#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
1	56897	7	0	0	0	0	General comment 1: Relying on worldwide refereed scientific articles and well-reported experiences the authors undertook a thorough work that set the basis for a sound interpretation of reality. At the same time, it should be noted the effort of contributors to consolidate essential concepts through the support of uncertainty analysis and empirical agreement. In general, I believe that Chapter 7 offers a complete picture to analyze the issue of food security under a concerning scenario of global warming and climate change. (Ernesto Viglizzo, INTA/CONICET)	Thanks for the positive comment
2	56898	7	0	0	0	0	General comment 2: the general structure of the text looks rather intricate. I was unable to capture the logics of this chapter after a first reading because it appears unnecessarily divided into an excessive amount of sections and sub-sections (e.g.: 7.3,...)7.3.2... 7.3.2.1... (7.3.2.1.1, etc.). Inevitably, complex structures conspire against clarity and the interpretation of various topics treated across the chapter. I believe that the presentation needs simplification in order to facilitate the understanding by both, specialized and non-specialized readers. Editors should work hard to get a friendly version of chapter 7. (Ernesto Viglizzo, INTA/CONICET)	The structure of the chapter was decided by IPCC before we were invited as authors in order to have some consitency across chapters.
3	56899	7	0	0	0	0	General comment 3: In relation to the general comment 2, I wonder if it is necessary to split the texts into paragraphs treating similar issues. I perceive concepts reiteration in different sections, especially those that report the effect of warming and CO2 enrichment on crops physiology. In fact, I perceive conceptual overlapping in sections and subsections that repeat topics on "production systems", "crop production", "livestock production", "fisheries", etc For example, I do not find arguments to undertake sections 7.2 (Observed impacts) and 7.3 (Assessing impacts...) as separate units. (Ernesto Viglizzo, INTA/CONICET)	We have divided the chapter into obseved, assessed and projected changes. Thus there is overlap. We may be able to shorten the chapter on the suggested basis.
4	58108	7	0	0	0	0	The influence of climate change on rice wheat and corn should be included according to Table5 of SPM (Yanling Song, China Meteorological Administration)	Thank you. We will make this point to the SPM team.
5	58839	7	0	0	0	0	We suggest making a brief reference to the relationship between climate extremes and food security, and link to the recent findings of IPCC SREX. (Carlo Scaramella, World Food Programme)	Good suggestion - we will look again at SREX. See reference IPCC 2012.
6	59051	7	0	0	0	0	I suggest to add in Section 7.2.1..1 some discussions on the effect of diming on crop production as a single or as interactiion with other climate change factors. (Genxing Pan, Nanjing Agricultural University)	This is dealt with in other sections.
7	59052	7	0	0	0	0	I think a relevant Chinese publication“Pan et al., editor-in-chief.Assessment Report of climate change impacts on agricultural production of China. China Agriculture Press, Beijing China. 2011.pp243-256. in Chinese . ” could be used for disucssion on crop production changes in response to climate change. (Genxing Pan, Nanjing Agricultural University)	Is this a refereed publication. From the title it seems not to be and thus we are loathe to accept it.
8	59976	7	0	0	0	0	References to other WGII chapters should refer to specific sections (e.g. 5.4.2.4 not simply Chapter 5) (AUSTRALIA)	We do this where possible but as the chapters are all under development sections can change - so it is safer to link to chapters and let readers find their own way.
9	60831	7	0	0	0	0	With a few exceptions, this chapter seems to lack reference to the important FORESIGHT Global food and farming project, the findings of which are written up in PtRS: http://rstb.royalsocietypublishing.org/content/365/1554.toc; a key overview paper on climate change is Gornall et al 2010: Jemma Gornall, Richard Betts, Eleanor Burke, Robin Clark, Joanne Camp, Kate Willett, and Andrew Wiltshire, Implications of climate change for agricultural productivity in the early twenty-first century Phil. Trans. R. Soc. B. 2010 365 2973-2989 doi:10.1098/rstb.2010.0158 (Peter Falloon, Met Office Hadley Centre)	These papers have been consulted but have little to say about climate change. There is some useful information on changes in land area (Smith et al) that has been looked at.
10	61119	7	0	0	0	0	Food production is considered from a one-eyed point of view, only referring on impacts on the components of the agricultural sector. Looking in the WGIII Chapter 11 in both chapters are missing links. Overall they should be better connected. In general nothing was said about future emissions from the agricultural sector in terms of life style changes, changes in the production styles and what happen under demographic growth in terms of future emissions. Here new literature exists (cf. Pradhan et al. 2013, PlosOne, in press). These two chapters perfectly provide an option to discuss anthropogenic interference (what happens with emissions and climate when people proceeds as in the past) with climate and agriculture. But in both chapters this do not play an important role. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Agreed - but the problem is the lack of refereed published material on the non-production elements of the food system in relation to climate change. This seems not to have been realised by IPCC when they decided on a food security chapter.
11	61120	7	0	0	0	0	this AR 5 chapter on food addresses the issue of food security, which is more relevant to policy and is a great improvement since AR 4. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Thanks for the positive comment

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
12	62790	7	0	0	0	0	Please consider including the report by Oxfam: Extreme Weather, Extreme Prices - the costs of feeding a warming world (Ref: http://www.oxfam.org/en/grow/policy/extreme-weather-extreme-prices) (Sai-ming Lee, Hong Kong Observatory)	Not clear that this is a peer refereed publication.
13	63382	7	0	0	0	0	The chapter is not entirely consistent with the use of the word "food". In some places (e.g. p13 L3) the material is about "crop" not "food" (Peter Gregory, University of Reading)	Good point - accepted. We will attempt to be more consistent in the final draft.
14	63441	7	0	0	0	0	General comment: What researchers really need is more accurate data for impact assessments. For example, for farm studies, we need more detailed information on when farmers plant, when farmers harvest and weather stations on agricultural holdings to be able to assess effects of weather extremes that are spatially selective. This way, we could better assess adaptation strategies, such as adjusting planting and harvesting dates, strategies to reduce damage through heavy precipitation events etc. (Natalie Trapp, University of Hamburg and International Max Planck Research School on Earth System Modelling)	This suggestion has been mentioned in section 7.6.
15	63516	7	0	0	0	0	Many regional and local examples make it difficult to get a global picture, the chapter should be completed by graphics showing worldwide trends. Sometimes expected developments are shown for 2050 and sometimes 2100 > there should be a general line mentioning both time frames. (GERMANY)	We have addressed global trends in Figure 7.5 and added a box to the chapter.
16	63541	7	0	0	0	0	Section 7.3: Agrobiodiversity as an important factor to reduce the risk of food insecurity should be mentioned. (GERMANY)	Where is the evidence for this? The points you have raised are beyond the scope of this chapter because we are adressing climate impacts.
17	65481	7	0	0	0	0	The Chapter is well composed and nicely written. It takes in to account the components of food security in addition to the Production part. The previous four IPCC reports mostly covered the production aspect of the Food Security but this chapter touches around other components (although data scarcity still remains a core issue) of the food security as well which is praise worthy. (Arif Goheer, Global Change Impact Studies Centre (GCISC))	Thanks for the positive comment
18	65500	7	0	0	0	0	At places typographical errors like placing of 'comma' before 'and' and non-uniformaity of abbrevaitaions etc are observed. These may be placed in order. (Arif Goheer, Global Change Impact Studies Centre (GCISC))	We assume that a copy editor will deal with these issues.
19	68892	7	0	0	0	0	In spite of what the title suggests the chapter mainly deals with food production. It is indicated that food production is an important element for food security but at the same time it's incomplete to cover food security. Food security deals with availability of food, access to food, stability and utilization just like the IPCC-report mentions. We recommend that IPCC spend more efforts and give a clearer view on the relation between climate change and the several aspects of food security; In the executive summary it is stated that food prices are important to food security. We agree completely with that statement. At the same time the authors state that the role of weather on prices remains unclear. We recommend that the impact from climate change to food prices at least scientifically based is indicated; A significant part of food production takes place within small farmers conditions or even in subsistence situations. It seems that the impact of climate change to food production mostly is related to the more sophisticated production systems missing socio-economic triggers for food production by small farmers and subsistence farmers due to climate change. We recommend that the authors consider these aspects too in this report or develop some guidelines for the next report; For the coming decade the importance of and attention to nutrient security will increase. We recommend that the relation between climate change and food nutrition is addressed and if possible has been clarified; The report gives also some statements on the impact from climate change to fisheries, aquaculture and oceans. For the Netherlands, in cooperation with World Bank, emphasises the role of oceans for food security, we would appreciate more scientific reviews on the impact of climate change on oceans within the IPCC –reports; The report states that adaptation leads to lower reduction of food production but most studies are focussed on food production. Obviously there's a greater need of studies on adaptation possibilities, hopefully IPCC can report about that next time. Mainstreaming and integrating climate change in for instance 'good agricultural practices' is important. We suggest IPCC to report on this issue. (NETHERLANDS)	We agree with the comment - but are restricted in what can be said by the lack of references that link your points to climate and its change explicity - and we are asked to focus on the impacts of climate and adaptation to it.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
20	68893	7	0	0	0	0	Effects of climate change on food production is put in context of other factors influencing food security. However, the effect of climate change is not put in context of other drivers clearly. Technological development, markets and policy also play a large role in both food supply and demand. It would be good to say more about the relative impact of climate change compared to other drivers. Effects may be negative, but still relatively small. The message of this Chapter is now very clearly that climate change has negative impacts almost everywhere, while the impact may be relatively small in many regions. As yield gap analyses (Van Ittersum et al., 2013, Field Crops Research 143: 1-3) show, in many regions yields are limited by other factors than climate. Other references are given in detailed comments. In the main text, climate chnage is sometimes put in context (e.g. p. 31, line 14), but this not come back clearly in the figures, conclusions and main messages. If there is ont enough information on this, this is not mentioned in section 7.6 on research gaps. (NETHERLANDS)	We have tried to be clear that many issues affect food production and have said this explcitly - but with the main point that the climate signal is expected to increase over time.
21	68894	7	0	0	0	0	reference list not consistent, reference list not complete, citations not consistent (et al./et al/et al in italic, etc.) (NETHERLANDS)	We are working on this - but with about 490 references in the chapter mistakes can happen. There have also been problems with the reference manager at the TSU.
22	68895	7	0	0	0	0	Although this chapter relies less on crop models compared to previous IPCC reports, their results are still not much discussed in this chapter. Among others, model comparisons for wheat (Palosuo et al. 2011, European Journal of Agronomy 35 103- 114) and barley (Rotter et al. 2012, Field Crops Research 133: 23-36) showed that no model can give accurate predictions of actual yield levels in Europe. In developing countries, crop model simulation results are often even less accurate, as actual yields deviate more from potential and/or water limited yields. A review paper discussing this is White et al. (2011, Field Crops Research 124, 357-368). Like many topics, it is discussed in the chapter (f.e. on p. 12), but in the main text, and not in figures, conclusions and main messages. Highlighted results still rely too much on crop models, which may not always give reliable projections. (NETHERLANDS)	We have assessed the uncertainty in the use of crop models - see Figures 7.5 and 7.7.
23	68896	7	0	0	0	0	The only impact mentioned for Europe in the SPM on p.19 is the stagnation of wheat yields due to climate (based on Ch.7). It may however be argued whether climate change is the reason. Prices of wheat decreased until 2008, and wheat became less important relative to other crops in rotations. It may be the case for some countries, but a study accepted with minor revisions in Field Crops Research (Rijk, B., M. van Ittersum, J. Withagen, 2013. Genetic progress in Dutch crop yields) shows that in the Netherlands genetic progress still increases linearly as in the past for all major crops. Actual yields do not keep up, so yield gaps increase. Yields are less limited by climatic conditions, but more by management factors. For example, in the Netherlands wheat is often grown after sugar beet. As sugar beet can be harvested later than in the past, to obtain higher yields, farmers do this. This implies wheat needs to be sown later than optimal, but as revenues for sugar beet are higher than for wheat, they prefer higher sugar beet yields. (NETHERLANDS)	This is an issue for the SPM.
24	68897	7	0	0	0	0	With the exception of a few scarce remarks into the effectiveness of policy measures in limiting price increases during the 2008 food price hike, there is no explicit analysis of potential economic policy measures that could be taken to mitigate the impact of climate change on food security. It would be worthwhile to add a paragraph discussing the effectiveness of such potential measures. Such a paragraph could deal with issues as the effects of export bans or market regulation on food markets under climate change. (NETHERLANDS)	The point raised is accepted but needs backing up by suggested reviewed papers.
25	68898	7	0	0	0	0	The chapter presents a very interesting analysis of likely climate change effecst on various food production systems. The discussion of literature on direct effects of climate change on crop yields and other food production systems is extensive and covers all important crops and regions. In contrast the 'food security' element of the chapter, i.e. the analysis of economic effects and behavioural responses to these projected yield changes, is relatively limited (paragraph 7.3.3 & 7.4.3). We feel that this is limitation that should be addressed by including a more thorough review of the economic (academic) literature of this field of study. Such a review should ideally also considere demographic projections for the human populations studied, in order to truly assess future food security issues and there relationship to climate change. Particularly, this is important as the food security component of the chapter is probably of most interest to policy makers. (NETHERLANDS)	These points are more relevant for the economics chapter (10). Chapter 7 is about food production systems and food security.
26	71298	7	0	0	0	0	Animal welfare issues with climate change - e.g. heat stress, extreme weather events, are not discussed. Is there literature in this area that could be assessed? (CANADA)	Included in 7.3.2.4.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
27	72509	7	0	0	0	0	As written, although there are a few places where the chapter identifies clearly severe risks that climate change poses to food security, especially over the 100 year time frame, it is possible to read the chapter and come away with the impression that, really, the risk may not be so large -- the situation not too bad. This impression contrasts starkly with papers like Battisti and Naylor (2009). From their abstract: "We used observational data and output from 23 global climate models to show a high probability (>90%) that growing season temperatures in the tropics and subtropics by the end of the 21st century will exceed the most extreme seasonal temperatures recorded from 1900 to 2006." This is purely observational; it does not employ alarmist language. But it puts the situation in a very different perspective. These findings are without doubt highly policy-relevant and readers of the IPCC report need to see them. Battisti, D. and R. Naylor (2009). "Historical Warnings of Future Food Insecurity with Unprecedented Seasonal Heat." Science 323: 240-244. Abstract: Higher growing season temperatures can have dramatic impacts on agricultural productivity, farm incomes, and food security. We used observational data and output from 23 global climate models to show a high probability (>90%) that growing season temperatures in the tropics and subtropics by the end of the 21st century will exceed the most extreme seasonal temperatures recorded from 1900 to 2006. In temperate regions, the hottest seasons on record will represent the future norm in many locations. We used historical examples to illustrate the magnitude of damage to food systems caused by extreme seasonal heat and show that these short-run events could become longterm trends without sufficient investments in adaptation. (UNITED STATES OF AMERICA)	We disagree. We have made the point that climate can have extremly severe consequences for global food production - see the executive summary.
28	72510	7	0	0	0	0	Building soil organic matter is a key agricultural action that improves soil fertility (and hence productivity) and water holding capacity (and hence resilience in the face of drought). The potential for building soil organic matter as a key component of climate change adaptation for food security, contributes to mitigation via carbon storage, and should be discussed more fully in this chapter. As is, the term appears only twice: first on page38 (lines 38-53), in the context of a case study, and second on page 44 line 26, in relation to OM inputs to the ocean. There are many references to support the relationship of soil organic matter to soil water holding capacity, soil fertility, and carbon storage: Rawls et al.(2003)"Effect of soil organic matter on soil water retention".Geoderma 116:61-76. Chivenge, P., et al. (2009). "Organic and Mineral Input Management to Enhance Crop Productivity in Central Kenya." Agronomy journal 101: 1266-1275. Manlay, R. l. J., et al. (2007). "Historical evolution of soil organic matter concepts and their relationships with the fertility and sustainability of cropping systems." Agriculture, Ecosystems and Environment 119: 217‰ÛÒ233. Bhardwaj, A. K., et al. (2011). "Ecological management of intensively cropped agro-ecosystems improves soil quality with sustained productivity." Agriculture, Ecosystems & Environment 140(3-4): 419-429. Magdoff, F. and H. Van Es (2010). Building Soils for Better Crops, Sustainable Agriculture Research and Education (SARE). National Research Council (2010). Toward Sustainable Agricultural Systems in the 21st Century. Washington, DC, National Academies Press. (UNITED STATES OF AMERICA)	There were different views on this point by different Reviewers. We have cross-referenced this point to other chapters in WG2 and WG3.
29	72511	7	0	0	0	0	Chapter 9 focuses on rural areas and there seems to be a slight amount of overlap between Chapter 7 and Chapter 9. Recommend that the authors of both chapters (7 & 9) to ensure that duplication is minimized and synergies are maximized. (UNITED STATES OF AMERICA)	A slight amount of overlap between chapters is inevitable and perhaps a good thing.
30	72512	7	0	0	0	0	It is laudible that the IPCC WG2 decided to broaden the focus of climate change impacts on agriculture beyond production to the food system more broadly, but the way this decision played out is confusing for two reasons. First, the chapter still focuses primarily on climate change impacts on production -- which leads to the second reason. Upon reflection, it may be that other aspects of food security simply are not strongly linked to climate change, at least not directly. The authors should address both of these points in concert, one way or another, because as it stands there is a large gap between what the chapter purports to do and what it actually does. One way to address this problem that could be extremely helpful is a figure and accompanying text that shows how climate change could impact food security via impacts on different parts of the food system (production, infrastructure, trade, access, storage, distribution, income), including some explanation of which impacts are direct and likely, which are probably not of great importance by comparison with other stressors on food security, and which could become critical via indirect routes even though they intuitively seem not so important. With that frame, the chapter could then reasonably ignore those areas of food security that are not particularly linked to climate, while setting the stage for future reports to revisit assessment of the strength of these links. (UNITED STATES OF AMERICA)	We agree with the comment - but as Figure 7.1 shows there is a dearth of literature on climate change and non-production aspects of food security. We have a section devoted to this and have also incoportated several experts in non-production aspects as CAs.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
31	72513	7	0	0	0	0	The chapter could be tighter and more synthetic, with clearer framing of debates and identification of conclusions from those debates, especially those where policy action is needed. Some sections seem to be more of a summary of what information is available rather than an analysis of what is most important. There is significant repetition and some sections include what appears to be more of a cutting and pasting of notes than conclusions from an overview of the weight of evidence. Parallel treatment of topics would also be helpful, for example, there is no discussion of pests and diseases for livestock on p. 10 Sec 7.2.1.3. The research conclusions seem hastily done and token rather than comprehensive, but this is more of an impression than systematic analysis on my part. Regarding balance, it is always too easy to point out what has not been addressed, however several key issues do seem to require more attention: (1) the basis for future projections of food needs or the uncertainty associated warrants discussion; (2) consumption and the possibilities for redirecting consumption into the future (this could be incorporated throughout, but one place where consumption really should be mentioned is on p. 24 lines 41-48); (3) the distribution of food within the household or the organization of food production as food production becomes more limited in certsain places and food more scarce; and (4) food security and conflict (currrently has one line). In addition, much of the discussion seems focused on temperature and precipitation changes, with less attention to seasonality. The discussion of genetics and breeding strategies for new cultivars seems limited. As an example of where policy actions could be highlighted, the suggestion of a gene bank is currently buried at the end of a paragraph, yet given the importance of new cultivars, this might be one of the most important actions required. Treatment of regional variation seems ad hoc. It also might be helpful to note where evidence is from modeling versus empirical data. (UNITED STATES OF AMERICA)	We are clearly mandated by IPCC to be policy relevant but not policy prescriptive and many of the points rasied here fall into the latter category. We devote many of the figures to showing the uncertainty in projections (Fig 7.5, 7.6, 7.7). We are also asked to synthesise and evaluate refereed research mainly since 2007 - if there has been no research on admitedly important topics then our statements are limited.
32	72514	7	0	0	0	0	The chapter includes text on some key assumptions about population growth rates and trajectory of diets. Dietary trends, in particular, could change -- either for reasons we do not currently understand or in response to targeted information or incentive programs that could be part of adaptation planning. The chapter does not address the benefits and practicality of transitioning towards a plant-based diet. Dietary assumptions need to be clearly identified as assumptions rather than as a fixed playing field that cannot change. (UNITED STATES OF AMERICA)	This is policy prescriptive - see comment 31.
33	72515	7	0	0	0	0	The chapter should address, at least briefly, food waste, which accounts for between 30-40% of food production globally, and the potential for reductions in food waste to both reduce emissions and to increase food security. As with energy, if waste can be reduced, demand decreases which means lower emissions from the agriculture sector, at all stages of the supply chain. And reduced food waste in industrialized countries also means less food decomposing after purchase by consumers, and hence lower methane emissions. The references below document and quantify the climate change impacts of food waste and the potential for food waste reduction to be an important part of addressing food security, including food security in the context of climate change impacts and mitigation. The US Government -- efforts at the Dept of State, for example -- recognizes the role food waste reduction can play in ensuring food security, showing that major institutions whose participation is required to tap the potential for using this approach are in fact participating. Energy efficiency is now widely regarded as the first critical step towards increasing resilience to climate change in the energy system. Reducing food waste could play a very large role in ensuring food security -- including resilience of the food system to climate change. This chapter should highlight that opportunity, both in the text and in the figures. Key references: Gustavsson, J., et al. (2011). Global Food Losses and Food Waste: Extent, Causes, and Prevention. Rome, Italy, Food and Agriculture Organization of the United Nations. Hall, K. D., et al. (2009). "The Progressive Increase of Food Waste in America and Its Environmental Impact." PLOS One 4(11): e7940. Parfitt, J., et al. (2010). "Food waste within food supply chains: quantification and potential for change to 2050." Philosophical Transactions of the Royal Society B: Biological Sciences 365: 3065-3081. Vermeulen, S. J., et al. (2012). "Climate Change and Food Systems." Annual Review of Environment and Resources 37: 195-222. Foley, J. A., et al. (2011). "Solutions for a cultivated planet." Nature 478(7369): 337-342. (UNITED STATES OF AMERICA)	Chapter 7 is about the impacts of climate change on food security and this comment is more relevant for WG3. It is also policy prescriptive and thus outside our remit.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
34	72516	7	0	0	0	0	The potential of small holder agriculture that integrates agroecology and "land-sharing" to increase food security needs more attention. The agricultural landscape and its implications for food security in the face of climate change (or even without) could look radically different than it does today. Just as we have embraced the vision of a low-carbon economy that differs dramatically from the current fossil-fuel based economy, we could envision and achieve a very different agricultural production system than dominates the most productive agricultural areas today. For example, perennials could be much more widely integrated with food crops to restore soil health and increase staple yields. See: Glover, J. D., et al. (2012). "Agriculture: Plant perennials to save Africa's soils." Nature 489(7416): 359-361. These possibilities need to be identified and included in the portfolio of available tools that need to be pursued. We don't know which ones will prove most successful and we expect that a variety of practices and agricultural systems will be needed depending on soil, climate, culture, and other place-based factors. But the full range of possibilities need to be identified in this IPCC chapter on food security -- possibilities including agroecological approaches like using perennials to increase soil organic matter, or N-fixers to enable rural poor in developing countries to avoid heavy reliance on costly synthetic fertilizer. (UNITED STATES OF AMERICA)	This in general adaption that is covered in 7.5.
35	72517	7	0	0	0	0	The treatment of uncertainty and confidence in this and other IPCC chapters has evolved with careful consideration over a number of years. It could be taken a step further to enable readers including governments to take advantage of a risk management perspective. A good resource for understanding how to interpret and present data about climate change and adaptation using a risk management framework might be: Mabey, N., et al. (2011). Defining a Risk Management Framework for Climate Security. London, UK, Third Generation Environmentalism Ltd: 177. Mabey et al. describe their report as "strongly informed by the experience of senior security, intelligence and defense officials and experts from the United States, Europe and developing countries through a series of closed-door meetings..." so it represents views that IPCC authors should care about. Scenarios that present climate change impacts to food production/food security that are low-probability, high-consequence is not only appropriate but needed. Similarly, adaptation options could be classified as most appropriate to high-probability or low-probability impacts, and that understanding could influence how governments and other entities choose to allocate resources among the portfolio of response options. (UNITED STATES OF AMERICA)	We agree and this point is dealt with for the whole of WG2 in the SPM risk table.
36	77567	7	0	0	0	0	South Asian studies are very sparse (Malini Nair, Indian Institute of Science)	We are constructing a box for regional studies for the final draft. The REs made a similar point - although Figs 7.5 and 7.6 distinguish tropical regions.
37	77830	7	0	0	0	0	General: I am surprised that nothing is mentioned about extreme events (froughts and hearvy rainfall or hail) and impacts on crops. This however has become an issue and there are a few papers published. (Liette Vasseur, Brock University)	Extreme events are mentioned many times in the chapter.
38	77832	7	0	0	0	0	I didn't see anything in realtion with national policies for food and nutrition. However in several developing countries they have huge impacts in increasing the likelihood of food insecurity. This is well known in Subsaharan Africa. (Liette Vasseur, Brock University)	See comment 31.
39	78322	7	0	0	0	0	As a human geogrpaher, I read this chapter with great interest. Food security is an important intervening variable between climate and all kinds of human behaviours, such as the things people do to adapt to changes in the climate. I feel that this chapter treats adaptation too narrowly as adjustments in agricultural production techniques. There is some mention of other things people and other actor do to adjust, but I think it would good to make clearer from the onset that agricultral change is just one of a larger set of options people and societies have. (Kees van der Geest, United Nations University)	Dealt with in 7.5
40	78914	7	0	0	0	0	This chapter has improved considerably as compared to the FOD; still there are a few weak points, mainly need for clearer presentation, missing information, and a few errors; suggestions for amendments, including detected errors are presented in teh detailed comments below; with respect to some important missing references, I have compiled a supporting file (IPCC_AR5_WGII_chapter 7_addREFs_(RP-Rotter)); I will refer to those Refs in detailed comments below (Reimund Rötter, MTT Agrifood Research Finland)	No comment needed.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
41	78915	7	0	0	0	0	One of the shortcomings is that the chapter does not clearer present what's new since AR4 (and, partly, findings that had already been well establised in the 1995 IPCC WGII chapter: Agriculture in a changing climate - are presented as new); here one could more prominently present as NEWS: more detailed, high resolution agricultural modelling since AR4 (e.g. Nelson et al. 2009, 2010) report substantial declines in yield for some crops in key producing areas (biophysical effects only); climatic risks more severe and earlier (already at +2oC); food price increases under most scenarios; etc. (Reimund Rötter, MTT Agrifood Research Finland)	Most of these new issues are dealt with in the chapter. Many comments make the point that there are many new elements in this chapter. We do not have space to flag each one but leave this to the informed reader.
42	78916	7	0	0	0	0	Summary of most severe omissions (see, also detailed page and line-explicit comments below): (i) Omission1: in sub-section 7.3.1 (methods..), section not detailed and complete enough: regarding differentation of capabilities of various. methods; better information available on recent advances in Multi-Model Ensemble (MME) crop simulations and uncertainty evaluation (ii) Omission1: also in methods section, lacking is mentioning of (global) economic models – they are not treated at all in the methods section (iii) Omission3: adaptation not presented and discussed sufficiently detailed (& and also too narrow) (iv) Omission4: claims on improved quantification and presentation of uncertainties since AR 4; this hardly or at least not not sufficiently reflected in this chapter (Reimund Rötter, MTT Agrifood Research Finland)	Many of these points are quite valid but the problem has been that WG2 has cut-off dates for literature acceptance and whilst some papers and reports made the deadline others did not. Some papers from the author referred to in comment 41 have been included. We have about 450 references in the chapter.
43	78917	7	0	0	0	0	Summary of most important errors detected (see, also detailed page and line-explicit comments below): (Reimund Rötter, MTT Agrifood Research Finland)	No comment needed.
44	78918	7	0	0	0	0	1) Executive summary, message 9: it should read ”Without adaptation....in tropical regions (instead of temperate) (Reimund Rötter, MTT Agrifood Research Finland)	ES has been revised.
45	78919	7	0	0	0	0	2) Executive summary, message 9: Error or Omission? ”Reductions of more than 5% are more likely than not beyond 2050 and....” [if 5% true, then this is a major discrepancy with AR4 results! – thus, an omission] (Reimund Rötter, MTT Agrifood Research Finland)	ES has been revised.
46	78920	7	0	0	0	0	3) Possible error /section 7.3.2: ”Heat stress effects have been better quantified at regional and local scales ..” => at least doubtful, as most models not capable to capture impacts of extreme weather events (heat, drought) sufficiently reliable (either relationships are oversimplified and/result from erroneous process description) (Reimund Rötter, MTT Agrifood Research Finland)	statistical models do good job of capturing responses, and controlled environment studies also show robust responses. However, we agree that having a physiological understanding to go alongside the quantification is not trivial .
47	78921	7	0	0	0	0	4) Possible error/omission, Section 7.6: ”..neglect include the need to update and revise food production impact models... ” – many of the research gaps mentioned have been (during past 2 years) and are currently actively tackled by international research network (such as AgMIP; CCAFS, Facce-MACSUR; ISI-MIP, etc) – see, e.g. my additional references compiled in supporting file such as Rosenzweig et al., 2013; Soussana et al., 2012, etc.: IPCC_AR5_WGII_chapter 7_addREFs_(RP-Rotter) (Reimund Rötter, MTT Agrifood Research Finland)	The work referred to is part of an ongoing process and we support this as stated in 7.6, especially with experimental studies as opposed to modelling.
48	79092	7	0	0	0	0	The general comment for Chapter 7: The relative titles and the clearly contents. However, when we mention the issues of Food Security and Food Production Systems, we should divide it into 2 parts: Food Security Systems and Food Production Systems for analysis. In The Introduction and Context, we should clarify the concept of Food Security Systems and Food Production Systems. And then we must also clarify The current State of food security and production Systems. Besides we should determine the Methods of Assessing Impacts. To clarify current state of it and its relation to weather and Climate as well as Effects of climate change on Food Security Systems and Food Production Systems (VIETNAM)	The structure of the chapter was decided by IPCC before we were invited as authors in order to have some consitency across chapters.
49	79503	7	0	0	0	0	In AR4 there was a very useful diagram giving the impacts on production of different crops with different climate change scenarios, including the impacts of Co2 fertilisation. It was very interesting, but the ranges were so wide it was difficult to make use of. We would like to see an update of this to see how the ranges have changed. (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	See Figures 7.5, 7.6, 7.7
50	80963	7	0	0	0	0	The chapter is on food security and food prduction system however it does not elaborate much on aspects of food production systems that go beyond the biophysical or the crop production. (Monalisa Chatterjee, IPCC WGII TSU)	See Figure 7.1, Sections 7.1 and 7.6.
51	80964	7	0	0	0	0	Section 7.3 is about impacts, vulnerailities and sensitivities and not so much about risks. (Monalisa Chatterjee, IPCC WGII TSU)	The chapter is about impacts on food security and production systems. We do address vulnerability aspects (Table 7.1).

