations

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23473	11	90	37	90	40	This sentence is based on a too partial perspective. It is not only a question of time frames or uncertainty, but of site-specific cases, type of end-point considered, and other factors (some of which were mentioned in the text).	Thanks: Accept Action: Modify
22867	11	90	37	90	40	The logic and clarity of the text can be improved. Since there is a clear link between the mitigation potential of bioenergy and the time scale over which they are evaluated, it is recommended to rephrase the text along these lines: 'Whereas some types of bioenergy provide immediate climate mitigation benfits, other types of bioenergy actually leads to an overall increase of GHG emissions in the short run which is then converted to a GHG reduction in the longer run resulting from continued displacement of fossil fuels or, in some cases, traditional bioenergy sources like charcoal. Some first generation biofuels most likely do not deliver climate mitigation benefits for several decades'. This text is only a proposal to indicate how conclusions could be sharpened because the knowledge base to do so is there.	Accepted. The sentence has been modified.
23193	11	90	38			Delete "is uncertain in many cases and the answer"	Conclusions have been deleted, as requested by the IPCC plenary.
23194	11	90	39			"some" needs defining. Be specific. Some do, some do not! The whole sentence is not univerally true as it stands.	Conclusions have been deleted, as requested by the IPCC plenary.
38020	11	90	39	90	40	This is a contentious statement. It's assumed to have such widespread appeal it needs no supporting context of evidence. Please give some examples of some present day first generation biofuel systems that have net GHG emission - please provide some evidence to support the claim.	Has been deleted.
38021	11	90	39	90	41	This is a highly debateable and largely unsubstantiated claim. Delete it or add sufficient references to bolster the argument.	Has been deleted.
31110	11	90	4	90	6	"Land conversion is reduced in the 450 ppm scenarios compared to the 550 ppm scenarios, a result consistent with a declining mitigation role of land-related mitigation with policy stringency." This sentence is hard to understand and needs some clarification, similar to P. 62, L 5-7. It also seems to contradict what was said at P. 62, L 34. Intuitively, one would think that a more stringent stabilization target would require more land conversion, though the difference between the 450 ppm and 550 ppm scenarios might be small.	Thanks. That is correct. The concluding paragraphs have been deleted, as by plenary decision in Batumi.
29510	11	90	40	90	43	Whilst it may be ideal for bioenergy systems to consider these factors, cognisance should be taken of the fact that competing land uses may not be required to consider all of these factors. It is essential from a policy perspective that all uses compete for resources on the same basis and that one sector is not favoured over another through either policy or regulation. Ideally sustainablity criteria would be applied equally to all land uses.	Accepted.
24875	11	90	40	90	44	Whilst it may be ideal for bioenergy systems to consider these factors, cognisance should be taken of the fact that competing land uses may not be required to consider all of these factors. It is essential from a policy perspective that all uses have to compete for resources on the same basis and that one sector is not favoured over another through either policy or regulation. Ideally, sustainability criteria would be applied equally to all land uses. Suggest in line 41 replace "will have to" with "should". Insert at 44 after "biodiversity. “It is recognised that competing land uses at present are not always required to consider all or even any of these factors. In the interests of transparency and equity, it is important that regulatory policy perspective should move toward a situation where uses compete for land resources on the same basis and that one sector should not be favoured over another through either policy or regulation. Ideally sustainability criteria would be applied equally to all land uses."	Conclusions have been deleted, as decided by the plenary in Batumi.
