IPCC Fourth Assessment Report

Expert Review of the First-Order Draft

Chapter 8

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
0-1	A	0	0			I limit my comments to a few overall observations. My major objection against the report is that the caveats have not been spelled out, which makes the report less than scientific. Its is based on the assumption that anthropogenic GHG, particularly CO2, represent major climate forcings. However, new doubts have arisen whether this is really the case. The ('peer-reviewed') literature which is sceptical of the man-made global warming hypothesis, has been growing quite impressively over de the last few years. It has been completely ignored. Many observations (e.g. on temperatures and CO2 concentrations, and their development over time) do not match the man-made global warming paradigm. They offer a multitude of 'anomalies' (in the vocabulary of Thomas Kuhn). This should be recognised. If not, the whole exercise runs the risk of being dismissed by critics as being biased by 'cherry-picking'. Model-based attribution of the different forcings, influencing the (minor) rise in surface temperatures since the middle of the previous century, cannot be construed as proof of the anthropogenic greenhouse effect, because no single model has ever been validated. The report posits that 450 ppmv CO2 concentration equals 2 degrees warming over the 21 century. In the light of the previous comments on the relationship between the two, this is not proven. It could be argued that these observations do not fit into the Report of Working Group III and that they should be addressed elsewhere. But as far as I know, this has not been done. Anyhow, the authors should make their assumptions explicit in the preamble of the document, so that the reader will be able to form his own opinion in the light of all available views and/or information. Moreover, nowhere reference has been made of the critical report on 'The Economics of Climate Change', which was issued, in early July 2005, by the British House of Lords Select Committee on Economic Affairs, and the discussion ensuing therefrom. Furthermore, at the recent G-8 Summit at Gleneagles and the Montreal Climate Conference, it has become clear that the first phase of the Kyoto (sort of European mini-Kyoto) will not get any follow-up. This is a crucial fact, which will drastically overturn the outlook presented in earlier IPCC reports. Somehow and somewhere, the authors should deal with this issue and its implications in the document. At various places in the report, it is suggested that (man-made?) climate change (if any) will disproportionably hurt the poor (especially in Africa). However, the	Noted. This comment is more relevant for WGI

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						causal relationship between the two, has not been convincingly substantiated to my mind. It is, furthermore, suggested that mitigation and sustainable development can be realised without impairing the fight against poverty (in the traditional meaning of the words). Undoubtedly there are many examples where this is true. At the same time, there are many opposite examples, where this is not the case. The relationship is simply more complex than the text wants us to believe. Therefore, a more elaborate and balanced presentation of pros and cons is called for. Another element which is missing is the impact of Kyoto (plus, plus) on our (socio)economic system. It is true, this issue has - so far - hardly been addressed in the climate change literature. But it is nevertheless of utmost importance. Emission trading, which, according to the logic of Kyoto, should be progressively extended to more and more sectors of the economy, will fundamentally change the main features of our (socio)economic system: from a basically free enterprise system to an more centrally planned system, with heavy (international) government intervention. This aspect has, so far, been almost totally ignored in the climate change policy literature. For an elaboration of this line of reasoning, see: http://www.tcsdaily.com/article.aspx?id=120304A As regards sea levels, no acceleration in sea level rise has been recorded, which is inconsistent with the statement that there is a discernable human influence on climate since the middle of the previous century. Only very rarely reference has been made to cost/benefit analysis. Where this has been the case, the relevant passages were on the whole overstating the benefits and understating the costs. The PPP approach concerning future real growth cum emissions, has not been covered (allegedly because of the fact that most of the literature is still based on market exchange rates). Let's hope that there is still sufficient time to include the outcome of new OECD work on that score which can be expected in the months to come. ---Leimuiden, 4 January 2006. (Hans H.J. Labohm, 0)	
0-2	A	0	0			It is very good indeed that in the report climate change is being placed in the context of sustainable development (SD) and the Millennium Development Goals (MDG). What has not been worked out to the full in this repect is the fact that SD and MDGs will not be reached in a reasonable time given the fact that there simply	Noted. Not relevant for Ch. 8

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						is not and will not be enough money available. In this respect the concept of Global Public Good, which has received a lot of attention of the last couple of years, could play a role (other than what has been denoted in e.g. chapter 1, paragraph 1.5.2.). It has been proposed as a new frontier of finance for international development. See especially Inge Kaul, Isabele Grunsberg, Marc A. Stern, Global Public Goods (International Cooperation in the 21st Century), UNDP and Oxford University Press, 1999, Inge Kaul, Pedro Conceicao, Katell Le Goulven, Ronald U. Mendoza, Providing Global Public Goods, UNDP, Oxford University Press, 2003. On the basis of the notion of Global Public Good innovative mechanisms for dealing with the climate change issue from a world-wide perspective; e.g. a CO2-tax, have been proposed. Through such a tax the environmental and development dimension of climate change could be clearly interlinked. This relates to the concept of the environmental footprint (Wackernagel and Rees, 1996; chapter 12, page 25, line 45) but is a more direct derivation of global warming. The CO2-footprint has been introduced by the World Wildlife Fund. The CO2-footprint of every inhabitant in the world could be related to the intrinsic capacity of the earth to absorb carbon dioxide from the atmosphere (about two tons of CO2 per year). Payment, in preferably an international fund, should start when this threshold is passed. The average emissions per year in most developing countries are still below 2 tons of CO2. They will receive money. Industrialized countries have to pay on the basis of their per capita footprint. Such a system could generate a lot of money for development and at the same time provide an economic incentive to reduce emissions. See in this respect: A, Sandmo, Environmental Taxation and Revenue for Development, in: A.B. Atkinson, 2005, New Sources for Development Finance, UNU-Wider Studies in Development Economics, Oxford University Press. See also D. Bradford, Improving on Kyoto: Greenhouse Gas Control as the Purchase of a Global Good, CEPS Working Paper No. 96, January 2004 (Gert de Gans, Kerkinactie)	
0-3	A	0	0			The units are different among the chapters. For example, the unit of CO2 emissions, GtC in fig.3.17, Mt-CO2 in Fig.5.28. The unit should be uniformed. (Toshihiko Masui, National Institute for Environmental Studies)	Noted. Consistency of units will be ensured in Ch. 8
0-4	A	0	0			In general, I found the quality of the report to be very uneven. The chapters that address mitigation potential in individual sectors that I managed to scan were far superior to the cross-cutting chapters 1, 12 and 13 that I reviewed in greater depth. The latter chapters generally do not constitute a systematic assessment of the state-of-	Noted. Not relevant for Ch. 8

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						the-art, based on publicly-available information, but are often anecdotal, reflecting only the view of the author or a very limited number of references or examples, even in cases where there is a rich literature on the subject. It will be crucial that these chapters are improved to meet the same standards of rigor that the WG1 report does, or the credibility of the IPCC as an independent assessment panel will be compromised. (Anne Arquit Niederberger, Policy Solutions)	
0-5	A	0	0			General comment: The level of detail of the draft text on co-benefits is uneven across chapters. Some discussions are relatively detailed, and some are very cursory. It would be better to have greater consistency across chapters and sections. (Mark Heil, U.S. Environmental Protection Agency)	Noted. Not relevant for Ch. 8
0-6	A	0	0			GENERAL COMMENT: Good treatment of SD linkages. Developing country (DC) literature on sustainable development could be used more, since it provides a different viewpoint. Some recent publications have been left out: e.g., the most up-to-date and comprehensive reference is (MMRS 2005) = Munasinghe, M. and Swart, R. 2005. Primer on Climate Change and Sustainable Development, Cambridge Univ. Press, UK. (Mohan Munasinghe, Munasinghe Institute for Development (MIND))	Noted. Reference will be considered for Ch. 8 PK, Daniel G.
0-7	A	0	0			Innovation is present in the whole report, yet how to steer innovation in the desired direction is not clear. How succesfull are policies directed at innovation, when sustainability or CO2-emissions rather than financial succes is the most important criteria? Presently, I am preparing research on this issue, and would like to take topics around climate and energy as a special case. (Tineke van der Schoor, Sustainability Centre Lauwersoog/ RUG-Bedrijfskunde)	Noted. Not relevant for Ch. 8v
0-8	A	0	0			In general, the importance of the public, of education, of changing behavior, could be more worked out as a separate issue. How to reach the public, how to involve consumers, what do consumers want, and then think again about technology, this is being overlooked. Many technological development paths as sketched in this report, but also in a lot of other publications (like the 'energy transition' in the Netherlands, are very technocratic in nature and fail to note people. Human beings seen as subjects, not as objects. As continually choosing, problemsolving, thinking individuals. The same comment goes for the integration of sustainable development in the curricula of schools. Not as a separate topic, but integrated in the normal	Noted. Not relevant for Ch. 8

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						courses. This issue is taken up in the Centre for Sustainability, mentioned above. (Tineke van der Schoor, Sustainability Centre Lauwersoog/ RUG-Bedrijfskunde)	
0-9	A	0	0	0	0	The developing world need energy for their development. Therefore denying them access to affordable energy sources through imposing policies that will make energy unaccessable will hinder their development and creat an unfair situation. (Mohammed Alfehaid, Saudi Aramco)	Noted. Not relevant for Ch. 8
0-10	A	0	0	0	0	In general, I found many of the chapters weak in providing references for key statements. While it is nice to save page length by not providing references and thus no bibliographic citations it does a dis-service to the reader. All chapter should take care to make sure that statements are bettere referenced and the TSU should be aware of this as well. Contrast this with WG2 who may have gone too far the other way in some cases.... (Jeff Price, California State University, Chico)	Noted. We will ensure to provide references for all key statements (Ch. 8)
0-11	A	0	0			I have not made comments on references, since I assumed this is dealt with by the technical support unit. However, I just want to mention that there are citations given in text here and there that does not appear in the list of references. (Göran Berndes, Chalmers University of Technology)	Noted. We will ensure that all citations are included in the list of references (Ch. 8)
0-12	A	0	0			Global climate change is a worldwide challenge and climate protection needs joint efforts by all countries. (James Bero, BASF Corporation)	Noted. Not relevant for Ch. 8
0-13	A	0	0			To avoid misunderstandings and errors, it may be helpful to use both Ceq and CO2eq. In most plubications for public and policy makers, greenhouse gas emissions are given in units gCO2eq/kWh or gCO2/kWh, which in itself may be confusing. The chance of wrongly quoted numbers increases with the introduction of two additional units gCeq/kWh and gC/kWh. (Jan Willem Storm van Leeuwen, Ceedata Consulting)	Noted. We will follow guidance from TSU in this respect (Ch. 8)
0-14	A	0	0			Suggestion to use SI units and SI notation throughout the report. For example: 1 Gt (1 gigaton or gigatonne? Metric tonne, short ton, long ton?) is not a SI unit and introduces ambiguities. Suggestion: use 1 Mg = 1 megagram = 1 metric tonne, 1 Gg = 1 gigagram = 10E9 gram = 1000 metric tonnes 1 Tg = 1 teragram = 10E12 gram = 1 million metric tonnes. For example: 0.7 GtC/yr becomes in SI notation: 0.7 Tg(C)/a (Jan Willem Storm van Leeuwen, Ceedata Consulting)	Noted. We will follow guidance from TSU in this respect (Ch. 8)
0-15	A	0	0			General comment: The FAR is a comprehensive, massive and impressive piece of work. Due to its size and depth, however, it is not very easy to digest.	Noted. We will follow guidance from TSU in this respect (Ch. 8)