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
52	82110	7	0	0	0	0	1) Overall -- The chapter team has developed a strong 2nd-order draft. In the final draft, the chapter team is encouraged to continue prioritizing compact and rigorous assessment, effective figures, clear writing, and high specificity. (Katharine Mach, IPCC WGII TSU)	No comment needed.
53	82111	7	0	0	0	0	2) Coordination across Working Group II -- In developing the final draft of the chapter, the chapter team should continue to ensure coordinated assessment, both in the chapter text and at the level of key findings. As appropriate, cross-references to the sections of other chapters and/or their assessment findings should be used, continuing to ensure that overlaps are reduced and assessment harmonized. (Katharine Mach, IPCC WGII TSU)	No comment needed.
54	82112	7	0	0	0	0	3) Harmonization with the Working Group I contribution to the AR5 -- In developing the final draft, the chapter team should also ensure all cross-references to the Working Group I contribution are updated, with discussion of climate, climate change, and climate extremes referencing the assessment findings in that volume. Where cross-references are made, wherever possible and appropriate they should specify the specific relevant sections of Working Group I chapters, instead of generic references to whole chapters. (Katharine Mach, IPCC WGII TSU)	We refer to sections whenever possible but chapter section numbers alter. We suggest that this is an issue for the TSU to del with in the FD.
55	82113	7	0	0	0	0	4) Presentation of uncertainty language within parentheses -- As much as possible, the chapter team should present calibrated uncertainty language within parentheses at the end of sentences. Such placement maximizes the directness and clarity of statements. Wherever possible, formulations such as "there is high confidence that" should be nixed and replaced by "(high confidence)" at the end of the sentence. (Katharine Mach, IPCC WGII TSU)	No comment needed.
56	82114	7	0	0	0	0	5) Report release -- The chapter team should be aware that the final drafts of the chapters will be posted publicly at the time of the SPM approval, before final copyediting has occurred. Thus, the chapter team is encouraged to continue its careful attention to refined syntax and perfected referencing. (Katharine Mach, IPCC WGII TSU)	No comment needed.
57	82115	7	0	0	0	0	6) Tightening the assessment and supporting a maximally rigorous executive summary -- In developing the final draft, the chapter team is encouraged to revise each section so that the core nuanced key findings emerge clearly with full and traceable support. Continuing with such focus, the chapter team should aim to shorten and tighten the assessment as much as possible. (Katharine Mach, IPCC WGII TSU)	No comment needed.
58	82116	7	0	0	0	0	7) Characterization of future risks -- In characterizing future risks for food security and systems, to the degree appropriate the chapter team should continue to indicate the extent to which risks (or key risks) can be reduced through mitigation, adaptation, or other responses. That is, is it possible to indicate how risks may increase as the level of climate change increases or, potentially, to indicate the relative importance of changes in mean conditions, as compared to changes in extreme events, as compared to potential non-linear changes associated with biome shifts or tipping points? And then, how much can risks be reduced through adaptation or development, in the near-term and the long-term? How are factors or stressors that multiply risks relevant in this context? As supported by its assessment of the literature, the author team should consider communicating risks for the era of climate responsibility (the next few decades, for which projected temperatures do not vary substantially across socio-economic/climate scenarios) and for the era of climate options (the 2nd half of the 21st century and beyond). As might be helpful to the chapter, the framing of table SPM.4 could be considered in characterization of future risks, along with the key and emergent risk typology of chapter 19. (Katharine Mach, IPCC WGII TSU)	No comment needed.
59	82117	7	0	0	0	0	8) Informing the summary products -- To support robust and insightful summary products for the report, the chapter team is encouraged to maximize nuance and traceability in its key findings, continuing to use calibrated uncertainty language. In addition to highlighting key findings throughout the chapter and characterizing future risks (see the previous comments), the chapter team is encouraged to consider themes emerging across chapters, indicating for example how extreme events have demonstrated adaptation deficits and vulnerability to date and may relate to future risks, how limits to adaptation may be relevant in the context of this chapter, how adaptation experience has been relevant to date, and how interactions among mitigation, adaptation, and sustainable development may occur. (Katharine Mach, IPCC WGII TSU)	No comment needed.
60	82118	7	0	0	0	0	9) Assessment of food security -- Is it possible to provide more assessment of the economic factors determining vulnerabilities and sensitivities in the context of food security? Such material could be placed between section 7.3 and 7.4. (Katharine Mach, IPCC WGII TSU)	No comment needed.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
61	84743	7	0	0	0	0	GENERAL COMMENTS: I congratulate the author team for all their work on an interesting and informative SOD. Please see my detailed comments for suggestions related to specificity of ES findings and traceable accounts, refining figures and tables, and various specific clarifications. I have two general comments. (1) The executive summary and chapter text use a mixture of all three forms of calibrated uncertainty language (agreement/evidence, confidence, likelihood), and the reasons for the different choices are not always clear. Please consider the overall approach to using calibrated language, particularly in the context of the executive summary, and how the usage can be better harmonized. Given that some key findings already use confidence, I would recommend shifting from agreement/evidence statements to confidence where possible (e.g., in cases where evidence is not "limited" and/or agreement is not "low"). The agreement/evidence terms can be retained as "XX confidence based on XX agreement, XX evidence" if desired, but keep in mind that this is quite a wordy construction, and it may be clearer to include the description of the evaluation of evidence and agreement in the chapter text. Where likelihood terms are used ("likely," "very likely," etc.), it is also not always clear whether they are intended as calibrated language or not--please carefully check this and avoid casual usage. (2) The chapter text would benefit from an edit aimed at tightening and focusing the discussions even further. When considering the suite of review comments, please look for opportunities to hone the text in revision. (Michael Mastrandrea, IPCC WGII TSU)	No comment needed.
62	84744	7	0	0	0	0	SUMMARY PRODUCTS: In preparing the final draft of your chapter and particularly your executive summary, please consider the ways in which your chapter material has been incorporated into the draft SPM and TS. For Chapter 7, this includes presentation of observed impacts and vulnerabilities in section A.i and sectoral risks in section C.i, as well as related figures and tables. Are there opportunities for presenting chapter findings and material in a way that further supports broad themes highlighted in the summary products and that facilitates additional cross-chapter synthesis in specific findings or figures/tables? Do the existing summary product drafts suggest additional coordination that should occur between Chapter 7 and other chapters at LAM4? (Michael Mastrandrea, IPCC WGII TSU)	No comment needed.
63	85208	7	0	0	0	0	Again complete disregard of the current absence of warming for the past 15 years. No mention of the possible influence of the recent persistent Northern Hemisphere cold winters on food supply (Vincent Gray, Climate Consultant)	This comment is for WG1. The lack of specifity and references in the comment means that a considered response is not possible.
64	65711	7	1	0	0	0	General Comments: limited to fisheries. (STEPHEN HAWKINS, UNIVERSITY OF SOUTHAMPTON)	Not an understandable comment.
65	84745	7	2	0	0	0	Executive Summary: Please carefully check the line of sight to underlying chapter sections throughout the executive summary, and ensure that indicated chapter sections provide clear traceable accounts and support for the presented findings. In this context, I would recommend further thought as to how the executive summary can most clearly communicate the findings of the chapter. The current draft contains much good material, but I feel that the clarity of the presentation can be improved, and there are a few cases where support in the chapter text is not clear (see specific comments). (Michael Mastrandrea, IPCC WGII TSU)	No comment needed.
66	56345	7	2	1	3	20	The language used to decribe the effect of global warming on food security is extremely cautious. The danger of a food crisis by 2050 is severely understated. To a lay reader, this executive summary will seem ambiguous, with sufficient uncertainty to justify a "do nothing" response. While alarmism is to be avoided, the report will fail politically if it is too cautiously worded. Too little attention is paid to the increasingly concentrated corporate ownership of the world food system, including land water and seeds (cf Amartya Sen). (Thomas Reuter, University of Melbourne)	We disagree. We have made the point that climate can have extremly severe consequences for global food production - see the executive summary.
67	72518	7	2	4	2	8	It would be helpful to include specific estimates as in previous paragraphs. (UNITED STATES OF AMERICA)	The ES will be updated in the final draft and a new figure introduced (7.7) that projects yield changes with time through to 2100..
68	72519	7	2	10	2	21	Both sections address extreme heat. Suggest that the authors combine these paragraphs. (UNITED STATES OF AMERICA)	Agreed and implemented in the final draft ES.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
69	82119	7	2	29	0	0	Characterizing Future Risks in the Executive Summary -- As much as possible and with firm grounding in the assessment of the chapter, the chapter team should continue to specify the degree to which future risks change or increase with increasing levels of climate change. Which risks emerge in the near-term, and which emerge in the long-term? What is the potential for reducing risks through adaptation and mitigation? The chapter team should also continue providing quantitative information on the ranges of possible outcomes. (Katharine Mach, IPCC WGII TSU)	No comment needed.
70	82120	7	2	29	0	0	Ensuring Traceability of Key Findings -- The chapter team should make sure the key findings in the executive summary clearly and robustly communicate the core findings of the chapter's assessment. For each statement, the chapter team should ensure that a reader is able to understand the traceable account of the finding, within the chapter sections referenced. (Katharine Mach, IPCC WGII TSU)	No comment needed.
71	82121	7	2	29	0	0	Confidence -- For some findings within the executive summary, the chapter team may be able to move from its evaluation of evidence and agreement to assignment of a level of confidence, following the guidance for authors. Wherever it is possible to do so, the chapter team is encouraged to present levels of confidence, building from the assigned summary terms for evidence and agreement. (Katharine Mach, IPCC WGII TSU)	No comment needed.
72	82122	7	2	29	0	0	Care with Extrapolation -- In making extrapolated statements about sensitivity and population, the chapter team should exercise care, ensuring rigorous support for the statements in the assessment of the chapter. In some places, more conditional framings may be appropriate where extrapolation is occurring. (Katharine Mach, IPCC WGII TSU)	No comment needed.
73	57659	7	2	29	4	20	This is all standard alarmist fare. Why don't you emphasize positive trends in yields, the great potential of genetic engineering, the potential of narrowing yield gaps? You neo-Malthusian we're all gonna starve story rings hollow. (Richard S.J. Tol, Vrije Universiteit Amsterdam)	We have merely assessed and evaluated the evidence and are not neo-Malthusians.
74	60661	7	2	31	2	38	The bolded statement appears to attribute effects on human causes of climate change while the underlying text appears to attribute to observed climate trends (not necessarily attributable to human causes). It is also unclear if climate change is meant to include changes in CO2. Noting lack of confidence in attribution of precipitation changes to human activities, suggest that this paragraph be clarified and any attribution assessment be clear and explicit. (Haroon Kheshgi, ExxonMobil Corporate Strategic Research)	Effects are caused by human and non-human induced climate change. Changes include CO2 responses. Detection and attribution is dealt with in chapter 18.
75	66155	7	2	31	2	38	In mid-latitude, there are both positive and negative impacts which depend on regional climate pattern and adaptation measures. (Dawei Zheng, China Agricultural University)	Agreed. Please see Figure 7.5.
76	66195	7	2	31	2	38	In mid-latitude, there are both positive and negative impacts which depend on regional climate pattern and adaptation measures. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	Agreed. Please see Figure 7.5.
77	72520	7	2	31	2	38	Because the role of climate change on food prices is poorly understood, it is difficult to say that "periods of rapid food price increases" demonstrate the "partial sensitivity of current markets to climate variability." The last statement of this paragraph does not clearly support the link between climate change and food production. Suggest revising appropriately. (UNITED STATES OF AMERICA)	We disagree and state the caveats clearly.
78	80965	7	2	31	2	38	The chapter has very limited evidence on the effects of climate change on food production. (Monalisa Chatterjee, IPCC WGII TSU)	Please see Figures 7.5, 7.6, 7.7.
79	62497	7	2	33	2	33	Even at high latitudes, some of the native species get affected. (INDIA)	Unspecific comment.
80	57658	7	2	33	2	34	That would be weather variability rather than climate variability. There are also studies that attribute price rises to climate policy, particularly the US biofuel mandate, rather than climate change. (Richard S.J. Tol, Vrije Universiteit Amsterdam)	We are clear that there are many factors affecting food prices including extreme weather.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
81	68899	7	2	33	2	34	The sentence "demonstrating partial sensitivity of current markets ..." is not well supported by the evidence presented in the actual chapter. Confidence estimate is also lacking. Moreover, the current phrasing of this sub-sentence suggests a logical connection between rapid food rise increases and an attribution to climate change, which is unwarranted. As a matter of fact economic (e.g. production and transaction costs, speculation, expectations) and social forces (population growth and structure, consume patterns etc.) are entangled and interplay in very dynamic conditions (see TS page 13 line 40). The sentence can be reformulated building upon the fact that climate change related factors are increasingly taken into account considered in food markets, but studies are required. Suggestion: "Since AR4, there have been several periods of rapid food price increases. These increases can partially be contributed to climate variability (low evidence, medium agreement) as factors related to climate change are increasingly considered in food markets even if extensive studies are required. (NETHERLANDS)	We are clear that there are many factors affecting food prices including extreme weather.
82	59054	7	2	33	2	36	the contents here seem not very well match the heading title of the bullet (Genxing Pan, Nanjing Agricultural University)	Unclear comment.
83	72521	7	2	34	0	0	The authors state that food prices have a "partial sensitivity of current markets to climate variability." and the authors continue to correlate short-term price changes to "climate change". In these cases the authors might receive more credibility if they correlate short-term price changes and weather variability. The authors' attempts to connect rapid food price increases with partial sensitivity to climate variability may overstep the science, and if not, they should provide a citation. (UNITED STATES OF AMERICA)	We are clear that there are many factors affecting food prices including extreme weather.
84	59053	7	2	34	2	34	Suggest to delete "demonstrating the partial sensitivity of current markets to climate change." (Genxing Pan, Nanjing Agricultural University)	We are clear that there are many factors affecting food prices including extreme weather.
85	70377	7	2	34	2	34	"partial sensitivity of current markets to climate variability" is hard to understand and potentially ambiguous; I think the authors intend "sensitivity of current markets to climate variability among other factors", but a skip-reader might well read "current markets are a bit sensitive to climate variability" (Andrew Moore, CSIRO)	We are clear that there are many factors affecting food prices including extreme weather.
86	84746	7	2	34	2	36	This statement is not fully explained in 7.2.2. Please explain the basis for the comparison of the role of climate change compared to other factors. (Michael Mastrandrea, IPCC WGII TSU)	We are clear that there are many factors affecting food prices including extreme weather.
87	59940	7	2	36	2	37	Query the statement that 'energy policy' is one of the 'main drivers' of changes in food security in the near term. The Chapter goes on to establish arguments for it being a driver, but does not establish it is a main economic driver over and above other important social and economic issues such as poverty, lagging agricultural development and inadequate market infrastructure. Recommend deleting 'energy policy' so the sentence reads: "Social and economic issues, such as changes in household income, will remain the main drivers of changes in food security in the near-term, regionally and locally". If a second example is needed recommend inserting "and rural development" after 'income'. (AUSTRALIA)	We are clear that there are many factors affecting food prices including extreme weather.
88	68900	7	2	36	2	37	The sentence starting with "social and economic" is inconsistent with other parts of the chapter. For instance, at page 6 line 49-50 at page 24 line 43-45 or at page 10 line 14 and following, it is stated something different. It is therefore impractical to say that "the social and economic remain the main drivers of change", rather, a sentence like "they are so far considered the better understood/more studied drivers of change" is more acceptable and reflect more fairly the content of Chapters 7. (NETHERLANDS)	We are clear that there are many factors affecting food prices including extreme weather.
89	79504	7	2	36	2	37	Which energy policies would effect food security? We presume this is referring to biofuels but please clarify. (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	We are clear that there are many factors affecting food prices including extreme weather.
90	63517	7	2	36	2	38	Civil wars and military conflicts should be added as main drivers of change in food security. (GERMANY)	This point is dealt with in Chapter 12.
91	72522	7	2	37	2	38	The authors point out that other policies will drive food security in short-term but do not identify the scale at which food security is being discussed. Here and elsewhere, to be both meaningful and understandable, the discussion of food security needs to be more specific to include locations and types of people affected. (UNITED STATES OF AMERICA)	This point is being dealt with in the final draft by the introduction of a box on regional food security.
92	82123	7	2	40	2	40	How relevant is it to mention global population here? (Katharine Mach, IPCC WGII TSU)	It establishes an important component of demand for food.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
93	60662	7	2	40	2	47	The seriousness of effects on yield is sensitive to the assumed improvement in yield (constant climate). Suggest that this paragraph state assumptions about baseline yield growth (and the uncertainty in this assumption) as well as effect of climate so that the magnitude of effects and uncertainties can put into context. (Haroon Kheshgi, ExxonMobil Corporate Strategic Research)	the impact of climate on yield is examined separately to the technology trend in the vast majority of studies.
94	61982	7	2	40	2	47	In line 43, after '…from the mid-21st century onwards.', it is suggested to add ', the combined global population increasing and climate change will pose a huge pressure on the poor in the vulnerable areas.'. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	We prefer to state the evidence for effects on the whole food system.
95	66156	7	2	40	2	47	In some countries arable area may decrease due to urbanization particularly in east and south Asia. (Dawei Zheng, China Agricultural University)	This statement needs to be backed up by literature.
96	66196	7	2	40	2	47	In some countries arable area may decrease due to urbanization particularly in east and south Asia. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	This statement needs to be backed up by literature.
97	72523	7	2	40	2	47	The header for this paragraph describes the "food system" but the paragraph content focuses on arable land. Decline in arable land would impact "food production" more directly than the "food system", unless there are other climate change impacts throughout the food system not described in the summary. Please clarify and/or elaborate. (UNITED STATES OF AMERICA)	Food production is more accurate. It is not certain that this bullet will remain in the final draft on account of space constraints.
98	77089	7	2	40	2	47	It is unclear what impacts this paragraph is focusing on; changes to yields or changes to arable area due to climate change, and how that translates into changes in the amount of land that is cropped. (Erin Coughlan, Red Cross / Red Crescent Climate Centre)	It is not certain that this bullet will remain in the final draft on account of space constraints.
99	84747	7	2	40	2	47	The logic of this paragraph is not completely clear. The first sentence mentions global population in 2050, but it is not clear what comparison the authors intend with the rest of the paragraph, which focuses on changes in cropping area globally and regionally and a general statement about adverse impacts in the second half of the century. Please clarify the points being made here, and ensure clear traceability to the underlying assessment. What elements of the food system will be affected and how? Is there evidence to support statements about how this intersects with population growth and demand for food? In addition, how do these statements intersect with the conclusions on page 3, lines 38-44? (Michael Mastrandrea, IPCC WGII TSU)	It is not certain that this bullet will remain in the final draft on account of space constraints.
100	68901	7	2	41	2	43	"Thereafter ... onwards." The current wording suggest an absolute and universal negative of climate change on the human food system after 2050. This is inconsistent with predictions that some sites will benefit from predicted climate projections, e.g. Page 27 lines 29-36. A proposed improvement can be the addiction of "However, at a local scale some sites may benefit from increases yields, particularly in temperate regions". (NETHERLANDS)	The new FD draft ES makes this point.
101	82124	7	2	41	2	43	It would be preferable to indicate more specifically what is meant by "seriously and negatively." Consistency of this statement with page 3, lines 38-54, as well as 7.4.1 should be ensured. (Katharine Mach, IPCC WGII TSU)	The new FD draft ES makes this point.
102	82125	7	2	44	2	44	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	OK.
103	80895	7	2	44	2	45	I suggest you re-word the sentence to: "Global arable area is projected to increase between 9% and 25% (medium evidence, medium agreement) over the period from 2007 to 2050…" (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	It is not certain that this bullet will remain in the final draft on account of space constraints.
104	68902	7	2	44	2	47	The first sentence of the period ("Global arable area") provides a positive message which is qualified in the immediately following sentence. In fact the mentioned agro-economic studies including global warming (which should be the most relevant for WGII) in line 45-47 weaken the initial positive message giving a more plausible and accurate message. The whole period should be reformulated, possibly just mentioning those studies that include global warming. (NETHERLANDS)	It is not certain that this bullet will remain in the final draft on account of space constraints.
105	82126	7	2	44	2	47	There are opportunities, it seems, to make these more clearly reflect the paragraph on page 28. Additionally, it would be helpful to further clarify how the 2 statements on these lines differ--would it be clearer to use a single sentence only? Finally, for the increase in the arable area described on line 44, it would be helpful to specify the various assumptions or scenarios underpinning the estimate. (Katharine Mach, IPCC WGII TSU)	This is not possible in the ES due to lack of space.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
106	84748	7	2	44	2	47	Please clarify that this means that the projected 9 to 25% increases in global arable area do not take into account climate change, and that the range is -9 to 20% for studies that do include climate change, per page 28. Please also clarify the reason for the change in agreement/evidence language between estimates. Finally, is the "likely" in line 44 intended as calibrated language? It appears not to be. (Michael Mastrandrea, IPCC WGII TSU)	It is not certain that this bullet will remain in the final draft on account of space constraints. If it remains it will be corrected to 20%.
107	63518	7	2	45	2	47	What are the reasons for the high uncertainty regarding the increase/decrease of cropping land from - 9 % to + 20 % by 2050? (GERMANY)	Please read the papers cited in 7.4.1.
108	72524	7	2	49	3	2	The timeframe for the high levels of warming scenario should be clarified. (UNITED STATES OF AMERICA)	This depends on the emission scenario. We have tried to make our projections in terms of impacts of absolute changes. Figure 7.7 in the FD does provide a decadal estimate of effects.
109	84749	7	2	49	3	2	The support for this paragraph is not completely clear in the chapter text. Please ensure clear traceability to the assessment of the underlying literature, and ensure that the text in the executive summary is clear and precise. For example, what does "very severe" mean in line 51? How would risks affect 90% of the population as noted also in line 51? What does "extrapolation from current models" mean in line 50, and is such extrapolation supported by the literature? (Michael Mastrandrea, IPCC WGII TSU)	As we have reported in the summary risk table this means that risks to food security are high at these levels of warming. Please see Figure 7.4 for extrpolations.
110	82127	7	2	50	2	50	Is this extrapolation robustly supported by the literature? (Katharine Mach, IPCC WGII TSU)	See Figure 7.4.
111	63519	7	2	51	0	0	Please be more specific than "very severe" and explain what this actually means. (GERMANY)	As we have reported in the summary risk table this means that risks to food security are high at these levels of warming. Please see Figure 7.4 for extrpolations.
112	82128	7	2	51	2	51	It would be preferable to indicate more specifically what is meant by "very severe." Additionally, for the risks affecting 90% of the population, is it possible to indicate to what extent people are affected, or to indicate more precisely the mechanism of the effect? (Katharine Mach, IPCC WGII TSU)	As we have reported in the summary risk table this means that risks to food security are high at these levels of warming. Please see Figure 7.4 for extrpolations.
113	79505	7	2	51	2	52	90% of population affected by risks how? This is very interesting, but needs a bit more context - at risk of food shortages? At risk of higher prices? Both or a mixture? (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	This is based on the demographic distribution of people where in 2050, 90% will live between about 50degN and 30degS. The meaning refers to food security in total.
114	59941	7	2	53	2	53	Suggest replacing 'additively compounded' with 'compounded' to make simpler and clearer. (AUSTRALIA)	Text altered in FD.
115	80896	7	2	53	3	1	Not completely obvious why increasing tropospheric ozone levels will contribute to "risk" to food production (Could we describe this briefly and parenthetically for those just reading the ES?) (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	O3 is a free radical that causes leaf senescence and this decreases crop yields.
116	79506	7	3	3	3	5	Impacted how? Positively or negatively? Could you include some numbers? (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	The second sentence of this paragraph explains that negative and positive impacts are expected. In the space available it is impossible to provide meaningful numbers.
117	82129	7	3	4	3	5	The timeframe for this finding should be specified. (Katharine Mach, IPCC WGII TSU)	There are multiple time frames included in this statement, as described in the relevant sections in the chapter.
118	84750	7	3	4	3	5	Is this statement an observation or a projection, or a mixture of both? Please clearly separate what can be said in each context. (Michael Mastrandrea, IPCC WGII TSU)	It is a summary of a high number of observations and projections - summarising the examples provided in the main body of the chapter.
119	63520	7	3	4	3	8	Please mention ocean acidification. What is the time frame of "long term"? (GERMANY)	Ocean acidification is one of several impacts of climate change. It is addressed in the chapter and in a cross-chapter box.
120	79507	7	3	4	3	8	Suggest this paragraph should come after the paras discussing impacts on crops - tells a better story. (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	Text altered in FD.
121	82130	7	3	4	3	8	This finding should be coordinated with the key findings of chapter 6 and 30 ensuring harmonized assessment. (Katharine Mach, IPCC WGII TSU)	Cross chapter box is being prepared for heat events for FD.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
122	58109	7	3	4	3	9	Please add"However, the understanding of the response of quatic food production system to climate change is still very poor" at the end of line 9 (Yanling Song, China Meteorological Administration)	These statements summarise the current level of understanding.
123	65712	7	3	4	3	9	might be worth trying to bring out the interaction of climate change with over fishing more. Climate change makes matters worse. (STEPHEN HAWKINS, UNIVERSITY OF SOUTHAMPTON)	This is addressed in the body of the chapter but cannot be done with the space available here.
124	82131	7	3	6	3	6	Here it is not clear what "these" refers to. (Katharine Mach, IPCC WGII TSU)	The subject of the previous sentence - climate trends.
125	64474	7	3	7	3	7	add: such as higher latitudes (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Correct but space did not permit elaboration here.
126	84751	7	3	7	3	7	Are there indications of which regions fall in each category? (Michael Mastrandrea, IPCC WGII TSU)	Yes. Detail is provided in the body of the chapter and in Chs 6 and 30 but could not be elaborated here.
127	68903	7	3	7	3	8	The reference to "benefits … 7.5.1.1.3" forgets to mention the adoption of adaptation strategies which are exactly mentioned in 7.5.1.1.3. The sentence should specify that benefits can occur should successful adaptation strategies are put in place. (NETHERLANDS)	Detail is provided in the body of the text but cannot be elaborated upon in the ES.
128	64475	7	3	8	3	8	Other marine chapters have mainly used summary terms for confidences. Authors should make sure their assignments of evidence and agreement match those. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	The statement of 'medium confidence' is consistent with those selected in Chs 6 and 30.
129	82132	7	3	10	3	11	The construction of this finding, to be fully understood, requires the reader to be familiar with the findings of the 4th assessment report. It would be preferable to make the finding fully stand-alone, alongside secondary reference to the 4th assessment report. (Katharine Mach, IPCC WGII TSU)	OK. In the FD ES.
130	79508	7	3	10	3	12	Very interesting but we would like to see some more information about how this has changed projections of impacts - is there something you can pull from the rest of the chapter? (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	Please read the papers cited in 7.3, 7.4.
131	77090	7	3	10	3	14	Not only the importance of temperature changes in the average, but also changes to temperature distributions and the likelihood of extreme hot temperatures. (Erin Coughlan, Red Cross / Red Crescent Climate Centre)	Agreed. Please see Figure 7.6..
132	84752	7	3	10	3	14	Clearer support in the chapter text is needed for this finding. Here and in the text please specify what new understanding has emerged since AR4 and how temperature changes are important for determining impacts on crop yields. (Michael Mastrandrea, IPCC WGII TSU)	Please see Figure 7.7 where the results of over 1000 studies are assimilated.
133	68904	7	3	13	3	13	"difference in precipitation" just includes one aspects neglecting more important and more general climate extremes as mentioned for instance in 7.3.2.2.2. This specification should be include for the sake of completeness. (NETHERLANDS)	Unclear comment.
134	63383	7	3	16	0	0	"nutrition and processing" appears imprecise andambiguous. I did not find robust evidence in the text for effects of high heat on food processing activities. High temperature is a common food processing technique so why should a few degrees of global warming have negative effects? (Peter Gregory, University of Reading)	Agreeing with the comment, we have assigned only medium confidence to this conclusiuon in the FD ES.
135	68905	7	3	16	3	16	"Extreme heat also a negative", verb is missing, the sentence should read "Extreme heat also has a negative" (or 'produces' as alternative to 'has')". (NETHERLANDS)	Thank you for noticing this.
136	80897	7	3	16	3	16	Typo: Extreme heat also [has?] a negative… (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	Thank you for noticing this.
137	59942	7	3	16	3	17	This statement is very generic (and appears to have a word missing) - is it applicable to livestock and cropping? What is meant by processing? (AUSTRALIA)	Thank you for noticing this. See Figure 7.1 and 7.3 for our description of the effects on non-production elements in the food system.
138	80966	7	3	16	3	17	The sentence needs rephrasing. (Monalisa Chatterjee, IPCC WGII TSU)	Unspecific comment.
139	61983	7	3	16	3	21	The context of the paragraph is not consistent with the first sentence with bold font, so it is suggested to change the whole context as ‘Extreme climatic events have negative effects on both food quality and food productivity. Extreme heat also has the negative effect on food quality in terms of nutrition and processing (robust evidence, high agreement). Extreme weather and climatic events, are important for all food and fodder production, but particularly for annual determinate crops in which yield is harvested as seeds.’ following the first bold font sentence. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	There seems minimal differnce between this suggestion and what is in the SOD. Text is revised in the FD.
140	82133	7	3	17	3	17	If here "extreme events" refers only to heat waves, it would be much preferable to use a more specific term. (Katharine Mach, IPCC WGII TSU)	Extreme events are more than heat waves.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
141	68906	7	3	20	3	21	"but ... seeds." In 7.3.2 no explicit comparison of determinate vs. indeterminate crops can be found, nor of seeds crops vs. other crops. This statement therefore probably represents an expert judgement that may very well be relevant, but it is currently insufficiently clear how it was reached. (NETHERLANDS)	Wheat, rice and maize are determinate seed crops and most of the crop results focus on these three.
142	82134	7	3	23	3	23	It would be preferable to frame this finding so that the core conclusion here can be fully understood without knowledge of the findings in the 4th assessment report, making the reference to the 4th assessment report secondary in its construction. (Katharine Mach, IPCC WGII TSU)	AR4 is referred to earlier in the ES and we are asked to note differences since AR4.
143	59055	7	3	23	3	24	In the heading " positive effect of CO2" better as "of CO2 as a single factor in experiment ". For the positive effect on grain produciton by CO2 is likely overweighted by warming, as evidenced in our field experiments with both factors. (Genxing Pan, Nanjing Agricultural University)	We now use 'stimulatory effects' in the FD ES.
144	82135	7	3	24	3	25	The calibrated uncertainty language here could be moved to the end of the sentence for clarity of reading. (Katharine Mach, IPCC WGII TSU)	This is done in the FD ES.
145	80967	7	3	24	3	26	It will be useful if you clarify if the interaction will be a benefit or a challenge. (Monalisa Chatterjee, IPCC WGII TSU)	There is not a single answer to this point.
146	82136	7	3	26	3	30	While important, these statements leave the reader wondering, "what ARE the key findings that this advanced approach and knowledge base has allowed?" (Katharine Mach, IPCC WGII TSU)	What is the evidence for this statement?
147	84753	7	3	26	3	30	Please clarify why the chapter takes more account of model and other uncertainties than has been the case previously (l. 27), and what conclusions this leads to. In addition, what more robust statements can be made (l. 28), and why is less confidence given to simulated increases in yield variability? (Michael Mastrandrea, IPCC WGII TSU)	This was a requirement from IPCC for our synthesis and evaluation and it has been done.
148	79509	7	3	27	3	29	Why is there less confidence in yield variability? I think you mean less confidence than in mean changes, but please clarify. (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	Fewer studies.
149	77412	7	3	32	3	36	Would it be appropriate to add a conclusion regarding insects ? (Blondlot Anne, Ouranos)	Unspecific comment.
150	68907	7	3	33	3	34	The confidence level here associated with the statement that climate change will increase the competitiveness of weeds seems at odd with remarks on page 17, lines 47-50 suggesting CO2 to increase typical crop competitivity compared to many weeds (generally C4-plants). Suggestion: lower evidence and agreement. (NETHERLANDS)	This is a judgement call. The important point is that there is not high confidence.
151	68908	7	3	34	3	36	The period starting with "The effects" should specify that assertions are made in spite of the scarcity of long term studies as specified at page 17 line 24. This is an important specification to be added. (NETHERLANDS)	This is why we have given this low confidence.
152	68909	7	3	36	3	36	Wrong referencing to the chapter. The actual part of the chapter on invasive weeds, pests and disease is 7.3.2.3. (NETHERLANDS)	Thanks. Corrected for the FD.
153	80898	7	3	36	3	36	I am curious if there is a more appropo word to describe what you mean by "disease intensity" (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	We considered 'severity' but wanted to contrast extent with intensity.
154	84754	7	3	36	3	36	I believe the line of sight for this finding should be 7.3.2.3. (Michael Mastrandrea, IPCC WGII TSU)	Thanks. Corrected for the FD.
155	66152	7	3	38	0	0	1) Clarify meaning of 'up to 2 deg C'. Does it many any small amount of warming reduces yield potential in this region, eg 0.2, .04 on the way up to 2. Unlikey. If so, suggest rephrasing as a effect under 'warming of about 2 deg C' 2) Is this an everage across the whole region? I presume so; and there will be areas where warming of more than 2 deg c which might produce incs in yield potential, eg Iceland. Suggest making it clear this is a generalisation across the region as a whole. 3) .And you do not mean' temperate' do you, but 'mid and mid-high latitude'. Or are you specifically excluding continental mid latitude. if former, use mid and mid-high lats; if latter, include additional ref to effects in non-temperate mid and mid-high latitudes latitudes. 4) this seems a revision of the conclusion in 4AR which states, p38 of SPM: "in mid to highlat regions moderate to medium increase of T (1 to 3 deg C can have small beneficial effects on crop yields." Worth clarifying if this is a change in conclusion. 5) The issue is complicate by whether or not one assumes adaptation (eg adopting culticars that make most of the longer growing season at higher lts under warmer conditions) . Can solve this, maybe, by separating out two statements: on a) altered yield potential without adaptation and b) likley changes in output after adaptation. (Martin Parry, Imperial College)	We will address these issues in the FD.
156	63521	7	3	38	3	44	Is this para referring to global values? (GERMANY)	No local values - see Figure 7.4.
157	72525	7	3	38	3	44	This section comes after the section on high levels of warming. Recommend that the authors discuss the effect of 2 degree increase and then the effect of 4 degree increase. (UNITED STATES OF AMERICA)	Agreed and implemented in the final draft ES.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
158	78922	7	3	38	3	44	In the Executive Summary, Page 3, Lines 38-44 (Message 9): it should read ”Without adaptation....in tropical regions (instead of temperate) - and next in the same paragraph, it is unclear whether there is an error or omission in following sentence: ”Reductions of more than 5% are more likely than not beyond 2050 and....” [if 5% true, then this is a major discrepancy with AR4 results! – thus, an omission] (Reimund Rötter, MTT Agrifood Research Finland)	This point has been clarified in the FD ES.
159	79510	7	3	38	3	44	In the bolded section, can we say what the overall affect on global food production will be? It will leave the policy maker wondering. Some of the text needs to be explained better - for example, is the 5% a global average? The final sentence here isn't clear at all I assume it means that if there's an overall reduction in yields, with some increase in temperate regions, then reductions in tropical regions must be large. This paragraph is also a little confusing as it mixes up temperature change and timing. (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	See new Figure 7.7 and the new FD ES.
160	82137	7	3	40	3	40	The phrase "there is confirmation" is ambiguous--as compared to what? (Katharine Mach, IPCC WGII TSU)	AR4.
161	84755	7	3	41	3	42	Where are the reductions of more than 5% projected to occur? This is currently unclear. (Michael Mastrandrea, IPCC WGII TSU)	See Figure 7.4.
162	66157	7	3	43	3	33	Biological stresses should plus diseases and pests, no tonly weeds. (Dawei Zheng, China Agricultural University)	See 7.3.2.3.
163	82138	7	3	43	3	43	"very likely" should be italicized if it is being used as a likelihood term or avoided if it is being used casually. (Katharine Mach, IPCC WGII TSU)	Agreed.
164	82139	7	3	44	3	44	This conclusion is important, but is it possible to make it more accessible to the reader? Adaptation will increase in the effectiveness by what metric, what are the net benefits, etc.? (Katharine Mach, IPCC WGII TSU)	See Table 7.2 in the FD.
165	59943	7	3	46	3	49	This sentence currently reads '...that adaptation will increase in effectiveness with increasing local mean temperature up to ca. 3C…'. Does this mean to suggest that adaptation becomes more effective as temperatures increase? Or should it read that adaptation will increase the effectiveness/productivity of food systems with increasing local mean temperatures up to ca. 3C? (AUSTRALIA)	The latter interpretation.
166	66158	7	3	46	3	49	Deleting content after “after”, effects of 3°C increase needs to be evaluated. (Dawei Zheng, China Agricultural University)	Unclear comment.
167	84756	7	3	46	3	49	What types of adaptation are considered in this context? It would be helpful to understand the scope of actions included. (Michael Mastrandrea, IPCC WGII TSU)	See Table 7.2 in the FD.
168	65865	7	3	46	3	54	It would be informative to mention here already what is included in 'adaptation'. For crop production, it can include change of cultivation timing (change of sowing date and cultivar change (higher/lower thermal requirement)) but also more systematic and drastic adaptations (introducing new crops) (e.g. Howden SM, Soussana J-F, Tubiello FN, Chhetri N, Dunlop M, Meinke H (2007) Adapting agriculture to climate change. Proc Natl Acad Sci U S A 104:19691-19696). (Eline Vanuytrecht, KU Leuven)	See Table 7.2 in the FD.
169	79511	7	3	47	3	47	Suggest changing this to 'the benefits of adaptation will increase… since it is the benefits, not the effectiveness that will increase. (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	This has been changed for the FD ES.
170	59944	7	3	50	3	53	This sentence is too long, making it difficult to understand. Consider re-phrasing. (AUSTRALIA)	Rephrased for FD ES.
171	82140	7	3	51	3	51	The directionality of the difference should be clarified--"overall crop yield greater in adaptation cases"? (Katharine Mach, IPCC WGII TSU)	We phrase this as 'adaptation' versus 'non-adaptation' cases
172	82141	7	3	53	3	53	The logic of the transition "thus" is not fully apparent to the reader. (Katharine Mach, IPCC WGII TSU)	OK. Removed in FD ES.
173	66159	7	4	2	4	8	Adaptation for livestock system is not clear, which should include adjustment of animal varieties, load capacity and grazing lands, improvement of feed ingredient and diseases control, and forage store. For indoor feeding, environment improving such as ventilation and air conditioner against heat stress is also important. (Dawei Zheng, China Agricultural University)	This is now addressed within the constraints of limited space.
174	66197	7	4	2	4	8	Adaptation for livestock system is not clear, which should include adjustment of animal varieties, load capacity and grazing lands, improvement of feed ingredient and diseases control, and forage store. For indoor feeding, environment improving such as ventilation and air conditioner against heat stress is also important. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	This is now addressed within the constraints of limited space.

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175	61121	7	4	9	4	20	importance of CO2 fertilisation effect on crop yield is missing from the summary. this is however very important to mention as with the benefit of CO2 fertilisation effect, yields of C3 crops would increase globally whereas it would decrease without it. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	See Figure 7-2.
176	63522	7	4	9	4	20	This list could be added to the SPM. (GERMANY)	Please provide this comment to the SPM.
177	79512	7	4	9	4	20	We like this set of summary bullets, but suggest a re-think as to whether these are really the 'key' messages that policymakers would be interested in. For example 'adaptation is predicted to be partially effective in ameliorating the negative effects of warming', is pretty self-evident. We would prefer to see some numbers - for example global average observed and projected impacts. (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	The bullets have been removed to save space as specified by the TSU.
178	84757	7	4	9	4	20	These points are generally covered by the previous paragraphs of the executive summary, and it is strange to repeat them again here in an even more compact form. I would recommend deletion. If retained, these statements must include calibrated uncertainty language as their counterparts on previous pages do, and ensure clear traceability and precision in each statement. For example, it is not clear what effects of climate change are meant in l. 11, or what "immense pressure" means in l. 18. (Michael Mastrandrea, IPCC WGII TSU)	The bullets have been removed to save space as specified by the TSU.
179	82142	7	4	11	4	20	Deletion of these statements is encouraged, with integration of any additional points into the preceding paragraphs. If these statements are retained, calibrated uncertainty language must be assigned to characterize the author team's degree of certainty in the statements. (Katharine Mach, IPCC WGII TSU)	The bullets have been removed to save space as specified by the TSU.
180	72526	7	4	12	4	14	This statement should be made clear in the summary paragraph on page 2. As currently stated, this is the first time this idea is clearly outlined in the document. (UNITED STATES OF AMERICA)	Please see 7.6.
181	62498	7	4	12	4	15	The statement needs to be qualified by adding ‘without adaptation’ (INDIA)	The bullets have been removed to save space as specified by the TSU.
182	63523	7	4	12	4	15	To be added "… in combination with changing diets…". (GERMANY)	The bullets have been removed to save space as specified by the TSU.
183	82143	7	4	12	4	15	Is this statement consistent with page 3, lines 38-54? (Katharine Mach, IPCC WGII TSU)	The bullets have been removed to save space as specified by the TSU.
184	65828	7	4	14	4	14	The description, "more than ca. 2-3 degree C", is "local mean temperature rise", isn't it ? If that is so, "local mean temperature" should be explicitly mentioned. Otherwise, readers may confuse it with global mean temperature rise. (Ayami HAYASHI, Research Institute of Innovative Technology for the Earth (RITE))	The bullets have been removed to save space as specified by the TSU.
185	62499	7	4	16	4	16	Some regions may increase yields with adaptation (INDIA)	The bullets have been removed to save space as specified by the TSU.
186	82144	7	4	16	4	18	Nuance in these statements should be ensured, in line with characterization elsewhere in the executive summary. Additionally, what is meant by "immense pressure" should be specified. (Katharine Mach, IPCC WGII TSU)	The bullets have been removed to save space as specified by the TSU.
187	61122	7	4	17	4	18	It would be good to split the effect of high scenarios on food availability, and food price. Is the availability of food itself threatened in the high scenarios, or is the food going to be very expensive, or both? the implication of these effects is very important. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	The bullets have been removed to save space as specified by the TSU.
188	68910	7	4	25	4	25	sentence not clear: 'noted over 200 as early as 1992 and more' (NETHERLANDS)	Corrected for the FD.
189	82145	7	4	28	4	30	The glossary could be cross-referenced for this definition. (Katharine Mach, IPCC WGII TSU)	This can be considered for the FD.
190	65482	7	4	30	4	30	Please insert "at" between words "food" and "centre" (Arif Goheer, Global Change Impact Studies Centre (GCISC))	Reworded for FD.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
191	64792	7	4	31	4	33	Suggest adding the following lines to clarifying the problems of overconsumption and obesity at the end of this paragraph: "For example, the number of overweight women exceeding the number of underweight women in most developing countries (Mendez M, Monteiro C,Popkin B. 2005. Overweight exceeds underweight among women in most developing countries. American Journal of Clinical Nutrition 81:714 –21). And a shift to increased meat production and consumption due to 1990's trade liberalization in Central America has been implicated in the region's rising epidemic of obesity and related diseases (Thow AM and Hawkes C. 2009. The implications of trade liberalization for diet and health: a case study from Central America. Globalization and Health 5(5). http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2729306/pdf/1744-8603-5-5.pdf. Accessed May 20, 2013). Popkin and Du (2003) have urged agricultural development policy to address the link between increase consumption of animal source foods and possible negative health effects (Popkin BM and Du S. 2003. Dynamics of the nutrition transition toward the animal foods sector in China and its implications: a worried perspective. The Journal of Nutrition 133(11 Suppl 2):3898S-3906S (abstract))." (Geoffrey Evans, Humane Society International)	Comments are only tangential to the climate impacts focus of the chapter
192	68911	7	4	37	4	38	By now, numerous peer-reviewed estimates have been made of the number of people affected by the 2007-2008 price hikes, so referencing to grey (and rather old) literature should be unnecessary. (NETHERLANDS)	New sources and more cases are included.
193	80899	7	4	37	4	42	Unclear if this 'price spike' was a global trend (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	International prices (Fig 7-3).
194	72527	7	4	41	0	0	FAO, 2012 not in references; FAO et al. 2012 is. (UNITED STATES OF AMERICA)	Both are in now.
195	68912	7	4	41	4	41	The word "hungry" can be substituted by "undernourished", which seems more appropriate. This word is also used at page 5 line 40. (NETHERLANDS)	We use both.
196	65483	7	4	42	4	42	Replace word "nutrient" with "nutrition" (Arif Goheer, Global Change Impact Studies Centre (GCISC))	Why? No reason given.
197	82146	7	4	47	0	0	Section 7.1.1. Line-of-sight references to corresponding chapter sections are required for each statement within this section. (Katharine Mach, IPCC WGII TSU)	Summary from AR4 included using the relevant ES points from AR5 WG" Chapter 5 including confidence statements.
198	59945	7	4	49	4	50	Poorly drafted sentence, consider revising. (AUSTRALIA)	However, even slight warming will decrease yields in low-latitude regions. Extreme climate and weather events will, with high confidence, reduce food production with or without changes in mean conditions. This sentence is clear.
199	80900	7	5	1	5	2	By 'adaptive capacity will be exceeded…' do you mean it will be difficult to execute adaptation measures? Unclear as worded. (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	Text altered to 'Adaption will be become less effective in low-latitude areas with temperature increases of more than 3°C.'
200	82147	7	5	2	5	4	The appropriateness of this statement here should be considered. Is it the most relevant finding on impacts for fish and fisheries, and how consistent is it with the assessment of chapter 6 and 30? (Katharine Mach, IPCC WGII TSU)	Removed.
201	80901	7	5	3	5	4	The mention of the 'meridional overturning circulation' is really specific and not obvious (as to why/what this is) (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	Removed.
202	82148	7	5	7	0	0	Section 7.1.2. Overall, the chapter team should ensure this section provides as effective a frame for the chapter as possible. Is it possible to introduce the food chain more clearly? In addition to figure 7-1, is it possible to provide a summary diagram for the major crops assessed in the chapter and how they fit into food systems more broadly? (Katharine Mach, IPCC WGII TSU)	We have produced a new Figure 1 that combines the original Figure 1 with a diagram that shows the flow in the chapter. Text needs to be modified in 7.1.2 to reflect the new figure.
203	79090	7	5	8	0	0	Add: There are 6 million children of hunger (VIETNAM)	Population includes all ages and the figure is generic.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
204	64793	7	5	18	5	24	This figure should include “animal welfare” as a socioeconomic factor. As listed in IAASTD, 2009 (section 7.3.2.4, pp. 471-72), animal welfare is important. 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; 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/). (Geoffrey Evans, Humane Society International)	The points raised are beyond the scope of this chapter which focuses on food security in the context of climate change. Comments on extreme temperatures and animals are in 7.2.1.3.
205	62500	7	5	20	5	24	Fig 7.1: Proximity and preference to food also are important drivers. (INDIA)	Included in Figure 7-1.
206	59946	7	5	26	5	26	If possible replace 'good agreement' with a standard certainty degree (low, medium or high) (AUSTRALIA)	We have improved the calibration language where possible.
207	82149	7	5	26	5	26	Where "good agreement" is used, it would be preferable to specify summary terms for evidence and agreement or delete the phrase. (Katharine Mach, IPCC WGII TSU)	We have improved the calibration language where possible.
208	61123	7	5	26	5	35	Through emphasising the importance of increasing food production, emphasis is also needed on infrastructure improvements as it is previously stated that there is currently enough food being grown but still hungry people. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	See Figure 7-1.
209	70378	7	5	29	5	35	I understand and approve of the shift in framing of this chapter from food production to food security, but in this paragraph I think that the authors have tied themselves in something of a knot. Yes, research to date has predominantly focussed on the production strand of food security; but this is an eminently defensible piece of collective priority-setting given that (i) change in food production is a major - and more likely than not *the* major - determinant of change in food security, and (ii) attacking the interactions and feedbacks from the upstream (production) end first makes strategic sense. In my view the authors would do better to shift the last sentence of this paragraph precede "Changes in food system activities...", and then re-frame the sentances at lines 28-33 along the lines of "nonetheless, the time has come for the initial, well-justified emphasis on production to be extended along the chains of causation & feedback in Figure 7-1". (Andrew Moore, CSIRO)	thanks - refer to new figure 1.
210	80902	7	5	30	5	30	(i.e., …); comma needed (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	Proof reading
211	82150	7	5	30	5	30	Is "needs consideration" the clearest wording here? Could it be improved? (Katharine Mach, IPCC WGII TSU)	Removed.
212	80903	7	5	32	5	32	(e.g., …) comma needed (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	Proof reading
213	72528	7	5	33	5	35	Suggest adding more references for this statement, given its importance. See, for example, page 5, line 46, concerning difference between FAO citation and Smith et al. 2006. (UNITED STATES OF AMERICA)	The summary has been removed.
214	82151	7	5	34	5	34	50% more food as compared to what baseline? (Katharine Mach, IPCC WGII TSU)	The summary has been removed.
215	82152	7	5	38	0	0	Section 7.1.3. For this subsection, more references should be provided, building from the key findings of other chapters. How has food security improved from its historical status? (Katharine Mach, IPCC WGII TSU)	See Box 7-1.
216	64794	7	5	40	5	41	Suggest adding two lines after sentence ending “sufficient food” that reads: “In fact, over 1.4 billion adults were overweight in 2008, and over 10% of the adult population was obese. And the double burden of obesity and undernutrition exists in many low and middle-income countries.” World Health Organization. 2013. Obesity and overweight. Media Centre Fact Sheet No. 311. http://www.who.int/mediacentre/factsheets/fs311/en/. (Geoffrey Evans, Humane Society International)	Not relevant for the topic of the chapter.
217	72529	7	5	41	0	0	Delete the phrase, "thus, the vast majority of people currently have sufficient food." This statement detracts from the point of the paragraph. (UNITED STATES OF AMERICA)	Deleted.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
218	76886	7	5	41	0	0	"thus, the vast majority…" -> this phrase may give a wrong message. As the same report (FAO et al., 2012) states the number of hungry people in the world remains unacceptably high. Suggest taking out the phrase. (Food and Agriculture Organization of the United Nations (FAO))	The majority of people currently have enough to eat.
219	58840	7	5	41	5	41	We suggest removing the phrase "thus, the vast majority of people currently have sufficient food". We consider that this may generate confusion about the state of food security, especially in the context of "hidden hunger" and seasonal hunger - which the FAO estimates do not consider. (Carlo Scaramella, World Food Programme)	The majority of people currently have enough to eat.
220	63524	7	5	41	5	41	"thus, the vast majority of people currently have sufficient food" - delete this, as it does not provide any relevant information; and with 870 million people being undernourished, I find this sentence rather cynic… (GERMANY)	The majority of people currently have enough to eat.
221	68913	7	5	41	5	41	"thus the vast majority …" is an unnecessary and rather obvious observation not relevant for the clarity of the text. (NETHERLANDS)	The majority of people currently have enough to eat.
222	82153	7	5	41	5	41	In place of "vast majority" the percentage could be specified: approximately 88%? (Katharine Mach, IPCC WGII TSU)	The majority of people currently have enough to eat.
223	82154	7	5	41	5	42	Again, what percentage is meant by "vast majority"? (Katharine Mach, IPCC WGII TSU)	OK
224	82155	7	5	46	5	46	In place of "the same period" it would be preferable to specify a timeframe. (Katharine Mach, IPCC WGII TSU)	See the Smith et al ref. We have to reduce the length.
225	82156	7	5	48	5	49	It would be preferable to place the summary terms for evidence and agreement within parentheses. (Katharine Mach, IPCC WGII TSU)	We do this where appropriate.
226	61124	7	5	48	5	50	this statement is not supported by any reference (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Revised for the FD and in Table 7-1.
227	77566	7	5	48	6	48	The food security bill of India deserves a special mention. (eac.gov.in/reports/rep_NFSB.pdf) (Malini Nair, Indian Institute of Science)	Too specific for a global report.
228	68914	7	5	49	5	50	"with ... life". The percentage of 60% is a misreading of Figure 2 in the original FAO (2012) report. That figure reports absolute numbers and percentages, however the 60% is obtained by using the line indicating absolute numbers in combination with the axes for percentage (right axis). The accurate number is about 28%, also see Table 1 in the same report. Change accordingly. (NETHERLANDS)	Removed.
229	63525	7	5	50	5	50	What is an "active life"? (GERMANY)	Removed.
230	82157	7	5	53	6	1	It would be preferable to place the summary terms for evidence and agreement within parentheses. (Katharine Mach, IPCC WGII TSU)	See 225
231	77825	7	6	1	0	0	I am very surprised that you don't mention Iron. This is the one that I see the most with vitamin A in Africa. I should say there are a few more up to date articles that may help. (Liette Vasseur, Brock University)	We mention micro-nutrients.
232	62501	7	6	1	6	2	Iron nutrition for female population deserves a mention as it is the most important factor affecting health of female population in several age groups. (INDIA)	See 232
233	59947	7	6	2	6	2	Incomplete sentence, insert 'people' after additional. (AUSTRALIA)	Thanks - proof reading.
234	58841	7	6	4	6	13	We suggest making a more explicit reference to rural poverty and food insecurity and highlighting that rural households are often highly vulnerable to climate due to the fact that they rely on climate-sensitive activities for their income and their food. Given that this section focuses on the current status of food security, we consider that at least a brief analysis of the situation in rural areas would be appropriate. Suggested text includes: "Rural households, especially in developing countries, are often highly vulnerable to climate due to their reliance on activities that are heavily dependent on climate, such as rainfed agriculture (robust evidence, high agreement; also Chapter 13). Evidence from several countries shows that the poorest households are vulnerable in two inter-related ways. First, the poorest rural households are often unable to produce sufficent food for their own consumption and therefore buy a large proportion of their food. In this context, the availability of labour and income may be limited as a result of seasonal and climate variability, reducing the ability of households to purchase food. Second, even when poor households produce a significant amount of their food, they often lack assets, resources and technology to manage climate-related risks. Therefore, climate variability can affect the amount of food that is produced." Suggested references: UK Met Office Hadley Centre and WFP (2012) Climate impacts on food security and nutrition: A review of exisitng knowledge". Exeter/Rome: Hadley Centre and WFP. (Carlo Scaramella, World Food Programme)	Refer to table 7-1