23195	11	90	41			"any bioenergy systems will have to consider" A system cannot consider!!! Whole sentence needs rewording	Conclusions have been deleted, as requested by the IPCC plenary.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28008	11	90	44	90	46	To be added: "Other crucial factors influencing mitigation potential are … the reduction of non CO2-emissions from residues in the animal production (manure, dung)…"	Noted: A: No need to cover all issues e.g. non co2 from annual production - a minor issue
27167	11	90	39	90	48	The conclusions of this paragraph related to first generation biofuels is largely based on the supposed negative iLUC effects over time. Since iLUC science is still evolving and is currently dependent on models that are very sensitive to the assumptions, the assessment that "some first generation biofuel systems almost certainly cause net increases in GHG emissions today" are not science-based and therefore very controversial and highly questionable. The whole paragraph (as the rest of the Annex) presents a negative bias towards first generation biofuels in terms of their contribution to climate change mitigation. There are first generation biofuel systems that certainly cause net reductions in GHG emissions today and this fact is not reflected in the conclusions. Recent studies - still to be publishef - of soy biodiesel in Brazil indicate reduction of GHG emissions around 70%. Besides that, soybeans are cultivated with no till and other best agricultural practices and under a strict environmental legislation which comprises public and private conservation of native vegetation. This sentence (lines 39-40) is clearly biased since the opposite is also true. i.e. Some first generation biofuel systems certainly cause net decreases in GHG emissions today (e.g. sugarcane ethanol produced in Brazil). Moreover, the amount and impact of co-products used should also be mentioned as factors influencing the mitigation potential.	Accept. Text was revised
30298	11	90	44	90	44	Animal welfare should be added so that it reads "…assets, as well as animal welfare and biodiversity." This is for the reasons discussed above, particularly as larger scale industrial operations may be advantaged in bioenergy over small-scale producers. See Lokey E. (2009). The status and future of methane destruction projects in Mexico. Renewable Energy 34, 556-69. The Humane Society of the United States. An HSUS report: the implications of farm animal-based bioenergy production. http://www.humanesociety.org/assets/pdfs/farm/hsus-the-implications-of-farm-animal-based-bioenergy-production.pdf. Accessed April 20, 2013.	Noted : - Not easy to relate to animal welfare, There could be positive implications for animal welfare Action: No Action:
23196	11	91	1			Add "domestic" biogas	Conclusions have been deleted, as requested by the IPCC plenary.
23197	11	91	2			Delete "not only" and displace "but also" on line 3 with "and"	Conclusions have been deleted, as requested by the IPCC plenary.
23199	11	91	3	91	10	This paragraph better placed under first para of this section.	Conclusions have been deleted, as requested by the IPCC plenary.
23198	11	91	4			Another example to change "bioenergy production" to "biomass production"	Thanks: accept
27181	11	91	1	91	3	There is no science-based evidence that supports the distinction between small and large-scale bioenergy systems in terms of their net GHG emissions reductions. Moreover, the reference to small scale biomass gasification as a technology already dominated (like biogas) is not scientific since the existing systems in India and China still present several technical difficulties and even environmental negative impacts not addressed in an adequate way, as related in the litterature (and also based in Brazilian experience in Amazonia villages - please see http://cenbio.iee.usp.br). It is not a scientific statement.	Accept. Text was revised
38022	11	92	2	143	6	Numerous references are repeated (with slightly different form of the citation). Examples include: Burney et al 2010a and Burney et al 2010b. (page 97, lines 35-40)	Has been reviewed. Thanks.
20164	11	GAPS				better understanding of climate change feedbacks on soil dynamics (of different soil types) particular regarding transformation of nitrate and activities of micro organisms	Accepted. This exact wording has not been used but the feedbacks on soil C and N is included.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23774	11	general				Terra Preta or composting is not mentioned, the biosequestration dimension is underdeveloped.	Rejected. Not mentioned in biochar box - potential diversion from mitigation strategy. Functionality of terra preta cannot be re-created on a relevant timeframe.
26145	11	General				Terms "demand-side", "production-side" and "supply-side" are all used in the Chapter. It should be defined what is meant by these terms, especially what the difference between "production-side" and "supply-side" is.	Accepted. Terms harmonised and defined
20166	11	General comment				the bioenergy appendix gives a good description of the sustainability concerns of biofuel and describes well the interactions between mitigation potential, land use issues and socio-economic concerns. It would improve to bring out a little more the impact on local communities and livelihood concerns. The discussion about the benefits and negative impacts of bioenergy use need a whole system approach including social, economic, environmental as well as indirect impacts and consideration of different scales.	Accepted.
20165	11	General comment/Gap				As the main share of agric emissions is/will be released in the developing world more attention would have been needed on mitigation option, socio-economic interactions and impacts, power and policy issues and cultural variability in these regions and on small/subsistence scale.	Accepted. More references on the potential impacts on agriculture have been included in sections 11.4.5, 11.7 and 11.8.