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						(Jan Paul van Soest, Advies voor Duurzaamheid on request of International Gas Union)	
0-16	A	0	0			There seems to have been little communication between the chapters. In particular, there is a good review of the issues of technological change in chapter 2, that is not reflected in chapter 3, where technological change is of vital importance. The material inchapter 2 is also not reflected in chapter 11, although the macroeconomic intersectoral analysis of chpater 11 requires an assessment of technology. (Jonathan Köhler, Tyndall Centre, University of Cambridge)	Noted. Not relevant for Ch. 8
0-17	A	0	0			While the Fourth Assessment Report (AR4) of WG III contains a wealth of information, I think it lacks a clear and concise statement (a "vision" if you will) of the mitigation/stabilization problem. While, to be sure, there is much relevant and useful material regarding stabilization throughout the thirteen chapters, it is difficult to find a clear statement of what seems to me the crucial question: What will it take to "stabilize climate" (by which I mean stabilize the atmospheric concentration of GHGs--or at least CO^2)? There are, of course, differing views regarding the answer to that question (the differences mainly centered on the importance, availability, and scaleability of carbon-emission free energy technologies--more on this later). It would be very helpful, therefore, if this question was explicitly posed up front, and, as well, explicitly acknowledged that among experts in the field there are different views and different approaches to answering this key question. I think the appropriate place to pose the "what will it take" question is in the Introductory Chapter (Ch 1), perhaps on p.5 after the conclusion of section 1.2 on article 2 of the FCCC convention. It might also be helpful to briefly set out the differing views about what it will take to "stabilize climate". For example, material in the last paragraph on p.68 of Chapter 2 could be usefully employed in Chapter 1. I think the AR4 report needs to acknowledge, from the outset, an important implication of the SRES emission scenarios, and scenarios that are similar to the SRES. The implication to which I refer is a general tendency to understate (perhaps greatly so) the costs and general difficulty of achieving stabilization. Because many of the 40 individual SRES reference scenarios have already built into them high long term (110 year) rates of global energy intensity decline (the main exception being the A2 family), and large amounts of carbon-free energy, their use in mitigation/stabilization analysis is likely to substantially understate the magnitude and cost of the stabilization task. Although, there is reference in Chapter 3 to other emission scenarios, it is not clear whether any other (than SRES) reference scenarios were used by the very large number of mitigation analyses that are	Noted. Not relevant for Ch. 8

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						reported in the chapter. Of particular interest here is whether the EMF-21 modelling scenarios used different baselines than those implied by the SRES. The reason for interest is that, as portrayed in chapter 3, including Figures 3.25 and 3.26, the EMF-21 appears to estimate much higher GDP costs of stabilization than do the great body of other mitigation scenarios. An obvious question is whether the difference in GDP costs of stabilization reflects the way in which the reference (or baseline) scenario(s) were constructed. (Another question is why Chapter 11 appears to have overlooked the EMF-21 findings.) To the Report's credit, it does include, in Chapter 2, a set of Figures (2.9.2) that reflect the excellent work, initially carried out by Edmonds for the IS92a scenario, demonstrating how much technology change is already assumed in reference emission scenarios. Figure 2.9.2 makes clear that the SRES reference scenarios incorporate a very large share of the emission-reducing "gains" from future technological change. What is unclear is the degree to which other parts of the Report take the reference scenarios as given (as if the embedded technological change were supplied as manna from heaven) and focus on what extra is needed for stabilization. For example, in Chapters 4-7, how much of the technological improvements from current practice will be required to meet the technological change incorporated in the reference scenarios? Arguably, most, if not all, will be. If so, then little or nothing is left over to achieve stabilization. The implications for interpreting the findings on the cost of mitigation reported in Chapter 11 are important. The relatively low costs estimates reported there for achieving stabilization (often generated by models assuming a carbon-free backstop technology) may be the result of effectively "double counting" the contribution of technological change, first in the reference scenario and second in the mitigation/stabilization scenario. Thus while the reader can find scattered statements about just how difficult it will be to achieve stabilization", the cost estimates reported in Chapter 11 make the economic (GDP) cost of stabilization seem small-and they do so in part because of a lack of clarity on the technology-mitigation issue in other parts of the report. One result is to continue to leave the false impression, initially generated in WG III TAR, that if we could only overcome socio-economic and institutional inertia, stabilization can be relatively easily achieved in the 21st century. One way to illustrate the nature and importance of reference scenarios for assessments of the difficulty of achieving stabilization is to contrast the paper by Pacala and Socolow (Science, 2004), which is frequently discussed as well as cited in AR4, with Hoffert et.al (Nature, 1998) which does not appear to be cited at all by AR4 (although there are a number of citations to a	

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						subsequent Hoffert et al paper (Science, 2002). Pacala and Socolow (P-S) conclude that (given the rate of growth of GDP) the technologies are available to stabilize emissions for the next 50 years (out to 2054), by assuming that energy intensity decline will automatically decline at a global average annual rate of 1.0%, and that the carbon intensity of energy will decline at a 0.5% rate. Thus, in considering the availability and scaleability of carbon-free energy technologies, P-S only consider what is needed over and above a 1.5% rate of decline in the carbon intensity of output. In contrast, Hoffert et al (Nature,1998) ask how much carbon free energy (power) is required to stabilize (given the rate of growth of GDP), and varying rates of decline in energy intensity, and find that the amounts are generally so large that major technological breakthroughs in the supply of carbon-free energy would almost certainly be required for stabilization. The Hoffert, et al, Science, 2002, article attempted to demonstrate that no individual or combination of carbon-emission-free technologies is up to the task. The Caldeira, et al (Science, 2003) article demonstrated the climate sensitivity implications for the speed and amount of carbon-free energy deployment. One disturbing implication, in my view, of the two Hoffert et.al and the Caldeira, et al, papers, taken together, is that if climate sensitivity is on the high side and if the threshold for acceptable temperature change is relatively low (say, 2 C), avoiding DAI may be, for all practical purposes, impossible. The possibility that energy technology cannot be changed fast enough, and in the required magnitudes, in time to avoid DAI should be recognized in the Report. It would be useful if the sector-based chapters (especially 4-7) provided a rough idea of the overall (within sector) increase in energy efficiency that is potentially achievable over the course of the 21st century. As the AR4 now stands, while estimates of energy efficiency are given for some individual users of energy, there is no indication of what these add up to on a global and cross-sectoral basis. But it is arguably very important to know something quantitatively about the overall potential for energy efficiency improvement, because that improvement, in combination with sectoral shifts in the share of economic activity, determine the overall decline in energy intensity. As Hoffert et al, (Nature, 1998) demonstrated (using the Kaya identity and a carbon cycle model), the rate of growth in GDP, and the rate of decline in energy intensity, determine the amount of carbon-free energy required for stabilization. Having some idea how much carbon-free energy is required for stabilization not only tells us how much technology change will be required on the energy supply side, but it may shed light on whether, as a practical matter, we can avoid a "dangerous anthropogenic interference" (DAI) with climate,	

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						given climate sensitivity and some estimate of how much warming is acceptable (say 2C). There is another reason why it would be useful to have some quantitative idea of what can be achieved on a sectoral basis (on a global scale) in terms of energy efficiency. It would help evaluate the plausibility of reference emission scenarios. In my view this is critical because three-quarters of the 40 SRES emission scenarios have pair-wise energy and GDP growth rates that imply 110 year (1990-2100) global average annual rates of energy intensity decline above 1.1%. Century-long, global average annual rates in excess of 1.1% seem implausibly high for the following reasons. The scope for energy efficiency increases in the electricity-generating sector are likely limited by thermodynamic factors to 100% or less. The same is almost surely the case for the heavy transport sub-sector (including boats airplanes railroads and heavy trucks). Together these sectors account for about 45% of energy consumed, and that share is likely to increase as more of the world is hooked up to the electric grid. While, 300% increases in energy efficiency are potentially achievable globally (more in the US), over the course of the 21st century, in the automobile/light truck and residential/commercial sectors, the scope for improvement in the industrial sector is more limited. Even if a 200% improvement in energy efficiency in the industrial sector is achievable, the weighted increase in energy efficiency across all sectors would, at most, be 200%.-and probably substantially less. Given the assumed increase in the relative importance of the electricity generating sector, it can be shown that these numbers imply that at best energy intensity in 2100 would be about 30% of the level in 1990. That works out to a 1.09% average annual rate of decline in energy intensity- a rate that we would have to work very hard to achieve. It is a rate that will require important advances in technology, ones that will require a long term commitment to well-funded R&D, and will not happen as if manna from heaven. Yet 30 of 40 SRES reference scenarios have imbedded within them 110 year global average annual rates of decline in energy intensity in excess of 1.09%. Moreover, 25 of the 40 SRES reference scenarios incorporate upward of 350 EJ/yr of renewable energy (including "new", but not old, biomass)-an order of magnitude above current levels. Arguably, the plausibility of most of the SRES emission is in doubt, yet they are used to carry out stabilization analyses. 4. In summary, while I would not quarrel with the chapter outline of the report, I believe that the manner in which the mitigation/stabilization issue is framed in the report could be substantially improved. So too, the individual components of the report need to be tied together in a more coherent and relevant manner-and related to what	