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
235	77826	7	6	5	0	0	Surprised $1 to $2 since it is now over a year that we use $1.25 as the minimum. (Liette Vasseur, Brock University)	No reference provided.
236	82158	7	6	5	6	13	Chapters 8, 9, 13 could be cross-referenced here, ensuring harmonized assessment. (Katharine Mach, IPCC WGII TSU)	See Box 7-1.
237	68915	7	6	6	6	8	These sentences would be more logical, if in the first sentence reference is made to the % of poor people in rural areas, instead of in urban areas, as the 2nd sentence gives an explanation based on nr of people in rural areas (NETHERLANDS)	We think the meaning is clear enough.
238	72530	7	6	15	6	16	There are other studies, such as Lee-Smith 2010, Environ and Urbanization 22: 483-499. (see page 495 --- http://eau.sagepub.com/content/22/2/483) that suggest in some urban areas in Africa people produce more than 'relatively small amounts'. (UNITED STATES OF AMERICA)	Removed.
239	58850	7	6	15	6	23	We recommend clarifying the discourse about potential benefits of price volatility to rural households. The complexity of effects of food price volatility on rural households is highlighted, it is necessary to stress that evidence highlights that weather shocks are the most important sources of variability in agricultural commodity prices. Weather shocks affects yields as well; therefore effects on rural households are more complex. Suggested references: Mirzabaev, A. and Tsegai, D. " Effects of weather shocks on agricultural commodity prices in Central Asia". ZEF-Discussion Papers on Development Policy No. 171. Center for Development Research. University of Bonn, Germany. November 2012, pp. 30. Gilbert, C. L., & Morgan, C. W. (2010). Food price volatility. Philosophical Transactions of the Royal Society B: Biological Sciences, 365(1554), 3023-3034. (Carlo Scaramella, World Food Programme)	Addressed in 7.3 . Rural poverty chapter/regional chapters too.
240	59948	7	6	15	6	23	There are a number of issues with this paragraph. 1. The paragraph is not referenced. 2. The average farm ize of rural poor is less than 3 hectares (e.g. fixed land, lack of technology and inputs) on the average and cannot take advantage of higher prices. 3. Lack of facilities (e.g. transport, storage) will not assist them to cash in on higher prices. 4. The intention of the rural poor in producing food stuff is to feed the family and there is no room for any significant commercial gains. 5. The farmers can only benefit from higher prices if they have cash crop (s) as part of their farming system and the prices increases and even then, in the short term, they cannot adjust. (AUSTRALIA)	This has been rewritten for the FD.
241	82159	7	6	15	6	23	Citations should be provided in full support of these statements. (Katharine Mach, IPCC WGII TSU)	This has been rewritten for the FD.
242	68916	7	6	17	6	17	The statement “which stands to benefit if prices rise” is not founded as benefits ultimately depends on the structure of the market and society. Many studies proves the poverty trap of rural areas in many parts of the world, just few examples DOI 10.1016/j.jpolmod.2008.09.004 (China); DOI 10.1111/j.1467-7660.2012.01779.x (Mozambique), and the lack of improvement of rural conditions even in the case of price increase. This sentence has to be revisited and re-written and backed with relevant references. (NETHERLANDS)	This has been rewritten for the FD.
243	77827	7	6	20	0	0	Conpletely disagree that leads to a new increase in well being since in most cases they buy things that are of lesser nutritional values. I am concerned here that no literature is cited. (Liette Vasseur, Brock University)	This has been rewritten for the FD.
244	79091	7	6	24	0	0	Add: There are some causes of poverty in the word: - Overexploitation of natural resources - Extreme weather: Storms, Floods, Sea level rise, Saltwater Intrucsion,… - Global agriculture is the lack of investment. (VIETNAM)	Not strictly relevant for the chapter.
245	68917	7	6	25	6	29	This part need to be backed by a reference, which is currently lacking. (NETHERLANDS)	This has been rewritten for the FD.
246	72531	7	6	25	6	36	This section should include a brief discussion of the fact local food prices in regions with food insecurity are likely to be POORLY CORRELATED to international food prices. Although the paragraph mentions 'the level of integration into global markets', the consequences of this lack of integration is not discussed. If a market is isolated, price levels and volatility at the international market may or may not reflect the conditions at the locality where food insecure reside. Poor infrastructure, extremely high transportation costs, poor market functioning and a poorly developed food marketing system in regions that grow their own food all come together to isolate some food insecure regions that are particularly vulnerable to changes in weather and climate. See Brown, M.E., Tondel, F., Essam, T., Thorne, J.A., Mann, B.F., Leonard, K., Stabler, B., & Eilerts, G. (2012). Country and regional staple food price indices for improved identification of food insecurity. Global Environmental Change, 22, 784-794 (UNITED STATES OF AMERICA)	Limited space. Look at the reference and shorten.
247	72532	7	6	29	6	31	Please discuss other drivers of volatility such as monocultures, lack of diversity, etc. This assertion is dependent upon how you think about volatility. (UNITED STATES OF AMERICA)	No references provided.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
248	61125	7	6	29	6	32	Another reason for price volatility that is not mentioned would be disease and pest outbreaks. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	No references provided.
249	80904	7	6	30	6	30	"…weather conditions, and greater reliance…"; comma needed (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	Proof reading
250	80905	7	6	30	6	30	intended sounds awkward to me (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	Deleted.
251	61126	7	6	33	6	33	A description of the 'adverse effects' in the markets would benefit this statement. Explain or just list a couple of the impacts to the local and global market. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	No references provided.
252	84758	7	6	39	0	0	Section 7.2: Please be very clear about attribution to climate change vs. anthropogenic climate change throughout this section. (Michael Mastrandrea, IPCC WGII TSU)	thank you, the draft was closely read for any possible confusions
253	61127	7	6	39	10	42	More emphasis on impacts to ecosystems, their services and human health required throughout section 7.2. Soil erosion, water quality, biodiversity loss. Also the societal demands causing monocropping (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	The points you have raised are beyond the scope of this chapter, which is focused on climate change impacts on agriculture
254	72533	7	6	43	0	0	It is important to note in what way the food systems are changing. The current statement is vague. (UNITED STATES OF AMERICA)	the text has been shortened and the sentence in question removed
255	82160	7	6	43	6	47	Is it possible to provide citations for these statements? (Katharine Mach, IPCC WGII TSU)	the text has been shortened and the sentence in question removed
256	57415	7	6	45	6	45	Only herbicides are mentioned, should this be pesticides (including insecticides and fungicides as well) (Asko Hannukkala, MTT Agrifood Research Finland)	the text has been shortened and only two factors are now mentioned (fertilizers and irrigation) as they are intended to be examples and not exhaustive
257	68918	7	6	53	7	1	There may not be many studies that simulate historical trends in food-related outcomes, but there are several that assessed historical trends, and also used these for future projections. These cannot be ignored in such a statement. For example, Ewert et al. (2005, AGEE 107:101-116) and Hermans et al. (2010, Ecological Modelling 221: 2177-2187) used statistics to estimate the impact of climate change compared to technological development and management changes for crop yields in Europe, and concluded that the impact of climate change was and will be relatively small. Although for a short time series, Reidsma et al. (2010, European Journal of Agronomy 32: 91-102) and related papers, used detailed farm level data to distinguish the impacts of climate change from socio-economic and management factors on crop yields and farm income in Europe. At a higher level, Mandryk et al. (2012, Landscape Ecology 27: 509-527) analysed the influence of climate change, technological development, policy and market developments on farm structure in a province in the Netherlands, and used the historical analysis to make projections towards 2050. Also here, the conclusion was that the influence of climate change was relatively small. (NETHERLANDS)	thank you. We have looked into all of these papers. The reviewer is correct they all include some use of historical statistics. But they do not attempt a formal detection or attribution of past impacts, which is the point of this section. They also do not provide quantitative estimates of impacts of past trends, which would have been used for figure 7.2 if available
258	63527	7	7	0	0	0	Fig 7-2: the box plot on the right hand shows no positive changes in yields, while the first paragraph of 7.2.1.1 and ES state with high confidence, that warming has had beneficial effects on some crops in some cold/temperate regions, and the left hand panel shows a number of studies with positive yield effects. Please clarify. Please also state what the colored bars, black line and whiskers refer to. (GERMANY)	the reviewer is incorrect. Both panels in 7-2 indicate some positive values. The boxplots on the RHS show the median, 25-75th percentile (box) and 10th/90th percentiles (whiskers) and the whiskers often span 0. this was likely unclear because this information was not in the caption, and so we have edited the caption to include the description of the boxplot. also we note that some of the positive values that show up in panel a and cited in text (e.g. sugarbeets) are not for the 4 main crops shown in panel b
259	65864	7	7	0	0	0	Figure 7-2 Does it make sense to include studies that do not consider CO2 concentration and its effect on crop growth and production? There is much evidence that this greatly affects crop production. How were these studies selected? (Eline Vanuytrecht, KU Leuven)	we believe it makes sense as long as it is very clear how the studies treat co2, especially since the majority of studies look only at climate

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
260	68919	7	7	7	7	13	Although models may show small differences between simulations with and without adaptation, comparing model simulations with observations does give large deviations. Crop models generally focus on adaptation measures that can be simulated; mainly changing cultivar and changing sowing date. In practice, there are much more adaptation measures. At the same time, crop simulation models simulate potential, water- and/or nutrient limited yields, not actual yields. Actual yields are often lower because of pests, diseases and weeds, and sub-optimal management. For example, for Europe, Reidsma et al. (2010, European Journal of Agronomy 32: 91-102) show that observed yields are differently influenced by climate variability compared to simulated yields, indicating a large influence of management and adaptation. Model comparisons for wheat (Palosuo et al. 2011, European Journal of Agronomy 35 103- 114) and barley (Rotter et al. 2012, Field Crops Research 133: 23-36) also showed that no model can give accurate predictions of actual yield levels. In addition, Angulo et al. (2013, Agricultural and Forest Meteorology 170: 32-46) show that when calibrating a crop model based on more parameters and processes, climate change impact projections are smaller. The reliability of crop model results should be more discussed in the chapter (also along with highlighted results); results still rely to much on crop models, which may not always give reliable projections. (NETHERLANDS)	the chapter does not rely exclusively on process models, and in fact figure 2 shows results separately for process and statistical models. Section 7.3.1 discusses some of the limits of crop models relative to other methods
261	66160	7	7	8	7	9	Do changes of sowing date and varieties belong adaptation measures? Farmers will do certainly although they do not understand climate change. (Dawei Zheng, China Agricultural University)	yes, these changes would be considered adaptations. We have added some examples to the text "...over time because of management changes, such as introduction of irrigation or changes in crop varieties"
262	66198	7	7	8	7	9	Do changes of sowing date and varieties belong adaptation measures? Farmers will do certainly although they do not understand climate change. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	yes, these changes would be considered adaptations. We have added some examples to the text "...over time because of management changes, such as introduction of irrigation or changes in crop varieties"
263	63526	7	7	16	8	47	it is not evident why confidence levels for estimated impacts, as given in the first paragraph of 7.2.1.1, and those for detection and attribution of observed changes, as given in Figure 7.3, are different, given that they are based on the same set of studies, and both relate to climate trends, not anthropogenic forcing. Please clarify. (GERMANY)	figure 7.3 has been removed so there is no longer any inconsistency
264	72534	7	7	18	0	0	The example of the Russian fires shows that temperate regions could suffer from lower yields through such extreme events and drying trends, instead of just trends towards higher yields as indicated in the figures. This sort of variation warrants brief mention. (UNITED STATES OF AMERICA)	comment not clear. There is no mention of russian fires here, and no statement or figure to suggest temperate areas always gain.
265	84759	7	7	18	7	18	Please specify the timeframe meant by the past few decades. (Michael Mastrandrea, IPCC WGII TSU)	text has been changed to 'half century' to specify we are talking about last 50 years
266	81393	7	7	18	7	25	Since this paragraph discusses the impacts of climate change on crop yields in both global and regional contexts, it may be more effective to provide a table rather than a figure so that the information can be summarized in regional contexts as well as in different crop types. Figure 7-2 does not provide any helpful data to support regional specific statements. (Yuka Estrada, IPCC WGII TSU)	given space constraints, we have opted to summarize data in small figure rather than a large table. The figure and references provided support all statements in this paragraph
267	82161	7	7	19	7	23	As much as possible, it would be preferable to move all uncertainty language within these sentences to the end of the sentences (or respective phrases), placed within parentheses, in order to maximize directness of wording. Additionally "medium confidence" on line 22 should be italicized. (Katharine Mach, IPCC WGII TSU)	thanks, we have tried to move as much out of sentence as appropriate
268	59056	7	7	20	7	20	Why negative effect not for rice? Here no confident reference. I do think negative also for rice production, at least observed in China.Pan et al., 2011.) (Genxing Pan, Nanjing Agricultural University)	the statement for rice says small effects, not negative
269	68920	7	7	21	7	21	"for negative ... these crops." It is unclear how the authors reach the conclusion that global aggregate production of wheat and maize will be negatively affected. The associated figure indeed shows that most studies find a negative effect of climate change on yields for these crops but also includes a number of studies that find positive effects. The authors seem to think that negative yields effects will outweigh positive ones on a global scale, but do not substantiate this implicit analysis. (NETHERLANDS)	we have clarified by adding the sentence "Since many of these regional studies are for major producers, and a global study (Lobell et al. 2011) estimated negative impacts on these crops, there is also medium confidence for negative impacts on global aggregate production of wheat and maize"

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
270	63438	7	7	23	7	15	Also Canada benefits from climate change (Mendelsohn and Reinsborough, 2007; Mendelsohn and Dinar, 2012) (Natalie Trapp, University of Hamburg and International Max Planck Research School on Earth System Modelling)	the reviewer is correct these studies show Canada can benefit from warming, but the studies do not attempt any analysis of historical trends in climate and their impact, which is the topic of this section
271	65866	7	7	23	7	23	I think it would be more informative to mention 'Northern and certain areas in Western Europe' instead of 'the UK' (e.g. Audsley E, Pearn KR, Simota C, Cojocaru G, Koutsidou E, Rounsevell MDA, Trnka M, Alexandrov V (2006) What can scenario modelling tell us about future European scale agricultural land use, and what not? Environ Sci Policy 9:148-162; Olesen JE, Carter TR, Diaz-Ambrona CH, Fronzek S, Heidmann T, Hickler T, Holt T, Minguez MI, Morales P, Palutikof JP, Quemada M, Ruiz-Ramos M, Rubaek GH, Sau F, Smith B, Sykes MT (2007) Uncertainties in projected impacts of climate change on European agriculture and terrestrial ecosystems based on scenarios from regional climate models. Clim Change 81:123-143). (Eline Vanuytrecht, KU Leuven)	this section is about past impacts, whereas the reviewer comments relate to studies that looked at projections
272	68921	7	7	24	7	24	The word "cold regions" should be substituted with "high-latitude regions" as more accurate and to better reflect the samples provided and what asserted in other parts of the chapter. (NETHERLANDS)	changed as suggested
273	80906	7	7	33	7	33	CO2 - subscript (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	corrected
274	62502	7	7	35	7	35	Other studies are available from India which may be considered. (INDIA)	reviewer did not provide any references. two studies for india are already included in figure caption
275	72535	7	7	40	7	40	Suggest inserting 'spatial' before scale for clarity (as on page 8, line 17). (UNITED STATES OF AMERICA)	changed as suggested
276	58842	7	7	40	7	47	We suggest highlighting examples of studies at the national level which have also shown the importance of climate trends on national crop production. We consider that illustrating country-level analyses of climate impacts on food production will add significant value to the chapter, and show what type of analysis can be done at more detailed scales. Suggested reference: National Planning Commission, Central Bureau of Statistics, World Food Programme, World Bank, AusAid, and UNICEF (2013) Nepal Thematic Report on Food Security and Nutrition 2013. Kathmandu: NPC. (Pages 76-80). Downloadable from: http://wfp.nepasoft.com.np/nefoodsec/publications/Nepal%20Thematic%20Report%20Food%20Security%20%20Nutrition%20Mar%2019_Final.pdf (Carlo Scaramella, World Food Programme)	unfortunately there are not enough samples at the national level to make meaningful national comparisons
277	82162	7	7	49	7	51	What is the baseline from which these changes are detected? Additionally, the different types of attribution--to climate trends versus anthropogenic emissions--should be fully clarified within the figure 7-3 caption. (Katharine Mach, IPCC WGII TSU)	figure 7.3 has been removed
278	77413	7	7	49	8	2	These are references that could be added to illustrate significant climate trends. The first one in Quebec where most stations considered in the study show a significant increase in the growing degree days above 5°C : Abderrahmane Yagouti , Gilles Boulet , Lucie Vincent , Luc Vescovi & Éva Mekis (2008): Observed changes in daily temperature and precipitation indices for southern Québec, 1960–2005, Atmosphere-Ocean, 46:2, 243-256. The second one regarding Canada. The results indicate a significant lengthening of the growing season due to a significantly earlier start and a significantly later end of the growing season. Significant positive trends are also observed for effective growing degree-days and crop heat units at most locations across the country : Qian, Budong, Xuebin Zhang, Kai Chen, Yang Feng, Ted O'Brien, 2010: Observed Long-Term Trends for Agroclimatic Conditions in Canada. J. Appl. Meteor. Climatol., 49, 604–618. doi: http://dx.doi.org/10.1175/2009JAMC2275.1 (Blondlot Anne, Ouranos)	figure 7.3 has been removed
279	63528	7	8	0	0	0	Fig 7-3: please specify "adaptation has not been considered". Does this imply zero adaptation has been assumed? (GERMANY)	figure 7.3 has been removed
280	62503	7	8	0	9	0	Section 7.2.1.2: Literature available in tropical regions (on marine and fresh water species) needs to be considered (Das et al., Vivekanandan et al., etc…) (INDIA)	KC - Thank you for the references. Vass et al. 2009 (Das as co-author) has been included for inland fisheries and aquaculture in India.
281	65867	7	8	4	0	0	Figure 7-3 It is not clear to me how this Figure was made. Which method was used to determine the degree of confidence? (Eline Vanuytrecht, KU Leuven)	figure 7.3 has been removed
282	65484	7	8	15	8	16	The line "In general…climate system" is noty self explainatory. It is not clear what is intended to be said, Whether work on the impact of climate change on food production is not ascertained yet or the attribution of anthropogenecity to climate system has yet to be determined. (Arif Goheer, Global Change Impact Studies Centre (GCISC))	it is the latter, as has been clarified in text

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
283	65868	7	8	15	8	16	Is it important here to attribute changes to the source of the impacts (either antropogenic or natural)? Isn't the actual impact on productivity most important in this Chapter? (Eline Vanuytrecht, KU Leuven)	yes the emphasis is on attribution to trends, but there is also some interest (as discussed in ch 18) on attributing to emissions
284	72536	7	8	15	8	31	Please address what is needed to support better climate attribution. What , if any of the trends noted in lines 21-31 can be quantified? (UNITED STATES OF AMERICA)	this is beyond the scope of the chapter, and covered in WG1 chapter in D&A
285	80908	7	8	15	32	8	This would be a good place to explain 'degree days' but this paragraph should come before Figure 3. (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	figure 7.3 has been removed
286	71299	7	8	19	8	22	The authors could also consider that climate change impacts, combined with possible increases in fossil fuel prices in the future, could lead to higher cost of production for farmers, offsetting the benefits of higher food prices. (CANADA)	thanks, but this appears beyond the scope of the section
287	68922	7	8	20	8	20	This is one example, where references are not used in the right way. Should be: 'Min et al. (2011) attribute' instead of '(Min et al., 2011) attribute'. Should be checked throughout the chapter. (NETHERLANDS)	corrected
288	80907	7	8	20	8	20	attribute[d]; past tense needed (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	corrected
289	82163	7	8	20	8	29	The timeframe for the changes/trends described on lines 20, 22, 24, and 29 should be specified. (Katharine Mach, IPCC WGII TSU)	changed as suggested
290	68923	7	8	24	8	24	The sentence "Positive trends" should instead start with "However" as it provides an important statement that contrasts with the previously mentioned evidence. (NETHERLANDS)	it doesn't contrast, since a reduction in frost (very cold nights) and an increase in very hot nights is consistent with warming
291	68924	7	8	24	8	24	The term "Positive trends" should be substituted with for instance "High frequencies" as the adverbial forms refers to occurrences. (NETHERLANDS)	changed to "Increased frequency of unusually hot nights …"
292	61128	7	8	34	8	40	referring to Long et al. Science's paper is inadequate as it has been demonstrated by Tubiello et al. (European Journal of Agronomy, vol. 26, 2007) conclusions of a lower than expected CO2 fertilisation effect were incorrect, being based in part on technical inconsistencies and lacking statistical significance. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	reference has been removed to save space and since it did not specifically support the point made in sentence
293	82164	7	8	35	8	35	It could be preferable to move "virtually certain" to " has virtually certainly enhanced." (Katharine Mach, IPCC WGII TSU)	changed as suggested
294	71300	7	8	36	0	0	It would be useful to provide examples of C3 crops for the general reader. (CANADA)	added wheat and rice as examples
295	77828	7	8	37	0	40	This sentecne about coral reefs is quite out of context. Move to next section? (Liette Vasseur, Brock University)	Sentence has been deleted
296	77414	7	8	37	8	32	"As described earlier" : I don't see where this was described before this page. (Blondlot Anne, Ouranos)	Sentence has been deleted
297	82165	7	8	37	8	39	Chapters 5, 6, 30 should be cross-referenced here, ensuring consistent assessment. Additionally, the wording of "are expected to have had" could be clarified. (Katharine Mach, IPCC WGII TSU)	This has already been done wherever considered necessary. When dealing with food security and production, those chapters also need to ensure consistency with Ch 7.
298	59949	7	8	37	8	40	Comment on coral reefs seems out of place in this section on impacts on cropping. Consider moving to another section or link more clearly to preceeding paragraphs. (AUSTRALIA)	Sentence has been deleted
299	72537	7	8	37	8	40	This statement about CO2 effects on coral reefs is valid, however, it is out of place in this section, which is otherwise dealing with crops. Sentence needs to be removed, and aded elsewhere, where a whole paragraph on CO2 effects in ocean systems is warranted. (UNITED STATES OF AMERICA)	Sentence has been deleted
300	80909	7	8	37	8	40	Be more explicit about how this relates to fishing/food security. {You don't do this until page 9, line 13). (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	Two new, introductory sentences have been added for this purpose.
301	72538	7	8	42	0	0	In this sentence it is difficult to understand how "Emissions of CO2 have been associated with ozone precursors...." Is the author trying to say that NOx and VOC emissions accompany CO2 emissions? The authors could further explain how CO2 emissions have been "associated" with O3 precursors. O3 is formed photochemically, so the authors should explain the attempted "association" more thoroughly. (UNITED STATES OF AMERICA)	yes this is the correct interpretation. We have reworded for clarity
302	82166	7	8	43	8	44	"very likely" could be moved to "has very likely suppressed." (Katharine Mach, IPCC WGII TSU)	changed as suggested
303	61129	7	8	46	8	47	How reliable is this data, stating it is the most severe over India and China? Details of the science and evidence to back this statement is needed. Was the research done on a global scale? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	we have added references to support this statement

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
304	82167	7	8	50	0	0	Section 7.2.1.2. The chapter team should ensure consistency of all statements within this section with the final key findings in chapters 6, 30, and 5. (Katharine Mach, IPCC WGII TSU)	This comment, repeated throughout the chapter, is not helpful unless specific inconsistencies have been identified, in which case they should be pointed out and will be addressed. Considerable effort was made in drafting these sections to ensure consistency and to provide cross-references wherever considered necessary (without becoming unwieldy). When dealing with food security and production, those chapters also need to ensure consistency with Ch 7.
305	65630	7	8	52	9	11	Range shift of fish are dealt in Chpater 6 (also Chapter 30 in regional context). Here, implications and impacts of range shifts to fisheries production need to be highlighted. In addition to range shfits, changes in potential fish production through bottom-up controls such as climate change and primary production may be introduced here. Ryther (1969) paper. (Sukgeun Jung, Jeju National University)	This paragraph has been modified to focus on fisheries production, cross-referring to Chapters 6 and 30 for more detail on underlying causes.
306	61130	7	8	54	9	8	Bring out the relevance for EU policy as species richness has been found to increase with rising water temperatures in the North Sea, thus impacting on fisheries and aquaculture. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	In a chapter of this length and covering such a broad topic it is impossible to provide detailed implications for each region.
307	82168	7	9	1	9	11	Specific relevant sections of chapter 6 and 30 should be cross-referenced here. (Katharine Mach, IPCC WGII TSU)	Cross references are provided for the second paragraph but will be added for the first too.
308	56948	7	9	2	9	2	A possible reference to incorporate in this section is "Hannesson, 2007" (after of "Brander, 2007"). This author shows that there is some indication of a positive correlation between the ocean temperature and the catches of mackerel in the North Sea and the Norwegian Sea, and between the ocean temperature and the catches of sardines in the North Sea. (M. Dolores Garza-Gil, University of Vigo)	Details on the underlying ecological and life-history changes should be covered in Chapters 6 and/or 30.
309	65713	7	9	2	9	2	Insert “Genner at al 2004” and “Simpson et al 2011” Genner, MJ., Sims, DW., Wearmouth, VJ., Southall, EJ., Southward, AJ., Henderson, PA., Hawkins, SJ 2004. Regional climatic warming drives long-term community changes of British marine fish PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES, 271: 655-661. Simpson, SD., Jennings, S., Johnson, MP., Blanchard, JL., Schon, PJ., Sims, DW., Genner, MJ. 2011. Continental Shelf-Wide Response of a Fish Assemblage to Rapid Warming of the Sea. CURRENT BIOLOGY, 21: 1565-1570. (STEPHEN HAWKINS, UNIVERSITY OF SOUTHAMPTON)	Details on the underlying ecological and life-history changes should be covered in Chapters 6 and/or 30. Genner et al. 2010 is referred to inb Ch 30.
310	63384	7	9	5	0	0	replace "inferring" with "implying" (Peter Gregory, University of Reading)	sentence containing 'inferring' has now been deleted.
311	70379	7	9	5	9	5	"implying", not "inferring" (Andrew Moore, CSIRO)	sentence containing 'inferring' has now been deleted.
312	65714	7	9	6	9	6	Recent work by Genner et al 2011 has separated the effects of fishing pressure and climate change on fish assemblages in the English Channel using data stretching back 100 years. Small fish track climate variability and change; in lower bodied fish, fishing pressure has truncated any climate signal. Body size-dependent responses of a marine fish assemblage to climate change and fishing over a century-long scale Genner, MJ., Sims, DW., Southward, AJ., Budd, GC., Masterson, P., Mchugh, M., Rendle, P., Southall, EJ., Wearmouth, VJ., Hawkins, SJ. 2010. Body size-dependent responses of a marine fish assemblage to climate change and fishing over a century-long scale. GLOBAL CHANGE BIOLOGY ,16: 517-527. (STEPHEN HAWKINS, UNIVERSITY OF SOUTHAMPTON)	KC - Details on the underlying ecological and life-history changes should be covered in Chapters 6 and/or 30. Genner et al. 2010 is referred to inb Ch 30.
313	58469	7	9	13	9	13	They provide 20-25% of fish caught in developping countries. Coral reefs have lost 40% of their coral cover by 2008 5Wilkinson C, 2008, Tab. p 11) Wilkinson CR (ed) (2008) Status of Coral Reefs of the World: 2008. Aust Inst Mar Sci, Townsville, Australia, 296 pp. Available at www.reefbase.org (Martin Pecheux, Institut des Foraminifères Symbiotiques)	KC - Burke et al. is an updated assessment of Wlikinson 2008, also cross-reference to Coral Reef cross-chapter box has been included.
314	68925	7	9	13	9	15	Reference is lacking. If the reference is Burke et al. 2011 as in the following sentence, it should be made clearing, interposing a colon or a semicolon between the two sentences. (NETHERLANDS)	KC - References have been included.
315	68926	7	9	13	9	16	"More ... impacts". Two statements on the number of coral reefs under threat are referenced by grey literature only, while there is a large body of work on threats to coral reefs in the primary literature. Adding reference from this body would strengthen the present statements. (NETHERLANDS)	KC - The subject is dealt with in depth in the Coral Reef cross-chapter box which is referenced here.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
316	61131	7	9	13	9	22	This paragraph focuses on global evidence, regionality is needed to provide more informative statements to be made. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	KC - It is impossible in this chapter to go into regional details on all the different types of fishery and ecosystem. Greater detail is given for marine fisheries in Chapters 6 and 30.
317	82169	7	9	14	9	19	It would be preferable to indicate more precisely what is meant by "immediate threat of damage," "under threat," and "additional threat." (Katharine Mach, IPCC WGII TSU)	KC - These are the terms used by the authors.
318	58471	7	9	18	9	18	(Munday et al., 2008; Box CC-CR; Chapter 5.4.2.4, 6.2.5.4, 30.6.1.1.2) (Martin Pecheux, Institut des Foraminifères Symbiotiques)	KC - Noted and added where appropriate.
319	58470	7	9	19	9	19	since 1979 (Martin Pecheux, Institut des Foraminifères Symbiotiques)	KC - This comment is not clear.
320	59950	7	9	19	9	19	The reference to Box 5-3 is incorrect, perhaps refer to Box CC-OA or section 5.4.2.4? (AUSTRALIA)	KC - The correct cross-reference to the cross-chapter box has been inserted.
321	64476	7	9	19	9	19	7.2.1.2. this is now Cross Chapter Box Coral Reefs (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	KC - The correct cross-reference to the cross-chapter box has been inserted.
322	68927	7	9	20	9	20	Should read 'Wilson et al. (2006)' (NETHERLANDS)	KC - Corrected.
323	63529	7	9	24	9	26	This paragraph is discussing forecasts, which is inappropriate in the context of observations. There is evidence of impact of warming on migration of Salmon (see e.g. Chapter 6.6.3). (GERMANY)	KC - The text has been moved, with modification, to Section 7.4.
324	80910	7	9	25	9	0	Author should not be parenthetical. (Rebecca R. Hernandez, Stanford University / Carnegie Institution for Science)	KC - The comment is not clear.
325	68928	7	9	25	9	25	Should read Xenopoulos et al. (2005) (NETHERLANDS)	KC - The text has been moved, with modification, to Section 7.4, where the change has been made.
326	82170	7	9	29	9	29	In place of "up to 75%" the range should be specified. (Katharine Mach, IPCC WGII TSU)	KC - Will check the original reference and amend as appropriate.
327	68929	7	9	29	9	30	"by 2070 ... water consumption". The article mentions up to 75% of fish biodiversity, but also reports a quartile range of 4-22% for its estimates. Mentioning the high outlier estimates without this information is misleading and would lead the reader to overestimate the effect on fish biodiversity. Please include the range of estimates. (NETHERLANDS)	KC - Will check the original reference and amend as appropriate.
328	72539	7	9	33	9	36	Some statements throughout this chapter are made with a bit too much confidence given the uncertainty in the data. This is one example. These should be rephrased to account for the disagreement/uncertainty. (UNITED STATES OF AMERICA)	KC - The line numbering of the SOD copy that I have does not match exactly that of the copy provided to reviewers. I assume this comment refers to the last sentence of the 3rd para on p9. If this is correct, the confidence statements match the statement by the reviewer.
329	72540	7	9	48	9	49	The sentence beginning "This dry period..." implies that the sole reason behind the decrease in the size of Lake Chad was the decline in precip. whereas others cite other reasons e.g. see http://www.unep.org/dewa/vitalwater/article116.html which states that "about 50% of the decrease in the Lake's size since the 60s is attributed to human water use, with the remainder attributed to shifting climate patterns." Other cites include: 1) Gao et al. 2011. On the causes of the shrinking of Lake Chad Environ Resource Letters 6 : July-Sept 2) GIWA 2004. Lake Chad Basin: GIWA Regional Assessment 43, UNEP (UNITED STATES OF AMERICA)	KC - Given the complexity of the Lake Chad example and the high uncertainty about fish catches, this example has been removed.
330	68930	7	9	49	9	51	"The decreasing.. Present". The fish catch figures in Chad reported in this part of text are wrong. The figures are presumably taken from Figure 17 in the Welcomme (2011) report. The text reports catch figures of over 100.000 tonnes in the late 1960 falling to under 70.000 tonnes in the early 1990s. However, Figure 17 clearly shows that the purple line, indicating Chad, rises from about 70.000 tones in 1969/1970 to about 85.000 tonnes in 1991/1992, effectively showing the opposite trend. The text of chapter 7 would be more consistent with the blue line, which is for Mali, but even then it would be misleading as Mali does report a recovery of fish catches back to 100.000 tonnes in 2006. Please change the wordings of the report to accurately reflect fish catches in Chad. (NETHERLANDS)	KC - Given the complexity of the Lake Chad example and the high uncertainty about fish catches, this example has been removed.
331	62504	7	10	0	10	0	Section 7.3.1.1: Some of recent references from South-Asia may be incorporated (INDIA)	reviewer did not provide any references. studies for india are already included in this section, especially as included in dataset used for figures

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
332	58844	7	10	0	12	0	We recommend making an explicit reference to country-level vulnerability analyses to assess the food security implications of climate change. Suggested references are included below. These references also expore the sensitivity of food production to weather and climate at national level, and can therefore also be relevant to Section 7.3.2 IRI and WFP (2011) Climate risk and food security in Mali. IRI/WFP: New York/Rome. WFP, ANACIM, and CCAFS (forthcoming) Climate risk and food security in Senegal: Analysis of climate impacts on food security and livelihoods. ANACIM/WFP: Dakar. WFP, DRMFSS, AAU, and CCAFS (forthcoming) Climate risk and food security in Ethiopia: Analysis of climate impacts on food security and livelihoods. DRMFSS/WFP: Addis Ababa. (Carlo Scaramella, World Food Programme)	we have added a box with more detail at the country and region level
333	65487	7	10	0	12	0	The inclusion of the Section on "Methods and Associated Uncertainities" is appreciable especially to make the reader understand that what sort of limitations and uncerainintes the mentioned results include. (Arif Goheer, Global Change Impact Studies Centre (GCISC))	thanks. No changes made
334	76884	7	10	0	27	0	Section 7.3 separates the discussion on food availability and other dimensions of food security. Most notably availability and accessibility should not be separately dealt with. By so doing the section totally fails to account for the fact that impacts of climate change on agriculture also impact the only source of income for small holders, totally impeding their access to food. The section 7.3 may be restructured to give a complete picture of food security by taking account of all dimensions. A sub-section could be added to bring food production and non-production food security elements together. (Food and Agriculture Organization of the United Nations (FAO))	the chapter makes clear that incomes are important for food access, and that incomes are dependent on agriculture
335	76909	7	10	1	0	0	Section 7.2.1.3: it is hard to believe that nothing can be discussed abouut livestock production. The authors should look at regional chapters which present relevant evidences along this line. At the very least the authors should discuss why few research exist on this subject. (Food and Agriculture Organization of the United Nations (FAO))	we have searched regional chapters for examples, and added some more text on ticks in europe. We have also added a sentence clarifying that this section pertains only to past impacts, on which little work has been done. it is not appropriate to speculate on reasons for this lack of work.
336	64323	7	10	1	0	7	No mention of recent work by Funk et al (2008) “Warming of the Indian Ocean threatens eastern and southern African food security but could be mitigated by agricultural development” ; Palm et al (2009)” Identifying potential synergies and trade-offs for meeting food security and climate change objectives in sub-Saharan Africa”. Other recent publications such as “Mwangi, M. 2007. Gender and drought hazards in the rangelands of the Great Horn of Africa: Is gender equity the only solution? Women & Environ. Int. 74, 21-24” are also significant contributions. In addition, there is no mention of pastoralism (livestock) in Africa, yet is a core production system toward food security and in food production in this continent, especially in the vast arid and semi-arid lands/regions. Recent publications include Krätli et al (2013): “Pastoralism: A critical asset for food security under global climate change” Gregory et al (2009): “Integrating pests and pathogens into the climate change/food security debate” ; Hendrix and Salehyan (2012) Climate change, rainfall, and social conflict in Africa; Recha et al (2013) “Empowering a local community to address climate risks and food insecurity in Lower Nyando, Kenya” (Margaret Mwangi, Pennsylvania State University)	none of these publications contain information on livestock relevant to this section
337	61132	7	10	1	10	7	More information required. This section is too biased towards cropping systems and needs greater consideration to livestock production. Any analysis of observed impacts on drought and grassland grazing. Is there any evidence of the impacts this has had on quality of milk from for example goats in Africa? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	we have searched regional chapters for examples, and added some more text on ticks in europe. We have also added a sentence clarifying that this section pertains only to past impacts, on which little work has been done. it is not appropriate to speculate on reasons for this lack of work.
338	68931	7	10	1	10	7	Section 7.2.1.3 is too limited compared to 7.2.1.1 and 7.2.1.2. There may be less literature on livestock production, but as also presented in later sections, more can be said about this. With one example on the blue-tongue virus, this section is unbalanced. (NETHERLANDS)	see previous response
339	77829	7	10	3	0	7	I am surprised that nothing would have been published on issues of droughts as one aspect of climate change? Even with limited evidence and low agreement? (Liette Vasseur, Brock University)	this section is about livestock impacts, not drought in general
340	59057	7	10	3	10	4	May add a simple description of "There have beeen some studies on extreme stormy rainfall and frozen weather 's damage to pig house and caused unexpected death of pigs in even large sized poultry breeding farm(Wang et al., Impact of climate change in livestock production of China. in Pan et al., editor-in-chief.Assessment Report of climate change impacts on agricultural production of China. China Agriculture Press, Beijing China. 2011.pp243-256. in Chinese . (Genxing Pan, Nanjing Agricultural University)	we appreciate suggestion but it is a non-peer reviewed paper in chinese, which we cannot include