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						I believe should be the central theme of the Report, "what will it take to stabilize"? As Chapter 11 makes clear, it is now widely accepted that technology and technological change will be crucial to stabilization. How much technological change, and how to assure the necessary research, development and deployment, remains uncertain and in dispute. The answers to these questions are the key to successful stabilization and to whether stabilization can be achieved before the threshold of DAI is breached. The science of climate change, as reported by IPCC WG I, convincingly demonstrates that we face major problems from rising emissions and concentrations of GHGs, especially CO^2. Unfortunately, WG III in its TAR fumbled the ball in failing to make clear just how difficult achieving stabilization short of DAI will be, both technologically and economically. Based on my reading of the First Order Draft of WG III AR4, the fumble has not yet been recovered. It is to be hoped that recovery is still possible before final publication. (Christopher Green, McGill University)	
0-18	A	0	0			I am missing in the report the ugency of the geopolitical dimension of climate change in relation to energy provision. (Even more) serious conflicts could arise as a result of the increased demands for oil and other resources by countries like China en India. (Gert de Gans, Kerkinactie)	Noted. Not relevant for Ch. 8
0-19	A	0	0			Congratulations on such an excellent start! The emphasis on sustainable development hits the very heart of the GHG problem in the future. (Tao Ren, Utrecht University)	Noted
0-20	A	0	0			There is much new literature about regional abatement costs of allocation schemes, which are not described in this report. Herewith a brief summary. Studies of energy system-models: Criqui, P. et al.: 2003. Greenhouse gas reduction pathways in the UNFCCC Process up to 2025; den Elzen, M.G.J. and Lucas, P.: 2005, 'The FAIR model: a tool to analyze environmental and costs implications of climate regimes', Environmental Modeling and Assessment 10(2), 115-134; den Elzen, M.G.J., Lucas, P. and van Vuuren, D.P.: 2005b, 'Abatement costs of post-Kyoto climate regimes', Energy Policy 33(16), pp. 2138-2151; Nakicenovic, N. and Riahi, K.: 2003. Model runs with MESSAGE in the Context of the Further Development of the Kyoto-Protocol. WBGU - German Advisory Council on Global Change, WBGU website, http://www.wbgu.de/, Berlin, Germany; Persson, T.A., Azar, C. and Lindgren, K.: 2006, 'Allocation of CO2 emission permits – economic incentives for emission reductions in developing countries', Energy Policy In Press. Also of macro-economic model analyses (although there are many others as well):	Noted. Not relevant for Ch. 8

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						Buchner, B. and Carraro, C., 2003. Emissions Trading Regimes and Incentives to Participate in International Climate Agreements. FEEM Working paper 104.03, Fondazione Eni Enrico Mattei (FEEM), Milan, Italy. Böhringer, C. and Löschel, A., 2003. Climate Policy Beyond Kyoto: Quo Vadis? A Computable General Equilibrium Analysis Based on Expert Judgements. ZEW Discussion Paper No. 03-09, Centre for European Economic Research, Mannheim, Germany.; Böhringer, C. and Welsch, H., 1999. C&C - Contraction and Convergence of Carbon Emissions: The Economic Implications of Permit Trading, ZEW Discussion Paper No. 99-13, Centre for European Economic Research, Mannheim, Germany; Bollen, J., C , Manders, A.J.G. and Veenendaal, P.J.J., 2004. How much does a 30% emission reduction cost? Macroeconomic effects of post-Kyoto climate policy in 2020. CPB Document no 64, Netherlands Bureau for Economic Policy Analysis, The Hague. (Michel den Elzen, The Netherlands Environmental Agency)	
0-21	A	0	0			The regional costs implications of post-2012 regimes for the allocation of emission allowances (future commitments) is not described in the overall report. Chapter 3 describes the regional costs of 4 IPCC SRES regions (based on EMF study), based on one (costs-based) regimes based on full IET and marginal costs. This seems rather ad-hoc choice, as there are many allocation schemes based on various equity principles and allocation schemes (i.e. Multi-Stage, Triptych, Contraction & Convergence, costs-allocation etc) (IIASA, WBGU, MNP-RIVM, Chalmers University/Gothenburg, CIRED, University in USA, MIT, etc. etc.). Chapter 13 describes part of these regimes (in fact not the costs-based regimes) as analyzed in the literature, but do not describe the regional costs implications (* see comment-block: in which I have included the some of the new literature in this field). In fact Chapter 11, discusses only one macro-economic study, i.e. Bollen et al. I would recommend discussing the regional costs in Chapter 3, and in Chapter 13 and Chapter 11. I can deliver some text on this issue. (Michel den Elzen, The Netherlands Environmental Agency)	Noted. Not relevant for Ch. 8
0-22	A	0	0			WGIII is not the competent IPCC Working Group to assess vulnerability of systems to temperature rise - that is principally the task of WGII and, to an extent, WGI. Throughout the WGIII report a figure of 2ºC for DAI is used, however, this has very little explanation or underpinning in the literature cited. For consistency the range of values expressed in the WGII report should be reflected in the WGIII report. (Spencer Edwards, Australian Greenhouse Office)	Noted. Not relevant for Ch. 8
0-23	A	0	0			Throughout the sectoral chapters there is no consistency in the dates used to report	Noted. We will follow guidance from TSU in

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						proportions of sectoral emissions (for example in Chapter 5 - Transport - figures for greenhouse gas emissions in 2000 are used; while in Chapter 6 - Residential and Commercial Buildings - 2004 figures are used). If there is no consistent use of dates/figures across sectors in the literature, this should be clearly explained and accounted for in a framework/consolidation chapter. (Spencer Edwards, Australian Greenhouse Office)	this respect (Ch. 8)
0-24	A	0	0			Throughout the report, mitigation efforts are equated with political instruments (particularly the Kyoto Protocol). For example in Chapter 1 at page 2 it is stated that "The entry into force of the Kyoto Protocol in February 2005 marks a first, though modest step, towards the implementation of Article 2". This statement fails to take into account the significant mitigation efforts already being implemented by Parties under the UN Framework Convention on Climate Change and the plethora of national mitigation measures that have been underway in a host of countries for many years. References in the WGIII report should concern specific mitigation activities rather than to compliance (or otherwise) with any particular political instrument. It is, therefore, submitted that a review be conducted of the report to ensure that references to the Kyoto Protocol are proportionate to its role in the body of mitigation literature. (Spencer Edwards, Australian Greenhouse Office)	Noted. Not relevant for Ch. 8
0-25	A	0	0			The use of 2006 references throughout the report, tends to obscure the transparency of the expert review process. If reviewers cannot obtain cited papers, it becomes difficult for an adequate assessment to be made of the literature used to constitute and support the assessment report. (Spencer Edwards, Australian Greenhouse Office)	Noted. We will ensure transparency in this regard (Ch. 8)
0-26	A	0	0			see my word paper on two proposed Common Methodologies for Priority Assessment of Mitigation Measures (PAMM) and for Priority Assessments of Adaptation (PAA) (Robbert Misdorp, PUM)	Noted. Not relevant for Ch. 8
0-27	A	0	0			Each of the sectoral chapters focuses on different regions to provide examples as to mitigation efforts. A more uniform treatment of the regions is necessary to provide a comprehensive summary of each mitigation sector. (Spencer Edwards, Australian Greenhouse Office)	Noted. We will follow guidance from TSU in this respect (Ch. 8)
0-28	A	0	0			Considered as a FOD, the report is in reasonable shape, and may---given progress already made at this stage--be reasonably expected to be up to (if not actually even over) the high standard already set by previous AR's. As advised, comments below	Noted. Not relevant for Ch. 8

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						concentrate on attempting to add value to specific content in, and the general direction of, AR4 as specified in its TOR. As also advised, therefore, comments made here specifically exclude any grammatical, linguistic and/or syntactic errors (glaring or otherwise) still present in this draft. In view of the time available to me, unfortunately only selected chapters are reviewed here in detail (naturally, without prejudice to the remainder). That said however (based on an initial, somewhat abridged, reading) I have reservations that a number of the most crucial cross-cutting issues have themselves not been adequately synthesised in terms of an overall requirement to get to grips with a global mitigation challenge that many policymakers still appear to be at risk of failing if Article 2 of UNFCCC is to be ultimately fullfilled. The introduction of Art 2 itself as a cross-cutter provides--it seems to me at least--- an opportunity to situate the challenge more firmly (vis a vis previous reports) where it ultimately belongs---i.e. explicitly within the arena of UNFCCC. Therefore one of the biggest problems (familiar to us all) namely the Annex-1 vs NA1 configuration has unfortunately not been adequately tackled throughout the report in my view. This is unfortunate, as I believe it is certainly highly arguable that a synthesis of the decision and policy-making, sustainable development, regional issues and short vs long-term cross cutting drivers could reasonably be summoned up as a strong case to incorporate a much larger and wider-spread review of the plentiful literature concentrating on the A1 vs NA1 dialectic. Subsequent comments below are framed against this context. (Pat Finnegan, Grian)	
0-29	A	0	0			Confidence ranges that are used for mitigation technology development could be included. The Working Group II practice of including specific confidence ranges in brackets after a forecast is made (as is done to a small extent in the Executive Summary of Chapter 9) could provide a useful addition to the report. (Spencer Edwards, Australian Greenhouse Office)	Noted. We will provide uncertainty ranges associated with our estimations (Ch. 8)
0-30	A	0	0			chapters 5-10 disregard generaly the social and regional differences when addressing the problems and solutions of these sectors as if these problems emanate from only one single society or region. (Mohammed Alfehaid, Saudi Aramco)	Noted. Regional analysis will be improved for SOD (Ch. 8)
0-31	A	0	0			As former Technical Secretary of the IPCC-WGII-Subgroup Coastal Zone Management 1989 - 1994 and present Netherlands Governmental IPCC Peer Reviewer WGII and III, I strongly suggest to the IPCC - Chair: do not shy away, do not introduce the word uncertainties" unnecessarily too much in the text of the FAR. Replace the word "uncertainty", because the cause you are fighting for is a	Noted. Not relevant for Ch. 8

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						right cause, and too much use of this word "uncertainties" will shy away the needed future investors. And I assume that that is not the intention of IPCC. Furthermore please come up with clear instructions on systematic mitigation and adaptation for each country so that all the 190 member countries will follow your leadership and enjoy the transfer of knowledge provided by IPCC in an harmonized and effective fashion. • I politely invite the chairman of IPCC to announce the introduction of the hereunder proposed Common Methodologies on PAMM and PAA in the IPCC-FAR, which in my view ought to be developed by IPCC. (Robbert Misdorp, PUM)	
0-32	A	0	0			Discussion(s) of carbon sequestration are difficult to identify in the outline of the entire report. There is a clear inclusion of sequestration in the agriculture and forestry chapters -- but it took me a while to find the discussion of sequestration related to fossil fuels. (Stan Bull, National Renewable Energy Laboratory)	Noted. Not relevant for Ch. 8
0-33	A	0	0			Throughout the whole draft report there is almost a total absence of gender analysis in relation to climate change and mitigation. From the limited research done it is clear that different energy and mitigation options have different impacts on men and women and this should be reflected in this report. See for example: Mainstreaming Gender into the Climate Change Regime 14 December 2004 COP10 Buenos Aires http://www.genanet.de/fileadmin/downloads/Stellungnahmen_verschiedene_en/Gender_and_climate_change_COP10.pdf and Lorena Aguilar (2004) Climate Change and Disaster Mitigation (IUCN) available on-line: http://www.iucn.org/congress/women/Climate.pdf (Lars Friberg, Climate Action Network (CAN) Europe)	Noted. Not relevant for Ch. 8
0-34	A	0	0			The sections on innovation and technological change in chapter 2, 3, 4 and 11 need a common view on how innovation processes work. All of them should include the perspective of the systems of innovation literature and the model of feedbacks between all phases of innovation. Chapters 3, 4, and 11 already imply that climate policies also have important feedbacks on generation of technologies. This view should be more thoroughly discussed in chapter 2, which lays out the foundations on how innovation processes work (see comment on chapter 2 below) (Rainer Walz, Fraunhofer Institute Systems and Innovation Research)	Noted. Not relevant for Ch. 8
0-35	A	0	0			My general impression is that the report should highlight the changes compared to TAR more specifically. In many chapters, the 'delta' to TAR is hard to conceive. (Fritz Reusswig, Potsdam Institute for Climate Impact Research)	Noted. We will ensure a comparison with main TAR findings is made in SOD (Ch.8)

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
0-36	A	0	0			It is noted that the terms are not used in a consistent manner throughout the whole report. It is strongly encouraged to better harmonize. (Radunsky Klaus, Umweltbundesamt)	Noted. We will follow guidance from TSU in this respect (Ch. 8)
0-37	A	0	0			It is noted that the scope of the WG3 report should be to provide on a comprehensive, objective, open and transparent basis, the scientific, technical and socio-economic information relevant to understanding the scientific basis of climate change mitigation. However, in its current status not all subchapters of the FOD are consistent with that scope. This is because a) the scope has been interpreted too broad and information clearly goes beyond the scientific basis of climate change mitigation, covering e.g. issues of a primarily political nature as the scientific basis of climate change should be mainly limited to methodological and conceptual issues but clearly shall not include issues related to implementation; b) the literature to be addressed should in general be limited to literature published after 1999 as it has to be assumed that the TAR already covered all relevant literature until 1999, c) the report should also be limited to more robust findings that can be based on more than one publication; d) conclusions included in the TAR need not be replicated but providing detailed reference could also help to keep the report concise and short. (Radunsky Klaus, Umweltbundesamt)	Noted. Not relevant for Ch. 8
0-38	A	0	0			It is noted that the length of the FOD (about 1300 pages) is considerable above the envisaged length. However, there seems to be room to shorten the report, e.g. be limiting the text to the scope as specified by the IPCC plenary (see below) and by streamlining the text by avoiding addressing the same information more than once. (Radunsky Klaus, Umweltbundesamt)	Noted. We will comply with our page allocation for SOD (Ch. 8)
0-39	A	0	0			It is noted that the FOD includes whole paragraphs without any linkage to other parts of the report or to literature. This clearly is inconsistent with the requirement of providing information on an open and transparent basis but may be interpreted as an indication that the text reflects the views of the authors but not findings identified in the underlying literature. Any text, that cannot be linked to underlying literature therefore should also be deleted in the SOD. If there are gaps in literature that do not allow to provide information based on literature but that should be provided according to the agreed outline than such findings should also be clearly indicated as that could help to guide future research. (Radunsky Klaus, Umweltbundesamt)	Noted. We will ensure to support all our main statements with approapriate references (Ch. 8)
0-40	A	0	0			I am very concerned that the focus of the Report, and particularly Chapters 3 and 4, is predominantly on the next 50 years, and subdominantly on the remainder of this century. The reality illustrated by the analysis of Wigley, Richels and Edmonds	Noted. Not relevant for Ch. 8

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(and later analyses provided for example on pages 223-224 of the TAR Climate Change 2001, The Scientific Basis) BUT IGNORED HERE, is that the problem is much longer term than this. Furthermore, the problem is 10x larger in the long term (~50,000 EJ / 50 years) than in the short term (~5000 EJ / 50 years). As part of the resolution of this problem, we need to introduce technologies in the present century that can almost fully replace carbon-emitting technologies in the next century. Thus we need to be advancing new energy technologies with very high total potential, and we need to be moving to energy uses that are consistent with very low CO2 emission. While it is important to pay attention to the near term, this report must absolutely also keep the much larger long term challenge in focus. It is critical that analyses looking to 2200 be included in this report, as they were in the TAR. See the attached analysis of future non-carbon energy needs, labeled "WRE Analysis.pdf". (Robert Goldston, Princeton Plasma Physics Laboratory)	
0-41	A	0	0			Preliminary Comments: My relevant areas of expertise are inverse integrated assessment modeling for climate change decision support and energy system modeling for energy policy support. The integrated assessment modeling is based on the tolerable windows approach (TWA) (other broadly equivalent terms include the guard-rail approach and safe-landing analysis). I have therefore concentrated on those parts of the WG III AR4 (principally chapters 2, 3, and the glossary), where the tolerable windows approach is discussed. As one of the lead developers of the TWA, I paid particular attention to the consistent usage of TWA-related terminology throughout the entire report. And as the AR4 is intended to provide a comprehensive assessment of scientific progress since the TAR, I took the liberty of adding two publications to the cited literature in order to highlight recent advances in the applicability of the TWA method. I have also proposed a substantial revision to the glossary entry for TWA. (Thomas Bruckner, Technical University of Berlin)	Noted. Not relevant for Ch. 8
0-42	A	0	0			IPCC, 2001 and the like are not valid references. The particular chapter of the assessment should be referenced using the lead authors' names. (Nick Campbell, ARKEMA SA)	Noted. We will follow guidance from TSU in this respect (Ch. 8)
0-43	A	0	0			In many of the chapters there should be further reference to relevant sections from WG I and or II FOD report. This would be useful to ensure full consistency of the reported findings and to demonstrate the interactions between the WGs, which do	Noted. We will ensure to make the necessary linkages with WGI and WGII (Ch. 8)

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						not seem fully optimal at this stage. Such systematic linking work will be time consuming, it is though necessary. (Philippe Tulkens, TERI School of Advanced Studies)	
0-44	A	0	0			Do a clear distinction between "Biological carbon sequestration" involving the enhanced uptake of atmospheric CO2 by plants, forest, soils, and ocean fertlisation, and "Carbon dioxide Capture and Storage (CCS) involving the capture of CO2 from industrial and energy-related sources and its long-term storage. This disctinction is very clear in the IPCC Special Report on CO2 Capture and Storage. It never uses the term "sequestration" for the CCS technology, and mentions explicitely that it does not cover "biological carbon sequestration". Such distinction is for instance clear in Chapters 3, 7, 8, 12 but should be made in other Chapters such as Chapters 4, 5, 11 etc. (CZERNICHOWSKI-LAURIOL Isabelle, BRGM)	Noted.
0-45	A	0	0			Chapter "GLOSSARY": Page 21: Line 35-40: Please replace the old TWA definition by (see cell above): "The tolerable windows approach (TWA) seeks to identify the set of all climate protection strategies that are simultaneously compatible with (a) prescribed long-term climate protection goals, and (b) normative restrictions placed on the emissions mitigation burden. These constraints or guard-rails can include limits on the magnitude and rate of global mean temperature change, on the weakening of the thermohaline circulation, on ecosystem type loss, and on economic welfare losses originating from selected climate damages, adaptation costs, and directed mitigation efforts. For a given set of guard-rails, and assuming that a solution exists, the TWA outputs an emissions corridor which delineates all complying emissions paths. Safe-landing analysis is similar in concept and if no particular research line is indicated, then the term guard-rail approach covers both." (Thomas Bruckner, Technical University of Berlin)	Noted. Not relevant for Ch. 8
0-46	A	0	0			The Report do not include any section about reserves, resources and prices, as it was not planned, but now under present conditions and the important relation to mitigation and not conventional technologies I suggest to consider some assessment of latest trends. (Juan Llanes, Havana University)	Noted. Not relevant for Ch. 8
0-47	A	0	0			The integration of the whole report requires much more work. Particularly in the treatment of costs and benefits of mitigation and technology, there is a lack of integration over chapters 2, 3, 4-10 and 11. My suggestion as to how to divide up the costs literature over chapters 2, 3 and 11 is that concepts should be in 2,	Noted. We will follow guidance from TSU in this respect (Ch. 8)

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						numbers for 2050 to 2100 should be in 3 and numbers for 2000 to 2050 in 11. However, Figures in chapter 3 may well need data over history and between 2005 and 2050 to make a point. Dividing up the technology literature is more difficult. My suggestion is that chapter 2 covers concepts and definitions, and explains the main ways that technology has been modelled (e.g. covering Clarke and Weyant, 2002) and later developments in the treatment as in Edenhofer, 2006), 3 covers baseline issues and effects of technology in cost-benefit studies which require a very long-term analysis and cost-effectiveness studies of stabilisation covering 2050 to 2100, and 11 covers technology in cost-effectiveness studies and attempts to integrate them with the technologies discussed in 4 to 10. When covering both cost-benefit and cost-effectiveness studies, it should be made clear in chapter 3 that there is a subsantial different between them as regards costs and effects of induced technological change as brought out in (Goulder and Matthai, 2000). There are so many estimates of GDP costs and carbon permit prices in recent literature that a meta-analysis is worth doing to supplement the tabulated comparison on models and qualitative discussion with some quantitative estimates to sort out the reasons for the differences. (Terry Barker, 4CMR Centre for Climate Change Mitigation Research, University of Cambridge)	
0-48	A	0	0			References: only 7.6 percent from developing countries in chapters 1,2,3,11,12.!!!!! (Juan Llanes, Havana University)	Noted. Not relevant for Ch. 8
0-49	A	0	0			Chapter 1, 2 and 12 dedicate more than 70 pages to Sustainable Development, suggest reviewing chapter 2 and 12 overlaps (Juan Llanes, Havana University)	Noted. Not relevant for Ch. 8
0-50	A	0	0			Also overlaps with regards to ancillary benefits within chapter 11 and 4-10 (Juan Llanes, Havana University)	Noted. We will ensure there are no overlaps in SOD (Ch. 8)
0-51	A	0	0			Almost all quotations to economic issues relays on the neoclassical approach, other approaches as ecological economics and bioeconomics both with well-known Journals are not included as alternatives to be assessed, specially on chapter 2,3, and 11. (Juan Llanes, Havana University)	Noted
0-52	A	0	0			There is a general problem how to handle the TAR. Should it be summarized or just cited as a reference? THis issue is not dealt with in the same way in the different chapters. (Marco Mazzotti, Institute of Process Engineering)	Noted. We will follow guidance from TSU in this respect (Ch. 8)
0-53	A	0	0			The whole present report gives a good updated material and captures as well new	Noted. Not relevant for Ch. 8