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
341	72541	7	10	3	10	7	There is significant research that exists on the effects of climate change on animal production, yet this sites only one study. This subject is dealt with in more depth elsewhere within the chapter. This small section is confusing and it is recommended to either remove this section entirely, or broaden it immensely, to account for the full breadth of studies. (UNITED STATES OF AMERICA)	we have lengthened section as described above. Again, this section is only on past impacts, there are more studies on projected impacts which are now discussed more fully in 7.4
342	81391	7	10	10	10	42	Section 7.2.2: It is not clear why this section is titled “Food Security.” If this section is about Food Security, what happened to the discussion about the three main components of food security as framed in the Figure 7-1? (Yuka Estrada, IPCC WGII TSU)	it was titled food security because we attempted to find information on all non-production elements. As explained in first paragraph, most of what we found pertains to food prices. To clarify we have relabeled 'food security and food prices'
343	58843	7	10	12	10	42	We consider that this section is too brief and does not consider the range of climate impacts on food security beyond those on food prices. We suggest balancing this section by considering broader impacts on food production, access to markets, and utilisation of food. For a detailed overview, we recommend referring to the following publication: UK Met Office Hadley Centre and WFP (2012) Climate impacts on food security and nutrition: A review of exisitng knowledge". Exeter/Rome: Hadley Centre and WFP. (Carlo Scaramella, World Food Programme)	this section is intended only to cover documented impacts of past climate trends. Section 7.3 and 7.4 discuss more the known sensitivities and pathways and future impacts.
344	59951	7	10	12	10	42	The discussion of global food prices in Sub- section 7.2.2 should be expanded. Economic issues such as global food price spikes and medium to longer term price (and consumption) trends are likely to be very important determinants of global food security. (AUSTRALIA)	for space limitations, and the fact that these other factors do not directly relate to question of climate, we have chosen not to considerably lengthen this section. However we have reworded for clarity and the point is made in the first bullet of executive summary, which emphasizes its import
345	72542	7	10	12	10	42	This section is misleading it is entitled "Food Security" (access, availability, utilization, stability) and yet over 75% of the text is about prices (lines 17-31). Should be retitled. (UNITED STATES OF AMERICA)	it was titled food security because we attempted to find information on all non-production elements. As explained in first paragraph, most of what we found pertains to food prices. To clarify we have relabeled 'food security and food prices'
346	68932	7	10	17	10	18	The statement starting with "Although" needs to be backed by a reference from a robust source (e.g. world bank). (NETHERLANDS)	we have added a citation to FAO document
347	61133	7	10	17	10	31	City migration has resulted in labour shortages in rural areas, impacting farming and possibly food security. Is there any evidence of this? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	this comment is not directly relevant to climate, and no specific literature was suggested, so no changes made
348	72543	7	10	17	10	31	According to the FAO, price volatility has increased dramatically in recent years. There is emerging consensus that the global food system is becoming more vulnerable and susceptible to episodes of extreme price volatility. This should be noted. It is also important to note that low income countries suffer the most during episodes of price volatility. (UNITED STATES OF AMERICA)	there is not complete consensus that volatility has increased. It depends on how it is measured, as the 1970s were also very volatile. See for instance gilbert and morgan (2010)
349	72544	7	10	17	10	31	This section needs to specify the food stuffs that the prices are for. The figure 7-4 shows FAO food price index reflects the international price and the capital city prices of rice, corn, wheat and soybeans. For the food insecure in many regions, these commodities are not consumed by the food insecure. The most food insecure eat locally grown, coarse grains of low value.. These commodities are rarely traded internationally because of their low value per ton. Thus local weather affects local food prices, but these prices are not affected by the international markets. Using this argument - that the international price affects local food security - is not true in many isolated areas of the developing world, and perpetuates the idea that more corn grown in the US will reduce food insecurity. It may be worth highlighting a few regional (i.e., developed vs developing nation) differences in this respect. Brown, M.E., Hinterman, B., & Higgins, N. (2009). Markets, Climate Change, and Food Security in West Africa. Environmental Science and Technology, 43, 8016-8020 Brown, M.E., Tondel, F., Essam, T., Thorne, J.A., Mann, B.F., Leonard, K., Stabler, B., & Eilerts, G. (2012). Country and regional staple food price indices for improved identification of food insecurity. Global Environmental Change, 22, 784-794 (UNITED STATES OF AMERICA)	fair point, we have changed this sentence to "One important aspect of food security is the prices of internationally traded food commodities (Section 7.1.3). These prices reflect the overall balance of supply and demand, and the accessability of food for consumers integrated with regional to global markets. "
350	63530	7	10	19	10	21	The price effect of bioenergy namely biofuels on agricultural commodities should be specified. How evident is the use of agricultural production for energy purposes on global price levels? (GERMANY)	we have provided four references, but do not wish to specify the quantitative effect as it is not the focus of this chapter

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
351	81396	7	10	19	10	21	How much effect does the increased biofuel demand following the increase in oil price have on food price compared to the other factors such as increased cost (fertilizer, transportations, etc) of agriculture production in general? (Yuka Estrada, IPCC WGII TSU)	we do not attempt a quantification of each factor, even in relative terms, as the literature does not support a robust conclusion and it is tangential to the climate topic
352	78692	7	10	19	10	26	Here biofuels are seen as a primary driver for the increased demand. However the increased wealth and income leveles, that have been increasing rapidly in large developing economies in Asia, in particular e.g. since 200, can be instead be seen as primary basic factors that have made high food and commodity prices possible. Without an increasing number of medium and high income buyers of food very high prices of cereals, for example, sustaining several months at the very high levels as experienced in 2007, and again 2012, would not have been poissible. An important driver of the high prices abd large volatility of food and commodity prices is not only the increased meat consumption which no doubt increases cereals demand, but also the fact that consumers of higher income become sluggish in responding to highher or lower prices. This is possible since the share of food expenditure out of all total expenditure has decreased in many large developing economies during the last few decades. In other words, increased income level and implied decreased price elasticity of demand have been the ultimate drivers of increasing food prices and their increased volatility. Since such income development is likely to continue, even ifm at a reduced rate, that is going to lead to sustained very high food and commodity prices and their volatility also inj the future, partly exacerbated by biofuel demand and various random shocks such as adverse weather conditions, national policies in large economies (export bans/ levies), regional conflicts etc. See e.g. W. Martin et.al. European Review of Agricultural Economics, August 2008 (Heikki Lehtonen, MTT Agrifood Research Finland)	the cited papers support the view that biofuels are an important factor, and we explain that here since the focus is on recent price trends and spikes. We do not exclude other factors such as increased wealth, but the studies cited argue these cannot explain the rapid changes.
353	68933	7	10	19	10	31	The entire sentences are problematic. Demand and supply factors in the food system are not clearly defined and non-food factors (such as market speculation) are not even mentioned. This section should be re-written in order to state clearly what are the main element of the market structure (e.g. the role of stocks, the role of financial instruments) and all the relevant factors shaping/influencing the market. Assertions like the one at line 23-24 are not clearly understandable and not supported by any reference. Climate-related studies are not mentioned in opportune quantity, just one study Lobell et al. 2011 based as stated, on data up to 2003. (NETHERLANDS)	the offending statements have been removed and the section edited for clarity
354	63385	7	10	22	0	0	replace "he" with "the" (Peter Gregory, University of Reading)	sentence removed
355	65485	7	10	22	10	22	Typographic mistake. Replace "he" with "the" (Arif Goheer, Global Change Impact Studies Centre (GCISC))	sentence removed
356	82171	7	10	24	10	24	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	sentence removed
357	82172	7	10	26	10	30	What is the timeframe for these estimated effects? (Katharine Mach, IPCC WGII TSU)	sentence removed
358	80968	7	10	34	10	42	Authors may wish to explain cereal price index. (Monalisa Chatterjee, IPCC WGII TSU)	we have added some clarification to caption
359	72545	7	10	36	0	0	What is a 'big' weather effect? Suggest that the authors find a more robust term. (UNITED STATES OF AMERICA)	reworded
360	71301	7	10	39	0	40	The authors attribute increase in food prices to higher crude oil prices driven by increased biofuel demand. However, it may be more than increase demand for biofuel that links higher crude oil prices to increases in food cost, including increased cost for nitrogen fertilizer and other energy intensive agricultural inputs. (CANADA)	offending phrase was removed when caption was shortened
361	81397	7	10	39	10	42	“because of increased biofuel demand, food prices are also increasingly linked to the price of crude oil” gives the impression that the increased demand for biofuel is the solo factor in the increased food prices following the change in the price of crude oil. Also, please make it more clear and explicit why the publication of AR4 is used as a timestamp of the food price change. (Yuka Estrada, IPCC WGII TSU)	offending phrase was removed when caption was shortened
362	78926	7	10	45	16	52	In ths section 7.3 Assessing IVR, both in the method sections regarding treatment of impacts and adaptation, many referencnes on recent work are lacking -- in a supporting document (see, above) I have send a selection of those - especially for the parts on treatment and reporting of uncertainties and the process-based crop modelling, importnat recent work progress is not adequately and sufficiently cited. MORE IMPORTANTLY, I find hardly anything on economic modelling, neither for farm level nor for sector level; more generally, the work that has been done on economic modelling or combined bio-economic modellig of climate change impacts and adaption options is completely underpresented in this chapter (Reimund Rötter, MTT Agrifood Research Finland)	A useful comment. The Mandryk reference has been added.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
363	72546	7	10	47	12	46	Section 7.3.1.1 seems more focused on research methods than on findings. The latter should be emphasized. For example, please explain what we know about key processes and trade-offs (p. 11, section 7.3.1.1, line 49-50). (UNITED STATES OF AMERICA)	This is a methods section - descriptions of key processes and trade offs are in 7.3.2.
364	64810	7	10	49	0	0	Section 7.3.1.1. I found very interesting the information summarized here. However, I think the authors could make some mention on complexity economic models based on agent behabiour which are being increasingly used to analyse the impacts of climate change in land use and food security. For example: Bharwani, S., Bithell, M., Downing, T., New M., Washington R., Ziervogel G. (2005). "Multi-agent modelling of climate outlooks and food security on a community garden scheme in Limpopo, South Africa". Philosophical Transactions, R Soc Lond B Biol Sci. 2005 November 29; 360(1463): 2183–2194. (SONIA QUIROGA, UNIVERSIDAD DE ALCALA)	Unfortunatly, this paper falls before the review period for AR5.
365	82173	7	10	51	10	51	For the described "more robust statements," is the author team referring to key findings in this chapter or to conclusions of published papers? (Katharine Mach, IPCC WGII TSU)	Both. Clarifed in text.
366	65869	7	10	52	10	54	This is quite vague. Can this be illustrated by an example for more clarity? (Eline Vanuytrecht, KU Leuven)	More detail is given in the text that follows. Text amended to clarify.
367	61137	7	11	1	11	0	A bias towards cropping models exists, are there any models for fisheries to provide a better overview? Otherwise very good explanations of the methods used to assess impacts. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	A section on fisheries models and other methods has been included in this section.
368	62505	7	11	3	11	8	Results from FACE experiments in conducted in sub-tropical condition are available. (Chakarborty et al., 2012); OTC experiments (Vanaja et al.) are available (INDIA)	The references provided are incomplete
369	61134	7	11	3	11	18	it should also be emphasised that FACE experiments are carried out mostly in the USA and in China, thus limited to specific environmental conditions, which do not reflect tropical or sub-tropical conditions, where CO2 & soil nutrient interactions could lead to large differences in photosynthesis rate, water use and yield. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Thanks. Your suggestion has been incorporated.
370	80969	7	11	3	11	18	Other examples of work using RS and GIS should be included in this discussion. (Monalisa Chatterjee, IPCC WGII TSU)	Other works added (Goswami et al., 2012; Thenkabail, 2009).
371	82174	7	11	4	11	4	The phrase "greater interest" is ambiguous--has it been done or just considered? (Katharine Mach, IPCC WGII TSU)	Thanks. The phrase changed.
372	82175	7	11	6	11	18	How have FACE studies been used for agriculture--can this be described more fully and rigorously? (Katharine Mach, IPCC WGII TSU)	Your suggestion has been incorporated.
373	61135	7	11	8	11	11	again this is not exact - see comments above related to Long et al. Science's paper. This is also supported by B.A. Kimball, Lessons from FACE: CO2 Effects and Interactions with Water, Nitrogen and Temperature, in ICP Series on Climate Change Impacts, Adaptation, and Mitigation: Volume 1, Handbook Of Climate Change And Agroecosystems Impacts, Adaptation, and Mitigation, edited by: D. Hillel and C. Rosenzweig, (2010) (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	The suggested reference added.
374	72547	7	11	14	0	0	Last word in sentence is 'levels' -- suggest replacing with an appropriate technical term, such as 'availability' (UNITED STATES OF AMERICA)	The suggestion incorporated.
375	62506	7	11	14	11	14	Micro climate plays important role (INDIA)	The suggestion incorporated.
376	72548	7	11	20	11	30	Authors should comment on quality of modeling and data in developing countries. (UNITED STATES OF AMERICA)	Comments on data are made elsewhere. There is too much diversity to generalise about models in developing countries.
377	62507	7	11	24	11	24	……continued to date supported by 2009 ref. ; a latest (2013) reference may be more appropriate. (INDIA)	Some 2013 refernces added.
378	65486	7	11	28	11	28	"Humaira et al. 2009" may be corrected as "Sultana et. al 2009" (Arif Goheer, Global Change Impact Studies Centre (GCISC))	The reference corrected.
379	63386	7	11	32	0	0	delete second "since" (Peter Gregory, University of Reading)	thanks, done
380	61136	7	11	32	11	34	should also refer to Deryng et al. (global Biogeochemical Change, 2011) (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Two examples were chosen; not clear what this third example adds
381	65870	7	11	34	11	0	Additional reference: Olesen JE, Carter TR, Diaz-Ambrona CH, Fronzek S, Heidmann T, Hickler T, Holt T, Minguez MI, Morales P, Palutikof JP, Quemada M, Ruiz-Ramos M, Rubaek GH, Sau F, Smith B, Sykes MT (2007) Uncertainties in projected impacts of climate change on European agriculture and terrestrial ecosystems based on scenarios from regional climate models. Clim Change 81:123-143 (Eline Vanuytrecht, KU Leuven)	Two examples were chosen; not clear what this third example adds

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
382	68934	7	11	36	11	38	This comment relates not only to this sentence, but also more in general to the chapter. The judgement is transparent, but it does not give much information. Here it is mentioned that it is increasingly common to assess both biophysical and socio-economic drivers of crop productivity, and this is a novel development. Later, we do not see any results of such studies however. It is useful to mention new developments, but results of these type of studies should also be presented. It would be useful to include a figure in the chapter that shows the relative impact of climate change on crop production and other relevant indicators, compared to other drivers. (NETHERLANDS)	The results of such studies are difficult to generalise in the way that is required here. This is now stated in section 7312
383	65871	7	11	37	11	38	Additional reference: Audsley E, Pearn KR, Simota C, Cojocaru G, Koutsidou E, Rounsevell MDA, Trnka M, Alexandrov V (2006) What can scenario modelling tell us about future European scale agricultural land use, and what not? Environ Sci Policy 9:148-162 (Eline Vanuytrecht, KU Leuven)	examples were chosen; not clear what this third example adds
384	68935	7	11	38	11	41	References in an IPCC report should be as complete as possible. Missing are e.g. Rotter et al. (2012, Field Crops Research 133: 23-36) and Asseng et al. (2013, accepted, is in the refence list), Palosuo et al. (2011, European Journal of Agronomy 35 103- 114). Some of these are mentioned later (p. 12, line 39-45). It would be more logical to include similar references when presnting methods and when presenting results, so it is clear for the reader these refer to the same topic. (NETHERLANDS)	Given the amount of literature since AR4, we cannot provide a full review. Our task is to assess. Parity between methods and results papers is a good idea, but is impractical.
385	68936	7	11	48	11	50	This comment relates not only to this sentence, but also more in general to the chapter. The judgement is transparent, but it does not give much information. Here it is mentioned that descriptions of uncertainty that present key processes and trade-offs is useful, and this is a novel development. Later, we do not see any results of such studies however. It is useful to mention new developments, but results of these type of studies should also be presented. (NETHERLANDS)	Greater signposting between section 7.3.2 and 7.3.1 has been introduced.
386	72549	7	11	52	11	54	A statement as to the lack of spatial specificity of agricultural statistics should be mentioned here. Regional, state and county level statistics are lacking in nearly all food insecure nations. Also, information is highly variable - some nations are far better at keeping accurate yield statistic than others - for example, the Democratic Republic of Congo has very little information about yield, but other countries in the region such as Botswana and Malawi have better information. There is also a lack of information in the time domain - this is why many authors use biophysical proxies to estimate interannual variability of yield over the past thirty years. (UNITED STATES OF AMERICA)	Literature supporting these ideas is cited further down (e.g. Watson reference).
387	61141	7	12	1	12	0	There is a strong bias of examples of crop models predicting yields, are there any models predicting crop quality for example? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	The bias reflect available literature
388	72550	7	12	7	0	0	Clarify if this is a multi-decadal 'prediction' or projection. (UNITED STATES OF AMERICA)	Both are difficult, prediction is the perhaps the most important
389	60758	7	12	8	12	8	Comment: This sentence should read "… are not simulated by most statistical models with stationality assumption (a few studies using a recent statistical methods such as the particle filtering (Sakurai et al., 2010) allow to model the time change in climate-crop relationship due to technology)". Reference: Sakurai, G., T. Iizumi, and M. Yokozawa (2011), Varying temporal and spatial effects of climate on maize and soybean affect yield prediction. Climate Research, 49, 143-154. (Toshichika Iizumi, National Institute for Agro-Environmental Sciences)	Text removed for final draft for space reasons
390	64811	7	12	8	12	8	Technological progress and its interaction with climatic variability have been considerated in some studies with production functions of yield response to socio-economic and bio-phisical variables. For example: Quiroga, S., Fernández-Haddad, Z , Iglesias, A. (2011). "Crop yields response to water pressures in the Ebro basin in spain: risk and water policy implications". Hydrology Earth Systems Science, 15, p. 505-518. (SONIA QUIROGA, UNIVERSIDAD DE ALCALA)	Text removed for final draft for space reasons
391	68937	7	12	8	12	8	Technological progress is not simulated by statistical models, but generally also not by process-based models. In general, statistical models are better able to capture technological progress than crop simulation models (e.g. Ewert et al. 2005, AGEE 107:101-116). A trend factor can be included that cannot be included in crop simulation models. Even though crop simulation models can capture some of the technological development, they often use the same cultivars and management for the whole simulation period. As data are difficult to collect, this may result in the use of cultivar data of 30 years ago (e.g. Reidsma et al. 2009, Ag. Sys. 100: 51-60). (NETHERLANDS)	Text removed for final draft for space reasons

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
392	64812	7	12	10	12	10	Crop models can extrapolate based on historically-determined relationships, but they can also be useful for transfer knowledge. There are existing regions or seasons having the climate that other regions or seasons will experience in the future due to climate change. For example, for drought extreme events, the values in the current Mediterranean region could be very useful to understand the potential losses in other regions (Continental or Atlantic regions). (SONIA QUIROGA, UNIVERSIDAD DE ALCALA)	True. No space to elaborate on this in the chapter.
393	68938	7	12	12	12	14	Related to agro-climatic indices, more references can be given: Schaap et al. 2011, Regional Environmental Change 11: 731-741 ; Schaap et al. 2013, European Journal of Agronomy 48: 30-42), Peltonen-Sainio (2009, AGEE, 139: 483–489) (NETHERLANDS)	Unclear what these references add to the text.
394	72551	7	12	12	12	14	For clarity: suggest providing examples of 'farmer-relevant metrics' (UNITED STATES OF AMERICA)	Text amended, but no space to elaborate
395	61138	7	12	17	12	19	The use of local knowledge and stakeholder engagement for model improvement is not mentioned. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Unclear what references we would add in order to make this point in a generalised way (ie outside of a few specific examples)
396	68939	7	12	18	12	19	On one side it is said that experiments have uncertainty, than it is said that they are used to measure uncertainty. The period mixes up intrinsic uncertainty which is related to modelling and doing experiments, and another type of uncertainty related to the complexity of the scientific object of study. The period should be re-written in order to increase clarity. (NETHERLANDS)	The reviewer perhaps confuses "measurement uncertainty" - a noun - with the act of measuring uncertainty
397	68940	7	12	29	12	30	The sentence is rather simplistic (obvious advantages/disadvantages of models) and does not help deepening the understanding of uncertainty as following the previous paragraph. The sentence should be re-written or simply deleting it (deletion will leave the comprehension of the following text unchanged). (NETHERLANDS)	Done
398	61139	7	12	29	12	37	uncertainty caused by the use of multiple crop models is 3 times higher than uncertainty caused by the use of multiple climate change scenarios (Deryng et al., 2013. Disentangling uncertainties in future crop water productivity under climate change. Submitted) (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	This reference may well be included if it is accepted on time
399	72552	7	12	31	0	0	Iizumi et al 2011 is not in refs. (UNITED STATES OF AMERICA)	Corrected.
400	60759	7	12	31	12	31	Comment: "…a single model" should read "…a single model with perturbed phenological and biophysical parameters". In addition, Iizumi et al. (2011) does not appear in References. Reference: Iizumi, T., M. Yokozawa, and M. Nishimori (2011), Probabilistic evaluation of climate change impacts on paddy rice productivity in Japan. Climatic Change, 107, 391-415. (Toshichika Iizumi, National Institute for Agro-Environmental Sciences)	That level of detail is not required.
401	68941	7	12	31	12	31	The reference to Iizumi et. al. 2011 in not right as the article actually speaks about the application of a particular approach (the Bayesian approach, notably the Markov chain Monte Carlo technique). The affirmation in line 12 cannot be traced in the text of the article. (NETHERLANDS)	Reference was missing and has since been added
402	59952	7	12	31	12	34	This sentence is too long, making it difficult to understand. Suggest re-phrasing. (AUSTRALIA)	Done
403	77415	7	12	39	12	39	"The use of multiple crop models in impacts studies is relatively rare". The project CLIMATOR in France could be cited as an example for several crop models were used : Nadine Brisson, Frédéric Levrault, Éditeurs. 2010. Changement climatique, agriculture et forêt en France : simulations d'impacts sur les principales espèces. Le Livre Vert du projet CLIMATOR (2007-2010), ADEME. 336p. (Blondlot Anne, Ouranos)	Unclear what this reference adds to the existing examples.
404	61140	7	12	39	12	46	recent effort to compare crop models started with AgMIP (2012-current) (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	We are less concerned with what is recent, compared to what is salient
405	65872	7	12	39	12	46	Absolute number may be dependent on crop model structure or assumptions, yet, simulated trends are often similar among different models (Olesen JE, Carter TR, Diaz-Ambrona CH, Fronzek S, Heidmann T, Hickler T, Holt T, Minguez MI, Morales P, Palutikof JP, Quemada M, Ruiz-Ramos M, Rubaek GH, Sau F, Smith B, Sykes MT (2007) Uncertainties in projected impacts of climate change on European agriculture and terrestrial ecosystems based on scenarios from regional climate models. Clim Change 81:123-143). (Eline Vanuytrecht, KU Leuven)	Reference added

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
406	58845	7	13	0	24	0	Several studies have been conducted at national level to quantify the sensitivity of food production to weather and climate. We recommend including some of these: IRI and WFP (2011) Climate risk and food security in Mali. IRI/WFP: New York/Rome. WFP, ANACIM, and CCAFS (forthcoming) Climate risk and food security in Senegal: Analysis of climate impacts on food security and livelihoods. ANACIM/WFP: Dakar. WFP, DRMFSS, AAU, and CCAFS (forthcoming) Climate risk and food security in Ethiopia: Analysis of climate impacts on food security and livelihoods. DRMFSS/WFP: Addis Ababa. (Carlo Scaramella, World Food Programme)	As noted above, no space to assess these here.
407	72553	7	13	3	13	21	Section 7.3.2 focuses entirely on the impact of climate on production. The lens of food security and food systems is dropped for clarity. This preface paragraph should note that the economic and cultural aspects of food production will be additional drivers of how food systems will respond to climate change and the text should reflect this. (UNITED STATES OF AMERICA)	This is already noted in the previous section
408	59953	7	13	5	13	21	The dot points presented here are particularly vague and add little value to what our improved understanding since AR4 is. Suggest some additional context, such as identifying applicable regions, may be useful. (AUSTRALIA)	Text removed for final draft for space reasons
409	82176	7	13	7	13	12	Calibrated uncertainty language should be assigned for these statements to communicate the author team's degree of certainty in the conclusions. (Katharine Mach, IPCC WGII TSU)	Text removed
410	78923	7	13	7	13	15	Page 13, lines 7-15, section 7.3.2, there is a possible error in: ”Heat stress effects have been better quantified at regional and local scales ..” well, this is, at least doubtful, as most models are not capable to capture impacts of extreme weather events (heat, drought) sufficiently reliable (either relationships are oversimplified /or then results are the outcome of different underlying relationship when more careful analysis is performed; see e.g. Lobell et al 2013 or Boote et al 2013 – for references see supporting file sent to WGII support unit) (Reimund Rötter, MTT Agrifood Research Finland)	Text removed
411	59954	7	13	13	13	15	This sentence is difficult to understand, consider replacing ' AR4 confirmation that' with 'discussed in AR4 have been confirmed,' (AUSTRALIA)	Text removed
412	84760	7	13	15	13	15	Please specify what is meant by moderate warming here. (Michael Mastrandrea, IPCC WGII TSU)	Text removed
413	61142	7	13	26	13	26	The title suggests this section will describe 'means and extremes of temperature and precipitation' however there is no reference to extreme rainfall. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Brief explicit mention of droughts and floods now included.
414	68942	7	13	26	14	47	It is mentioned that statistical models and process-based models are used, but results are not separated. As they are based on different methods, they can inform eachother. Crop simulation models simulate potential, water-limited or nutrien-limited yields, while statistical model use actual observed yields. In Reidsma and Ewert (2008, Ecology and Society 13(1):38) for example, it is shown that effects of temperature and precipitation on crop yields largely differs when using a statistical model compared to when using a crop simulation model. (NETHERLANDS)	There are many reasons for differences between model results, and we are not aware of any evidence of a systematic difference between model types
415	66161	7	13	28	13	36	Supplemental examples of impacts of temperature change to crops: Favourable: (1)In temperate regions, as climate warming, the growing period or the frost free period will prolong, therefore, long term cultivars could be cultivated or the multi cropping index will increase, as a result, the total yield will increase. (2)Overwinter of winter wheat in the North China becomes safer, farmers could use cultivars with shorter vernalization stage and higher yield. (3)Also raising animals in Inner Mongolia will become safer from winter and early spring cold. (4)If the global warming is 2℃, because warming in winter is bigger than that in summer, shortening of the dormancy period of winter wheat in North China is more than the total growth duration, as a result, the effective growth period will prolong and the yield will increase (but the effective duration will shorten in the region without winter dormancy). In the areas with cold winter, as climate warming, the seeding date of spring wheat and rape will shift earlier than the maturity date if there is no water deficit stress, therefore, the total growth duration will prolong too. (5)As climate warming, both summer chill damage in Northeast China and overwinter freezing damage in North China has decreased. Unfavourable: (1)In some subtropical regions, reproductive process of some crops like litchi may meet obstacle of reproductive process due to lacking enough vernalization. (2)Store of vegetable and fruit will become more difficult. (3)Potato often degenerates when the daily average temperature is higher than 19℃. (Dawei Zheng, China Agricultural University)	No space to include this, unfortunately

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
416	66199	7	13	28	13	36	Supplemental examples of impacts of temperature change to crops: Favourable: (1)In temperate regions, as climate warming, the growing period or the frost free period will prolong, therefore, long term cultivars could be cultivated or the multi cropping index will increase, as a result, the total yield will increase. (2)Overwinter of winter wheat in the North China becomes safer, farmers could use cultivars with shorter vernalization stage and higher yield. (3)Also raising animals in Inner Mongolia will become safer from winter and early spring cold. (4)If the global warming is 2℃, because warming in winter is bigger than that in summer, shortening of the dormancy period of winter wheat in North China is more than the total growth duration, as a result, the effective growth period will prolong and the yield will increase (but the effective duration will shorten in the region without winter dormancy). In the areas with cold winter, as climate warming, the seeding date of spring wheat and rape will shift earlier than the maturity date if there is no water deficit stress, therefore, the total growth duration will prolong too. (5)As climate warming, both summer chill damage in Northeast China and overwinter freezing damage in North China has decreased.Unfavourable: (1)In some subtropical regions, reproductive process of some crops like litchi may meet obstacle of reproductive process due to lacking enough vernalization. (2)Store of vegetable and fruit will become more difficult. (3)Potato often degenerates when the daily average temperature is higher than 19℃. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	No space to include this, unfortunately
417	61143	7	13	28	14	4	maize, which is a very important crop, is missing from this section (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Maize is already included further down
418	59955	7	13	32	13	33	Unclear what this sentence refers to. Consider inserting 'crop' between 'for' and 'development' (AUSTRALIA)	done
419	63439	7	13	33	13	36	There is quite a number of studies on high temperatures (e.g. Schlenker and Roberts, 2008; Schlenker and Roberts, 2009; Abrol, Y.P., Bagga, A.K., Chakravorty, N.V.K. and Wattal, P.N. 1991. Impact of rise in temperature on productivity of wheat in India. In: Impact of Global Climatic Change on Photosynthesis and Plant Productivity. Y.P. Abrol et al. (eds.). Oxford & IBH Publishers, New Delhi. pp. 787-798.; Ahrens, M.J. and Ingram, D.L. 1988. Heat tolerance of citrus leaves. Hort Sci. 23: 747-748; Asana, R.D. and Williams, R.F. 1965. The effect of temperature stress on grain development in wheat. Aust. J. Agric. Res. 16: 1-13) (Natalie Trapp, University of Hamburg and International Max Planck Research School on Earth System Modelling)	agreed. No room to cite them all
420	65873	7	13	40	13	43	"rice yields have been found to be negatively correlated with temperature […] due to negative correlation between temperature and water stress". Thus, increased temperatures are correlated with decreased water stress and this would result in lower rice yields? Is this what is meant? (Eline Vanuytrecht, KU Leuven)	The subsequent sentence explains
421	72554	7	13	41	0	0	Zhang et al., 2010 not in refs. (UNITED STATES OF AMERICA)	Corrected.
422	77230	7	13	41	13	43	Positive correlations between temperutre and yield in many temperate regions often result from chiling stress under low temperaure even without any association with solar radiation. (Hasegawa Toshihiro, National Institute for Agro-Environmental Sciences)	agreed, but not in this particular study
423	61144	7	13	43	13	43	Could a simple explanation of spikelet sterility be provided for any non-expert readers. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	space, and flow of text, precludes this. It is easily looked up.
424	62508	7	13	43	13	43	Impacts also vary with management (irrigated/rainfed) and depends on the dominant limiting factor (rainfall –low or excess) or temperature as in case rice in India (Naresh Kumar et al., 2013; Naresh Kumar et al., 2011) (INDIA)	agreed

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
425	77231	7	13	43	13	46	When extreme high temperatures (>35 oC) occurred at the critical period, sterility does occur in farmers' fields (Hasegawa et at 2011) but the extent was lower than expected largely due to the gap between air temperature and canoy tempeture. The difference can be as large as 7 oC under dry hot conditions (Matsui et al 2007). On the ohter hand, humid and windless condtions, sterility can occurr even below 35oC in China (Tian et al 2010). Matsui, T., Kobayasi, K., Yoshimoto, M., and Hasegawa, T. 2007: Stability of rice pollination in the field under hot and dry conditions in the Riverina Region of New South Wales, Australia. Plant Production Science, 10, 57–63. https://www.jstage.jst.go.jp/article/pps/10/1/10_1_57/_pdf Tian, X., Matsui, T., Li, S., Yoshimoto, M., Kobayasi, K., and Hasegawa, T. 2010: Heat-induced floret sterility of hybrid rice (Oryza sativa L .) cultivars under humid and low wind conditions in the field of Jianghan Basin, China. Plant Production Science, 13, 243–251. https://www.jstage.jst.go.jp/article/pps/13/3/13_3_243/_pdf Hasegawa, T., Ishimaru, T., Kondo, M., Kuwagata, T., Yoshimoto, M., and Fukuoka, M. 2011: Spikelet sterility of rice observed in the record hot summer of 2007 and the factors associated with its variation. Journal of Agricultural Meteorology, 67, 225–232. https://www.jstage.jst.go.jp/article/agrmet/67/4/67_67.4.3/_pdf (Hasegawa Toshihiro, National Institute for Agro-Environmental Sciences)	there is insufficient literature on air/canopy temperature differences to include an informed assessment here
426	62509	7	13	48	13	48	Varietal/ crop change may become necessary (INDIA)	agreed
427	82177	7	13	52	13	53	Are these percentages average decrease? This could be clarified. (Katharine Mach, IPCC WGII TSU)	No action, the text shortened.
428	71302	7	13	54	0	0	Please explain the units used to report chickpea yields, or convert them to a more commonly used metric. (CANADA)	No action, the text shortened.
429	72555	7	13	54	0	0	Suggest replacing q per ha with SI unit (kg)...sentence will then read 300 kg per ha (UNITED STATES OF AMERICA)	No action, the text shortened.
430	70380	7	13	54	13	54	Convert q/ha to SI units (I expect that "q" is quintal, but 100 kg or 100 lb?) (Andrew Moore, CSIRO)	No action, the text shortened.
431	82178	7	14	3	14	3	Is it possible to specify the ranges simulated at each temperature? (Katharine Mach, IPCC WGII TSU)	No action, the text shortened.
432	70943	7	14	3	14	4	Evidance of Copper et la should state at what specific stage of development is the statement holding true. Otherwise misleading. In practice, it has not been shown satisfactorily that increased temperature over the years has reduced crop yields. in East Africa, there has been an increase in temperature for about 0.6^{o}C since year 2000 and so far no indication of reduced yeild as a result. (Didace Musoni , Rwanda Meteorological Agency)	No action, the text shortened.
433	63387	7	14	8	0	0	insert "of" after "response" (Peter Gregory, University of Reading)	sentence reworded
434	65488	7	14	8	14	9	Please insert "for" between "Response" and "crop yield" (Arif Goheer, Global Change Impact Studies Centre (GCISC))	done
435	65874	7	14	9	0	0	"…is insensitive to increases in rainfall, since wetter climates …" (Eline Vanuytrecht, KU Leuven)	done
436	62510	7	14	10	14	26	The trade-off between increase in rainfall offsetting the increase in temperature (at low rainfall zone with projected increase in rainfall) has been available for rice, sorghum and maize in India (Naresh Kumar et al., 2013; Srivastava et al., 2010; Byjesh et al., 2010) (INDIA)	unclear what this comment means
437	71303	7	14	11	0	15	The authors could be more explicit in their explanation of the example: Are they trying to say that spikelet damage measured in controlled experiments is offset by other yield enhancing factors at the field level? Or, are they saying that spikelet damage does not happen in the field? (CANADA)	Text deleted to save space
438	72556	7	14	17	14	18	This is an example of a place where some treatment of this material in a risk management framework would be valuable. (UNITED STATES OF AMERICA)	agreed, but no space here
439	68943	7	14	22	14	22	Also concluded in Reidsma et al. (2010, European Journal of Agronomy 32: 91-102) (NETHERLANDS)	unclear what third reference would add
440	59058	7	14	25	14	26	This statement is not supporting "the less imoortance of rainfall" ementioned above. Furthermore, a stronger impact by warming than drought could be only valid few countries. (Genxing Pan, Nanjing Agricultural University)	"less importance of rainfall" at larger spatial scales - here we refer to a time evolution
441	60760	7	14	26	14	26	Comment: Hawkins et al. (2012) that should be cited in this line is not “Hawkins, Osborne, Ho & Challinor (2013), Calibration and bias correction of climate projections for crop modelling: an idealised case study over Europe, Agricultural and Forest Meteorology, 170, 19, doi: 10.1016/j.agrformet.2012.04.007” but “Hawkins, Fricker, Challinor, Ferro, Ho and Osborne, 2013, Increasing influence of heat stress on French maize yields from the 1960s to the 2030s, Global Change Biology, 19, 937, doi: 10.1111/gcb.12069”. (Toshichika Iizumi, National Institute for Agro-Environmental Sciences)	Corrected.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
442	77232	7	14	28	14	38	Summarizing simulation results based on different assumptions and comparing them with those in AR4 does not indicate any "change" in the crop response, because the assumptions and sites are different and not comparable. The reason why adaptation in tropical maize makes predicted yields lower is counter-intutive but not explained. Why? I don't see from Figure 7-5 that rice yield starts to decrease above 1-2 oC above the local mean both in temperate and tropical regions. (Hasegawa Toshihiro, National Institute for Agro-Environmental Sciences)	The counter-intuative result is explained in the paper that is cited. The beginning of the decrease is perhaps a little above 2 degrees for rice, but in the interests of summarising, we retain the text as it is.
443	80970	7	14	28	14	40	Authors may wish to consider revising this paragraph. At present it is not clear if this just applies to wheat yields in temperate regions. Moreover this discussion is just based on two studies. (Monalisa Chatterjee, IPCC WGII TSU)	Looks clear as it is - temperate referred to explicitly. Moreover, one of the two studies summarises many studies. This has been clarified in the text.
444	61145	7	14	30	14	30	instead of referring to Frieler et al, 2013 the author should refer to Rosenzweig et al., 2013. Assessing agricultural risks of climate change in the 21st century in a global gridded crop model intercomparison, under review (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	We cannot refer to papers under review
445	61146	7	14	35	14	35	New analysis since AR4 suggest more yield decreases than increases at all temperatures. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Indeed.
446	68944	7	14	36	14	38	"Hence ... warming". It is unfortunate that the far reaching and important conclusions presented here, are based on two studies that according to the bibliography are still in peer review. Perhaps this issue will have been solved by the final publication of the report, if not it seems better to substantiate these important conclusions with research data that is publicly available. (NETHERLANDS)	Indeed.
447	68945	7	14	39	24	29	"which ... meta-analyses". There is no logical reason why yields couldn't be compared in a meta-analysis on the local scale. It could obviously be the case that there is not enough studies to do so, but the current phrasing suggests a methodological impossibility. (NETHERLANDS)	Text amended
448	61147	7	15	5	15	6	this statement should be emphasised and cited earlier - see comment No 4. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	The statement is at the beginning of the second paragraph already
449	77233	7	15	5	15	15	An important advance in the FACE studies since AR4 is that the CO2 reponses are genotype-specific. A recent study shows that yield enhancment due to elevated CO2 by 200 ppm ranged from 3 to 36 % among rice cultivars (Hasegawa et al 2013). While this is a source of uncertainty in yield prediction but shows the potential opportunities for adaptation (Throuout the chapter, descriptions on climate change x genotype interaction are very limited, but should be very important for adaptation).This citation is important to support the statement that appears in line 54 in page 39 of Chapter 7. Another importat lesson from the FACE study was CO2 enhancment was limited under both low temperutere (Shimono et al 2008) and under high temperature (Hasegawa et al 2013). These will also have strong implications for the crop production under variable temperauteres and high CO2 concentrations. Hasegawa, T., Sakai, H., Tokida, T., Nakamura, H., Zhu, C., Usui, Y., Yoshimoto, M., Fukuoka, M., Wakatsuki, H., Katayanagi, N., Matsunami, T., Kaneta, Y., Sato, T., Takakai, F., Sameshima, R., Okada, M., Mae, T., and Makino, A. 2013 :Rice cultivar responses to elevated CO2 at two free-air CO2 enrichment (FACE) sites in Japan. Functional Plant Biology, 40, 148–159 [online] http://www.publish.csiro.au/?act=view_file&file_id=FP12357.pdf . Shimono, H., Okada, M., Yamakawa, Y., Nakamura, H., Kobayashi, K., and Hasegawa, T. 2008: Rice yield enhancement by elevated CO2 is reduced in cool weather. Global Change Biol. 14, 276–284. http://doi.wiley.com/10.1111/j.1365-2486.2007.01498.x (Hasegawa Toshihiro, National Institute for Agro-Environmental Sciences)	Thanks, both references used.
450	82179	7	15	7	15	8	How should this statement be interpreted with respect to the 2nd bullet of 7.3.2? Further nuance in the bullet could help clarify the potential contrast. (Katharine Mach, IPCC WGII TSU)	Second bullet removed
451	82180	7	15	19	15	19	It could be helpful to specify the precursor directly. (Katharine Mach, IPCC WGII TSU)	The suggestion has been incorporated.
452	71304	7	15	33	0	0	The sentence should be more explicit: The global yield losses of soybean, wheat and maize 'caused by surface ozone' in 2000 ranged from 8-15% ... (CANADA)	The ranges of losses of soybean, wheat and maize incorporated.
453	82181	7	15	33	15	36	It could be helpful to clarify if these effects are due to ozone. (Katharine Mach, IPCC WGII TSU)	Yes, the losses are due to ozone.
454	68946	7	15	34	15	37	"The projected ... billion". In the paper cited (Avnery et al. 2011b), the range under scenario A2 is in fact 5.4-25.8%, and the range under scenario B1 4.3-12.1% on a global scale (Tables 3-4). The authors appeared to have chosen the highest estimates when multiple were available, but do not justify or explain this. Please double check these numbers and justify reporting particularly these. (NETHERLANDS)	No action, the text shortened.
455	61148	7	15	35	15	36	It is unclear as to which scenario will suffer from 9-17% yield reduction, B1 or B2? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	No action, the text shortened.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
456	72557	7	15	37	15	38	Feng et al. 2008 is about broilers hence incorrect reference here. Ref for wheat yields = Feng et al. 2011 (UNITED STATES OF AMERICA)	No action, the text shortened.
457	70381	7	15	43	15	45	The sentence beginning "Ozone may have..." discusses a generic effect of ozone and so belongs in the preceding paragraph (that at lines 17-26). (Andrew Moore, CSIRO)	The suggestion incorporated.
458	62511	7	16	0	16	0	Section 7.3.2.2: Information on other crops such as coconut (major perennial plantation crop in tropics and sub-tropics) –(Naresh Kumar and Aggarwal, 2013); Cotton (Hebber et al., 2013) may be included. (INDIA)	Space precludes this, unfortunately
459	71305	7	16	8	0	0	Section 7.3.2.2 is not very clearly written and would benefit from an editorial review to improve the grammar and sentence structure. (CANADA)	Done
460	71306	7	16	10	0	16	Do the negative signs associated with the values of winter chill indicate a decline of that amount per decade? It is not clear as written. In the last sentence of the paragraph, it is also not clear what is meant by "some 400 h could be assured along the century"? (CANADA)	Yes indicate a decline. Rephrased and moved to section 7.4
461	63388	7	16	15	0	0	"along the century" looks odd (Peter Gregory, University of Reading)	Rephrased and moved to section 7.4
462	72558	7	16	22	0	0	Lobell and Field 2011 = missing in references (Lobell and Field 2007 is there)... (UNITED STATES OF AMERICA)	Corrected.
463	71307	7	16	23	16	26	This sentence is difficult to read. Suggest rewording and adding punctuation to make the sentence flow and to clearly explain its contents. (CANADA)	Rephrased and moved to section 7.4
464	68947	7	16	29	16	30	After Australia there should be the parenthesis and the sentence "Jones …" in the same line (line 29). (NETHERLANDS)	Amended and moved to section 7.4
465	68948	7	16	30	16	30	it could be a benefit'; it is not clear to what 'it' refers to (NETHERLANDS)	Rephrased and moved to section 7.4
466	65489	7	16	30	16	31	the lines are not properly in connection with the above paragraph (Arif Goheer, Global Change Impact Studies Centre (GCISC))	Amended and moved to section 7.4
467	68950	7	16	41	16	41	"Cassava" it can be added "also known as manioc", as the term "manioc" is very frequent and in some cases better know as closer to the Latin scientific name. (NETHERLANDS)	Done
468	68949	7	16	41	16	43	This sentence is not logical. If cassave is indeed characterised by higher optimum temperatures and co2 levels, it does no necessarily follow that it could not be significantly affected by future climate. In fact, it could be positively affected in a significant way. Please rephrase this sentence, or present evidence supporting the claim that there is no substantial effect. (NETHERLANDS)	Rephrased to clarify
469	63389	7	16	42	0	0	replace "could" with "should" (Peter Gregory, University of Reading)	done
470	68951	7	16	46	16	52	On potato yields in Europe: Schaap et al. (2011, Regional Environmental Change 11: 731-741) and Schaap et al. (2013, European Journal of Agronomy 48: 30-42) showed that extreme events can have relatively large impacts on potato yields in the Netherlands, but that impacts can be largely reduced by adaptation measures. (NETHERLANDS)	Text removed for final draft for space reasons
471	62512	7	17	0	17	0	Section 7.3.2.3.1: The information on pests is available (Rao et al.,) (INDIA)	Insufficient information without the proper citation.
472	82182	7	17	5	17	6	Given that "current" is used but the citation is from 2006, it'd be helpful to specify the relevant time frame. (Katharine Mach, IPCC WGII TSU)	Text amended
473	72559	7	17	15	17	17	To better reflect references, suggest changing sentence to read "Changes in temperature can result in geographic shifts through changes in seasonal extremes, and thus, for example, overwintering and summer survival." (UNITED STATES OF AMERICA)	Done
474	61149	7	17	17	17	17	This statement needs to be strengthened. Clarity on why ozone and CO2 can either increase or decrease disease and whether it differs between regions or seasons. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Space precludes this, unfortunately
475	68952	7	17	22	17	22	such' does not refer to anything, omit (NETHERLANDS)	Text amended
476	82183	7	17	26	17	28	It could be even clearer to indicate the specific time frames for the described durations of "over 160 years" and "over almost 7 decades." For example, are these measurements that extend nearly to the present? (Katharine Mach, IPCC WGII TSU)	Yes - 'ongoing' added
477	57416	7	17	28	17	30	There is also a more recent contribution: Hannukkala 2012, History and consequenses of migrations, changes in epidemiology and population structure of potato late blight, Phytophtora infestans in Finland from 1845 to 2011. Doctoral dissertation, MTT Science 18, 136 p. available at http://jukuri.mtt.fi/bitstream/handle/10024/438308/mtttiede18.pdf. In these studies the impact of climate to increased use of fungicides is not so evident, but the change is more or les due to profound changes in cropping practices (potato monoculture) and pathogen behaviour (oospores, soil borne primary inoculum) (Asko Hannukkala, MTT Agrifood Research Finland)	No space to add this citation