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						recent information. Chapters 2, 3, 11 and 12 will be in that regard very important, in the sense they are going to capture cross sectoral informations as well as long term perspective consequences of all the relevant informations. I recommend that particular attention is given to these chapters, which will be of added value, for the whole process. (Jean-Yves CANEILL, Electricité de France)	
0-54	A	0	0			Very comprehensive document, but from the Chapters I have carefully read, I would like to see more integration between Ch. 4 and the general aspects covered in Ch. 2, 12 and 13. Presume this also relates to the other sectoral chapters. (Oren Kjell, Norsk Hydro ASA)	Noted. Not relevant for Ch. 8
0-55	A	0	0			There are a number of practical consequences of taking such a view seriously. One is that distributional issues are much more important than commonly recognized. Mainstream economics acknowledges the existence of a "declining marginal utility of income", but with limited exception it is not incorporated into economic analysis. Frankly, there is not - and I would argue cannot be - an "objective" measure of the declining marginal utility of income; in practice it is a choice of the analyst, and - as with the choice of a discount rate - it implies that costs are fundamentally indeterminate, and specifiable only by value choices of the analyst. The few studies (e.g., the work of Richard Tol and Christian Azar) that have taken this up have demonstrated that the conclusions of climate policy analyses are enormously dependent on these choices, but the consequences of this indeterminacy haven't been widely acknowledged. (Paul Baer, Stanford University)	Noted. Not relevant for Ch. 8
0-56	A	0	0			One issue that seems to have fallen between the scope of chapter outlines is any analysis of the financial sector. I am not expert in this field but surely it plays an important role and the literature on this should be covered somewhere? (Michael Grubb, Cambridge University)	Noted. Not relevant for Ch. 8
0-57	A	0	0			Indeed, if I had one meta-level comment to make about all of the WGIII FOD, it's that the draft needs to be more self-conscious about the deep controversy about values at the heart of the economic paradigm. In particular, the assumption that "utility" is something objective that can be measured through market or non-market valuation, and thus that economic analysis is a useful approximation of "true" values, is only one perspective, albeit the dominant one. What I would consider the primary alternative - that valuation is an ongoing a social process, and that the value of "outcomes" is a question of meaning and choice rather than utility - is not well represented in this document.	Noted. Not relevant for Ch. 8

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Paul Baer, Stanford University)	
0-58	A	0	0			Generally I am surprised there is not an element in the structure that identifies key weaknesses in literature/knowledge to assist future work (Andrew Dlugolecki, university of east anglia)	Noted. We do note whether there is lack of knowledge and uncertainty within Ch. 8
0-59	A	0	0			A second practical consequence is that uncertainty becomes much more important. Subjective expected utility maximization requires a unique probability distribution for outcomes as well as a unique utility function. Such unique probability distributions do not exist for most parameters of interest (both “scientific” and “economic”) in the climate policy debate (see Baer et al 2005 and Baer 2005). The consequences of this kind of multi-dimensional uncertainty for decision-making have barely begun to be explored, but again, it implies that most economic analyses which suppress this uncertainty through unexplained value choices of the analysts, do not provide the kind of “objectivity” that they are presumed to have. (Paul Baer, Stanford University)	Noted. Not relevant for Ch. 8
0-60	A	0	0			Whenever data for the European Union are mentioned, it is important to make clear "which" EU it refers to. The EU has been enlarged from 15 to 25 member states in 2004, and it maybe further enlarged by 2007. Some data cannot be interpreted without the knowledge whether it refers to the EU-15, the EU-25 (and perhaps later the EU-27). (Diana Urge-Vorsatz, Central European University)	Noted. We will follow guidance from TSU in this respect (Ch. 8)
0-61	A	0	0			All authors and lead authors must be commended for bringing a large amount of valuable material in this first order draft. There at this stage many redundancies, which should be reduced in the further development of the report. However, despite these redundancies, or perhpas because of them, there are several topics that are not addressed with sufficient scope and detail altogether - or presented in a misleading manner. I shall limit my general comments to two of them: renewables, and long term strategy (though a third one could be discounting, but I hope the detailed comments that follow will be sufficient). 1. RENEWABLE. It is hardly surprising that in a 1255 page draft renewables are only covered in a few pages, and with somehow misleadidng information. First, a global perspective could be given about the overall potential. Solar energy exceeds 8,000 times our primary energy supply. Although the technico-economic potential is certainly orders of magnitude lowers than the overall potential, it is still likely to ultimately cover a large percentage of our needs, if not all. Second, a fair assessment could be made of the "technico-economic potential" that could be reached, say, in 2050 and 2100, for all technologies. For example, table 4.3.1 narrows solar thermal to solar thermal	Noted. We do cover the biomass aspects from the agriculture sector in Ch.8

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						electricity alone - and mixes estimates of overall technical potential, such as indicated for PV (1600 Ej/y), and assessments likely to be derived from technico-economic consideration, such as that for solar thermal (1.7 Ej/y). Although the confusion is in the source, IPCC role is to critically assess the information. What solar technology is more likely to provide more electricity in 2050 or 2100 is hard to guess, but they may end with comparable contributions: PV is handicapped by its costs and intermittent nature, CSP technologies being cheaper and more easily made guaranteed and even dispatachable, but limited to areas with strong direct insulation unless exported. In any case, both technologies may remain outweigthed by far, as they are today, by solar thermal contribution to heating and cooling needs (see comments on chapt'er 4). 2. LONG TERM STRATEGY.The report could perhaps more clearly make three points: 1) cooperative strategies oriented toward research and development, as useful they might be, are unlikely to produce sufficient results by themselves in the absence of carbon prices throughout the economy; 2 Economic instruments, as useful they might be, need to be complemented by other instruments to address market imperfections, including R&D support and some specific financing mechanisms for technologies in their infancy, in order to bring down their costs through learning by doing processes; 3 Uncertainties on both costs and benefits of climate policies conflict with inertia to create a dilemma on long term objective(s): it cannot be defined once for all, but its absence is detrimental to the process. An abundant literature showing firm targets do not really fit the long terme cumulative nature of the climate change problem in the context of uncertainties. Combined with periodic revisions of an educated guess on what we would like to pay for mitigating climate change, the most pragmatic way to drive action by all countries and all players would be set indicative ambitious long term targets while making their full achievement dependent on actual costs - ie a sustained use of price capping mechanisms to accompany tradable permit schemes. This and similar suggestions could be more extensively discussed, in particular, but not exclusively in chapter 13 (see detailed comments). (Cédric Philibert, International Energy Agency)	