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
478	68953	7	17	30	17	31	The entire sentence starting with "Up to" is unclear and need to be re-written, highlighting that there are similarities between adaptation to climate change and adaptation to new scenarios (explaining what scenarios). (NETHERLANDS)	Sentence deleted
479	72560	7	17	37	0	0	For clarity, suggest inserting 'geographic' before 'range' (UNITED STATES OF AMERICA)	Done
480	61150	7	17	37	17	45	Some specialised pest species may suffer from a habitat range decrease or from the interactions between changes in other 'non pest' insect species populations. It is important to point out that entire ecosystems are complex and may be disrupted. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Text amended
481	65490	7	17	40	17	40	Delete words "are will" (Arif Goheer, Global Change Impact Studies Centre (GCISC))	Done
482	68954	7	17	41	17	45	The generalization may be true, but new methods have been developed to better assess impacts of pests and diseases among other climate factors: Schaap et al. (2011, Regional Environmental Change 11: 731-741) and Schaap et al. (2013, European Journal of Agronomy 48: 30-42). Climate factors affecting crop production have been identified, the damage these climate factors cause, and the frequency in the current and future situation. (NETHERLANDS)	We have no space to discuss methods here
483	61151	7	17	47	17	53	It is important to consider the potential impact on weed demographics. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Agreed
484	62513	7	18	0	18	0	Section 7.3.2.4: Information on livestock, milk production in India are available (INDIA)	Where?
485	59956	7	18	9	18	10	Does this northward migration only refer to the Northern Hemisphere? Please clarify. (AUSTRALIA)	Text amended
486	72561	7	18	10	0	0	Ziska 2011 is not in refs (but Ziska 2011a is). (UNITED STATES OF AMERICA)	Corrected.
487	68955	7	18	10	18	11	The sentence starting with "The projected" is unclear, the concept "preferential selection" needs clarification of this concept to a public with less knowledge of ecology. Such a clarification will probably make the sentence more understandable. (NETHERLANDS)	Sentence deleted
488	72562	7	18	15	0	0	It is worth mentioning climate extremes and in particular droughts have played a role in price hikes, particularly the case of Russian wheat that is noted in the food price graph. Perhaps in the beginning of the report there can be a differentiation between climate trends and climate extremes. Drought can be both a product of climate trends (decreasing precipitation and warming temperatures) and extremes. (UNITED STATES OF AMERICA)	See Figure 7-3
489	71308	7	18	18	18	20	The "Canada thistle" appears to be introduced here with little additional context. Suggest elaborating/explaining further if possible. (CANADA)	Space precludes this, unfortunately
490	60346	7	18	26	18	28	The following reference is also relevant in this context: J. JUNK, M. EICKERMANN, K. GÖRGEN, M. BEYER and L. HOFFMANN (2012). Ensemble-based analysis of regional climate change effects on the cabbage stem weevil (Ceutorhynchus pallidactylus (Mrsh.)) in winter oilseed rape (Brassica napus L.). The Journal of Agricultural Science, 150, pp 191-202. doi:10.1017/S0021859611000529. (Andrew Ferrone, Public Research Centre - Gabriel Lippmann)	Unclear what this reference adds to the existing text
491	72563	7	18	28	18	29	To better reflect source, suggest changing sentence beginning "Increased generations..." to read: "Infestations of coffee nematode (Meloidogyne incognita) and leaf miner (Leucoptera coffeella) are predicted to increase with climate change primarily due to an increase in the number of generations (Ghini et al, 2008)." (UNITED STATES OF AMERICA)	Text amended
492	59957	7	18	30	18	32	The sentence on potato late blight should specify the locations and scenarios to make this sentence meaningful. (AUSTRALIA)	The point here is that there is no one direction of change. Space precludes us being spatially explicit
493	77416	7	18	32	18	32	I propose to add this sentence before ".Luck (2011)" : The pressure of European corn borer in sweet corn crops and of Colorado potato beetle in potato crops are predicted to increase in southern Quebec under climate change scenarios in connexion with an earlier arrival of the adults or increased numbers of generations per year (Gagnon et al., 2013). Refernce : Gagnon A.E. et al. 2013. Études de cas pour faciliter une gestion efficace des ennemis des cultures dans le contexte de l'augmentation des risques phytosanitaires liés aux changements climatiques. Rapport final pour Ouranos. http://www.ouranos.ca/media/publication/166_RapportRoyM2013.pdf (Blondlot Anne, Ouranos)	No room for this example, unfortunately
494	68956	7	18	34	18	35	The Deutsch 2008 paper does not consider the effect of climate change on insect damage to plants, and is thus inappropriate as a reference to this statement. (NETHERLANDS)	Reference removed

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
495	57417	7	18	35	18	38	It probably should be emphazized that increasing trade of propagation material will increase pest risks. There are many recent examples like rapid spread of new potato blackleg and soft rot bacteria, Dickeya spp. and many destructive Phytophthora (e.g. P. ramorum) species (e.g. Toth et al. 2011. Dickeya species: an emerging problem for potato production in Europe. Plant Pathology 60:385-399; Lilja et al. 2011. Introduced pathogens found on ornamentals, strawberry and trees in Finland over the past 20 years. Agricultural and Food Science 20:74-85) (Asko Hannukkala, MTT Agrifood Research Finland)	Ref cited
496	61152	7	18	39	18	40	Mycotoxins and pesticide residues in food are of great concern for food safety. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	agreed
497	72564	7	18	43	0	0	May be pertinent to describe differences between pastures in tropical and temperate climates, especially because the bulk of pasture expansion is found in the tropics. The loss of moisture from tropical deforestation can locally lead to drying trends as well as increase CO2 emissions. (UNITED STATES OF AMERICA)	There is enough text on differences already
498	64324	7	18	43	0	53	No mention of arid and semi-arid lands/regions of Africa; yet these land/regions contribute the highest proportion of socioeconomically productive and/or inhabited landmass in this continent (Margaret Mwangi, Pennsylvania State University)	There is no literature on this to cite
499	64795	7	18	43	20	34	The climate change impacts on livestock listed in this section should be summarized here as likely vast and varied impacts to animals' health and welfare (Nardone A, Ronchi B, Lacetera N, Ranieri MS, and Bernabucci U. 2010. Effects of climate changes on animal production and sustainability of livestock systems. Livestock Science 130:57-69). (Geoffrey Evans, Humane Society International)	"Vast and varied" is not very precise - we choose different language
500	68957	7	18	47	18	47	The sentence should start with "For example" as it refers to a specific case in the USA. (NETHERLANDS)	Sentence already ends with "usa"
501	68958	7	18	47	18	49	Referencing is needed for this relevant sentence. (NETHERLANDS)	reference added
502	70382	7	18	47	18	49	The sentence beginning "Projected increases..." discusses a regionally-specific impact that is out of place in a paragraph that otherwise covers generic, world-wide considerations. I would suggest that it is better placed in the paragraph that begined at page 19 line 8 (with some attention paid to reconciling it with the conclusions of Craine et al 2011). I presume that the assertion in this sentence is justified by Izaurralde et al 2001? (Andrew Moore, CSIRO)	Text moved to section 7.4 and rephrased
503	77417	7	18	49	18	49	I propose to add this sentence before "".In addition.." : Under predicted future climate, risks of winter injury to perennial forage crops in eastern Canada will likely increase because of less cold hardening during fall and reduced protective snow cover during the cold period, which will increase exposure of plants to killing frosts, soil heaving, and ice encasement (Belanger et al., 2002). Reference : Gilles Bélanger, Philippe Rochette, Yves Castonguay, Andrew Bootsma, Danielle Mongrain and Daniel A.J. Ryan (2002). Climate change and winter survival of perennial forage crops in eastern Canada, Agronomy Journal 94:1120–1130 . (Blondlot Anne, Ouranos)	This is old literature (pre-AR4)
504	62514	7	19	0	19	0	Section 7.3.2.4: Reference (Rajkumar et al., 2011) may be looked into (INDIA)	Insufficient information without the proper citation
505	68959	7	19	2	19	2	Reference can be made to: Kroes, J. G., & Supit, I. (2011). Impact analysis of drought, water excess and salinity on grass production in The Netherlands using historical and future climate data. Agriculture, Ecosystems & Environment, 144(1), 370-381. (NETHERLANDS)	Text removed for final draft for space reasons
506	82184	7	19	3	19	5	It would be helpful to specify the relevant scenarios of climate change for this expected outcome--across a range of feasible scenarios? (Katharine Mach, IPCC WGII TSU)	Text moved to section 7.4 and added "for the SRES A2"
507	77418	7	19	14	19	14	I propose to add these two sentences before ".Also in French..." : The forecasted increase in air temperature in eastern Canada over the next 100 years will result in lower yields and nutritive value of timothy (Bertrand et al., 2008). Reference : Bertrand, A., G. F. Tremblay, S. Pelletier, Y. Castonguay et G. Bélanger. 2008. Yield and nutritive value of timothy as affected by temperature, photoperiod and time of harvest. Grass Forage Sci. 63 :421-432. (Bertrand and al., 2007) found that it is possible to identify rhizobial strains to improve plant performance under predicted future CO2 concentrations with no negative effect on nutritive value of perennial alfalfa.. Refernec : Bertrand, A., D. Prévost, F.J. Bigras, R. Lalande, G.F. Tremblay, Y. Castonguay et G. Bélanger. 2007. Alfalfa response to elevated atmospheric CO2 varies with the symbiotic rhizobial strain. Plant and Soil 301: 173-187. (Blondlot Anne, Ouranos)	Text moved to section 7.4 and rephrased
508	61153	7	19	19	19	20	Water availability will also constrain temperature effects. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Text removed for final draft for space reasons

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509	70383	7	19	30	19	30	Moore and Ghahramani 2013: in the reference list for chapter 7, the conference paper by these authors is given, which is correct for the reference at line 5. Here, however, the paper by the same authors in Global Change Biology should probably be cited (doi:10.1111/gcb.12150) (Andrew Moore, CSIRO)	Text removed for final draft for space reasons
510	82185	7	19	33	19	33	Presumably the SRES scenarios are meant here? It could be helpful to specify this. (Katharine Mach, IPCC WGII TSU)	Text removed for final draft for space reasons
511	72565	7	19	41	19	50	This section would benefit from greater discussion of homogeneity/heterogeneity of livestock -- what the situation is today and what future situations could offer regarding resilience. (UNITED STATES OF AMERICA)	I don 't understand the comment
512	61154	7	19	48	19	54	Milk yields will be reduced and mortality increased due to heat stress in dairy cows. Breeding goals often focus on production traits which tend to reduce heat tolerance. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	No references have been provided.
513	68960	7	20	5	20	5	"Host and pathogen systems" it should be added "in livestock" to increase clarity. (NETHERLANDS)	added
514	63233	7	20	6	20	8	Make sure this sentence is in line with the remaining report. Could it be removed from this chapter? (Torleif Markussen Lunde, University of Bergen)	It is.
515	72566	7	20	10	20	12	Suggest deleting 'such as African horse sickness and bluetongue' from the sentence beginning "Vector-borne diseases..." as Cutler et al. 2010 mentions neither illness. Alternatively, find the appropriate reference. (UNITED STATES OF AMERICA)	Text moved to 7.4 and reference added: Lancelot R, de la Rocque S, Chevalier V (2008), "Bluetongue and Rift Valley fever in livestock: a climate change perspective with a special reference to Europe, the Middle East and Africa". PP 87-89 in P Rowlinson, M Steele, A Nefzoui (eds), Livestock and Global Climate Change. British Society of Animal Science, Penicuik.
516	59958	7	20	11	20	11	Does this northward migration only refer to the Northern Hemisphere? Please clarify (AUSTRALIA)	Text moved to section 7.4 and amended "… northwards in the northern hemisphere because …"
517	59959	7	20	13	20	13	Specify or provide examples for the 'new areas' refered to in this sentence. (AUSTRALIA)	Text moved to 7.4. The reference does not specify - simply refers to the fact that new areas may open up.
518	64796	7	20	18	20	19	A line should be added here to indicate that there will likely be vast impacts to the welfare of animals used in agriculture (Nardone A, Ronchi B, Lacetera N, Ranieri MS, and Bernabucci U. 2010. Effects of climate changes on animal production and sustainability of livestock systems. Livestock Science 130:57-69). (Geoffrey Evans, Humane Society International)	Text removed for final draft for space reasons
519	76910	7	20	21	0	0	Cross reference should be made to the fresh wtater chapter (Food and Agriculture Organization of the United Nations (FAO))	Added
520	72567	7	20	25	20	29	The source cited (Masike and Urich, 2008) does not contain the information in the two sentences "In Kgatleng District..." and "At the same time...". There is nothing in the source about 'an annual increase in cattle water demand of more than 20%..' or 'contribution of surface pan water to cattle water supply' etc...perhaps authors intended to cite Masike's PhD thesis as it appears to contain this information, but was unable to access it on line to see if it is the source of these two sentences. It seems a bit speculative to project annual increases of 20% in cattle water demand demand to 2050 and recommend removing unless references can be found. (UNITED STATES OF AMERICA)	Text moved to 7.4 and cite added: Masike S (2008). The impact of climate change on cattle water demand and supply in Khurutshe, Botswana. PhD thesis, International Global Change Institute, University of Waikato.
521	61155	7	20	31	20	34	Water must be effectively managed to sufficiently provide for global food demands. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Text removed for final draft for space reasons
522	64797	7	20	31	20	34	Two things should also be noted here. First, farm animal production has a large relative impact on our water footprint (Mekonnen MM and Hoekstra AY. 2012. A global assessment of the water footprint of farm animal products. Ecosystems 15:401-415). Second, any attempts at improving productivity should be evaluated for a range of sustainability impacts, including on animal welfare (De Boer IJM, Cederberg C, and Eady S et al. 2011. Greenhouse gas mitigation in animal production: towards an integrated life cycle sustainability assessment. Current Opinion in Environmental Sustainability 3:423-31). (Geoffrey Evans, Humane Society International)	Text removed for final draft for space reasons
523	68962	7	20	39	20	39	adapt to: Climate change will have some adverse impacts on food quality (NETHERLANDS)	The suggestion incorporated.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
524	65310	7	20	39	20	47	7.3.2.5. Food and Fodder Quality and Human Health I propose that following sentences are inserted after this section: Changes in the taste and textural attributes of fruit have been observed in apple (Sugiura, et al, 2013, submited). Reference Sugiura, T., H. Ogawa, N. Fukuda, and T. Moriguchi, 2013, In review: Changes in the taste and textural attributesof apples in response to climate change. Scientific Reports. Abstract of the reference: The effects of climate change on the taste and textural attributes of foods remain largely unknown, however, despite much public interest. On the basis of a 30–40-year records, we provide evidence that the taste and textural attributes of apples have changed as a result of recent warming. Decreases in acid concentration, fruit firmness and watercore development were observed regardless of the maturity index used for harvest date (e.g., calendar date, number of days after full bloom, peel colour and starch concentration), whereas in some cases, the soluble-solids concentration increased; all such changes may have resulted from earlier blooming and higher temperatures during the maturation period. These results suggest that the qualities of apples in the market are undergoing long-term changes. (Toshihiko Sugiura, National Agriculture and Food Research Organization, Institute of Fruit Tree Science)	No action, the text shortened.
525	68963	7	20	39	20	47	The studies of Schaap et al. (2011, Regional Environmental Change 11: 731-741) and Schaap et al. (2013, European Journal of Agronomy 48: 30-42) focus on crop production including both yield and quality, not only production. Examples include second growth of potatoes during heat waves. With second growth yield may still be high, but the higher number of small tubers cannot be sold on the market. (NETHERLANDS)	No action, the text shortened.
526	70384	7	20	39	20	47	This paragraph reads oddly to me; surely the term "food quality" should be defined before it is used? (Andrew Moore, CSIRO)	The paragraph reorganized.
527	68961	7	20	39	22	15	Section 7.3.2.5 is said to present effects of climate change on food quality and human health, but the focus is on CO2 impacts on food quality only. Most impacts are also negative. There may however also be positive impacts of changes in temperature and/or precipitation on food quality. For example, wheat in the Netherlands is currently mainly used for feed, but may be more used for food when temperatures increase. Grape quality in colder regions may also increase. We don't have references for this, but including such information would make the section more balanced. (NETHERLANDS)	No references have been provided.
528	68964	7	20	41	20	41	"plant" instead of "grain", is much more ad-hoc word. (NETHERLANDS)	Thanks.
529	68965	7	20	49	21	2	In this paragraph it is not clear how experiments measuring changes in N concentrations were set up. Was N supply kept the same is in the current situation, or was N supply adapted based on changes in (expected) crop yield? When yields increase with increasing CO2 concentrations, N uptake also increases, so more N is required. If this is not applied, it is logical that N concentration reduces. (NETHERLANDS)	No action, the text shortened.
530	72568	7	21	2	0	0	Erda et al 2010 is not in refs ...Erda et al 2005 is. (UNITED STATES OF AMERICA)	Deleted
531	77234	7	21	2	21	2	I don't see Erda et al 2010 in the reference list. For rice, three FACE studies showed reduction in grain protein content due to elevated [CO2] (Liefferint et al 2004; Yang et al 2007; Zhang et al 2013). Lieffering, M., Kim, H.-Y., Kobayashi, K., and Okada, M. 2004: The impact of elevated CO2 on the elemental concentrations of field-grown rice grains. Field Crops Research 88, 279–286. http://linkinghub.elsevier.com/retrieve/pii/S0378429004000164 Yang, L., Wang, Y., Dong, G., Gu, H., Huang, J., Zhu, J., Yang, H., Liu, G., and Han, Y. 2007: The impact of free-air CO2 enrichment (FACE) and nitrogen supply on grain quality of rice. Field Crops Research 102, 128–140. http://www.sciencedirect.com/science/article/pii/S0378429007000354. Zhang, G., Sakai, H., Tokida, T., Usui, Y., Nakamura, H., Yoshimoto, M., Fukuoka, M., Kobayashi, K., and Hasegawa, T. 2013: The effects of free-air CO2 enrichment (FACE) on carbon and nitrogen accumulation in grains of rice (Oryza sativa L.). J. Exp. Bot. in press. doi:10.1093/jxb/ert154. (Hasegawa Toshihiro, National Institute for Agro-Environmental Sciences)	No action, the text shortened.
532	72569	7	21	5	21	6	The two sentences beginning "Although there are numerous.." lacks a citation and needs to be clarified. (UNITED STATES OF AMERICA)	The sentence reorganized.
533	82186	7	21	12	21	12	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	The suggestion incorporated.
534	68966	7	21	17	21	20	Referencing is needed for this relevant sentence. (NETHERLANDS)	No action, the text shortened.
535	70385	7	21	20	21	24	The citated papers both cover food crops. I note that in a P-limited grassland Niklaus and Korner (2004; doi:10.1890/03-4047) found dilution only for both N and P under high CO2, i.e. total plant N & P did not change (Andrew Moore, CSIRO)	No action, the text shortened.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
536	59960	7	21	23	21	24	This sentence is incomplete, please revise. (AUSTRALIA)	No action, the text shortened.
537	68967	7	21	23	21	24	sentence is not finished (NETHERLANDS)	No action, the text shortened.
538	82187	7	21	31	21	31	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	The suggestion incorporated.
539	68968	7	21	38	21	39	Referencing is needed for this relevant sentence. (NETHERLANDS)	No action, the text shortened.
540	77235	7	21	44	21	46	High night temperautre also decreases grain setting (increases sterility) (Cheng et al 2009, Mohammaed and Tarpley (2009). Cheng, W., Sakai, H., Yagi, K., and Hasegawa, T. 2009: Interactions of elevated [CO2] and night temperature on rice growth and yield. Agricultural and Forest Meteorology 149, 51–58. http://linkinghub.elsevier.com/retrieve/pii/S0168192308002037 Mohammed, a. R., and Tarpley, L. 2009: High nighttime temperatures affect rice productivity through altered pollen germination and spikelet fertility. Agricultural and Forest Meteorology 149, 999–1008. http://linkinghub.elsevier.com/retrieve/pii/S0168192308003523. (Hasegawa Toshihiro, National Institute for Agro-Environmental Sciences)	No action, the text shortened.
541	82188	7	21	48	21	48	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	No action, the text shortened.
542	82189	7	21	48	21	50	It would be preferable to present these summary terms for evidence and agreement parenthetically at the end of the respective sentences, using italics font. (Katharine Mach, IPCC WGII TSU)	No action, the text shortened.
543	77236	7	21	50	21	51	For rice, three FACE studies showed reduction in grain protein content due to elevated [CO2] (Liefferint et al 2004; Yang et al 2007; Zhang et al 2013). Lieffering, M., Kim, H.-Y., Kobayashi, K., and Okada, M. 2004: The impact of elevated CO2 on the elemental concentrations of field-grown rice grains. Field Crops Research 88, 279–286. http://linkinghub.elsevier.com/retrieve/pii/S0378429004000164 Yang, L., Wang, Y., Dong, G., Gu, H., Huang, J., Zhu, J., Yang, H., Liu, G., and Han, Y. 2007: The impact of free-air CO2 enrichment (FACE) and nitrogen supply on grain quality of rice. Field Crops Research 102, 128–140. http://www.sciencedirect.com/science/article/pii/S0378429007000354. Zhang, G., Sakai, H., Tokida, T., Usui, Y., Nakamura, H., Yoshimoto, M., Fukuoka, M., Kobayashi, K., and Hasegawa, T. 2013: The effects of free-air CO2 enrichment (FACE) on carbon and nitrogen accumulation in grains of rice (Oryza sativa L.). J. Exp. Bot. in press. doi:10.1093/jxb/ert154. (Hasegawa Toshihiro, National Institute for Agro-Environmental Sciences)	No action, the text shortened.
544	62515	7	22	0	22	0	Section 7.3.2.6: References from south Asia may be looked into (INDIA)	The sections reorganized.
545	68969	7	22	1	22	4	This conclusion is possible based on the sentence prior to it, but evidence is provided for it. (NETHERLANDS)	The paragraph reorganized.
546	61156	7	22	3	22	5	Can this statement be justified? What evidence is available? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	The paragraph reorganized.
547	82190	7	22	12	22	12	In place of "little to no confidence," is it possible to assign a level of confidence following the guidance for authors? (Katharine Mach, IPCC WGII TSU)	The suggestion incorporated.
548	59961	7	22	12	22	15	Question if this statement should refer to: little to no 'evidence' rather than 'confidence' regarding the effects of climate change on human health through changes in nutrient composition. Otherwise one of the five defined qualifiers for confidence should be used eg very low or low. Further suggest that a 'complete understanding' is unlikely to ever be achieved and this sentence should refer to a 'focused research effort' instead. (AUSTRALIA)	The suggestion incorporated.
549	61157	7	22	12	22	15	Links between impacts of climate change on human migration and consumption habits and the impacts on human health are not mentioned. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	No action, the paragraph reorganized.
550	77831	7	22	18	0	0	This section was done rapidly it seems. There are several papers for exmaple on American, European and Australian lobsters and issues of cliamte change (including temperature and ocean acidification). If this is because it is covered in another chapter, this should be mentioned instead to being so superficial. (Liette Vasseur, Brock University)	This chapter deals with all food production sectors and it is not possible to go into much detail. Chapters 6 and 30 are the appropraite places for more detailed information on marine species.
551	82191	7	22	18	0	0	Section 7.3.2.6. The chapter team should very carefully consider the key findings of chapter 6 and 30, cross-referencing them here and ensuring consistency. It seems this chapter should focus on aquaculture and freshwater fisheries, leaving ocean fisheries to chapter 6 and 30. Additionally, further attention to subsistence versus commercial fisheries could be given. (Katharine Mach, IPCC WGII TSU)	The proposal that marine fisheries should not be included is out of line with the ToR approved for this chapter.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
552	65631	7	22	18	22	34	Recruitment of individual fish population is very sensitive to climate variability (e.g., anchovy vs. sardine) Weather can influence working conditions of fishermen, aggravating fishing efficiency. Sever storms and other extreme weather events can damage greatly aquaculture facilities and cause mass mortality of fish and invertebrate in the facilities. For example, unusually-low salinity water from river discharges can cause mass mortality of oysters and other invertebrates in cage culture. (Sukgeun Jung, Jeju National University)	This is a valid comment. Details on fish recruitment belong in Chapters 6 and 30, but additional information has been added here on climate influences on living and working conditions in fisheries and aquaculture.
553	64477	7	22	25	22	26	7.3.2.6. this reads odd, why is this in addition? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Sentence modified to clarify the meaning of 'additional'.
554	61158	7	22	28	22	28	What other environmental impacts exist? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	It is not possible to go into more detail on other environmental impacts with the space limitations in this chapter. Those details should be found in Chapters 6, 30, etc.
555	82192	7	22	29	22	29	It would be more accurate to say "and/or seasonality." (Katharine Mach, IPCC WGII TSU)	In this context 'and' is the appropriate conjunction to use.
556	61159	7	22	29	22	30	A number of points made here are not elaborated on later in this section. Changes in sea level rise, glacier melt, groundwater and river flows. Perhaps a reason should be provided as to why no further detail is provided. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	This chapter focuses on the most important impacts. More detail is provided in Chs 6, 30 etc.
557	64478	7	22	31	22	32	7.3.2.6. to be balanced with ch. 5 and 6, a reference to chapter 6 could be added here. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	A number of new cross-references to other chapters have now been added.
558	82193	7	22	37	0	0	Section 7.3.2.6.1. The chapter team should very carefully consider the key findings of chapter 6 and 30, cross-referencing them here and ensuring consistency, for example especially on lines 46-49 of this page. (Katharine Mach, IPCC WGII TSU)	A number of new cross-references to those chapters have now been added.
559	61160	7	22	37	23	10	This paragraph does not provide much work on the impacts of mean and extremes of precipitation although it is in the title. Research on freshwater fisheries or of ecosystems such as mangroves are not included in this explanation of the sensitivity to weather and climate. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Agreed. The title has now been deleted.
560	65717	7	22	39	22	54	Either here or on page 23, 29 – some mention should be made of (i) the possible effects of mis-matches between seasonal production cycles and reproduction in fish leading to recruitment failure (work by Beaugrand et al., 2008). (ii) How climate change will affect up welling systems, (iii) How climate variability drives shifts between pelagic fish (e.g. English Channel herring in cold periods and Sardines in warm periods – known back to the 12th Century – work by Southward et al., 1980, 1988, 1995, 2005; Hawkins et al., 2003) recently linked to the Atlantic Multidecadal Oscillation (Edwards et al., 2013). These changes are likely to be amplified and accelerated by climate change. Beaugrand, G., Edwards, M., Brander, K., Luczak, C., Ibanez, F. 2008. Causes and projections of abrupt climate-driven ecosystem shifts in the North Atlantic. ECOLOGY LETTERS, 11: 1157-1168. Edwards M, Beaugrand G, Helaouët P, Alheit J, Coombs S (2013) Marine Ecosystem Response to the Atlantic Multidecadal Oscillation. PLoS ONE 8(2): e57212. doi:10.1371/journal.pone.0057212. SOUTHWARD, AJ. 1980. THE WESTERN ENGLISH-CHANNEL - AN INCONSTANT ECOSYSTEM. NATURE, 285: 361-366 SOUTHWARD, AJ; BOALCH, GT; MADDOCK, L. 1988. FLUCTUATIONS IN THE HERRING AND PILCHARD FISHERIES OF DEVON AND CORNWALL LINKED TO CHANGE IN CLIMATE SINCE THE 16TH-CENTURY. JOURNAL OF THE MARINE BIOLOGICAL ASSOCIATION OF THE UNITED KINGDOM, 68: 423-445. SOUTHWARD, AJ., HAWKINS, SJ., BURROWS, MT . 2005. 70 YEARS OBSERVATIONS OF CHANGES IN DISTRIBUTION AND ABUNDANCE OF ZOOPLANKTON AND INTERTIDAL ORGANISMS IN THE WESTERN ENGLISH-CHANNEL IN RELATION TO RISING SEA TEMPERATURE. JOURNAL OF THERMAL BIOLOGY, 20: 127-155. Hawkins, S.J., Southward, A.J., Genner, M.J., 2003. Detection of environmental change in a marine ecosystem – evidence from the western English Channel. Science of the Total Environment, 310: 245-246. (STEPHEN HAWKINS, UNIVERSITY OF SOUTHAMPTON)	These physical and ecological details would be more appropriately addressed in Chapter 6.
561	65715	7	22	40	22	40	Worth citing some references here? (STEPHEN HAWKINS, UNIVERSITY OF SOUTHAMPTON)	The sentence has now been deleted.
562	65716	7	22	41	22	41	Insert “Genner et al., 2004” Genner, MJ., Sims, DW., Wearmouth, VJ., Southall, EJ., Southward, AJ., Henderson, PA., Hawkins, SJ 2004. Regional climatic warming drives long-term community changes of British marine fish PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES, 271: 655-661. (STEPHEN HAWKINS, UNIVERSITY OF SOUTHAMPTON)	The relevant text has now been deleted and, in substantially reduced form, will be moved to Section 7.4.
563	61161	7	22	42	22	42	this sentence is a comment and need to be deleted (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	The comment has been removed.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
564	68970	7	22	42	22	42	There is still a comment of JP included. (NETHERLANDS)	The comment has been removed.
565	63222	7	22	42	22	43	The comment here seems to imply need for more coordination with chapter 6. I raised questions above concerning the evidence and confidence for statements about large changes in yield and the information cited later in this paragraph (lines 46-52) seem to diverge substantially, as summed up at the end of the paragraph. (Keith Brander, Technical University of Denmark)	The comment has been removed.
566	65491	7	22	42	22	43	the note (perhaps from one of the contributors) :JP: I have…this vaolume" need sto be deleted. (Arif Goheer, Global Change Impact Studies Centre (GCISC))	The comment has been removed.
567	68971	7	22	42	22	43	This is a comment from the authors to each other and should be removed from the text. (NETHERLANDS)	The comment has been removed.
568	82194	7	22	42	22	43	This note should be deleted. (Katharine Mach, IPCC WGII TSU)	The comment has been removed.
569	62516	7	22	48	22	48	40% decrease in fish yields by 2055 (over-estimated the impacts?), better to add (low confidence) after this (INDIA)	This section hasbeen moved to 7.4 where confidence statements consistent with those in Chapter 6 are used i.e. Medium confidence for trends, low confidence for magnitude.
570	82195	7	22	48	22	48	It would be preferable here to provide the full range instead of "up to 40%." (Katharine Mach, IPCC WGII TSU)	Has been changed to give range - 7.4.
571	61162	7	22	51	22	52	This statement needs to be strengthened. It is too vague as it stands 'managed sustainably'. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	There is good international understanding of the general requirements for managing fisheries for sustainability (e.g. the FAO Code of Conduct for Responsible Fisheries). It is not possible to go into the details of what it entails in this chapter.
572	68972	7	23	1	23	6	Fulton (2011) study, here quoted, instead writes in the mentioned article ">90% in the relative value of their operations" (page 1336 in Fulton 2011). (NETHERLANDS)	The text has been corrected.
573	59962	7	23	2	23	2	Please spell out the acronym EEZ (Exculsive Economic Zone) (AUSTRALIA)	Has been spelt out
574	65492	7	23	2	23	2	for what "EEZ" stands for? (Arif Goheer, Global Change Impact Studies Centre (GCISC))	Has been spelt out
575	68973	7	23	4	23	4	The introduced term "economic returns" (which are hypothetical - should be written "alleged profits/returns"), but seems not very relevant for the purpose of this section. Moreover the economic projections presented seems to be contrasting with Brown et al 2010, quoted at page 29 line 39-42. (NETHERLANDS)	The wording has been changed to that used in the original paper i.e. 'relative value of their operations'
576	62517	7	23	18	23	28	Studies from South Asia may be considered (INDIA)	This section, 7.3.2.2 had been shortened considerably and much of the geographic detail replaced with cross-references to other chapters and sections, including 7.2.1.2 where there is reference to a publication addressing India
577	59963	7	23	28	23	28	Reference to Box 5-3 is incorrect, perhaps refer to Box CC-OA or section 5.4.2.4? (AUSTRALIA)	Correct cross reference inserted
578	64479	7	23	28	23	28	7.3.2.6.1. reference to Box 5-3 to be checked, there is now a cross-chapter box on coral reefs. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Correct cross reference inserted
579	59964	7	23	30	23	30	Clarify what kind of projections these are (i.e. projections of what?) (AUSTRALIA)	The sentence has been deleted
580	68974	7	23	30	23	31	The entire sentence is very generic and the two concept "minimizing risks" and "new opportunities" are extremely vague in this context: they reduce the already the questinable significance of the sentence which should be therefore rewritten providing substantial explanations. (NETHERLANDS)	The sentence has been deleted
581	82196	7	23	34	0	0	Section 7.3.2.6.2. The chapter team should very carefully consider the key findings of chapter 6 and 30, cross-referencing them here and ensuring consistency. (Katharine Mach, IPCC WGII TSU)	This has been done throughout
582	63531	7	23	36	23	41	It is difficult to believe, that the economic cost of ocean-acidification-induced coral reef loss by 2100 will be 500-870 billion USD annually and the global cost of loss of production of mollusks could be over 100 billion USD. (GERMANY)	The relevant sentence has been deleted.
583	65493	7	23	38	23	38	"WG2" may be replaced with "WGII" (Arif Goheer, Global Change Impact Studies Centre (GCISC))	Reference has been deleted.
584	82197	7	23	38	23	38	The proper format for cross-referencing cross-chapter boxes should be used here. (Katharine Mach, IPCC WGII TSU)	Correct cross reference inserted

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
585	66162	7	23	44	24	5	As climate warming, the productive period of fish pond in temperate regions will prolong but the danger of death by suffocation in the hot night in summer will increase. In north China, many fish pond had been closed due to precipitation decreased. In East China Sea, the number of typhoon has not increased but its intensity increased obviously, as a result, fishing for seafood has become more dangerous. As water temperature increases, algal reproduction becomes stronger, water pollution becomes more serious, inland fish ponds have been affected, and the red tide often affects sea-farming along the coast such as kelp and pearl shell. (Dawei Zheng, China Agricultural University)	Unfortunately suitable references describing these effects could not be found.
586	66200	7	23	44	24	5	As climate warming, the productive period of fish pond in temperate regions will prolong but the danger of death by suffocation in the hot night in summer will increase. In north China, many fish pond had been closed due to precipitation decreased. In East China Sea, the number of typhoon has not increased but its intensity increased obviously, as a result, fishing for seafood has become more dangerous. As water temperature increases, algal reproduction becomes stronger, water pollution becomes more serious, inland fish ponds have been affected, and the red tide often affects sea-farming along the coast such as kelp and pearl shell. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	Duplicate of previous comment.
587	82198	7	23	46	23	50	This text highly overlaps with the text above and could be deleted or at least very substantially reduced. (Katharine Mach, IPCC WGII TSU)	Redundancies have been removed.
588	58846	7	24	0	26	0	Several studies have been conducted at national level to quantify the sensitivity of food consumption, access to markets, and other food security indicators to weather and climate. We recommend including some of these: IRI and WFP (2011) Climate risk and food security in Mali. IRI/WFP: New York/Rome. WFP, ANACIM, and CCAFS (forthcoming) Climate risk and food security in Senegal: Analysis of climate impacts on food security and livelihoods. ANACIM/WFP: Dakar. WFP, DRMFSS, AAU, and CCAFS (forthcoming) Climate risk and food security in Ethiopia: Analysis of climate impacts on food security and livelihoods. DRMFSS/WFP: Addis Ababa. (Carlo Scaramella, World Food Programme)	We have included references on this topic.
589	82199	7	24	17	24	17	Is it possible to specify what is meant by "major implications"? (Katharine Mach, IPCC WGII TSU)	This is a broad conclusion that is considered sufficiently clear in this context.
590	82200	7	24	18	24	18	It would be more accurate to say "frequency and/or severity." (Katharine Mach, IPCC WGII TSU)	and' is the correct conjunction to use in this case.
591	68975	7	24	22	26	10	Section 7.3.3.2. This section is an relevant and well written of some of the economic consequences of and behavioural responses to climate-change induced changes in global food production. It is unfortunate that this section is not covered in the TS, and hardly in the SPM. It would advisable to cover some of the main conclusions of this paragraph in the TS at least, and ideally also in the SPM. Currently the coverage of chapter 7 in the SPM and TS seems to focus almost exclusively on the 'food production systems' aspect of the chapter, rather than on the 'food security' aspect. (NETHERLANDS)	The content of the TS and SPM are up to the leaders of WG2.
592	58847	7	24	26	24	30	Another important element of food access is household access to markets. We recommend expanding this section to include this. Some suggested references to highlight this relationship include: UK Met Office Hadley Centre and WFP (2012) Climate impacts on food security and nutrition: A review of exisitng knowledge". Exeter/Rome: Hadley Centre and WFP. IRI and WFP (2011) Climate risk and food security in Mali. IRI/WFP: New York/Rome. National Planning Commission, Central Bureau of Statistics, World Food Programme, World Bank, AusAid, and UNICEF (2013) Nepal Thematic Report on Food Security and Nutrition 2013. Kathmandu: NPC. (Pages 76-80). Downloadable from: http://wfp.nepasoft.com.np/nefoodsec/publications/Nepal%20Thematic%20Report%20Food%20Security%20%20Nutrition%20Mar%2019_Final.pdf (Carlo Scaramella, World Food Programme)	See Table 7-1
593	72570	7	24	45	0	0	For clarity, suggest replacing 'nutritional levels' with 'nutritional status' (UNITED STATES OF AMERICA)	Unclear what the difference is.
594	61163	7	24	50	25	3	It is important to note that extreme weather events and disasters disrupt food access. If events become more frequent, food access will be greatly disrupted. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	See Ingram 2011 in the refs.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
595	76885	7	25	4	0	0	Add a paragraph after line 4 "Small holders, whose livelihoods depends, totally or mainly, are extremely vulnerable to food insecurity when agricultural production is impacted (HLPE 2012). Dryland agriculture in arid and semi-arid regions of Asia, Africa and Latin America (Cline 2007, Swaminathan and Kesavan, 2012, Nienaber and Hahn, 2007; Thornton et al., 2008) is particularly vulnerable to the risks of climate change and variability (particularly drought). Most vulnerable in dry areas are pastoralists and smallholder farmers (Hassan, 2010; Dinar et al., 2008) with extensive systems whose vulnerability is expected to worsen with climate change (HLPE 2012)." The refs are: Cline, W. R. (2007). Global Warming and Agriculture: Impact Estimates by Country. Washington, D.C.: Center for Global Development. http://www.cgdev.org/content/publications/detail/14090. Dinar, A., Somé, L., Hassan, R., Mendelsohn, R. and Benhin, J. (2008). Climate change and agriculture in Africa: impact assessment and adaptation strategies. Earthscan/James & James. Nienaber, J. A., and Hahn, G. L. (2007). Livestock production system management responses to thermal challenges. 52: International Journal of Biometeorology: 149-57. Hassan, R. M. (2010). Implications of Climate Change for Agricultural Sector Performance in Africa: Policy Challenges and Research Agenda. Journal of African Economies 19 (Supplement 2) (July 21): ii77-ii105. http://jae.oxfordjournals.org/cgi/content/abstract/19/suppl_2/ii77. Swaminathan, M. S., and Kesavan, P. C. (2012). Agricultural Research in an Era of Climate Change. Agricultural Research 1 (1) (January 31): 3-11. doi:10.1007/s40003-011-0009-z. http://www.springerlink.com/content/l04630341j00u524/. Thornton, P. K., Jones, P. G., Owiyo, T., Kruska, R. L., Herrero, M., Orindi, V., Bhadwal, S., Kristjanson, P., Notenbaert, A., Bekele, N. and Omolo, A. (2008). Climate change and poverty in Africa: Mapping hotspots of vulnerability. African Journal of Agricultural and Resource Economics 2 (1): 24-44. http://purl.umn.edu/56966. HLPE, 2012. Social protection for food security. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome 2012. http://www.fao.org/cfs/cfs-hlpe/reports/en/ (Food and Agriculture Organization of the United Nations (FAO))	We have covered the issue and space precludes more.
596	61164	7	25	11	25	16	The example of the Pakistan flood survey is not linked well to the issue of food. Many findings stated are not relevant to this chapter. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Agreed that this could have come in the rural chapter but there is always some overlap between chapters and there should be. See also Box 7-1.
597	63390	7	25	15	0	0	replace "heavier" with "larger" (Peter Gregory, University of Reading)	Wiil do at the proof stage
598	70386	7	25	19	25	19	"negative effect on poverty" is ambiguous - negative outcome, or less poverty? (Andrew Moore, CSIRO)	Both.
599	62518	7	25	21	25	29	This paragraph does not fully reflect the situation in tropical regions such as South Asia (INDIA)	Unspecific request in the comment.
600	72571	7	25	26	0	0	Delete the reference to Kassie et al. 2008 as it is not about 'lower likelihood of applying purchased inputs such as fertilizer...' but rather about the impact of stone bunds on crop yields. (UNITED STATES OF AMERICA)	Done.
601	72572	7	25	35	25	37	The sentence that begins with "Currently...." contains a reference to two sources Fafchamps, 1999 and Frankenberg, 1999 -- "1999" is not "current". Two sources cited are not in refs: McPeak, 2004 and Frankenberg, 1999. (UNITED STATES OF AMERICA)	But provides background material
602	72573	7	25	42	0	0	Hoddinott and Malucio, 2002 is not in refs. (UNITED STATES OF AMERICA)	Corrected.
603	68976	7	25	50	25	51	What written here is in contrast with the content of page 22 line 12-15. The contradiction should be solved. (NETHERLANDS)	P25 - 50-51 reads All of these responses generally lead to both lower current and future farm profits (robust evidence, high agreement) (Rosenzweig and Binswanger, 1993; Hurley, 2010). Cf. humidity during flowering and also to high night-time temperature causing a decrease in rice eating quality and assimilates accumulation, and yield (Okada et al., 2009; Wassmann et al., 2009). P22 12-15 reads There is robust evidence and high agreement that elevated CO2 on its own likely results in decreased N - I do not understand the contradiction.
604	72574	7	26	4	0	0	HLPE 2012 not in refs...2011 is. (UNITED STATES OF AMERICA)	Corrected.
605	82201	7	26	5	26	6	It would be preferable to provide summary terms for agreement and evidence in place of "good agreement," or alternatively, "there is good agreement" could be deleted. (Katharine Mach, IPCC WGII TSU)	The reference is an example of a general point that mycotoxins are not good for people.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
606	57849	7	26	13	0	0	Section 7.3.4. It is not necessarily the case that resources will be directed towards activities that are less affected by climate change. This depends upon trade and prices. If local prices of strongly affected commodities rise by more than the climate impact, farmers may "adapt" by planting more of the highly affected crops rather than less. Arndt, C., P. Chinowsky, S. Robinson, K. Strzepek, F. Tarp and J. Thurlow. "Economic Development Under Climate Change." Review of Development Economics. 16(3)(2012): 369–377. (Channing Arndt, University of Copenhagen)	No such implication is made
607	68977	7	26	13	27	15	In section 7.3.4 a lot more can be said about crop choice adaptation compared to crop level management adaptation. For example, crop yields of wheat may decline, and instead of adopting adaptation measures increasing wheat yields, it may be more profitable to switch to other crops. Such type of adaptations are included in Ricardian analyses following Mendelsohn et al. (1994, American Economic Review 84: 753-771). Currently, bio-economic models are also coupled to crop models to simulate both types of adaptation measures. (NETHERLANDS)	Adaptation is covered in a later section
608	76911	7	26	16	0	17	The sentence "studies since…" needs to be revised (Food and Agriculture Organization of the United Nations (FAO))	Done
609	82202	7	26	16	26	16	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Sorted
610	59965	7	26	16	26	17	Incomplete or poorly drafted sentence, please revise. (AUSTRALIA)	Done
611	59966	7	26	16	26	17	Sentence appears to be incomplete, not clear what is meant by 'total time regions.' (AUSTRALIA)	Sorted
612	72575	7	26	16	26	17	Sentence that begins " Studies since..." is unclear. Please clarify. (UNITED STATES OF AMERICA)	Done
613	82203	7	26	19	26	19	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Sorted
614	68978	7	26	20	26	21	The studies of Schaap et al. (2011, Regional Environmental Change 11: 731-741) and Schaap et al. (2013, European Journal of Agronomy 48: 30-42) have assessed the impacts of extreme climate events including pests and diseases. Specifically studies using agroclimatic indices instead of crop simulation models can include pests and diseases in their assessments. (NETHERLANDS)	Sounds like an interesting methodological development
615	82204	7	26	27	26	27	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Sorted
616	72576	7	26	29	0	0	Burke et al. 2009 is not in refs. (UNITED STATES OF AMERICA)	Corrected.
617	68979	7	26	29	26	29	The Burke (2009) reference is about reefs according to the bibliography, while the sentence discusses changes in crop areas. Please check this. (NETHERLANDS)	Two Burkes. Corrected.
618	72577	7	26	35	26	35	The authors should consider including a brief discussion of (or reference to) agroecological approaches or landscape approaches to manage water. (UNITED STATES OF AMERICA)	No space
619	82205	7	26	35	26	35	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Sorted
620	59059	7	26	36	26	37	There was a case study that water supply alleviate or recovered loss of maize yiled under rain-fed conditions, reported for poor soil in rain-fed loess plateau, China. Chu et al., 2009. Impact of spring drought on winter wheat yield and the mitigation by fertilization and irrigation: An example of survey and field experiment in 2003 and 2009 in Yuanqu County, Shanxi Porovicne, China. Journal of Agro- environment Science, 30(9):1772-1776,2011 (Genxing Pan, Nanjing Agricultural University)	Sounds interesting, no space to cite
621	80118	7	26	38	26	40	At this point it is important to consider that a proper management in the use of water is critical for climate change adaptation. Since Chile is highly vulnerable to climate change, the National Irrigation Commission considers that is necessary the well-planned construction of irrigation infrastructure, for adapting to climate change. The planning of this infrastructure must necessarily consider the impacts that may arise, and then anticipate and mitigate the impacts . (CHILE)	Agreed - but this is a section on autonomous adaptation
622	82206	7	26	42	26	42	It would be preferable to indicate more precisely what is meant by "seriously impacted." (Katharine Mach, IPCC WGII TSU)	This is referenced to Brander 2007
623	59967	7	26	51	26	54	It appears that the reference given for these statements on Australian cropping and grazing is incorrect (Nidumolu 2011 - relates to heat stress in diary cattle). The correct reference may be Nidumolu UB, Hayman PT, Howden SM, Alexander BM (2012) Re-evaluating the margin of the South Australian grain belt in a changing climate. Clim Res 51:249-260? (AUSTRALIA)	Included
624	56262	7	27	0	0	0	Here we could cite Roudier et al. (2011) who have done a meta-analysis on the impact of climate change on crop yields in Africa. The exact reference is "Roudier P., Sultan B., Quirion P., Berg A. (2011) The impact of future climate change on West African agriculture: what does the recent literature say? Global Environmental Change, doi:10.1016/j.gloenvcha.2011.04.007." (benjamin Sultan, IRD)	Paper was reviewed and assessed

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
625	56263	7	27	0	0	0	In this section, we could mention the work of Sultan et al. (2013) who simulated the effects of both temperatures and rainfall changes on crop yields in West Africa. The exact reference is "Sultan B., Roudier P., Baron C., Quirion P., Muller B., Alhassane A., Ciais P., Guimberteau M., Traoré S.B. and M. Dingkuhn (2013) Assessing climate change impacts on sorghum and millet yields in the Sudanian and Sahelian savannas of West Africa, Environ. Res. Lett. 8 014040 doi:10.1088/1748-9326/8/1/014040." (benjamin Sultan, IRD)	Paper was reviewed and assessed
626	62520	7	27	0	27	0	Section 7.4: This section intends to provide information from the studies conducted using integrated assessments. However, the literature provided is not justifying the intention. Studies on cropping systems (ex. Naresh Kumar et al., 2011), integrated impacts need to be looked into. I also agree that the information this aspect is relatively scarce. Just linking climate and crop models may not qualify for this section. (INDIA)	this comment is unclear. The chapter includes use of many studies, not only those from integrated assessments. No changes made
627	62521	7	27	0	27	0	Section 7.4: There can be a section in model ensemble (climate and crop models) studies. (INDIA)	this comment is unclear and we have not made any changes
628	63440	7	27	0	28	0	General comment: It should be stressed that it is difficult to study the impacts of 3 or 4°C temperature increases, because there are hardly regions where such an increase in the average temperature can be observed. Cross-sectional analyses can give only an indication for such temperature increases, but what is needed is a two-world experiment. One world in which the temperature is increases and one in which it remains constant. This allows an accurate assessment of climate impacts. The study of Burke and Emerick (2012). (Marshall Burke and Emerick Kyle (2012): "Adaptation to climate change: Evidence from US agriculture". (Natalie Trapp, University of Hamburg and International Max Planck Research School on Earth System Modelling)	the Burke and Emerick study is not yet peer reviewed so we have not included it. In general, we agree with the difficulty of understanding large T increases, but feel this is adequately discussed in 7.3.1
629	61165	7	27	2	27	15	Biofuels are discussed but other monocrops such as soya and the impact of such land use change is not. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Text removed for final draft for space reasons
630	61166	7	27	2	27	15	this section on the role of biofuel production incentives needs to be expanded and fully referenced. Complex links between crop use for biofuel production, food prices and food security need to be better described. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Text removed for final draft for space reasons
631	63532	7	27	2	27	15	Information on by-products of bioenergy production is missing. For example 1 ha rape oil production delivers expeller and husks for feeding and substitutes 1,3 ha of soy production. Additionally here should be mentioned, that the main source for bioenergy is wood, which is not competing with food security. (GERMANY)	Text removed for final draft for space reasons
632	85133	7	27	5	27	6	"Brazil, Malaysia, Peru, Argentina and Thailand" should not be specified directly in the text as many other developing nations are also relatively food secure and have high demand for fossil-based fuels. It is more appropriate to just refer to "a number of developing countries" in the sentence. (MALAYSIA)	Text removed for final draft for space reasons
633	61167	7	27	13	27	14	"Targets of biofuel production will cause an additional 140 - 150 million people to be at risk of hunger by 2020." What is the reference for this? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Text removed for final draft for space reasons
634	62519	7	27	17	27	25	This statement will hold good provided food-crop land is diverted to biofuel crops, which is unlikely situation at least in south Asia. (INDIA)	Text removed for final draft for space reasons
635	80393	7	27	18	31	53	Section 7.4: WGI AR5 Ch12 has to be cited for the discussion of climate targets instead of providing your own assessment. Please cross-reference to the WGI/SREX report wherever applicable. The section does not refer to any of the WGI Chapters 11, 12, or 14 dealing with climate change projections in WGI AR5. Encourage authors to make use of, and carefully cross-reference the relevant information from these WGI AR5 chapters. Please revise accordingly. (Gian-Kasper Plattner, IPCC WGI TSU)	thanks for suggestion. We have reviewed section to make sure any time we refer to climate projections we cite WG1 as necessary
636	61168	7	27	18	32	2	This section does not include a sub-section on the projected impacts on livestock or pasture. If it is to follow the structure of the chapter it would be expected after the cropping system and before fisheries. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	we have added a section on livestock impacts

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
637	65854	7	27	20	0	0	Section 7.4.1 After three decades of sugar cane ethanol production, Brazil has many studies about interaction among climate change, sugar cane and food production. Please contact University of Viçosa, professor Dr. Justino; www.ufv.br. Also the University of Sao Paulo, department of economic studies. Instituto de Estudos do Comércio e Negociações Internacionais; www.iconebrasil.org.br (Milton Nogueira da Silva, Climate Change Forum of Minas Gerais, Brazil)	we have cited some work on sugarcane and also referred to chapter 27 for more details
638	68980	7	27	23	27	26	all areas are projected to have negative yield impactspast 3 degrees of local warming'. More explanation is needed, as this study is not published yet. (NETHERLANDS)	we now reference figure 7-5 which shows it clearly. Also, the paper will be published by the time the report is released
639	59968	7	27	26	27	26	Please include reference for these 'more recent studies'. (AUSTRALIA)	these are well over 50 studies, which are provided in the Challinor review paper. Here we have added a reference to the Challinor paper rather than to all of the recent studies
640	61169	7	27	29	27	29	A description of which crops are included in this study would be beneficial. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	this study considers projections from any available study regardless of crop, resulting in a broad mix of crops. This has now been clarified
641	82207	7	27	29	27	29	Are 20-year bins the best approach? Wouldn't it be preferable to be able to see how yield is expected to change over different levels of climate change? Recognizing that many variables are important in determining yields, would degrees Celsius bins nonetheless be preferable? (Katharine Mach, IPCC WGII TSU)	we adopted the 20-yr bin approach as a complement to the local temperature representation in figure 7-5. also, we would have liked to do things by global temperature increase but few studies reported it.
642	85156	7	27	29	28	18	The relationship of the impacts with the assumption made on GHG emissions (SRES ou RCPs) should more clearly presented (Michel Petit, CGIET rue de Bercy)	we agree this would be interesting but the sample sizes are too small when separating studies by emission scenario and time slice to make any meaningful comparisons, partly because the emission scenarios were not always specified or, in the case of the studies prior to ar4, the scenario was not recorded in the metaanalysis
643	68981	7	27	32	27	32	reductions of more than 5% are more likely than not beyond 2050'. This is a very small impact compared to the technological development in many parts of the world in the past decades. It would be good to put numbers into context. (NETHERLANDS)	we agree it is important to put numbers in context. We attempt to do that more clearly in the summary figure (now 7-7)
644	82208	7	27	33	27	33	The chapter team here asserts that regional differences are masked in the figure, but what about differences across scenarios of climate change, which are also masked? (Katharine Mach, IPCC WGII TSU)	we have clarified this masks differences by emission scenarios. for reasons why, see above. We agree scenario differences would be of interest for past 2050, but don't feel there are enough studies to make robust statements. Unfortunately the recent agmip work has also not addressed this question, focusing on crop model uncertainty rather than differences between emission scenarios.
645	68982	7	27	34	27	34	yield reductions in the tropics are very likely'. This may be true, but also here yield changes should be put into context. Actual yields in the tropics are often much lower than potential yields, and yield gaps can still be largely reduced (Van Ittersum et al., 2013, Field Crops Research 143: 1-3). Yields are often not limited by climatic conditions, but by nutrients and other management factors (e.g., Tittonell et al., 2008, Plant Soil 313:19–37), and may therefore respond less to climatic conditions as projected by the general crop models. (NETHERLANDS)	context is addressed in figure 7-7. also, while it can be argued that tropics are not currently climate-constrained, it is not likely that by 2070 this will remain the case.
646	68983	7	27	34	27	34	"suggesting... time". This reasoning is dubious. Positive yield changes in temperate regions do not logically imply that yield reductions at the same time in the tropics are very likely. This may be factually true, and the paper by Knox cited in the succeeding sentence supports the assertion, but the current sentence makes a logical connectiont that feels unwarranted. Re-writing the sentence should help clarity and comprehension. (NETHERLANDS)	have reworded for clarity

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
647	64813	7	27	43	27	48	See also: (1) Iglesias A, Garrote L, Quiroga S and Moneo M. (2012) A regional comparison of the effects of climate change on agricultural crops in Europe. Climatic Change,112 (1), 29-46. (2) Ciscar, J.C., Iglesias, A., Feyen, L. Szabo, L., van Regemorter, D., Amelung, B., Nicholls, R., Watkiss, P., Christensen, O.B., Dankers, R., Garrote, L., Goodess, C.M., Hunt, A., Moreno, A., Richards, J., Soria, A. (2011). Physical and economic consequences of climate change in Europe. Proceedings of the National Academy of Sciences 108 (7): 2678-2683. (3) González-Zeas D., Quiroga, S., Iglesias, A., Garrote, L. (2013). "Looking beyond the average agricultural impacts in defining adaptation needs in Europe". Regional Environmental Change, In press. (DOI: DOI 10.1007/s10113-012-0388-0) (SONIA QUIROGA, UNIVERSIDAD DE ALCALA)	these studies refer only to yields within europe, and are covered in the Europe chapter. We are focused here on studies comparing different regions
648	82209	7	27	45	27	45	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	term was removed
649	68984	7	27	46	27	48	It is more informative and accurate to report an average yield decrease, with an associated measure of range indicating outliers, rather than just mentioning the outlier value (up to 50%), as in the current text. Additionally, Knox et al. 2012 report large reductions in yield of up to 50% for some scenarios in other regions than Sub-Saharan Africa and South Asia as well. Why are only these two regions considered here? (NETHERLANDS)	we have replaced this sentence to focus on the mean and range, rather than outliers.the knox study is focused on africa and south asia. They do not provide estimates for other regions
650	82210	7	27	50	27	50	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	sentence reworded
651	59969	7	27	51	27	52	CV (coefficient of variation) should be defined in the text. (AUSTRALIA)	clarified
652	60761	7	27	54	28	8	Comment: The following text can appear here: "Iizumi et al. (2011) find that the paddy rice yield loss in Japan induced by hot days (>33°C) during the flowering period in the 2050s will exceed the severest yield loss induced by cool-summer damage in the 1990s with the probability of up to 15%." Reference: Iizumi, T., M. Yokozawa, and M. Nishimori (2011), Probabilistic evaluation of climate change impacts on paddy rice productivity in Japan. Climatic Change, 107, 391-415. (Toshichika Iizumi, National Institute for Agro-Environmental Sciences)	we have shortened this section for+I8 length concerns, and no longer include the relevant discussion to this paper
653	82211	7	28	4	28	4	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. If being used as a likelihood term, it should be italicized. (Katharine Mach, IPCC WGII TSU)	removed
654	82212	7	28	7	28	7	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. If being used as a likelihood term, it should be italicized. (Katharine Mach, IPCC WGII TSU)	removed
655	68985	7	28	7	28	8	"Overall ... regions." This is an important and very policy-relevant conclusion. It is currently not discussed in the TS or SPM. It would be advisable to reconsider this choice. (NETHERLANDS)	thanks. We have made this more prominent in the exec summary and included it in summary fig 7-7 with intentions to have it feed into TS and SPM
656	82213	7	28	7	28	8	It would be preferable to place "medium confidence" within parentheses at the end of the sentence. (Katharine Mach, IPCC WGII TSU)	done
657	56257	7	28	12	0	0	It is "Berg et al. 2013" and not "Berg et al. 2012". It should also be corrected in the reference (benjamin Sultan, IRD)	thanks, corrected
658	56261	7	28	13	0	0	It is "Berg et al. 2013" and not "Berg et al. 2012". It should also be corrected in the reference (benjamin Sultan, IRD)	thanks, corrected
659	72578	7	28	20	0	0	New et al., 2011 not in refs. (UNITED STATES OF AMERICA)	we have removed this reference as the sentence was shortened and the reference no longer needed
660	68986	7	28	20	28	20	There is no reference to New et al. 2011 to be found in the bibliography. This is an important assertion, so make sure it is properly referenced. (NETHERLANDS)	we have removed this reference as the sentence was shortened and the reference no longer needed
661	82214	7	28	22	28	25	It would be preferable to place the summary terms for evidence and agreement within parentheses at the end of the sentence. (Katharine Mach, IPCC WGII TSU)	done
662	82215	7	28	24	28	24	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. If a likelihood term, it should be italicized. (Katharine Mach, IPCC WGII TSU)	corrected
663	68987	7	28	25	28	27	It is unclear how the two percentages reported here are calculated. We could not identify them in the original paper, and it is unclear how they are calculated based on the data presented there. (NETHERLANDS)	They are averages from table 1
664	82216	7	28	25	28	27	Is this an outcome expected at 4°C average temperature increase? (Katharine Mach, IPCC WGII TSU)	It is for 5 degrees as stated
665	70387	7	28	26	28	26	"decumbens", not "descumbens" (Andrew Moore, CSIRO)	corrected

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
666	63391	7	28	29	0	31	This sentence does not seem to be consistent with comments about weeds on page 17 (Peter Gregory, University of Reading)	we have reviewed this and do not find any inconsistencies. E.g. section 7.3. says climage change may be a factor in extending northern range of weeds
667	72579	7	28	30	0	0	Ziska et al. 2011 not in refs (2011a is) (UNITED STATES OF AMERICA)	Thanks, fixed
668	63392	7	28	34	0	36	I can find no evidence to support this statement in this document. What is the evidence? (Peter Gregory, University of Reading)	we have added reference to section with the supporting evidence. we have also specified this is based on limited evidence, but think it is important to include
669	61170	7	28	34	28	36	No explanation is provided as to why chemical control of weeds may become less effective. Examples of findings from the past could be drawn upon regarding weed adaptations. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	explanation is given in 7.3.2.3. we have also specified this is based on limited evidence, but think it is important to include
670	82217	7	28	40	28	40	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. If being used as a likelihood term, it should be italicized. (Katharine Mach, IPCC WGII TSU)	reworded to remove word likely
671	82218	7	28	40	28	46	All summary terms for evidence and agreement on these lines should be italicized. (Katharine Mach, IPCC WGII TSU)	done
672	66163	7	28	51	28	51	Other effects: (1)As climate warming, the soil organic matter, fertilizer and pesticide will speed degradation and loss. (2)As sea level raises, part cultivated field low land along coast will be submerged or often invaded by sea water. (Dawei Zheng, China Agricultural University)	agreed, but no changes made for brevity
673	66201	7	28	51	28	51	Other effects: (1)As climate warming, the soil organic matter, fertilizer and pesticide will speed degradation and loss. (2)As sea level raises, part cultivated field low land along coast will be submerged or often invaded by sea water. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	agreed, but no changes made for brevity
674	65718	7	29	0	0	0	General Comments: Changes in upwelling regimes should be mentioned as major fisheries are linked to these. (STEPHEN HAWKINS, UNIVERSITY OF SOUTHAMPTON)	Upwelling systems are now being covered in a cross-chapter box CC-UP that indicates considerable uncertainty in the impacts of climate change on upwelling systems.
675	62522	7	29	0	29	0	Section 7.4.2.: Mention about sea surface temperature while dealing with marine fisheries becomes important. Some of the references from south Asia may be considered (marine and fresh water fisheries). (INDIA)	Sea temperatures are frequently referred to as being a driver of change. Suitable references on future impacts in S. Asia were not provided by the reviewer and could not be found.
676	82219	7	29	1	0	0	Section 7.4.2. The chapter team should ensure consistency of all statements in this section with the final key findings of chapter 6 and 30, providing cross-references to the specific relevant sections of those chapters. (Katharine Mach, IPCC WGII TSU)	As in earlier comments. Without providing specific instances of inconsistency, this comment is not helpful.
677	65632	7	29	13	29	21	The main point here needs to be changed to 'fisheries production' rather than the range shifts of fish. (Sukgeun Jung, Jeju National University)	This section has been redrafted to emphasise fisheries production, as suggested here.
678	72580	7	29	18	0	0	Lehodey, 2011 not in refs (2010 is...) (UNITED STATES OF AMERICA)	Will be corrected.
679	64480	7	29	21	29	21	7.4.2.1. this is now in 30.6.2.1.1., mere mentioning of that tuna fisheres is discussed there, seems superfluous, do assessments agree? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	The studies reported here and in Ch 30 are important and relevant to both Chapters. The focus in Chapter 7 is on food production and food security.
680	82220	7	29	31	29	34	The timeframe for all of these statements should be clarified. Does the 1st sentence here pertain to 2035? (Katharine Mach, IPCC WGII TSU)	Yes, it refers to 2035 as is implicit in the sentence.
681	61171	7	29	32	29	32	Reasoning could be provided as to why differences exist in coastal fisheries vulnerability between the west and east of the PICTs, as this is not known to the reader. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	It is not possible to go into this detail in the space available. The detail can be found in the original reference.
682	64481	7	29	39	29	42	7.4.2.1. DELETE "broad-based"from sentence on modelling study as the region covered is rather small.... (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	The sentence has been deleted.
683	65633	7	29	39	29	44	I think this kind of bottom-up control on fisheries production can be highligted in this section (7.4.2.1) to avoid overlaps with chapters 6 and 30. (Sukgeun Jung, Jeju National University)	Noted. No action required.
684	64482	7	29	47	30	14	7.4.2.2. The treatment of aquaculture is only covering the North American Pacific and the tropical Pacific. This seems selective rather than comprehensive. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	The selectivity is based on the availability of information that meets IPCC's requirements.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
685	65634	7	29	49	30	4	7.4.2.2. Aquaculture' Aquaculture production is highest in China, and I wonder why there is no mention of China. (Sukgeun Jung, Jeju National University)	No suitable references could be found.
686	63533	7	29	49	30	14	Very local examples (Washington State, French Caledonia) which do not underline the general findings under 7.4.2.3. (GERMANY)	The study referred to in 7.4.2.3 was a stand-alone study and the general findings are reported as such. Two other global studies are now included in 7.4.2.
687	68988	7	30	0	31	0	7.4.3 It is unfortunate that elements of this paragraph are hardly found back in the TS or in the SPM. This is one of the most important paragraphs of the chapter, if not the most important one, and it deserves a more prominent position in both summaries. (NETHERLANDS)	Thanks. We have made this more prominent in the exec summary and have approached the authors of the SPM and TS requesting inclusion.
688	58472	7	30	8	30	8	French Polynesia (Martin Pecheux, Institut des Foraminifères Symbiotiques)	this section was shortened, reference no longer made
689	64483	7	30	22	30	23	7.4.2.3. chapter 6 structure has changed so this reference should be adjusted (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	The correct cross-reference has been inserted.
690	72582	7	30	33	0	0	For clarity, the section on page 10 regarding price volatility should be combined with section 7.4.3. Projected Impacts on Food Prices and Food Security. (UNITED STATES OF AMERICA)	page 10 dealt with past changes, whereas this section is about projections. This is part of the structure dictated by ipcc and so no changes were made
691	59970	7	30	33	31	53	Recommend section 7.4.3 clearly articulate that there is a high level of uncertainty about the 'projected impacts on food prices and food security' because much is dependent on domestic policy responses. This impact of domestic policies, such as export bans, are noted earlier in the chapter but should also be highlighted in the context of this section. (AUSTRALIA)	good point, we have added it and also refered back to 7.2.2 by adding sentence "Studies also typically ignore potential changes in yield variability (Figure 7-6) and policy responses such as export bans which have important international price effects (section 7.2.2)."
692	72581	7	30	33	31	53	This section reads very much like the concept of food security being used is really the old 'food balance' approach at the national scale. The studies cited use the idea that if global yields go down, population goes up, then food prices will by necessity go up and food security will worsen. This kind of tautology is extremely misleading, since the causes of food security are as varied as the causes of poverty, ill health or any social ill. Increased prices may actual decrease food insecurity if a region develops its agriculture, has a growing economy, or otherwise can harness the increased income from these prices. The reality is far more diverse and diffuse, since food security is a complex idea that is not linearly related to food availability. Recommend that the authors take this section out and use the 'food security' phrase much more carefully, referring to overall food availability and the likely pressures on supply and demand of broader food availability on the nationals scale. Much more care on defining these terms is critical. (UNITED STATES OF AMERICA)	prices are not just about availability but also provide an indictor of overall access. In any case, we hope the new figure 1 and other changes make it abundantly clear that international prices are one metric but an imperfect one. We have added in this section a sentence "Of course, international prices are only one indicator of global food security, with the pathways by which price changes can affect food security outlined in section 7.3.3. A limited number of studies have estimated the effects of price changes on food security and related health outcomes. "
693	72583	7	30	35	30	49	This section must refer to which prices where - prices are not like CO2 in the atmosphere that is an immutable fact no matter where you are on the planet. Which food prices are we referring to? Cereals - maize, wheat, rice? If so, they are not very relevant to the world's food insecure who cannot afford to eat these very western, commoditized grains. Most very poor people eat locally grown small, coarse grains like millet, sorghum, and tubers of cassava and yams. They can't hope to afford to eat bread from imported wheat from cold climes - so how relevant are these trade studies to the really food insecure? Who exactly are being referred to here? Which countries and urban dwellers or rural? Many of the studies being used are global trade studies for the taxed and clearly visible grain movements, not the informal economies with grain moved on the back of men or animals with barter. In many regions of the world, the formal trade is dwarfed by the informal trade. Recommend that the authors much more carefully define. (UNITED STATES OF AMERICA)	see above. We have made some clarifying small changes but don't wish to spend a lot of space defending the value of studies looking at global prices, especially since the reviewer's statements are not backed up by much literature
694	63534	7	30	43	30	44	Combined effect of global warming and rising CO2 leads to prices by 2050 which are - 30 - +45 % less/higher than today: There is no evidence and no clear finding in these figures! Possibly it can be said, that rising CO2 content in the atmosphere compensates negative effects of climate warming? (GERMANY)	we have reworded for clarify. But we think saying price impacts could range betwee -30 to +45 is indeed informative, for instance it is quite different than saying it could be between -200 and +200

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
695	68989	7	30	43	30	46	This paragraph could also be classied as C4 and C1. The entire paragraph is undersupported by evidence and it is in over contradiction to what said in the Chapter about the difficulty to disentangle climate components in the price formation. Moreover an estimate increase with a range "3-84%" is not very informative: it would be much more informative to not only show the range of estimates but also report a measure of central tendency for these estimates like mean or medians. It is unclear where these percentages orginate from. (NETHERLANDS)	not sure what "C4 and C1" means. The citations for these numbers are provided in previous paragraph, which we now clarify. Given the small number of studies and the fact that they all consider different time frames and commodities, we choose not to present a mean.
696	68990	7	30	47	30	47	Nelson et al. 2013 is not yet available and its content not verifiable. (NETHERLANDS)	we have been told it is now accepted and will be available when report is published
697	82221	7	30	51	30	51	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. If being used as a likelihood term, it should be italicized. (Katharine Mach, IPCC WGII TSU)	removed
698	61172	7	31	1	31	2	Accelerated investment in planned adaptations is crucial and this statement needs to be emphasised more throughout this section. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	we do not want to be policy prescriptive, per ipcc guidance
699	72584	7	31	5	31	8	This statement does not make logical sense: please clarify these numbers (as currently stated, climate change would lead to a net reduction in the global malnourished population by 17 million)? (UNITED STATES OF AMERICA)	reworded for clarity
700	63535	7	31	6	30	8	Combined effect of climate change and CO2 results in yield increases and reduces the number of malnourished population by 15 %: If this is fact no adaptation strategy would be necessary. It would be helpful to have an estimation of confidence on this. (GERMANY)	the synthesis statements following this sentence summarize the overall confidence as medium
701	59971	7	31	6	31	6	Please spell out SSA (sub-saharan Africa ?) (AUSTRALIA)	done
702	59972	7	31	6	31	8	Sentence is unclear, consider replacing 'number' (line 8) with 'global malnourished population' to make clearer. (AUSTRALIA)	reworded for clarity
703	61173	7	31	7	31	7	It is not clear what the baseline is for this statement of an increase of 11%. Is it 11% from present levels of malnutrition? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	no it is compared to a baseline scenario in 2050. we have reworded for clarity
704	82222	7	31	10	31	10	It would be preferable to place all uncertainty language within parentheses at the end of the sentence, to maximize directness of wording. (Katharine Mach, IPCC WGII TSU)	done
705	68991	7	31	13	31	16	It would be informative, and very relevant if the relative contribution of climate change to food security issues, compared to other factors could be discussed more explicitly, and ideally quantitatively. Determining the relative contribution of climate change compared to other factors is a core question of this chapter. (NETHERLANDS)	we have added figure 7-7 in part to make this point
706	61174	7	31	14	31	14	'growth and development' of what? People? Crops? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	reworded for clarity to "At the same time, it is likely that socio-economic and technological trends, including changes in institutions and policies, will remain a relatively stronger driver of food security over the next few decades than climate change "
707	72585	7	31	21	31	54	The discussions of the positive impacts of food prices in exporting countries (p. 31 line 22-24, also p. 24 line 36) and conflict (p. 31, line 28) seem under examined. The lack of discussion of conflict in particular seems out of balance relative to the importance of the topic and work done on this. Note repeated paragraph starting line 44. (UNITED STATES OF AMERICA)	we have cross-referenced chapter on human security. Also have removed duplicate paragraph
708	57660	7	31	28	31	30	There is a whole chapter on conflict, which is a bit more nuanced than Hsiang. (Richard S.J. Tol, Vrije Universiteit Amsterdam)	good point, we have we have cross-referenced chapter on human security.
709	76912	7	31	32	0	53	The same paragraph is repeated twice but referring to different figures (Figure7-7 and Figure 7-6). I don't think either figures support the argument "Extremes contribute to variability in productivity". Reference should to figure 7-7 or 7-6 should be removed. (Food and Agriculture Organization of the United Nations (FAO))	have removed both paragraphs, as we know point out earlier that effects on variability are not yet considered in food security projections
710	68992	7	31	32	31	53	The text was copied and pasted twice in 32-42 and 44-54 and not spotted by revision. (NETHERLANDS)	have removed paragraph
711	82223	7	31	33	31	33	This description of changes in extreme events must be further qualified. As is, it is an overgeneralization. Not all types of extreme events are expected to become more frequent. (Katharine Mach, IPCC WGII TSU)	have removed paragraph
712	61175	7	31	40	31	42	Effective monitoring and predictions of extreme events and building resilience into food systems is crucial to avoid negative impacts. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	have removed paragraph