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
8-1	A	0	0			Overall: very interesting comprehensive chapter. It covers most of the relevant issues in relation to agriculture and mitigation (Berien Elbersen, Alterra)	Noted. Thank you.
8-2	A	0	0			Chapter on Agriculture is a major effort and significant improvement on dealing with the agricultural sector including multi – gas approaches and listing pit-falls, trade – offs and co – benefits not only for C (CO2 and CH4) but also N (N2O). The separation in regions is appreciated yet an approach on the basis of farming systems and differences between regions would signigicantly improve the chapter and have farmers recognize issues (Peter Kuikman, Alterra)	Accepted. Acknowedgement of regional differences between farming systems added, stating that different measures will be used in different regions, depending on local farming systems.
8-3	A	0	0			The following recent publications are highly relevant to this chapter and should be consulted by the authors to include considerations on tradeoffs between agriculture, abandonement of agriculture through urban migration, forest recovery, different agricultural alternatives with different GHG emissions, etc.. Grau, H.R. et al., 2003. The Ecological Consequences of Socioeconomic and Land-Use Changes in Postagriculture Puerto Rico. BioScience, 53, 1159-1168. Aide, T.M. and Grau, H.R., 2004. Globalization, migration and Latin American Ecosystems. Science, 305, 1915-1916. Grau, H.R., Aide, T.M., Zimmerman, J.K. and Thomlinson, J.R., 2004. Trends and scenarios of the carbon budget in postagricultural Puerto Rico (1936-2060). Global Change Biology, 10, 1163-1179. As well as the excellent New Zealand overview of PCE, 2004. Growing for good: Intensive farming, sustainability and New Zealand's environment. Parliamentary Commissioner for the Environment, Wellington, 238 pp. (Stephan Halloy, Universidad Mayor de San Andrés)	These publications were consulted. Section on regional trends revised but trends analysed at regional level rather than individual countries, as discussed in these studies.
8-4	A	0	0			Comprehensive, it presents also comparison with SAR and TAR, missing in other chapter. The UN convention are present also in other part of the report	Noted. Thank you.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Marco Mazzotti, Institute of Process Engineering)	
8-5	A	0	0			General Comment here: Section 8.8 on Co-benefits and Trade-offs is by far the weakest of any in this chapter and needs to be reconsidered. Of course, every action has a reaction, but not always "equal and opposite". Some examples of rather inane entries follow: (Norman Rosenberg, 0)	Accepted. Completey rewritten and much of the information summarised in a table (8.8).
8-6	A	0	0			Your allocated pages are 30 IPCC pages, which means max. 60 A4, including references and tables and figures. You are now :57 (text) and 20 (T&F). These usually tend to increase towards the SOD!! (Sander Brinkman, TSU WG III / Brinkman Climate Change)	Accepted. In the SOD we now have 61 pages in total.
8-7	A	0	0			The chapter is mainly written as a top-down approach, while it might be useful to explore bottom-up options: what exists at farm level management? (Sander Brinkman, TSU WG III / Brinkman Climate Change)	Noted. All of the per-area potentials are “bottom up”. New table added comparing to 29 other regional (bottom up) studies for comparison. See also response to 8-2.
8-8	A	1	5	1	5	It should be considered if Chapter 8 should refer to the recent study of Keppler et al. published in Nature (Vol. 439, 12 Jan 2006, pages 187-191 with comments on pages 128, 148 and 149) that plants, by some still unknown mechanism, might produce a significant proportion of the total global methane emission. One also could consider this information as too premature. (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. The Keppler et al. paper was published after the FOD was submitted. We considered its inclusion for SOD but, as noted by the reviewer, it is premature as the findings have yet to be corroborated.
8-9	A	1	22	1	22	Remove the word "each" (...potential of agricultural management practices) (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Rewritten.
8-10	A	1	23	1	23	IThis item is related to the existent Kyoto Protocol mechanisms only or to paralell iniciatives? (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Rewritten.
8-11	A	1	0			Thanks for the authors for the update on agriculture, inparticular on mitigation potential, and the clear presentation of that quite complex area. (Radunsky Klaus, Umweltbundesamt)	Noted. Thank you.
8-12	A	2	23	4	7	The executive summary does not refer to the livestock revolution (term introduced by IFPRI, Washington), while it is done so in the subsequent chapters. The executive summary as a whole does not refer to mitigation measures presumed to be effective and has a somewhat fatalistic 'flavour' as if nothing is likely to happen (at least until 2010) (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. The “livestock revolution” is now inherently included in the mitigation potentials section. The executive summary notes significant potential but that little has so far been implemented. This is not fatalistic, but a statement of reality.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
8-13	A	2	25	2	48	One of the first ~3 paragraphs should clearly state the major sources of agricultural emissions for each gas . For example, "Agricultural CH4 emissions result mainly from rice paddies (x%) and ruminant animals (x%). It is important to avoid a laundry list of sources, but also very important to avoid excessively vague language. (W. Troy Baisden, Landcare Research)	Accepted. This has now been done.
8-14	A	2	25	4	7	A critical point not to overlook in the Exevcutive summary (and to develop in the body of the ms) is a point, obvious to the authors but not necessarily so clear to plicy people, that C sinks in agriculture are once-only sinks because there is a limit to how much the land can absorb before saturation. And furthermore, that once the land-based sinks are increased for GHG mitigation purposes, the sequestered C will not necessarily stay put without continuing stewardship (via certain management options thast may not be the most profitable ones) indefinitely by future land managers. In this way biological sequestration is fundamnetally different from energy conservation, switching to non-GHG-emitting energy sources or, if it works, even geosequestration. For geosequestration the advocates hold out the promise of permanency without indefinite stewardship, but for biosequestration there is not even a such a potential. It is important that policy makers are unambiguosly clear about that. Also that this situation for C-sinks is fundamtally diferent from the situation for methane abd nitorus oxide for which an emission curtailed does not carry a steardship legacy of the same kind. (Roger Gifford, CSIRO)	Reject. Saturation and permanence issues are listed in the barriers section – this is a cross-cutting issue – not specific to agriculture. Our mitigation potentials are estimated for a fixed period of time (2030), and this includes due consideration of saturation.
8-15	A	2	25			Text suggest that Agriculture accounts for 49% of (GHG?) emissions source FAO 2003. This text should be cross-checked with figures provided in Page 4:Line 17: to ensure that data are consistent and may be at odds with the 30% figure on Page 7 line 19. These data seem to have a similar source. (Frank McGovern, Environmental Protection Agency)	Accepted – all figures now consistent (US-EPA, 2006 and FAOSTAT, 2006).
8-16	A	2	29			This should refer to methane emissions? But it would be useful to have a global sum as well. (W. Troy Baisden, Landcare Research)	Accepted. See also 8-16 to 8-21.
8-17	A	2	29	2	29	The word methane is missing. (Lenny Bernstein, L. S. Bernstein & Associates, L.L.C.)	Accepted. See also 8-16 to 8-21.
8-18	A	2	29	2	29	..anthropogenic emissions.. should be ..anthropogenic "methane" emissions.. (Shigeo Murayama, The Federation of Electric Power Companies)	Accepted See also 8-16 to 8-21.
8-19	A	2	29	2	29	Insert CH4 with reference to '49%'.	Accepted. See also 8-16 to 8-21.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Spencer Edwards, Australian Greenhouse Office)	
8-20	A	2	29	2	29	.... global anthropogenic methane emissions (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. See also 8-16 to 8-21.
8-21	A	2	29	2	29	,,,,of global athropogenic METANE emissions…. (Bas van Wesemael, Université catholique de Louvain)	Accepted. See also 8-16 to 8-21.
8-22	A	2	29	2	29	The contribution of agriculture should be checked against the figures provided on page 7, chapter 8, line 19. Probably a more precise explanation about the scope of the figures (including/excluding land-use change) might help the reader to better understand those figures. (Radunsky Klaus, Umweltbundesamt)	Accepted – all figures now consistent (US-EPA, 2006 and FAOSTAT, 2006).
8-23	A	2	29			add methane between anthropogenic and emissions (Michel Petit, CGTI)	Accepted. See also 8-16 to 8-21.
8-24	A	2	41	2	48	The mitigation potential should be related to total GHG emisssions (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. This has been done.
8-25	A	2	42			It is unclear what is meant by the ranges shown in parentheses (ie -200 to 3400) because a range is already shown in the primary estimate (ie 700-1500). What are these different ranges? (Roger Gifford, CSIRO)	Accepted. Uncertainty ranges now clarified and new plot added to show ranges (Figure 8.4.3c).
8-26	A	2	44			It is unclear which of the upper and lower limts are being referred to - those in parentheses or those in the primary estimate (Roger Gifford, CSIRO)	Accept. Uncertainty ranges now clarified and new plot added to show ranges (Figure 8.4.3c).
8-27	A	2	46	3	24	It would be useful to directly tie the projection of realistic mitigation potential made at the bottom of Pg. 2 to the cost curve information provided on Pg. 3, lines 12-24. The numbers suggest that you are assuming < 30% of biophysical potential and a price of ~17 US$/tCO2-eq., but it would help the reader to have this stated explicitly. (Lenny Bernstein, L. S. Bernstein & Associates, L.L.C.)	Accepted – now all analysed on basis of economic potentials – artibtrary10 and 20% implementations dropped.
8-28	A	3	1	3	10	GHG emission reduction potential of bioenergy produced from agricultural or forestry land it is necessary to include the GHG emsiion implications of the activity that was displaced from that land by the bioenergy crops. Iew the opportunity cost. If it were agricultural land in the first place then the agricultural production displaced will happen some where else either by more land opened up or higher yield eslewhere. Either way this has its own GHG implcations which may offset the gain from the bioenergy crop. (Roger Gifford, CSIRO)	Noted. This trade-off is already incorporated in the cost analysis. We are now using the bio-energy figures from Chapter 4.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
8-29	A	3	1	3	10	I have lost your argumentation. Are you really substracting avoided emissions from biomass emissions and relate that to energy?? In addition, this part on biomass energy is completely different than what was mentioned in Chapter 4, also mainly refering to energy crops... (Monique Hoogwijk, Ecofys)	Noted. We are now using the bio-energy figures from Chapter 4.
8-30	A	3	3	3	3	yields are expressed in ton oven dry matter. I am not familiar with this abbreviation (odt). Is this explained in a list of abbreviations? (Bas van Wesemael, Université catholique de Louvain)	Noted. Odt = oven dry tones, but this text removed in the rewrite.
8-31	A	3	3	3	3	As the abbreviation "odt" is not so common, it might be more user friednly to include some explanation when this abbreviation is used for the first time. This might also help the reader to interpret "od" in line 4 on the same page. (Radunsky Klaus, Umweltbundesamt)	Noted. Odt = oven dry tones, but this text removed in the rewrite.
8-32	A	3	4	3	6	This text must be reviewed, since it is not clear. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Reworded.
8-33	A	3	5	3	10	1) I don't understand your calculation when accounting for 270 - 660MtCO2eq./yr from biomass burning. TAR Assumed an average sustainable yield of 15 odt/há which means that all CO2 from burning is captured by forest growth. Essentially there is no CO2 net emission from biomass burning as is set in the IPCC Inventory and used extensively in CDM projects approved by the CDM - Executive Board. 2) If you are accounting for other GHGs emissions be clear in the textThis means that if you want to consider an yield of 4 and 12 odt/ha/yr this produces a CO2 mitigation of 270 - 660MtCO2eq./yr. 3) The amount of energy calculated as 2EJ/yr is tied with the yield of 4 odt/ha/yr in an area of 25Mha (at 20GJ/odt). These figures are fully uncompatible with the numbers assumed in TAR, which is valid for an area of 1.3 billion ha. 4) Thus your critic to TAR doesn't proceed due the two differences: 1. assumption that biomass burning yields net CO2 and 2: the different areas considered. Please, review your calculation and assumptions and don't make critics to early IPCC results unless you have full confidence in your assumptions. 2 or 22EJ are peanuts!! Finally, TAR concludes that primary forest energy is 400EJ which is fully independent of how much you are using combined heat and power. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Noted. This estimate and text removed since we are now using the bio-energy figures from Chapter 4.
8-34	A	3	5			why increased GHG emissions from biomass burnimg? Explain (Norman Rosenberg, 0)	Accepted. We have explained. Burning biomass now defined and explained more clearly.
8-35	A	3	5	3	6	Emissions from biomass burning is regarded as "carbon neutral", according to Guidance for National Greenhouse Gas Inventories, and all Kyoto practices are	Accepted. We have explained. Burning biomass now defined and explained more

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						based on this principle. We would like to confirm that this article does not give any influence to the Kyoto principle. (Shigeo Murayama, The Federation of Electric Power Companies)	clearly.
8-36	A	3	9	3	10	The sentence "Most modeling studies…" is likely to leave the reader with the impression that forestry-related mitigation options (the subject of the sentence) are not worth pursuing because of the likelihood of adverse impacts on forest ecosystems and biodiversity. This could be made more accurate by changing the words "are likely to be adversely impacted" to "can be adversely impacted". This helps introduce the opportunities for mitigation and adaptation synergies mentioned in the following sentence. (Reid Miner, NCASI)	***Comment on Chapter 9, not chapter 8***
8-37	A	3	12	3	16	The claim that "price-based constraints on implementation diminish as the price per tCO2-eq. in-creases" needs to be supported by citation, as does the basis behind citing ~17 US$ tCO2-eq.-1 as a low price and prices of ~33 and 50 as high. (Spencer Edwards, Australian Greenhouse Office)	Reject first part of the comment. As the price paid for CO_2 offset goes up, it becomes more economical to offset CO_2. This is the case by definition and the McCarl and Schneider reference, in any case, is provided to support it in the main part of the text – this is the executive summary. Accepted second part. All price categories now as per Price and Blok. See also 8-39.
8-38	A	3	12	3	26	I would not include this paragraph in the executive summary of that report, as well as the tables. There are too many details for a summary. By the way, there is any mention about the author (s) of that analysis. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Reject. This is crucial information that belongs in the summary. The full details are given in the main part of the chapter – this is the summary.
8-39	A	3	14	3	14	The low price of CO2 credit is assumed to be under 17US$. As we suppose it is higher than current prices, we are afraid that it might give some implication to carbon markets. (Shigeo Murayama, The Federation of Electric Power Companies)	Accepted. All price categories now as per Price and Blok. See also 8-37.
8-40	A	3	28	3	30	An important example or two in parentheses of such synergistic activities would be worthwhile in this Exec Summary. (Roger Gifford, CSIRO)	Accepted. Done.
8-41	A	3	33			It would be helpful to add a sentence saying "Recent studies have helped define the benefits of policies to encourage the use of biomass-based products in place of more carbon intensive products." We have provided references for use in Chapter 6 illustrating this point. (Reid Miner, NCASI)	***Comment on Chapter 9, not chapter 8.***

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
8-42	A	3	40	3	41	Sorry but I don't agree that very little progress has been made and little is expected by 2010. On the contrary very large extensions of sugarcane, corn and rapeseed are being planted for alternative fuel production. And if storage of C is not being pursued is because economic, as well as physical CO2 mitigation, is much better accounted with the annual production of energy crops (an so small amount of accummulated C on biomass) then with long-term storage in forests. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Reject. In terms of meeting the full biophysical potential for GHG mitigation in agriculture globally, little progress has been made so far. That is a fact, not a matter of opinion. Total biophysical potential ~6000 Mt CO_2-eq. yr^{-1}. This is equivalent to 1.5-2 PgC y^{-1}. There is no way that this is currently being achieved (larger than the total land sink) by changes in agricultural management. We have provided the numbers to support this.
8-43	A	3	45	3	50	Agree with comment that trade-offs and co-benefits need to be balanced. However, the statement that "many options…could be implemented immediately, without further technological development…" has a mixed message. The message inferred is that these options could be implemented without the need to check the balance between trade-offs and co-benefits. Probably this is true, but the statement about balance suggests that implementation of things that could make a difference immediately should be put on hold until the balance is checked. I don't think that is the intended message. (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	Accept. Agreed, this is not the intended message. This has been reworded.
8-44	A	3	47	3	48	The few options that are undergoing development are constrained by the political difficult to compete with the fossil fuel industry and other political interest of developed countries that set barrier for importantion of biofuels. At least in Brazil, where the practice is under implementation for three decades and there was enough time to optimize production, the cost of ethanol is lower than oil derivatives for oil above US$35/bbl. The slow growth isn't set by agricultural constrants. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Accepted. Text reworded in the rewrite.
8-45	A	3	0			Define terms like "odt" the first time you use them since not all readers may be familiar with bioenergy vocabulary. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Term no longer appears. See also 8-30 and 8-31
8-46	A	4	20	4	23	The role of technical measures versus management is outlined by Oenema et al. in Technical and policy aspects of strategies to decrease greenhouse gas emissions from agriculture (Nutrient Cycling in Agroecosystems 60: 301–315, 2001). The Oenema et al. (2001) paper stresses the multi – gas approach and the importance of addressing the efficiency of use of C and N; this concerns in most cases proper and adjustment of management and managers rather than implementing technologies only (see also section 8.9, l 21 -34). Even technologies need to be managed (see	Accepted. These references are now included – thank you – see also response to 8-2.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						issue of water in Africa). SEE ALSO P.37, l 33 - 34 and reference and finding of Rounsevell who stresses technology as key factor; other views (of definitions?) are in literature and deserve consideration in this review. A further improvement would be to address these issues from a perspective of farm systems approaches (see Schils et al., 2005 GCB (in press); Schils et al., NCA; Oleson, DIAS, Denmark and the EU project Greengrass). (Peter Kuikman, Alterra)	
8-47	A	4	25	4	30	Please, rank the alternatives in such way that the most promising show up first. Start with option f. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Noted. No longer relevant - the paragraph has been removed.
8-48	A	4	25	4	34	Section 8.1.1. Lns 25-34 suggest certain mechanisms of CO2 emissions (and GHG for that matter), but this is only a basic conceptual model of mechanisms; at best, this paragraph describes general processes through which strategies for mitigation can be developed for region-specific application. I suggest that 1) “mechanisms” be restricted to actual processes that can be defined either globally or regionally, then quantified to some degree; 2) the general processes listed in the paragraph be called that; 3) that the “practices” after ln 35 be used to suggest basic strategies to mitigate emissions. This comment carries into Section 8.4.1.1 and includes the “mechanisms” listed in sections 8.4.1.1.1-12 (pp12 – 18). The “mechanisms” listed in section 8.4.1.1 fall short of becoming strategies, and I think the role of IPCC here is to highlight strategies to implement. (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	Noted. The mechanisms section and paragraph here have been removed.
8-49	A	4	26			Add "reduced" in front of "decomposition" (Roger Gifford, CSIRO)	Noted. The mechanisms section and paragraph here have been removed.
8-50	A	4	26	4	26	.."losses" from agricultural soils.. should be .."emissions" from agricultural soils, same as other parts of the article. (Shigeo Murayama, The Federation of Electric Power Companies)	Noted. The mechanisms section and paragraph here have been removed.
8-51	A	4	27			Liming improves the pH of soils with benefits on chemical, physical and biological soil properties. These improvements can in turn foster greater fertilizer use efficiency (FUE), which would then reduce N2O emissions. It is therefore important to consider the net effects of lime on greenhouse gas emissions from arable land. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. The mechanisms section and paragraph here have been removed.
8-52	A	4	30	4	32	Reducing excessive mineral N fertilizer use could be also a powerful mitigation measure (I specify this later on) (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of	Noted. The mechanisms section and paragraph here have been removed.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						Technology (ETH))	
8-53	A	4	42	4	43	There is is an inherent contradiction between increased productivity and less fallow on one hand and de-intensification on the other. Although there may be situations where de-instensification has a role, sustainable intensification is more likely to be a major way to reduce agricultural GHG, especially if extensification entails the conversion of large tracts of wooded land to cultivation. Please see Cassman, K.G., Dobermann, A., Walters, D.T., Yang, H. 2003. Meeting cereal demand while protecting natural resources and improving environmental quality. Annu. Rev. Environ. Resour. 28: 315-358 for a detailed discussion of this. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Reject. We are considering two alternative ways of achieving GHG reduction which may not be compatible. Each has its merits and its drawbacks and it is right to consider both, not just sustainable intensification, which may not be possible in some regions which already have very intensive agriculture (e.g. NL, DK in Europe). This paper is now included.
8-54	A	4	43	4	43	Should be included a reference on the prescription burning of agricultural residues? (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. Already done.
8-55	A	4	45			What is meant by a "fertilizer free zone?" Should this be "buffer zones"? (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. Fertilizer free zones include buffer strips, riparian zones and “biodiversity headlands”. Fertilizer free zones covers all of these and is an explicit and unambiguous title for the practice. This term is no longer used in the SOD.
8-56	A	4	45	4	46	Cassman et. al have demonstrated that there is virtually no correlation between the quantity of fertilizer applied and nutrients losses. HOW the fertilizer is applied is much more important than HOW MUCH. See Cassman, K.G., Dobermann, A., Walters, D.T., Yang, H. 2003. Meeting cereal demand while protecting natural resources and improving environmental quality. Annu. Rev. Environ. Resour. 28: 315-358. and Cassman, K.G., Dobermann, A., and Walters, D. 2002. Agroecosystems, nitrogen-use efficiency, and nitrogen management. AMBIO 31:132-140. Furthermore, emissions could be decreased on some soils because of the greater efficiencies achieved through balanced fertilization or because the initial soils are extremely degraded (such as much of Africa). It is essential to match the amount, timing, etc to a crop's needs throughout its growth cycle and local agroclimatic conditions. Therefore "reduced fertilizer rates" could either be "site-specific fertilizer rates" or "optimized fertilizer rates". However, the best phrasing would be "increased fertilizer use efficiency". (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. We have added these references and pointed out that improved mechanisms to improve N use efficiency are explicitly considered (under nutrient management). Improved fertilizer use efficiency is included under “fertilizer placement, timing, precision farming, slow-release forms, nitrification inhibitors”.
8-57	A	4	46			Integrated plant nutrient management (IPNM) should be added to this list. IPNM ensures the holistic management of all sources of nutrients, not just fertilizer	Accepted. We have used a similar description but not this term (to avoid jargon).

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						nutrients. By favouring balanced nutrition and water retention (due to increased soil organic carbon), IPNM increases fertilizer use efficiency. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	
8-58	A	4	47	47		Many sites around the UK and along the north western coast of France that would be suitable for tidal stream generation. Many marine current devices are still at the R&D stage but some of them have been tested and deployed in the sea. One of them is deployed along norvegian coast another in the Messina Straight (see : http://www.worldenergy.org/wec-geis/publications/reports/ser/marine/marine.asp and http://www.marineturbines.com/home.htm or http://www.e-tidevannsenergi.com/index.htm). Two projects are at the R&D stage in France. (MICHEL PAILLARD, IFREMER)	**Wrong chapter – this is not a comment on Chapter 8.**
8-59	A	4	0			Section to 8.1. Please consider recommendations that could be adopted immediately, in the short term but not immediately, and things that will need to be evaluated for balance. I suggest also that the recommendations be tied directly to the objective of Article 2 (as stated in Ch. 1, p. 3, ln 18-23): "…stabilization of greenhouse gas concentrations…that would prevent dangerous anthropogenic interference with the climate system." (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	Reject. This is not dealt with here (just the introduction of what is later discussed in detail in section 8.4.2) so not appropriate for this point in the chapter. It is done later. SOD introduction much reduced.
8-60	A	5	6			Insert "and renewable" before "power sources". (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Reject. Being renewable does not imply it is more efficient.
8-61	A	5	7	5	8	What is the relationship between fat in the diet of animals and GHG emissions? (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. A reference is provided later in the chapter.
8-62	A	5	9	5	9	Correct the word: ionophores (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. This error was introduced by TSU edit.
8-63	A	5	9	5	11	Caution must be used with the recomendation of some additives, since they are allowed and some countries, and prohibited in others. Other implications to the human and animal healthy should be considered and therefore caution must be used in recommendations of products. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. This is discussed later in the chapter.
8-64	A	5	13			If "improved livestock" means livestock bred to emit less CH4 from digestive processes, it would be better to make this explicit. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. This is discussed later in the chapter.
8-65	A	5	15	5	15	Livestock manure fermentation in biogas plants should be added (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. This is now considered under manure management (which is now distinct from biosolid application to soil).
8-66	A	5	29	5	37	N2O at bio – energy production has now been assessed in several LCA studies and	Noted. We now use Chapter 4 bio-energy