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
713	82224	7	31	41	31	41	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	have removed paragraph
714	71309	7	31	44	0	54	Suggest deleting - these lines repeat the previous paragraph (CANADA)	have removed paragraph
715	60763	7	31	44	31	53	Comment: This paragraph is the same as Chapter 7, Page 31, Line 32-42. (Toshichika Iizumi, National Institute for Agro-Environmental Sciences)	have removed paragraph
716	68993	7	31	44	31	53	This paragraph repeats the previous one, omit. (NETHERLANDS)	have removed paragraph
717	70388	7	31	44	31	53	This paragraph repeats the preceding one (Andrew Moore, CSIRO)	have removed paragraph
718	77419	7	31	44	31	53	Same paragraph as the previous one (NOTE: Pasted here for your reference) I propose to add these two sentences before ".Also in French..." : The forecasted increase in air temperature in eastern Canada over the next 100 years will result in lower yields and nutritive value of timothy (Bertrand et al., 2008). Reference : Bertrand, A., G. F. Tremblay, S. Pelletier, Y. Castonguay et G. Bélanger. 2008. Yield and nutritive value of timothy as affected by temperature, photoperiod and time of harvest. Grass Forage Sci. 63 :421-432. (Bertrand and al., 2007) found that it is possible to identify rhizobial strains to improve plant performance under predicted future CO2 concentrations with no negative effect on nutritive value of perennial alfalfa.. Refernec : Bertrand, A., D. Prévost, F.J. Bigras, R. Lalande, G.F. Tremblay, Y. Castonguay et G. Bélanger. 2007. Alfalfa response to elevated atmospheric CO2 varies with the symbiotic rhizobial strain. Plant and Soil 301: 173-187. (Blondlot Anne, Ouranos)	have removed paragraph
719	82225	7	31	44	31	53	This paragraph repeats the previous paragraph and should be deleted. (Katharine Mach, IPCC WGII TSU)	have removed paragraph
720	82226	7	31	52	31	52	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	have removed paragraph
721	62523	7	32	0	32	0	Section 7.5.1.1.1.:Recent literature from south Asia may be considered. (many references provided along with these comments also deal with the adaptation strategies - for your reference and appropriate integration with the draft). (INDIA)	References to South Asia already included and no additional references included in the comment but we will continue to look for additional references
722	64814	7	32	4	0	0	Section 7.5.1. Potential adaptation improvements that have been evaluated for building adaptive capacity by decision-makers are the economic value of improved meteorological forecasts, in order to know if increasing support to weather forecast systems is important. (See Katz and Ehrendorfer, 2006, Cerdá and Quiroga, 2011). References: (1) Katz, R.W., Ehrendorfer, M. (2006). "Bayesian Approach to Decision Making Using Ensemble Weather Forecasts". Weather and Forecasting, 21, 220-231 (2) Cerdá, E. Quiroga, S. (2010). Economic value of weather forecasting: the role of risk aversion. TOP: An Official Journal of the Spanish Society of Statistics and Operations Research, 19(1), 130-149. (SONIA QUIROGA, UNIVERSIDAD DE ALCALA)	The use of seasonal or other forecasts to adapt to climate change is addressed on page 2, line 14 and page 4, line 6 with several suitable references used already.
723	56900	7	32	4	38	29	I suggest considering the following adaptation measure: Reducing food wastes Some adaptation strategies should aim at reducing the gap between food production and food waste. Reducing wastes can become a powerful adaptation tool to increase food security since roughly 30% to 40% of food is lost as waste, both in developed and developing countries (Godfray et al, 2010). In most developing countries, losses are mainly explained by the lack of transport infrastructure, technical knowledge and storage technology (Stuart, 2009). In developed countries, farm-level losses are much lower, but wastes grow dramatically on other steps of the food chain, e.g., retail, food service, home consumption and municipal residues disposal (WRAP, 2008). Unfortunately, too much unwanted food goes to the landfill. Different strategies can be used to tackle the two types of waste: in developing countries food-chain infrastructure, education, financial mechanisms to avoid farmers selling in the wrong time and best-practice guidelines are necessary to improve post-harvest management and storage. In developed countries, a decrease of the volume of waste produced can be achieved by alerting consumers about the importance of the issue and by spreading strategies (accompanied by legislation) to reduce domestic food losses (Parfitt et al., 2010). Legislation such as that on sell-by-date that has increased food waste should be re-examined (Godfray et al., 2010). Godfray et al. (2010). Food security: The challenge of feeding 9 million people. Review. Science 327: 812-818. Parfitt J, Barthel M, Macnaughton S (2010). Food waste within food supply chains: quantification and potential for change to 2050. Phil. Trans. R. Soc. (B) 365:3065-3081. Stuart, T (2009). Uncovering the Global Food Scandal (Penguin, London, 2009). WRAP (2008). (2008), The Food We Waste. Waste and Resources Action Programme (WRAP), Banbury, UK. (Ernesto Viglizzo, INTA/CONICET)	Food waste is clearly an issue that pertains to food security. So we will ensure that it gets covered in the introduction for this chapter. There is very little literature dealing with waste and adaptation per se. Since the release of the SOD, a new paper by Stathers et al. (2013) has become available and the results will be included in this section.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
724	56901	7	32	4	38	29	I suggest considering the following adaptation measure: Increasing water-use efficiency Due to population growth, the potential water availability decreased from 12900 m3 per capita per year in 1970 to less than 7800 m3 in 2000 (CA, 2007). Food production consumes more than two-thirds of the world extracted water, and food demand is expected to rise by 70 % by 2050 due to population growth. Consequently, the increasing requirement of water for food production is inevitable. Agriculture consumes around 70 % of global extracted water. Animal husbandry is the most water-intensive consumer, is cause of the great water-use disparity between developed and developing countries. The result of this is that world leaders and policy makers must balance the demand from agriculture and industry with the need for sustainable sources of clean water (Gilbert, 2012). Given the declining stocks of freshwater many scientists state that worldwide food security can be achieved by improving the water-use efficiency for food production, or in other terms, by getting more crops per drop, particularly in areas where water could become increasingly scarce due to climate change (Vince, 2010). A number of strategies to improve water use efficiency can be applied according to IAASTD (2009): (i) improve timing and increase the reliability of water supplies, (ii) improve land preparation and fertilizer application to maximize returns per unit of water, (iii) reduce evaporative losses from fallow land, streams and water bodies, (iv) reduce transpiration losses from non-productive vegetation, (v) reduce deep percolation and surface runoff, (vi) avoid losses from salinization and contamination of water bodies, (vii) reallocate water resources to efficient users, (viii) develop storage facilities, (ix) improve irrigation techniques to avoid water waste and deliver drips directly to plant roots, (v) in rainfed farming, improve harvest, storage and temporal transfer of rainfall water through best agronomic practices (Fernandez et al., 2008). CA (2007). Water for food, water for life: A comprehensive assessment of water management in agriculture (CA). Summary. Earthscan, London. Fernandez, R.; Quiroga, A.; Noellemeyer, E.; Funaro, D.; Montoya, J.; Hitzmann, B.; Peinemann, N. (2008). A study of the effect of the interaction between site-specific conditions, residue cover and weed control on water storage during fallow. Agricultural Water Management 95: 1028-1040. Gilbert, N (2012). Water under pressure. Nature 483: 256-257. IAASTD, 2009. Agriculture at the Crossroad: Global Summary for Decision Makers, IAASTD (International Assessment of Agricultural Knowledge, Science and Technology for Development). Island Press, Washington, D.C., www.agassessment.org. www.islandpress.org/iaastd. Vince G (2010). Getting more drops to the crops. Science 327: 800. (Ernesto Viglizzo, INTA/CONICET)	Increased water use efficiency has already been addressed on page 3, line 8 and page 5, line 15 and in a Table replacing Fig 7.7.
725	56902	7	32	4	38	29	I suggest considering the following adaptation measure: Dealing with non linear, abrupt transitions The analysis was mainly focused on increasing warming and increasing GHG concentration in atmosphere and their impact on agricultural production and food security. However, in its current state, this chapter tends to set aside important phenomena connoting abrupt ecosystem transitions like drought, floods and some other extreme climate events that threat food security. I believe that a paragraph considering non-linear episodes in food production in vulnerable ecosystems is quite pertinent. The food security of large arid, semiarid and sub-humid areas across the world is frequently threatened by the occurrence of non-linear events that lead to irreversible degradation (e.g., desertification, salinization). The threat of reaching dangerous “tipping points” is higher in many dry and humid environments setting a risk on food security. (Ernesto Viglizzo, INTA/CONICET)	This is a good point that has been addressed in sections 7.3 and 7.4. The key point to be addressed in this sction of the chapter is in relation to adaptation measures to extremes.
726	80394	7	32	6	32	34	Section 7.5.5.1 and Chapter in general: References to WGI AR5 Chapters and/or SREX currently are rather unspecific (sometimes not even providing the Chapter number or section, e.g., Section 7.2.1) or completely missing. Specific cross-references to the WGI AR5 contribution are essential, please revise accordingly. (Gian-Kasper Plattner, IPCC WGI TSU)	Cross-references amended - these were not finalised as at the time of SOD.
727	82227	7	32	8	32	11	Reference here could be made to the eras of climate responsibility and climate options. Please also note that much of the commitment to future climate change is due more to technological/policy lock-in as compared to past greenhouse gas emissions. (Katharine Mach, IPCC WGII TSU)	Relative emissions addressed via text changes through the inclusion of the words 'and likely greater'
728	82228	7	32	9	32	10	Cross-references should be provided ideally to specific relevant sections of the working group 1 chapters. (Katharine Mach, IPCC WGII TSU)	Cross-references amended - these were not finalised as at the time of SOD.
729	82229	7	32	24	32	24	Please note autonomous adaptation is not in the glossary anymore. (Katharine Mach, IPCC WGII TSU)	Insertion into Glossary through Liyong Xie and more generally via discussions with Chris Field and Adaptation Chapter CLA's.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
730	59973	7	32	26	32	26	This sentence references Howden et al 2010 - there is no such reference currently listed in the chapter references. Reference used again at p 38, line 7 and line 13; p 39 line 36. (AUSTRALIA)	Reference should be: Howden SM, Crimp SJ and Nelson RN (2010) Australian agriculture in a climate of change. In Jubb I, Holper P and Cai W (Eds) Managing Climate Change. CSIRO Publishing, Melbourne. pp 101-111
731	68994	7	32	26	32	30	It is unclear what sort of changes in institutional arrangements and policies are suggested here. It would be worthwhile for readers to expand on this and give some examples of institutional arrangements and policies that can be changed to strengthen adaptation to climate change. (NETHERLANDS)	These sort of changes are given later in the section (e.g. 7.5.1.1.3). To insert them here interrupts the flow of the text.
732	61176	7	32	27	32	32	Not only are new technologies and infrastructure required for effective adaptation but also information and advice delivery at local scales. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Good point. Text included on p 32, line 30.
733	59974	7	32	32	31	53	These two paragraphs are repeated with the only apparent difference being a reference to figure 7-4. Once should be deleted. (AUSTRALIA)	It seems like the incorrect page and line numbers have been inserted.
734	65855	7	32	37	0	0	Section 7.5.1.1.1- In tropical regions, such as in Brazil, sugar cane can be planted using inter-cropping techniques in agricuture. Unlike corn, sugar cane takes one year to grow, therefore can be planted at the same time (intercropping) as short-term vegetables, fruits and grains, thus increasing food production, through agro management. There should be no competition of food versus ethanol. (Milton Nogueira da Silva, Climate Change Forum of Minas Gerais, Brazil)	Intercropping has been introduced into the text.
735	70389	7	32	47	32	51	This sentence is too focussed on northern-temperate regions. In the many parts of the world where crops are grown in the cooler months, higher temperatures will accelerate crop development and possibly also the onset of summer drought, so shortening the growing season. Changing planting date is still a frequently identified option (Andrew Moore, CSIRO)	The text makes no reference to which hemisphere and the studies referred to are drawn from several continents. The suggested text relating to end of season drought included.
736	61177	7	32	47	32	54	bias references - Deryng et al., 2011, which shows adapting planting dates and crop cultivars to climate change could trim crop yield losses by 18-7% globally. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	The Deryng et al. 2011 study is included in the meta-analysis. It is not required dto include every reference on a topic. And this point already has 14 references.
737	59060	7	32	47	33	17	Here may add some notion that risks with extreme weather on crop damage would incraese in the marginal climate region where extended cropping area expected. For examplew by a cold or frozen event in high latitude area exeriencing warming for more cropping lands. (Genxing Pan, Nanjing Agricultural University)	This point is covered on page 33, line 1 and is partly addressed by inclusion of the end of season drought point above.
738	68995	7	32	47	33	17	Changing planting dates is indeed an often identified option, but usually based on crop simulation models. As crop simulation models are most often used for climate change impact studies on agriculture, and changing planting dates is one of the few adaptation options that can be simulated, it is often studied. However, also for the past models may simulate higher yields with earlier planting dates, but despite this, planting dates have not been adapted yet. In an unplublished study related to Reidsma et al. (2009, Ag. Sys. 100: 51-60), simulations with WOFOST in Europe showed that the effect of earlier planting was similar for 1975, 2000 and 2050. Most studies only show the effect for the future, mentioning that it is an dapatation to climate change, but it can be argued it is not an adaptation to climate change, but an adaptation to climate and other assumed conditions in the model in general. Van Oort et al. (2012, Europ. J. Agronomy 40: 102– 111) showed that farmers may not be able to adjust sowing dates because of climatic and other conditions not accounted for in models. (NETHERLANDS)	Thankyou for the reference and the points. Text reflecting the preferences for planting into appropriate seedbed conditions has been inserted on page 33, line 2
739	72586	7	32	50	32	51	Van de Giesen et al. 2008 not in refs (2010 is..) Tingem and Rivington 2010 not in refs (2009 is...) (UNITED STATES OF AMERICA)	References have been included. Thanks.
740	70390	7	32	53	32	53	Passioura and Angus 2010 (Andrew Moore, CSIRO)	Reference corrected
741	72587	7	33	1	0	0	The section of the sentence stating ....."and to avoid late season frosts" This sentence and the follow-up sentence focus on early sowing whichis questionable. Are the authors talking about "late in the (planting season) frosts" or are they talking about "late (spring) frost"? Recommend the authors make the language more articulate. (UNITED STATES OF AMERICA)	Changed to 'late spring frosts' to be more specific.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
742	62524	7	33	1	33	17	Elevated CO2 may cause necessity of higher fertilizer inputs, particularly in low management/ input situations for reaping the benefits of CO2 fertilization. (INDIA)	Whilst this is a legitimate consideration, it was covered in the AR4 and no significant change in understanding has arisen since and insertion into the text here is problematic given space constraints.
743	82230	7	33	7	33	7	In supplying this cross-reference, the chapter team should ideally reference the specific relevant chapter sections within the working group 1 report. (Katharine Mach, IPCC WGII TSU)	Cross reference expanded
744	82231	7	33	10	33	11	To maximize directness of wording, all uncertainty language could be placed within parentheses at the end of the sentence. (Katharine Mach, IPCC WGII TSU)	This is a matter of style and readability - the mid-sentence insertions are used to make the material more readable. In most cases, we will move the uncertainty language but a few instances it works better when inserted at a different point in the sentence..
745	63536	7	33	14	33	17	It is not clear what is meant by "…care is needed to ensure that the provision of forecast does not increase existing inequities in farming or fishing communities." What is the relation between forecast and inequity? (GERMANY)	Text replaced with additional references to make the point.
746	56260	7	33	15	0	0	Here we could cite Roudier et al. (2012) and Sultan et al. (2010) as two studies showing the benefits of integrating climate forecast for agriculture in the Sahel. The references are: "Roudier P., Sultan B., Quirion P., Baron C., Alhassane A., Traoré S. and B. Muller (2012) An ex-ante evaluation of seasonal forecasting for millet growers in SW Niger, International Journal of Climatology, doi: 10.1002/joc.2308." and "Sultan B., B. Barbier, J. Fortilus, S.M. Mbaye and G. Leclerc (2010) Estimating the potential economic value of the seasonal forecasts in West Africa: a long-term ex-ante assessment in Senegal, Weather, Climate and Society, 2, 69–87." (benjamin Sultan, IRD)	The Sultan et al. (2010) reference has been used.
747	72588	7	33	15	0	0	Cooper et al. 2008 not in refs (2009 is.. (UNITED STATES OF AMERICA)	Reference corrected
748	65876	7	33	19	0	0	Figure 7-8 On which studies is this figure based? (Eline Vanuytrecht, KU Leuven)	The studies used are now listed in the relevant figure captions.
749	68996	7	33	19	33	22	This figure 7-8 is only based on crop simulation models, and therefore includes only a selected number of adaptation options. Although it may be difficult to estimate yield impacts of many other adaptation measures, it is still relevant to include them in a figure, to get a good overview. Studies like Iglesiaset al. (2012, Climatic Change 112: 143–168), Olesen et al., (2011, European Journal of Agronomy 34: 96–112), Schaap et al. (2013, European Journal of Agronomy 48: 30-42) and many earlier studies can be used as a basis. (NETHERLANDS)	This is a good point and some of these references are used already. Also there are several mentions of adaptations already in the chapter that are sourced without modelling and via stakeholder engagement processes. The figure arose from a meta-analysis of several thousand data points.
750	71310	7	33	24	0	31	The authors could also consider how substrate could limit a poleward expansion of cropping activities. For example, the substrate in much of northern Canada is based on preCambrian shield rocks and is not arable. (CANADA)	Thanks, the point has been included
751	66164	7	33	24	33	31	Replacing cultivars of shorter term with cultivars with longer term. Sowing and transplanting earlier in the spring as climate warming. Cropping area expands to further north and higher region. Multicropping index could be increased. Using varieties with less demand of vernalization and weaker cold hardiness as winter warming. (Dawei Zheng, China Agricultural University)	These points are largely already explicitly addressed in the chapter.
752	66202	7	33	24	33	31	Replacing cultivars of shorter term with cultivars with longer term. Sowing and transplanting earlier in the spring as climate warming. Cropping area expands to further north and higher region. Multicropping index could be increased. Using varieties with less demand of vernalization and weaker cold hardiness as winter warming. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	These points are largely already explicitly addressed in the chapter.
753	62525	7	33	33	33	41	Increased number of low-temperature days due to increased climatic variability also may cause problem for crop production in some regions of South Asia. (INDIA)	We agree with the broad proposition but this needs a reference and a literature search has not revealed one so far.
754	61178	7	33	36	33	38	It is important to emphasise the necessity of securing a large variety of genes to ensure food security in an unpredictable future. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	This point is already covered in that paragraph. The word 'extensive' has been used to emphasise the point.
755	72589	7	33	38	0	0	Wassman et al. 2008 not in refs..only 2009 (UNITED STATES OF AMERICA)	Reference corrected
756	68997	7	33	40	33	41	This reference is not complete and therefore inaccessible. (NETHERLANDS)	Reference corrected.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
757	59061	7	33	43	33	54	I strongly recommend to add a notion that increasing soil organic carbon helps to increase stability of crop yield against climate fluctuations, for example of China. Pan G, Smith P, Pan W. 2009. The role of soil organic matter in maintaining the productivity and yield stability of cereals in China. Agriculture, Ecosystems and Environment,129, 344-348. (Genxing Pan, Nanjing Agricultural University)	Text removed for space saving
758	59368	7	33	43	34	3	In the section on climate change adaptation regarding soil/cropping systems it is extremely important to give more emphasis on carbon addition on degraded soils. IPCC should make the point that carbon/organic matter ammendments to soil is the key action to restore soil functions such as biomass production, carbon sequestration, water transformation and filtration and below ground biodiversity and thus prepare regions for climate change adaptation. There is a huge list of literature on this subject epitomized by the UNEP 2012 Year Book chapter on "The Benefits of Soil Carbon" (chapter 2, pages 19-33). Other literature on the subject is the published work og the EU FP7 SoilTrec project listed below (Banwart, 2011; Banwart et al., 2011 and 2012; Stamati et al., 2013; Nikolaidis 2011). Part of the action that would require major adaptation is closing the nutrient gap between urban and peri-urban areas. This means that we need to redirect society towards complete recycling of organic matter and returning it back to the soil. 1. Banwart S., 2011. Save our soils, NATURE Comment, 474, 151-152. 18. 2. Banwart S., S. Bernasconi, J. Bloem, W. Blum, M. Brandao, S. Brantley, F. Chabaux, C. Duffy, L. Lundin, P. Kram, N.P.Nikolaidis, M. Novak, P. Panagos, K. V. Ragnarsdottir, B. Reynolds, S. Rousseva, P. de Ruiter, P. van Gaans, W. van Riemsdijk, T. White, B. Zhang, 2011. Assessing Soil Processes and Function across an International Network of Critical Zone Observatories: Research hypotheses and experimental design, Vadose Zone Journal, 10, 978-987. 3. Banwart SA, Bernasconi S, Bloem J, Blum W, de Souza DM, Chabaux F, Duffy C, Lundin L, Kram P, Nikolaidis N, Novak M, Panagos P, Ragnarsdottir KV, Reynolds B, Robinson D, Rousseva S, de Ruiter P, van Gaans P, Weng L, White T, Zhang B. (2012) Soil Processes and functions across an International Network of Critical Zone Observatories: introduction to experimental methods and initial results. Comptes Rendu Geosciences, 344, 758-772. 4. Stamati F., N.P. Nikolaidis, J.L. Schnoor. 2013. The role of soil texture on carbon and nitrogen sequestration in agricultural soils of different climates. Agriculture, Ecosystems and Environment, 165, 190-200. 5. Nikolaidis, N.P, 2011. Human Impacts on Soil: Tipping Points and Knowledge gaps, Applied Geochemistry, 26, S230-S233. 6. Nikolaidis, N.P. and G. Bidoglio, 2013. Soil Organic Matter Dynamics and Structure, Sustainable Agriculture Reviews, 12, 175-200. (Nikolaos Nikolaidis, Environmental Engineering, Technical University of Crete, Greece) (GREECE)	Text removed for space saving
759	70391	7	33	49	33	51	The claim that "Increasing soil organic carbon levels plays an important role for improved water retention and absorption capacity of soils" needs to be critically evaluated before it is included in this Report. There is no doubt that higher soil organic matter levels increase the water-holding capacity of soil; but it is debatable whether the claim that this is *important* is well-justified by the literature. El-Hage et al 2010 assert "In organic systems, the water retention and drainage capacity of the ecosystem is enhanced" - without citation - and "Soil organic matter has positive effects on the water-capturing capacity of the soil" - again, without citation. Smith and Oleson (2010) write "...improving soil water holding capacities through adding crop residues and manure to arable soils or by adding diversity to the crop rotations", citing Mäder et al (2002, doi:10.1126/science.1071148). I can find nothing about soil water retention in the Mäder et al paper. A modelling study that I have done (presented as a poster at the 2010 European Society of Agronomy meeting) strongly suggested that for cropping systems across Australia, the effects of increased soil carbon on the soil water holding capacity had only minor effects on crop yield. Essentially, the depth to which SOC change could affect water retention was so small that even 50% increase in SOM had insignificant impacts on PAWC - and further, the increase in water storage was near the surface, where it was vulnerable to evaporative losses. In high-runoff environments, increased infiltration capacity might play a role but it was not apparent in my work. Effects of higher SOM on the N cycle were, of course, large and important. (Andrew Moore, CSIRO)	Text removed for space saving
760	72590	7	33	51	33	0	There must be a brief discussion on agronomic effects of enhancing soil organic carbon pool in the root zone on increase in crop yields (kg/ha/Mg of soil organic carbon). The yield response would depend on the threshold level of soil organic matter in relation to soil quality. Establishing the link with agronomic productivity through improvements in water retention, nutrient availability etc is important. There should be supporting references provided. (UNITED STATES OF AMERICA)	Text removed for space saving
761	63537	7	33	52	33	52	To be added "compost, farm yard manure and digested residues" (GERMANY)	Text removed for space saving
762	82232	7	33	54	33	54	It would be preferable to more specifically cross-reference the relevant chapters of the working group 3 contribution. (Katharine Mach, IPCC WGII TSU)	Text removed for space saving
763	82233	7	33	54	34	3	To maximize directness of wording, all calibrated uncertainty language could be placed within parentheses at the end of the sentence. (Katharine Mach, IPCC WGII TSU)	Text removed for space saving

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
764	62526	7	34	1	34	3	Results from studies from South Asia may be included. (INDIA)	References unfortunately not provided and a search has not revealed additional studies so unable to respond directly.
765	72591	7	34	2	34	3	It seems misleading to speak about irrigation optimisation increasing yields by only about 4% without mentioning that optimising irrigation (conserving water) has benefits food security by contributing to the sustainability of the resource base, which in turn contributes to food security in the long term. (UNITED STATES OF AMERICA)	Thanks. Text added to make this point.
766	77833	7	34	4	0	0	A paragraph should be added to explain the role of ecological engineering and agroforestry as adaptive means for crop production. There are a good series of papers of this. (Liette Vasseur, Brock University)	This is added as a possible adaptation - but as one among several.
767	61179	7	34	5	34	5	As farms can diversify into on or off farm activities it should be made clear as to what type of other activities are being referred to. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	This is a huge potential list and will be very contextual. Due to space constraints, this is not attempted.
768	78693	7	34	5	34	14	However in Europe specialisation seems to continue in livestock production especially in eastern Europe (e.g. Poland) where small or medium mixed farms are replaced by large farms, partially with the help of Eum structural aids, in order to increase competitiveness. In old EU member countries such Denmark, large farms have been enlarging even further for decades, leading to highly specialised production areas. Policy and market developments such as milk quota abolition will most likely lead to even larger and more specialised farms tha before, and especially in areas where farms are already large (Kempen et.al.2011, Journal of Policy Modelling). Hence one should remember that large specialised farms often in intensive production areas are still typical trends in Europe and developed countries, and major conventional means of maintaining economic viability. (Heikki Lehtonen, MTT Agrifood Research Finland)	This trend has been happening in many parts of the world - usually with little reference to climate factors. The purpose of this assessment is to assess the implications of climate factors.
769	68998	7	34	6	34	6	reference should be Reidsma and Ewert (2008), and is missing from reference list (NETHERLANDS)	Reference corrected in text
770	68999	7	34	9	34	13	The study of Seo (2010) is cited to say something about changes in revenues of different farm types. This study was criticized however by Rufino et al. (2011, Food Policy 36(3): 452-454), arguing that it cannot be assumed that smallholder farmers in Africa are profit maximizers. Studies may be peer reviewed, but their quality should still be checked. (NETHERLANDS)	Thanks. Text modification made
771	82234	7	34	20	34	20	The recommended citation format should be used for this cross-reference to the 4th assessment report. (Katharine Mach, IPCC WGII TSU)	Citation format fixed
772	82235	7	34	34	34	34	To maximize directness of wording, all uncertainty language could be placed within parentheses at the end of the sentence. (Katharine Mach, IPCC WGII TSU)	Location of wording addressed
773	69000	7	34	42	40	44	"a considerable opportunity cost may arise". It is unclear what opportunity costs this refers to and how the incremental nature of current research would logically imply considerable opportunity cost. Please clarify this reasoning and provide an explanation of the trade-off involved. (NETHERLANDS)	A few additional words have been added to explain that an opportunity costs can airse if adaptation not done well.
774	69001	7	34	43	34	44	Starting from "Consequently" is not very clear and reference Challinor et al. is not yet published, therefore, the article remains unverifiable. (NETHERLANDS)	The word 'consequently' is a logical connection. It says that only a small subset of possible adaptations have been assessed and consequently, the benefits of adaptation may be understated. The second part of the sentence has been removed.
775	59369	7	34	49	35	16	As an adaptaption strategy and in order to overcome the adverse impacts of livestock grazing to grassland and prairie ecosystems it is important to promote the combined agriculture-livestock raising under controlled conditions where the recycling of organic matter would be conducted in a strategic way to account for the fertilization of the fields without the adverse effects of livestock grazing. 1. Stamati F., N.P. Nikolaidis, D. Venieri, E. Psillakis, and N. Kalogerakis, 2011. Dissolved organic nitrogen as an indicator of livestock impacts on soil biochemical quality. Applied Geochemistry, 26, S340-S343. (Nikolaos Nikolaidis, Environmental Engineering, Technical University of Crete, Greece) (GREECE)	The option of strategic grazing has been covered with appropriate references.
776	69002	7	34	50	34	50	Referencing is needed for this relevant sentence. (NETHERLANDS)	Reference included
777	82236	7	34	51	34	51	To maximize directness of wording, "high confidence" could also be placed within parentheses at the end of the sentence. (Katharine Mach, IPCC WGII TSU)	This does not enhance readability in this instance.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
778	70392	7	35	4	35	4	The reference to Moore and Ghahramani (2013) here is not to the conference paper given in teh reference list, nor to the paper that should be cited at page 19 line 30, but to a 3rd paper that is now in press: Moore AD, Ghahramani A (in press) Climate change and broadacre livestock production across southern Australia. 3. Adaptation options via livestock genetic improvement. Animal Production Science (Andrew Moore, CSIRO)	Paper is now published: Moore AD, Ghahramani A (2013) Climate change and broadacre livestock production across southern Australia. 3. Adaptation options via livestock genetic improvement. Animal Production Science: http://dx.doi.org/10.1071/AN13052
779	70393	7	35	4	35	4	The paper cited as Ghahramani and Moore (2013) was rejected by Crop and Pasture Science. A revised version will very shortly be re-submitted. Some of the material in it will be also covered in an oral paper to the International Grassland Congress. (Andrew Moore, CSIRO)	Paper is now published: Moore AD, Ghahramani A (2013) Climate change and broadacre livestock production across southern Australia. 3. Adaptation options via livestock genetic improvement. Animal Production Science: http://dx.doi.org/10.1071/AN13052
780	66165	7	35	18	35	24	For indoor livestock, shading, spraying and ventilation to avoid heat stress. (Dawei Zheng, China Agricultural University)	Reference to spraying included
781	66203	7	35	18	35	24	For indoor livestock, shading, spraying and ventilation to avoid heat stress. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	Reference to spraying included
782	72592	7	35	20	0	0	Seo et al 2008 not in refs. (UNITED STATES OF AMERICA)	Reference has been corrected.
783	64798	7	35	20	35	22	The sentence here is too limited. There are a wide range of synergies and tradeoffs, such as animal welfare, that go far beyond productivity alone (Nardone A, Ronchi B, Lacetera N, Ranieri MS, and Bernabucci U. 2010. Effects of climate changes on animal production and sustainability of livestock systems. Livestock Science 130:57-69. De Boer IJM, Cederberg C, and Eady S et al. 2011. Greenhouse gas mitigation in animal production: towards an integrated life cycle sustainability assessment. Current Opinion in Environmental Sustainability 3:423-31). (Geoffrey Evans, Humane Society International)	Thanks for the suggestion. Text included to address welfare and other aspects.
784	61180	7	35	24	35	24	The mentioning of housing and feed stocks has no relevance. There should be an explanation as to how it is relevant if it is. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	This statement is important to add balance for a couple of reasons 1) to demonstrate that not all impacts are negative and adaptations need to address this and 2) to contrast cool climate responses to warm climate responses. The relevance to the paragraph is clear so we have made minor changes to emphasise this point.
785	77834	7	35	27	0	0	7.5.1.13: this section should have included some setences about storm surges. In many cases they are the most challenging issues for both capture fisheries and aquaculture. (Liette Vasseur, Brock University)	A valid comment - the problem is now addressed in this section.
786	82237	7	35	27	0	0	Section 7.5.1.1.3. The chapter team should ensure consistency of all material here with the final key findings in chapter 6 and 30. (Katharine Mach, IPCC WGII TSU)	Cross-chapter references have been used where appropriate.
787	64484	7	35	29	35	30	7.5.1.1.3. How does this statement match the earlier ones that mostly indicate increases in fisheries with climate change? These sections need to be balanced and also with the assessments of stocks as in chapters 6 or 30 or FAQ 7.3. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	The increases in fisheries that are predicted as a result of climate change will be increases against the pre-climate change baseline. As the statistics reported here indicate, in many cases that baseline will have been in relation to over-exploited or fully-exploited resources. There is therefore no inconsistency here.
788	66166	7	35	29	36	7	For fish pond, using aerator to avoid suffocation of fish caused by hot night, decreasing density of fish and quantity of bait input. As water temperature increases, fish krill could be put into pond earlier in the spring and close later in the autumn. (Dawei Zheng, China Agricultural University)	Noted but these adaptation actions would also have costs associated with them. Notwithstanding this, the comment does not provide references to these statements which would justify their inclusion.
789	66204	7	35	29	36	7	For fish pond, using aerator to avoid suffocation of fish caused by hot night, decreasing density of fish and quantity of bait input. As water temperature increases, fish krill could be put into pond earlier in the spring and close later in the autumn. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	Noted but these adaptation actions would also have costs associated with them. Notwithstanding this, the comment does not provide references to these statements which would justify their inclusion.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
790	72593	7	35	36	0	0	Welcomme et al. 2010 not in refs (UNITED STATES OF AMERICA)	An alternative reference is now used and has been included in the reference list.
791	61181	7	35	41	35	46	Listing of adaptive responses to climate change for fisheries. Bring through to TS and or SPM (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Noted and this suggestion has been brought to the attention of the lead authors of those summaries.
792	64485	7	35	46	35	46	7.5.1.1.3. chapter 6 reference correct? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Cross-references have been updated.
793	65719	7	36	0	0	0	General Comments: In adapting to climate change, fisheries management should take into consideration whether species are retreating or advancing poleward when setting up quotas and other management interventions. A more precautionary approach needs to be adopted in species which are at equatorward range edges (i.e. Cod in North Sea) than those that are expanding poleward (e.g. Sardine and Anchovies in English Channel and North Sea). Reduction in spawning biomass renders species more likely to be at risk of mis-match with seasonal production cycles in cold-temperate regions (older work by Cushing, 1976, recent work by Beaugrand et al 2003.) Cushing DH, Dickson RR. 1976. The biological response in the sea to climatic changes. Advances in Marine Biology 14: 1-122. Beaugrand G, Brander KM, Lindley JA, Souissi S, Reid PC. 2003. Plankton effect on cod recruitment in the North Sea. Nature 426: 661-664. (STEPHEN HAWKINS, UNIVERSITY OF SOUTHAMPTON)	The references provided here pre-date AR4 and are therefore not providing new information for AR5. The explanation in this comment of how management needs to respond to the migration changes is simple and clear but goes into a level of detail that is not possible in the limited space available.
794	72594	7	36	3	36	6	Missing in refs: FAO 2009a; Daw et al. 2009 (UNITED STATES OF AMERICA)	Reference has been added.
795	64486	7	36	7	36	7	7.5.1.1.3. this is now in 30.6.2.1.1 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Cross-references have been updated.
796	69003	7	36	9	36	10	The message is misleading. Aquaculture is a very small subsector in the food economy; relate its rate of growth to the one of global population is conceptually weak and can pass the false message that its aquaculture will feed the world. Simply skipping the connection with global population will avoid misunderstanding. (NETHERLANDS)	The item has been deleted.
797	66167	7	36	9	36	31	For capture fisheries on the sea, in order to avoid over capture, closed fishing season should be set up and input of krill is necessary. In the typhoon season, early warning is need. (Dawei Zheng, China Agricultural University)	These points provide partial solutions in some cases but could not be presented as primary responses to addressing future problems , other than early warning systems which are referred to in this section .
798	66205	7	36	9	36	31	For capture fisheries on the sea, in order to avoid over capture, closed fishing season should be set up and input of krill is necessary. In the typhoon season, early warning is need. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	These points provide partial solutions in some cases but could not be presented as primary responses to addressing future problems , other than early warning systems which are referred to in this section .
799	64902	7	36	34	37	5	Suggest including Altieri, M et al.(in press) "The Adaptationa nd Mitigation Potential of Traditional Agriculture in a changing Climate" In Journal of Climatic Change Special Issue on Climate Change Mitigation and Adaptation with Local Communities and Indigenous Peoples (Ameyali Ramos Castillo, United Nations University - Institute of Advanced Studies)	Thanks to the reviewer for this reference. However, the point has been made in the references listed - which are not intended to be exhaustive.
800	66168	7	36	36	36	51	Using indigenous knowledge: In north China, farmers choose different sowing technique depending on soil moisture and drought situation e.g. earlier sowing, sowing after pressing, furrow sowing, deep furrow sowing, sowing after little irrigation in the hole and so on. GUO Hong, ZHANG Limin, WEI Lijun et al., Study on the improvement of water-saving and ant-i drought seed-sowing machine. Journal of Changchun University of Technology (Natural Science Edition), 2005, 26(4):289-292 Zheng Dawei, Anti Drought Based on Scientific Principles---A Case Study on Combating Drought and Protecting Wheat in 2009. JOURNAL OF CATASTROPHOLOGY. 2010,25(1):7-12 (Dawei Zheng, China Agricultural University)	This does not appear to align with the use of the term 'indigenous knowledge' that is being used in this section.
801	66169	7	36	36	36	51	In hilly areas of Sichuan Province, farmers have changed the cropping system from rice pad relying collected winter rain into dryland rotation of winter wheat, spring maize and summer sweet potato since early 1980s to cope with drier winter and hotter summer. The annual yield is much more than the old cropping system. (Dawei Zheng, China Agricultural University)	Difficult to respond to as no reference provided and a literature search did not come up with a study.
802	66206	7	36	36	36	51	Using indigenous knowledge: In north China, farmers choose different sowing technique depending on soil moisture and drought situation e.g. earlier sowing, sowing after pressing, furrow sowing, deep furrow sowing, sowing after little irrigation in the hole and so on. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	This does not appear to align with the use of the term 'indigenous knowledge' that is being used in this section.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
803	66207	7	36	36	36	51	In hilly areas of Sichuan Province, farmers have changed the cropping system from rice pad relying collected winter rain into dryland rotation of winter wheat, spring maize and summer sweet potato since early 1980s to cope with drier winter and hotter summer. The annual yield is much more than the old cropping system. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	Difficult to respond to as no reference provided and a literature search did not come up with a study.
804	59370	7	36	36	37	5	AR5 should emphasize that agro-ecological practices in agriculture is the ticket to restore degraded land, increase soil functions and increase food production especially in areas where the climate change impacts would be most adverse. (Nikolaos Nikolaidis, Environmental Engineering, Technical University of Crete, Greece) (GREECE)	Difficult to respond to as no reference provided. This perspective is subject to significant debate.
805	69004	7	36	36	37	5	The focus is on indigenous knowledge in developing countries, but also in developed countries stakeholder knowledge can contribute to estimate impacts and design adaptation measures (e.g. Schaap et al. 2013, European Journal of Agronomy 48: 30-42). (NETHERLANDS)	The paper referred to does not mention indigenous or traditional knowledge.
806	72595	7	36	38	0	0	Ford 2009 missing in refs (UNITED STATES OF AMERICA)	Reference addressed.
807	64903	7	36	53	37	2	Consider revising - the way this phrase is currently written suggests that it is desireable to reduce the reliance on TK when the pragraph above (and the pragraph on pg 40, line 20-23) suggests that TK has been successful in helping IPs adapt to climate change. (Ameyali Ramos Castillo, United Nations University - Institute of Advanced Studies)	Thanks. The material has been rephrased.
808	82238	7	36	54	36	54	"medium confidence" should be italicized, and it could be placed within parentheses at the end of the sentence to maximize directness of wording. (Katharine Mach, IPCC WGII TSU)	Phrase removed
809	82239	7	37	2	37	5	"medium confidence" could be placed within parentheses at the end of the sentence to maximize directness of wording. (Katharine Mach, IPCC WGII TSU)	Phrase removed.
810	69005	7	37	13	37	14	Battaglini et. al 2009 article specifically deals with winegrowers in France, Germany and Italy: the results from the questionnaire distributed to winegrowers only a "majority of German growers said they would consider changing varieties to adapt to warming temperatures, while only a minority of the Italian and French growers said they would consider such changes" (Battaglini et al. page 62). It is recommended to find more substantial bibliography otherwise the sentence would remain a generalization or just a refence valuable for wine lovers of the three mentioned. On this regard at page 39 lines 33 -43 it is also mentioned the case of Australia winegrowers and the possibility to move to cooler regions (refence Park et al. 2012). (NETHERLANDS)	The sentence has been recast.
811	70792	7	37	15	0	0	*Observation: Many more examples of adaptation exist than seems to be implied here. Suggest adding Galloway McLean (2010) and Nakashima et al (2012) to this list of references. *References: Galloway McLean, K (2010). Advance Guard: Climate Change Impacts, Adaptation, Mitigation and Indigenous Peoples – A Compendium of Case Studies. United Nations University – Traditional Knowledge Initiative, Darwin, Australia, pp. 124. | Nakashima, D.J., K. Galloway McLean, H.D. Thulstrup, A. Ramos Castillo, and J.T. Rubis (2012). Weathering Uncertainty: Traditional Knowledge for Climate Change Assessment and Adaptation. UNESCO and UNU, Paris and Darwin, 120pp. (Kirsty Galloway McLean, United Nations University - Institute of Advanced Studies)	Thanks to the reviewer for these references. However, the point has been made in the references listed - which are not intended to be exhaustive.
812	65875	7	37	22	37	43	It is worth mentioning here that farmers are not often likely to adopt cultivars with higher temperature requirements (which have a longer growing period, thus more radiation interception, thus a higher potential for biomass production) and/or shift sowing dates. Even if the adoption of these measures have been shown to be beneficial and have been adopted already in some regions, farmers behave risk-adverse when they fear early/late frosts or extreme events in longer/altered growing seasons. (Eline Vanuytrecht, KU Leuven)	In many regions these sorts of adoptions have indeed occurred. This does not remove the need for such innovations to be assessed against desirable characteristics such as risk of damage. The issue of risks, costs and benefits has already been raised in the text.
813	82240	7	37	38	37	39	"high confidence" could be placed within parentheses at the end of the sentence to maximize directness of wording. (Katharine Mach, IPCC WGII TSU)	Text altered.
814	61182	7	37	48	38	3	this section is missing risk of increasing N2O emissions due to additional N fertiliser use (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	This point has already been raised in p37, line 51 and a cross reference made to WGIII Chapter 11 where such emissions are dealt with
815	72596	7	38	2	0	0	Phosphorus is immobile in most soils, hence leaching of P is rare -- more likely to be lost through erosion. Suggest changing sentence to read " ...reduce soil erosion (and loss of nutrients, such as phosphorus) and reduce leaching of mobile nutrients such as nitrogen...." (UNITED STATES OF AMERICA)	This point has now been addressed

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
816	69006	7	38	5	38	16	For the Netherlands, a study on farm structural change was performed, showing that climate change has relatively small impacts on farm structural change (Mandryk et al. 2012, Landscape Ecology 27: 509-527). (NETHERLANDS)	Reference and point included
817	66208	7	38	5	38	19	In order to reduce volatilization loss of fertilizer, slow release fertilizer and combining organic fertilizer is extended now. Dressing should avoid hot time. (Yinlong Xu, Institute of Environment and Sustainable Development in Agriculture (IEDA), Chinese Academy of Agricultural Sciences (CAAS))	These are incremental changes - the paragraph deals with systemic and transformational changes.
818	82241	7	38	6	38	6	"medium confidence" could be placed within parentheses at the end of the sentence to maximize directness of wording. (Katharine Mach, IPCC WGII TSU)	Text changed,.
819	69007	7	38	7	38	7	Howden et al (2012) is missing from the reference list (NETHERLANDS)	The reference has been included.
820	70394	7	38	14	38	14	I suggest taking advice from the authors of the relevant papers as to whether the peanut industry is a good example here. As I understand it, the business that was attempting to re-locate has abandoned the attempt. (Andrew Moore, CSIRO)	The text has been changed to address.
821	69008	7	38	20	38	22	Also in Schaap et al. (2013, European Journal of Agronomy 48: 30-42) a cost-benefit analysis was performed together with engagement with farmers to design adaptation strategies. (NETHERLANDS)	That paper dealt with incremental changes - this paragraph deals with systemic and transformational changes.
822	82242	7	38	23	38	23	It would be preferable to provide specific cross-reference to the relevant chapters of the working group 3 contribution. (Katharine Mach, IPCC WGII TSU)	Cross-references included
823	65856	7	38	32	0	0	Section 7.5.2 Food cases. The University of Vicosa, Brazil, has analysed several cases of interaction between food systems, climate change, land use, and water. Please contact Professor Justino. (Milton Nogueira da Silva, Climate Change Forum of Minas Gerais, Brazil)	Two of these case studies have been removed
824	72597	7	38	32	39	44	Most of this section on Food Case studies is weak; it is anecdotal and lacking in peer--reviewed sources. Case 1 and Case 4 are acceptable, but strongly suggest deleting Case 2 (one source) and Case 3 (one CARE public relations source). (UNITED STATES OF AMERICA)	Two of these case studies have been removed
825	72598	7	38	32	39	44	This section is quite weak and is much better reviewed in Ch 9, Rural Areas. Perhaps remove and point to Ch 9 for the overview (UNITED STATES OF AMERICA)	Two of these case studies have been removed
826	58848	7	38	34	39	44	We recommend making a reference to MERET, a successful food security project with and adaptation component in Ethiopia. Suggested text includes: "A joint venture between the Ethiopian government and WFP, the MERET programme gets chronically food-insecure communities involved in environmental rehabilitation and sustainable income- generating activities that improve livelihoods. Under MERET, chronically food-insecure communities participate in environmental rehabilitation and income generating activities designed to improve livelihoods through the sustainable use of natural resources to support adaptation to climate impacts. Its primary objective is to build resilience to climate-related shocks and food price volatility. "In the past 5 years alone, MERET has reached 1.7 million beneficiaries in over 500 communities. According to a mid-term evaluation conducted in 2009, MERET has contributed to the rehabilitation of over 400,000 hectares of degraded lands. A cost-benefit analysis made in 2005 showed that economic and financial rates of return exceeded 12% from the assets created and soil fertility restored, with evident impacts in food production, rural income generation and livelihoods. Food security in the targeted areas was reduced by 40%, while 80% of interviewees reported being better able to cope with shocks and stress. Increased resilience will gradually allow communities to phase out from food assistance." References: WFP and SDC (2011) Building Resilience: Bridging Food Security, Climate Change Adaptation and Disaster Risk Reduction. Rome: WFP/SDC. (Carlo Scaramella, World Food Programme)	Two of these case studies have been removed. We looked at the MERET project early on and it was a close alternative as it looks like it is a great project. However, the writing team decided to persist with the existing case study.
827	61183	7	38	38	38	54	This example is very interesting but if land scarcity and new market opportunities are the primary factors rather than climate is it the best example to give? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Two of these case studies have been removed
828	69009	7	39	8	39	12	Migration of people is not a strategy, but rather a necessity more likely determined by serious condition that by cold calculation. The entire period has to be re-phrased in a way not to mix up determinants and consequences. (NETHERLANDS)	This was reporting what the key study said. Migration can be a strategy which can be driven by a range of factors. The text has been kept.
829	69010	7	39	33	39	44	This section on transformational adaptation may be a good example, but it should be noted that farming systems constantly change, also in respons to other factors like markets, technological development and policy. Although it differs per region, it can be argued that in general other drivers are stronger than climate change (e.g. Hermans et al. 2010, Ecological Modelling 221: 2177-2187; Mandryk et al. 2012, Landscape Ecology 27: 509-527) (NETHERLANDS)	The case study has been removed.
830	70395	7	39	38	39	39	I suggest taking advice from the authors of the relevant papers as to whether the peanut industry is a good example here. As I understand it, the business that was attempting to re-locate has abandoned the attempt. (Andrew Moore, CSIRO)	The case study has been removed.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
831	62767	7	39	47	0	0	Descriptions of Sections 7.5.3 and 7.6 are both too conceptual to understand. Please involve a few of example with referring as same as Chap.24. (Motoki Nishimori, National Institute for Agro-Environmental Sciences)	This is intended to be a summary section - not suited to detailed examples. The section will be further edited.
832	72599	7	39	49	39	54	The authors state that some adaptations are more effective than others. Please summarize here which adaptation measures are expected to be most important or characterize our understanding in more detail. (UNITED STATES OF AMERICA)	Relative effectiveness of adaptations is very context specific. There is no global summary of the relative effectiveness as requested here. We attempt this for cropping systems in Table 7.2. Where some relativities of adaptations can be assessed, they are addressed in the main text of 7.5 in association with Table 7.2.
833	72600	7	39	51	39	52	Stating that irrigation optimisation is less beneficial than cultivar adaptation is not helpful and soemwhat misleading. Optimising water use to times of critical crop growth stages makes for more efficient use of water resources -- and contributes to conserving the resource base for other livelihood and food security needs. (UNITED STATES OF AMERICA)	This was from quantitative analysis referred to in the main text (Table 7.2). The sentence has been modified to refer to this as an average response.
834	82243	7	39	54	39	54	All calibrated uncertainty language could be placed within parentheses at the end of the statement to maximize the directness of wording. (Katharine Mach, IPCC WGII TSU)	Done.
835	69011	7	39	54	40	2	The limit to incremental adaptation that is here described to occur beyond 2°C temperature rise, is not apparent from the data presented in chapter 7.5. The decreasing effectiveness of incremental adaptation is not explicitly discussed or mentioned in the actual paragraph 7.5. In fact, figure 7-9, which to our understanding presents data mostly from incremental adapatations, shows highest effectiveness of adaptation at 3C temperature increase, and now decrease up until 5°C. Please reconsider this sentence and carefully consider the consistency of the paragraph. (NETHERLANDS)	The sentence has been changed and generalised
836	62529	7	40	0	40	0	Section 7.6: Mention about 1) crop-pest interactions in future climates 2) Weather forecast-base crop management 3) Integrated assessments and use of model ensembles is needed (INDIA)	These types of options have been addressed in the main text.
837	62527	7	40	1	40	7	Soil moisture conservation, drip irrigation, raised bed planting, etc. are important management practices (INDIA)	These types of adaptations are noted in the main section text.
838	65720	7	40	9	40	18	See earlier comments on taking a more precautionary approach for stocks at risk from climate change (e.g. due to recruitment failures). (STEPHEN HAWKINS, UNIVERSITY OF SOUTHAMPTON)	Addressed by referring to a risk-based ecosystem approach.
839	61184	7	40	9	49	12	It is stated that there is no adequate information to aggregate the possible value of adaptations, however there is high confidence and medium evidence that they will bring benefit. This is not a convincing statement. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	There is a difference between precision and confidence. The studies which have been made to date, support this assessment.
840	82244	7	40	10	40	12	All calibrated uncertainty language could be placed within parentheses at the end of the statement to maximize the directness of wording. The level of confidence in the 1st half of the statement would have to be clarified as well. (Katharine Mach, IPCC WGII TSU)	In this case, the sentence flows better as it is.
841	61185	7	40	17	40	18	Existing fishery management tools and strategies are not sufficient for adaptation. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	This remains to be seen. The chapter section presents a range of different options for adaptation drawn from the literature.
842	82245	7	40	21	40	23	All calibrated uncertainty language could be placed within parentheses at the end of the statement to maximize the directness of wording. (Katharine Mach, IPCC WGII TSU)	Done
843	82246	7	40	26	40	27	All calibrated uncertainty language could be placed within parentheses at the end of the statement to maximize the directness of wording. Formulation of the sentence would have to be adjusted slightly. (Katharine Mach, IPCC WGII TSU)	Done
844	77835	7	40	32	0	0	This section could mention the research need in Ecosystem based adaptation. (Liette Vasseur, Brock University)	Relevant for WG chapter 4.
845	78924	7	40	32	41	7	Section 7.6, Research and Data Gaps, pages 40 (lines 32 ff) and 41 (lines 1-7): here there is a possible error or omission, especially lines 39-40, page 40: ”Other areas of neglect include..... the need to update and revise food production impact models... ” – many of the research gaps mentioned have been (during past 2-3 years) actively tackled by several international research networks (such as AgMIP; CCAFS, Facce-MACSUR; ISI-MIP, etc) – see, e.g. my additional references compiled in supporting file such as Rosenzweig et al., 2013; Soussana et al., 2012, etc.: IPCC_AR5_WGII_chapter 7_addREFs_(RP-Rotter); it should be mentioned at least, that research gaps have been recognized and promising approaches have already let to good interim reslts (e.g. such as documented by Asseng et al., 2013 and in those relevant other additional referecnes I provided). (Reimund Rötter, MTT Agrifood Research Finland)	We make this point.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
846	59062	7	40	34	41	7	For gaps, I think in future more studies will be needed on intercation of temperature, moisture and nutrient regime, of crop-weed-pest and pathogens as well as intercation of soil food web system of agro-ecosystem, for addressing a holistic or integrated understanding of long term systematic impacts by climate change. (Genxing Pan, Nanjing Agricultural University)	These are mentioned.
847	62528	7	40	36	40	36	Food processing in fact is age old science…. (INDIA)	We mean it as part of the food system.
848	65494	7	40	36	40	36	There is scanty of information on the impact of climate change on Cropping systems (although much information is there on particular crops but how and to what extent a partcular croping system is projected to affected biophysically or economically is less known). Secondly by climate change pest-host associations will also change which ultimately will effect crop production and subsequently food security, this may also be the research part of future efforts. (Arif Goheer, Global Change Impact Studies Centre (GCISC))	We mention these items.
849	77237	7	40	43	40	43	There is no mention of genopyte x climate (and possibly x management) interaction. This is the very source of adaptation strategy which should not be overlooked here. (Hasegawa Toshihiro, National Institute for Agro-Environmental Sciences)	We mention this.
850	64815	7	40	50	40	54	In González-Zeas et al. (2013) the role of variability of yields on impact assesments is analysed. See: González-Zeas D., Quiroga, S., Iglesias, A., Garrote, L. (2013). “Looking beyond the average agricultural impacts in defining adaptation needs in Europe”. Regional Environmental Change, In press. (DOI: DOI 10.1007/s10113-012-0388-0) (SONIA QUIROGA, UNIVERSIDAD DE ALCALA)	Thank you for this information.
851	61186	7	40	50	41	7	many studies haven't addressed yield variability - scaling issues (both spatial and temporal) should be mentioned here. technical difficulties of assessing year to year yield variability in global scale analyses, which are designed to detect trends in impacts (typically average over 30 years). (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Mentioned now.
852	60762	7	41	4	41	5	Comment: The following text can appear hear: “The recently developed global dataset of historical yields (Iizumi et al., 2013) that offers statistics-satellite-aligned yield estimates of major crops for the period 1982-2006 over the global croplands will likely be a fundamental database for impacts assessments over the coming years.” Reference: Iizumi,, T. M. Yokozawa,G. Sakurai,M. I. Travasso, V. Romanernkov, P. Oettli, T. Newby, Y. Ishigooka, and J. Furuya (2013), Historical changes in global yields: Major cereal and legume crops from 1982 to 2006, Global Ecology and Biogeography (in review). (Toshichika Iizumi, National Institute for Agro-Environmental Sciences)	Thank you for this information.
853	69012	7	41	4	42	2	Question 7.1 is not answered in this section. Does low food production necessarily lead to food security? is answered to some extent, but What factors determine food security? is not answered (NETHERLANDS)	We review the evidence. No evidence then no review.
854	78925	7	41	9	41	16	Page 48, line 9-16, References – Asseng et al paper is in press and received a DOI: 10.1038/NCLIMATE1916; also its title has slightly changed: Uncertainty in simulating wheat yields under climate change (Reimund Rötter, MTT Agrifood Research Finland)	Included.
855	61187	7	41	15	41	15	An explanation as to why the contribution of inland fisheries is 'probably frequently under-estimated' should be provided. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	Included in 7.6.
856	63538	7	41	29	41	30	Why should agronomic and breeding adaptation be limited to +5°? The range of adaptation possibilities depend on the baseline, as lower the average temperature is now, the higher the adaptation range would be. (GERMANY)	Reseach at these temperatures would be an advance.
857	69013	7	41	30	41	30	change: but the relative (NETHERLANDS)	Proof reading

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
858	78694	7	41	30	41	32	"…the actual range of adaptations open to farmers…" does not depend only on agronomic practices made available by crop science etc. Often the appropriate tools are existing already, but they are often not applied effectively, or are even not known because the overall set-up of policies and markets are not encouraging or do not provide incentives, or do not require good farming practices that would make adaptations really open for farmers. For example, CAP payments in Europe are paid in full regardless if soil structure, drainage or other issues important for productivity are neglected. In other words, good farming practices are not ensured in reality, while subsidies paid per hectare may imply cost minimising behaviour on less productive areas. It also depends on the other institutional factors, such land tenure legislation and land owbership structure what is the willingness of farmers in investments and actions that would promote productivity and hence also adaptations (Myyra, Sami & Pietola, Kyosti & Yli-Halla, Markku, 2007. "Exploring long-term land improvements under land tenure insecurity," Agricultural Systems, Elsevier, vol. 92(1-3), pages 63-75, January.). In other words, socio-economic drivers of the so-called yield gaps are not at all fully understood and their role on productivity development and adaptations have not been properly studies even in develooped countries. This is surprising, since it is otherwise widely understood that developing agriculture is a long-term issue but not too much is discussed on the possibility that the current de-motivating or limiting factors may have long-lasting impacts on food system resilience. For example , neglected soil fertility, e.g. soil compaction, or drainage investments in large scale are medium to long-term issues to be solved and they may be retardation factors form many years. What is neglected or is limited today may have long shadows into the future. However one needs to remember that markets and price signals should eventually tell farmers should they increase production - but markets can work properly and lead to efficient work division if major retardation factors and limitations have been solved. (Heikki Lehtonen, MTT Agrifood Research Finland)	We agree and make this point.
859	77238	7	41	42	42	2	FAQ 7.1 seems to be a wrong question judging from the anwers, for climate change is only a part of food security. The answer does not at all touch upon other factors than climate change, which is strange. (Hasegawa Toshihiro, National Institute for Agro-Environmental Sciences)	We have changed the question to better reflect the topic of the report (Climate change impacts) and changed the text to clarify the answer.
860	58849	7	41	42	42	27	If possible, we suggest adding references to support the material in the FAQs. (Carlo Scaramella, World Food Programme)	It is impossible, as not meet IPCC writing format
861	81241	7	41	44	0	0	FAQ 7-1 It is important to explain what factors affect food insecurity and then move to describing what aspects of food insecurity is affected by climate change. At present it seems that aspects affected by climate change are the only factors causing food insecurty. (Monalisa Chatterjee, IPCC WGII TSU)	see response to 859
862	81242	7	42	4	0	0	FAQ 7-2 It seems adaptation actions here refer to changes to tolerant crops, adjusting planting, harvesting seasons, using technology to increase crop production. Another set of adaptation actions would be improving irrigation systems, ensuring access to latest technologies, Options of diversifying livelihoods are also important. Perhaps the answer could reflect that or clarify the type of adaptation actions meant here in the question. (Monalisa Chatterjee, IPCC WGII TSU)	thank you. all of your mention is adaptation actions, but FAQ2 is "How could adaptation actions enhance food security and nutrition", which means it no need set out all of adaptive actions or measures, but it need select those could enhance food security and food nutrition
863	77239	7	42	4	42	6	I don't deny the imporatnce of water, but 100 % of the crop needs to produced under elevated [CO2] and non-negligivel proportion of crop has to be produced under high temperature. The anwer seems a bit biased to precipitation. (Hasegawa Toshihiro, National Institute for Agro-Environmental Sciences)	which refer to rain-fed agriculture, so no bias
864	61188	7	42	4	42	17	The title of FAQ 7.2 suggests this section will describe 'security and nutrition' however nutrition is not mentioned. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	page 42 line 10, "sustainable livelihoods" change into "nutrition access"
865	69014	7	42	6	42	8	adaptation outcomes ... could have the most direct benefits on livelihoods'. It can also be argued that other factors than climate change and adaptation to this will have more impacts on livelihoods (e.g. Van Ittersum et al., 2013, Field Crops Research 143: 1-3). Adaptation is needed indeed, but not only to climate chnage/ (NETHERLANDS)	yes, adaptation is not only to climate change , but we are talking about climate change
866	82247	7	42	12	42	13	The formulation of this sentence is prescriptive and should be revised accordingly. (Katharine Mach, IPCC WGII TSU)	OK, revised again
867	81243	7	42	19	0	0	FAQ 7-3 The FAQ could focus on impact on fish stock and may drop ocean acidification. Other chapters have FAQs on ocean acidifcation. Moreover, the current answer only briefly touches on it so OA doesn't have to be highlighted in the question. (Monalisa Chatterjee, IPCC WGII TSU)	accept and reviesed.
868	62530	7	43	17	43	17	Any literature regarding beneficial algae? (INDIA)	No reference provided.
869	63540	7	44	0	0	0	Please be more specific than "substantial" and explain what this actually means. (GERMANY)	These are specified later in the paragraph.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
870	63539	7	44	11	44	14	See comment on page 23, 36-41. (GERMANY)	Deleted sentence.
871	69015	7	44	13	44	13	Starting from "Consequently" the semantic construction of the sentence leads to very unclear message which as written might constitute a generalization. The sentence could be: Although this number is small compared to global GDP, for some regions or small islands relying on coral reef, it can represents a very large GDP loss in their economies. (NETHERLANDS)	Removed.
872	57500	7	44	19	44	21	See the comment to (Chapter 5, Page 50, Lines 26-28) (Alexey Ryaboshapko, Institute of Global Climate and Ecology)	What is the comment?
873	65495	7	44	49	45	24	the "CC-OA References" can be incorporated under ordinary References List (Arif Goheer, Global Change Impact Studies Centre (GCISC))	Agreed - up to the TSU.
874	64799	7	45	38	45	38	After “food production,” the parenthetical “(particularly of animal products)” should be added so that the line reads, “While food production (particularly of animal products) and transport…” (Steinfeld H, Gerber P, Wassenaar T, Castel V, Rosales M, and de Haan C. 2006. Livestock’s long shadow: environmental issues and options. Food and Agriculture Organization of the United Nations; Pelletier N and Tyedmers P. 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):18371-18374). (Geoffrey Evans, Humane Society International)	This is a WG3 issue.
875	65496	7	46	27	47	11	the "CC-WE References" can be incorporated in the ordinary References list (Arif Goheer, Global Change Impact Studies Centre (GCISC))	Agreed - up to the TSU.
876	56258	7	48	53	0	0	It is "Berg et al. 2013" and not "Berg et al. 2012". The rest of the reference is ok. (benjamin Sultan, IRD)	Corrected.
877	56949	7	54	35	54	37	In that case, include the reference: Hannesson, R., 2007: Geographical distribution of fish catches and temperature variations on the northeast Atlantic since 1945. Marine Policy, 31, 32-39. (M. Dolores Garza-Gil, University of Vigo)	No reason given for the introduction
878	65497	7	55	28	55	29	The reference "Humaira. S. N. Ali…." may be corrected as "Sultana, H. N. Ali …" (Arif Goheer, Global Change Impact Studies Centre (GCISC))	Deleted.
879	56903	7	57	49	0	0	Full reference of Lobell et al (2011) is References is incomplete. Please, add Science 333: 616-620. (Ernesto Viglizzo, INTA/CONICET)	Corrected.
880	59975	7	69	0	0	0	Table 7.1 Final sentence in 'Urban Consumers' box incomplete, there are missing words. (AUSTRALIA)	fixed
881	82248	7	69	0	0	0	Table 7-1. Citation should be provided for all entries in this table. Additionally, the instance of "limited evidence" should be italicized for clarity. (Katharine Mach, IPCC WGII TSU)	limited evidence now italicized. References have been added to entries previously lacking them – except one case where citable literature was not found (but the conclusion in any case seems obvious)
882	62531	7	69	0	69	0	Table 7.1: Include Peri-urban cultivators, they do protected cultivation or high value crop cultivation, require high energy for crop growth, high process of produced food. (INDIA)	Agreed it's potentially important but no literature was provided and we are not aware of any, so nothing added
883	61189	7	69	1	69	0	Table7.1. urban consumers impacts of food price increase on food access box: final sentence is incomplete. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	fixed
884	65857	7	70	0	0	0	Fig 7.1- Two factors are missing from the figure: (1) the enormous food waste due to bad eating habits in industrialized countries; (2) market imperfections in the distribution, where a lot of food is lost and wasted. (Milton Nogueira da Silva, Climate Change Forum of Minas Gerais, Brazil)	this figure has been modified and simplified to focus on giving an overview of chapter, rather than a complete overview of food security. Therefore the comment is no longer applicable.
885	69016	7	70	0	0	0	References for this figure are not complete. A summary for an IPCC report chapter should include all relevant literature, not just some selected ones. Following Mendelsohn et al. (1994, American Economic Review 84: 753-771) many studies have used statistical models to estimate climate impacts on yields and other indicators related to food production. For Europe, Reidsma et al. (2009, Regional Environmental Change 9: 25-40) provides information. (NETHERLANDS)	this figure uses all studies that provided estimates that could be expressed as or converted to impacts per decade. The study cited by reviewer does not provide such data.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
886	69017	7	70	0	0	0	The statistical technique used to produce figure 7-2 is unclear and is probably less appropriate for the aim of this report. It seems, based on the figure subscript, that an unweighed approach where each studies weighs equally heavy to calculate an average effect size and distribution of effect sizes. More appropriate would be to take into account study size and variability and weigh studies according to this. This information is typically available in the original article. Unweighed meta-analyses, i.e. just counting the number of studies finding a particular effect size, are notoriously prone to small outlier studies and have a big danger of producing biased overall estimates. It seems unwise to base such a core figure on an inappropriate statistical technique when better ones are readily available. (NETHERLANDS)	we have clarified that all studies were equally weighted. Given the amount of information available, it was not possible to weight studies. Also, we make explicit the sample sizes, and show nonparametric statistics (median, 5th percentile, etc.) so that a few outliers would not have as much influence as if we were computing means. to the caption we have added "Each study received equal weighting as insufficient information was available to judge the uncertainties of each estimate.] "
887	72601	7	70	0	0	0	Figure 7-1: For clarity, suggest inserting 'temperature' before 'means' in GEC bubble. (UNITED STATES OF AMERICA)	figure has been changed, comment no longer applicable
888	76913	7	70	0	0	0	Figure 7-2 (a) can be removed. I don't think aggregating all crops at all locations by all different models adds value to the argument. Figure 7-2 (b) is good. (Food and Agriculture Organization of the United Nations (FAO))	we think this panel is important for supporting the overall statement that negative impacts have been more common than positive ones
889	76914	7	70	0	0	0	y-axis labels are not aligned with the bars (Food and Agriculture Organization of the United Nations (FAO))	fixed
890	81392	7	70	0	0	0	Figure 7-1: It would be helpful (and probably important as the first figure of the chapter) that this figure explicitly illustrates the concept of “Climate change”. It is implied but not obvious. (Yuka Estrada, IPCC WGII TSU)	good suggestion, which has been incorporated into current figure version
891	81394	7	70	0	0	0	Figure 7-2: X-axis label “Yield impact of climate trend (% decade)” (or “(% yield per decade)” in caption) is not very intuitive. Please explain. Please also clarify 1) what colors of bars and boxes in the both charts mean, and 2) what solid black lines (median or mean?) in the boxes are illustrating. The non-expert reader cannot be expected to look up the literature (Yuka Estrada, IPCC WGII TSU)	these issues have now been clarified
892	82249	7	70	0	0	0	Figure 7-1. As an addition to this figure, is it possible to provide additional figures that illustrate how these interactions work--more specifically--for major crop types? Such a graphic could provide an effective summary figure for mechanisms assessed in the chapter. (Katharine Mach, IPCC WGII TSU)	see above, figure has been simplified
893	82250	7	70	0	0	0	Figure 7-1. As 2 broad points for this figure, it would be helpful to clarify the reasoning behind the colors used. Additionally, refined approaches for depicting the differing components could be considered. (Katharine Mach, IPCC WGII TSU)	see above, figure has been simplified
894	82251	7	70	0	0	0	Figure 7-1. As a series of smaller points for this figure: 1) Should environmental feedbacks also feed back onto socio-economic drivers? 2) Should energy be depicted in the graphic? 3) Should the socioeconomic drivers bubble also refer to markets (and energy)? 4) Within the caption, it would be helpful to indicate how social welfare and environmental welfare are being defined. Does social welfare include economics, and does environmental welfare include environmental/ecosystem services, and sustainability? 5) Why aren't the circles for food utilization, food access, and food availability overlapping? Don't they interact? 6) Should the food system activities rectangle refer to the food chain and also include disposal of food? 7) For food system outcomes, which seem more local as compared to other components that are more global or national, is it possible to depict an element of scale within the figure? For example could global to local be depicted within the food chain? 8) It is a bit ambiguous to refer to "circles" within the caption, as the relevant shape is really an oval. (Katharine Mach, IPCC WGII TSU)	see above, figure has been simplified
895	82252	7	70	0	0	0	Figure 7-2. The start of caption refers to recent climate trends--which variables are considered in addition to temperature? In addition to median length of 29 years, is it also possible to indicate some measure of when these studies occurred on average? For the plot on the left, would it make more sense to specify the full range for greater than 0? For the plot on the right, the type of average and ranges shown should be defined within the caption for the boxplots. (Katharine Mach, IPCC WGII TSU)	the specific variables considered vary by study, so we have not specified which variables were used. The meaning of the boxplots have now been defined in the captions. We have not indicated the other details suggested because it would clutter the figure, but the references provide a traceable account
896	80971	7	70	0	70	0	Figure 7-1 The author team may wish to use one crop to show interactions between all these components. (Monalisa Chatterjee, IPCC WGII TSU)	see above, figure has been simplified
897	80972	7	70	0	70	0	Figure 7-1 global to local scale may be added in this description. It is not clear where the impact of climate change comes in. It is not clear if colors add another dimension. (Monalisa Chatterjee, IPCC WGII TSU)	see above, figure has been simplified

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898	61190	7	70	1	70	0	figure 7.2 (b): there is only 2 studies that included CO2 fertilisation effect, hence most studies of the impact reported did not include the CO2 fertilisation effect, hence supporting the conclusion of the general decrease in yield. There is an evident bias in the analysis and should be highlighted in the executive summary (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	we have made all sample sizes clear. The executive summary makes clear that the historical impacts were mainly about climate trends, not co2 + climate.
899	62768	7	71	0	0	0	Figure 7-3. is quite interested but relatively understandable at a glance, therefore it is strongly recommended the area and kinds of crops are disposed not only figure caption but also the figure itself. (Motoki Nishimori, National Institute for Agro-Environmental Sciences)	figure has been removed
900	69018	7	71	0	0	0	Units are not clear (NETHERLANDS)	figure has been removed
901	69019	7	71	0	0	0	Figure 7-3: Both the way this figure was generated, as well as the message it is trying to convey are unclear. What data sources was the figure based on? How positive and/or negative are the yield impacts found? Are they substantial? With what variability? Without this type of information, it its current the message does not really convey any clear point (particulary not compared to 7-2, which is much more informative), and would be better left out. Perhaps consequently, there is hardly any discussion of the figure in the main text. (NETHERLANDS)	figure has been removed
902	72602	7	71	0	0	0	Figure 7-3: Please specifiy scale of x and y axes and source of data. (UNITED STATES OF AMERICA)	figure has been removed
903	76915	7	71	0	0	0	Figure 7-3. Is y-axis supposed to be "attribution" only? (Food and Agriculture Organization of the United Nations (FAO))	figure has been removed
904	76916	7	71	0	0	0	Suggest removing Figure 7-3. The graph does not add value to the discussion. The estimate of confidence levels is by expert judgement, which is questionable. The dots are aligned on a linear line too neatly. I wonder if the expert judgement is arbitrary. The IPCC reviews should provide objective evidences to the extent possible (Food and Agriculture Organization of the United Nations (FAO))	figure has been removed
905	82253	7	71	0	0	0	Figure 7-3. The chapter team is strongly encouraged to provide an accompanying table to emphasize, with more nuance, what is being depicted--examples within chapters 3 and 6 could be considered. (Katharine Mach, IPCC WGII TSU)	figure has been removed
906	65498	7	71	0	71	0	The Reference of the Figure 7.3 needs to be given (Arif Goheer, Global Change Impact Studies Centre (GCISC))	figure has been removed
907	69020	7	72	0	0	0	reversed the historical downward trend (NETHERLANDS)	figure has been removed
908	72603	7	72	0	0	0	Figure 7-4: This caption needs to point out that the figure refers NOT to the food that the food insecure eat but food that is valuable for international trade. The FAO Cereal price index, which is correlated to the FAO Food price index, does not capture the price of the foods that the food insecure eat. There is significant evidence that the international price reflected in these FAO indices are not linearly adopted by the most isolated and food insecure markets in the developing world. This is because of the lack of infrastructure, the lack of demand, poorly functioning markets, high transaction costs, and the low value of the locally produced food stuffs. An alternate figure might be the food price indices produced by FEWS NET by region, that show the foods the food insecure actually eat in non-capital cities where the food insecure live. See the Price Watch bulletin at http://v4.fews.net/Pages/markettrade.aspx?loc=3&l=en (UNITED STATES OF AMERICA)	the caption has been reworded for clarity on this point
909	72604	7	72	0	0	0	Figure 7-4: Please include citations. (UNITED STATES OF AMERICA)	references added
910	72605	7	72	0	0	0	Figure 7-4: The figure legend does not explain the added arrows for Australian wheat, U.S. maize, etc. (UNITED STATES OF AMERICA)	figure and caption have been changed to clarify this
911	81395	7	72	0	0	0	Figure 7-4: It seems to be more effective and informative to provide additional plots of the actual yield data for the major crops from selected countries instead of showing some “events” in this figure. (You could still highlight those specific events in the price index plot.) It also may be more helpful to show the yield data to make points about the effect of the biofuel demands. (Yuka Estrada, IPCC WGII TSU)	we have worked with TSU to modify this figure for clarity
912	65499	7	72	0	72	0	The reference of the Figure 7.4 needs to be given (Arif Goheer, Global Change Impact Studies Centre (GCISC))	references added
913	69021	7	73	0	0	0	It should be made clearer what adaptation is. If these are simple measures, as mentioned in section 7.3.2.1, then we may assume that they will be adapted. If more complex adaptation measures are not included, the possible benefits of adaptation may be underestimated. (NETHERLANDS)	caption has been revised and this has been made clearer
914	70944	7	73	0	0	0	Fig 7.5 also shows that crop yields are likely to decrease with increase in temperature (Didace Musoni , Rwanda Meteorological Agency)	agreed. No changes made

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
915	72606	7	73	0	0	0	Figure 7-5: Please provide citations for this figure. (UNITED STATES OF AMERICA)	citations have been provided
916	76917	7	73	0	0	0	What is the source of Figure 7.5? If this is the original of the IPCC review authors, the methodology for creating the figure needs to be discussed more (Food and Agriculture Organization of the United Nations (FAO))	caption has been revised and this has been made clearer
917	81398	7	73	0	0	0	Figure 7-5: The figure caption needs to be rewritten to be comprehensible to non-experts and explain all elements of the figure. To the non-expert, these scatter plots will look like nothing but “scatter”. A more careful explanation of what is being plotted with “95% confidence” is required. In other words, explain, albeit briefly, how these results are obtained from the data. Please clarify what “500 bootstrap samples” mean. (Yuka Estrada, IPCC WGII TSU)	caption has been revised and this has been made clearer
918	82254	7	73	0	0	0	Figure 7-5. For tropical maize, why are outcomes are worse with adaptation? For temperate maize and wheat and tropical rice, it could be helpful to specify why adaptation becomes more effective over time. Also within the caption, it would be helpful to indicate the baseline for the simulated yield changes. If this figure has been published in the literature, the relevant source should be cross-referenced. Otherwise, it should be more directly indicated that the figure originates from the chapter's assessment. (Katharine Mach, IPCC WGII TSU)	caption has been revised and this has been made clearer
919	84761	7	73	0	0	0	Figure 7-5: Is it accurate that yield decreases are less without adaptation than with in the upper right panel of the figure (maize, tropical)? If so, please explain this seemingly counterintuitive relationship. (Michael Mastrandrea, IPCC WGII TSU)	caption has been revised and this has been made clearer
920	67861	7	73	0	73	0	Figure7-5: In Maize-Tropical regions figure (upper right one), blue band (presence of adaptation) goes below red band (absence of adaptation). While there is no definition given for "adaptation", to our understanding, blue band goes above red band because of presence of adaptation. The causes should be examined and if there is no reasonable explanation, this figure and any text based on this figure should be deleted. (JAPAN)	caption has been revised and this has been made clearer
921	80973	7	73	0	73	0	Figure 7-5 It may be useful to explain how this analysis was done in the text or caption. Is this from a paper or was this meta analysis done for the chapter. (Monalisa Chatterjee, IPCC WGII TSU)	caption has been revised and this has been made clearer
922	56259	7	74	0	0	0	It is "Berg et al. 2013" and not "Berg et al. 2012". It should also be corrected in the reference (benjamin Sultan, IRD)	fixed
923	69022	7	74	0	0	0	Figure 7-6: This figure is difficult to understand. The caption indicates that the y-axis indicates consensus, but it is unclear how this is measured (percentage of studies agreeing on a certain projection), and how these estimates of consensus relate to the various yield bins. Are estimates equally confident for all of these? Is this an overall confidence estimate for each time period as a whole. Please clarify this figure and make it easier to interpret. (NETHERLANDS)	we have worked with TSU to modify this figure for clarity
924	82255	7	74	0	0	0	Figure 7-6. This figure is really just a description of the available research, not an analysis of it. Is it possible to go more in the direction of figure 7-2 within this figure? Additionally, how much is gained from the vertical orientation of the bars, given the usage of color and the fact that they all stack to 100%? Are time intervals the best way to depict the data--what about mean Celsius temperature increase instead? It would at least be beneficial to specify how many scenarios of climate change are being binned. Is adaptation versus no adaptation being grouped, and what other variables are being binned within the time intervals? It could be helpful to specify these points. It would be also helpful to specify how many studies are depicted within each vertical bar, and whether there are any measures of error that could be given for the yield change bins. (Katharine Mach, IPCC WGII TSU)	we have worked with TSU to modify this figure for clarity
925	82256	7	74	0	0	0	Figure 7-7. Given that the studies reflect a range of scenarios of climate change, is it possible to depict the results by level of temperature increase instead of year? (Katharine Mach, IPCC WGII TSU)	fig 7-4 expresses changes in terms of local temperature. The main point of this figure was to show how the distribution of impacts shifts over time. We also had hoped to try one with global temperature change on x-axis, but not enough studies report the necessary information
926	84762	7	74	0	0	0	Figure 7-6: I like the potential of this figure, but find it needs further refinement to be clear. First, it is not immediately obvious that each bar spans 100% on the y-axis, and the choice of y-axis makes it somewhat difficult to deduce how large each bin is in each case. Second, it is not clear to what extent differences reflect different sources of variation, in particular adaptation vs. no adaptation and magnitude of climate change. Are there ways to communicate further information about the factors underlying the spread in results displayed? (Michael Mastrandrea, IPCC WGII TSU)	we have worked with TSU to modify this figure for clarity

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
927	80974	7	74	0	74	0	Figure 7-7 This figure doesn't explain factors mentioned in the ES (page 3 line 23-24) (Monalisa Chatterjee, IPCC WGII TSU)	this figure was only intended to support last sentence in that ES statement. The ES has been modified so this should no longer be an issue
928	69023	7	75	0	0	0	Figure 7-9. It is unclear how this figure and the very similar figure 7-5 relate to each other. Does 7-9 include all crops from 7-5 combined in one figure? Clarify please. (NETHERLANDS)	this figure has been removed
929	72607	7	75	0	0	0	Figure 7-8: Suggest deleting this graphic as it is misleading -- e.g., irrigation optimisation contains an adaptive feature with benefits (resource conservation) that is not evidenced by this graphic. (UNITED STATES OF AMERICA)	this figure has been removed
930	76918	7	75	0	0	0	What is the source of Figure 7.8? Which papers were used in the analysis for Figure 7.8? (Food and Agriculture Organization of the United Nations (FAO))	this figure has been removed
931	76919	7	75	0	0	0	Suggest removing Figure 7-9. It appears to be an aggregation of graphs in Figure 7-5. Figure 7-9 does not add value to the discussion. At least give the source to the figure and explain in detail how the graph was produced. (Food and Agriculture Organization of the United Nations (FAO))	this figure has been removed
932	81399	7	75	0	0	0	Figure 7-8 and Figure 7-9: Please specify the source of data. (Yuka Estrada, IPCC WGII TSU)	this figure has been removed
933	82257	7	75	0	0	0	Figure 7-8. What is the source of this figure? Are results being binned across levels/scenarios of climate change? (Katharine Mach, IPCC WGII TSU)	this figure has been removed
934	82258	7	75	0	0	0	Figure 7-9. Where "baseline" is mentioned, what baseline is being used--current yield? What is the source of this figure? (Katharine Mach, IPCC WGII TSU)	this figure has been removed
935	65858	7	76	0	0	0	Fig OA-1- figure with 3 graphs is confusing and could be split into 3 figures. Graph ´a´ mentions ´geoengineering´ as a valid option, despite all the controversies. Is it really an option? (Milton Nogueira da Silva, Climate Change Forum of Minas Gerais, Brazil)	this comment will be addressed by the authors of the cross-chapter boxes
936	72608	7	77	0	0	0	Figure WE-1: The nexus concept is very important.However, the nexus must also include" waste" and its reuse and recycling for water,energy,and climate change.The waste in agroecosystems consists of plant residues, and animal residue(manure etc). (UNITED STATES OF AMERICA)	this comment will be addressed by the authors of the cross-chapter boxes