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						could be included in the 4AR (Peter Kuikman, Alterra)	estimates.
8-67	A	5	42	5	42	Good thing that agriculture is now addressed separately as this is a major industry. In this 4AR, focus is more on all greenhouse gases from agricultural production than in previous AR. This could be improved further as the literature develops fast. Agriculture and agricultural production is growing as food requirements increase and bio – energy cropping and other bio – based technologies using crops are introduced. What can be said about opportunities for decoupling of food and fiber production from production of greenhouse gases in this industry? Does society know how to produce its food at low greenhouse gas emissions or lower emissions than we do today? Compare with the no (or low) – CO2 energy generation. (Peter Kuikman, Alterra)	Noted. Our job is to review and synthesise the available literature, not to perform new research or to express opinions on society's views.
8-68	A	6	3	6	3	The text should be coherent in referring periods of time for analysis of mitigation - sometime,s discussions consider a period of 4 decades, other since 1990, and so on. The same caution is applicable for the time period of scenarios used. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. We have only used 2030 for the SOD for future projections. For past trends, we have predominantly considered emissions since 1990, though changes in agrciluture back to the 1960s are considered as these are still influencing 1990s emissions.
8-69	A	6	5	6	5	An absolute increase of soil for agriculture of 13Mha/yr represents 0.3%% of the total agriculture area available (5020Mha). If this trend is mantained (which isn't expected due slow down in population growth and continuous increase in yield) it will take 2 centuries to occupy all agricultural land and displace pasture to closed cattle-ranching activity. Consequently, I don't see any reason for the strong warning your information is trying to sell to the readers. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Reject. There is no warning either stated or implied in this statement. These are simply the numbers from FAO statistics. The reviewer sees "the strong warning your information is trying to sell to the readers" where there is none. The comment is baseless.
8-70	A	6	10	6	10	Please, confirm if the increase has been 8% since 1960. This is really a modest figure. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Noted. There is a confusion between agricultural land and cropland. Now worded carefully.
8-71	A	6	10	6	15	"This tend will continue…" probably true, but it should be stated strongly and clearly in this paragraph that the increase in cropland cannot sustainably come at the expense of forests they displace. (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	Noted. We have added four references to support this statement.
8-72	A	6	11	6	15	If the trend is 8% in 40 yrs how agriculture will require further 500Mha in 23 years? (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Noted. We have added four references to support this statement.
8-73	A	6	13	6	15	The authors express excessive certainty in saying "This trend will continue into the	Noted. We have added four references to

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						future." More tentative language should be used, and reasoning given. I agree that this is likely the trend will continue for some time, but it must reverse at some point. Perhaps more importantly, one of the hopes of sustainable development is that land degradation and agricultural expansion can be halted by a combination of reversing the changes in diet, ending rich-nation's agricultural subsidies, and restoring traditional cropping methods to areas where excess labor is available (i.e., migration to sweatshops). Room should be allowed for this perpective. I am also concerned about the reference to Trewavas (2002) as this is not an element of primary literature on land areas, but rather an opinion/perspective piece arguing that because of supposed need for food, more agricultural biotechnology is needed. This article is controversial, and potentially in conflict with sustainable development principles I note above. I suggest that this reference should not be cited as it is conversial and not primary literature nor a review of the primary literature. (W. Troy Baisden, Landcare Research)	support this statement. See also comment 8-73.
8-74	A	6	17	6	20	"Technological progress…"—true again, but also it has to be stated that productivity has costs of emissions, land degradation, etc. These points are made elsewhere in the 1200 pages of the report and done well, but these points are missing here where they could have a lot of benefit. Also, stronger caution about cropland conversion of marginal lands and the possibility of added land degradation are appropriate here. (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	Partially accepted. It is mentioned already and revisited later in the chapter.
8-75	A	6	28	6	28	Do you refer to 5% per year at the end of the period? (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Noted. Yes.
8-76	A	6	30	6	30	There is a noun missing after 'highest'. (Bas van Wesemael, Université catholique de Louvain)	Accepted. Reworded.
8-77	A	6	39	6	40	what evidence is there for "saturation of technological progress"? (Norman Rosenberg, 0)	Accepted. Wording changed to "decreasing returns from technological progress"
8-78	A	6	40			Average land productivity will also be negatively impacted by the continued loss of some of the most fertile lands to urbanization. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted.
8-79	A	6	49			explain how "irrigation and N fertilization may increase GHG emissions (Norman Rosenberg, 0)	Noted. Mechanism now described and references added
8-80	A	7	1	7	1	Info on changes in food demand and food quantity and relation with greenhouse gas emissions had been dealt with recently by Oenema et al. (see Oene Oenema, Nicole Wrage, Gerard L. Velthof, Jan Willem van Groenigen, Jan Dolfing and Peter J.	Accept. We have consulted and added this reference.

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						Kuikman (2005) Trends in Global Nitrous Oxide Emissions from Animal Production Systems. Nutrient Cycling in Agroecosystems 72: 51 – 65). (Peter Kuikman, Alterra)	
8-81	A	7	1	7	5	(first bullet): There has to be a more systems-oriented statement here (and elsewhere): the demand increase in meat will also increase the need for manure and nutrient management at a new level, and the systematic connection of these to emissions of GHG is only left for the reader to discover. I think another strong statement about the inter-connectedness of the production system is appropriate and needed. (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	Accepted. Statements on inter-connectedness added where appropriate during the rewrite.
8-82	A	7	5	7	5	If we are comparing animal production systems, all the animal production chain should be considered, including the GHG emissions derived from the fields that produces the grains used as feed. As we consider the balance of GHG emissions, we should sum the emissions derived for eachl input applied in the system. In this case, it is not exactly correct to consider only the methane produced by the animals via eructation, but rather, it should be have the total balance of GHG emissions and sinks for the whole system adopted. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Reject. Where the whole system is being considered, the mitigation due to the system change is already considered. In any case, we are comparing emissions with mitigation, against a baseline where the mitigation is not applied. All other aspects therefore remain the same and cancel out.
8-83	A	7	6	7	6	change the order from 'beef, poultry and pork' to 'poultry, pork (and beef)' (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. Wording changed in the rewrite.
8-84	A	7	6	7	6	What can be said on the changes of emissions of greenhouse gases as industrial production of animal products gets more common (intensive versus extensive production methods and production on – or off – land)? As demand for food and energy from agricultural production go up so do emissions of greenhouse gases but what are the changes per area or unit of product. Such information is crucial for mitigation of emissions (Peter Kuikman, Alterra)	Noted. This is addressed explicitly in section 8.4.1.5.
8-85	A	7	7			"increased amounts of manure … higher GHG emissions" but the animals are fed withplant materials based on carbon drawn from the atmosphere; further the manure can be used as fuel to offset petroleum. Circular and unclear reasoning here (Norman Rosenberg, 0)	Reject. True only for CO_2, not true for CH_4 and N_2O. Manure is now discussed under bio-energy from agricultural by-products.
8-86	A	7	8	7	8	1) In Brazil beef cattle is mostly produced in grazing conditions, and the nitrous oxide emissions from soils under grazing systems trends to be very low, considering the lower rates of protein intake by animals. So, the increase of N2O emissions would not increase substantially as a trend. 2) Pork production has kept	Part 1 of comment noted / accepted. Changed wording to “intensive” instead of “industrial”. The text refers to this form of farming rather than grazing. Reject part 2 of comment. These

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						stable since 1988, when there were 32 million head. In 2005 there were 34 million head, and 3) more and more producers are being involved in CDM projects for biogas production in the South and Middle-West region. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	regional figures do not negate the global trend to which the text refers. Part 3 of the comment is noted. CDM not relevant here.
8-87	A	7	13	7	15	discussion of the use of agricultural products is cursory. Thisw is an important opportuinty that deserves deeper analysis (Norman Rosenberg, 0)	Accepted. This is dealt with in more detail in the SOD.
8-88	A	7	13	7	15	N2O at bio – energy production has now been assessed in several LCA studies and could be included in the 4AR (Peter Kuikman, Alterra)	Noted. We are now using the energy estimates from Chapter 4.
8-89	A	7	17	11	44	Section 8.3 Emission trends (global and regional) should include EPA… which estimates historic (since 1990), present, and future (out to 2020) ag CH4 and N2O emissions for all key regions and countries. (Francisco de la Chesnaye, USEPA)	Accepted. Emissions section now based on this data that was not available at the time of the FOD.
8-90	A	7	32	7	32	The decrease in sheep numbers was so meaningful in a global wide? In which regions this happened? New Zealand, Australia only? (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. The decrease in sheep numbers was globally 17% between 1990 and 2004. This section rewritten in terms of emissions – text removed.
8-91	A	7	35	7	36	This sentence should be rephrased as follows: "Due to the collapse of the Soviet Union, fertilizer use in the Russian Federation fell from 5.44 milliom nutrient tonnes in 1990 to 0.91 million nutrient tonnes. The drop in Ukraine over the same period was from 1.78 to 0.22 million nutrient tonnes." (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Partially accept. This is clearer wording but reworded so that we do not refer to “the collapse of the Soviet Union” which is politically sensitive.
8-92	A	7	37	7	38	According to IFADATA 2004, In 2002/03, New Zealand's fertilizer consumption was only up 188% from 1990/91. However, with regard to considering future trends, it makes much more sense to look at fertilizer consumption in China or India than New Zealand. In 2002/03 New Zealand represented 0.6% of global fertilizer consumption. In contrast, India represented 11% (from 8.7% in 1990) and China represented 27.8% (from 19.4% in 1990). Fertilizer consumption in India grew by 34% in 2002/03 compared to 1990/91, while's China's consumption grew by 48% over the same period. [We are happy to post a copy of the IFADATA cd-rom to the author on request. The 2005 edition of IFADATA should be available in time for the preparation of the SOD.] (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. This was useful data source which was used in US-EPA (2006), upon which the new emissions section is based. Data only to 2010. This section was reworded.
8-93	A	7	40	7	43	This paragraph makes leaves the impression that changes in agricultural practices have been the sole reason for the stabilization of N2O emission rates and the slight	Accepted. The word “agricultural” has been inserted after “global”. However, it is worth

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						decline in methane emissions. However, there have been significant emission reductions in other sectors. N2O emissions from adipic acid manufacture have been significantly reduced (See Section 7.4.3.4) as have methane emissions from natural gas production and distribution (see www.epa.gov/gasstar/accomplishments.htm for details of the U.S. EPA's program to reduce these emissions) and landfills (see Chapter 10). It would be useful to put the change in agricultural emissions into this context. If it cannot be done with numerical data, the steps being taken in other sectors should be identified. (Lenny Bernstein, L. S. Bernstein & Associates, L.L.C.)	mentioning that 84% of N2O emissions originate in agriculture.
8-94	A	7	40	7	41	Is it known whether the decline in the early 1990s was due to global factors or simply the collapse of Soviet industry and agriculture? If so, this should be specified. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. This text has disappeared in the SOD.
8-95	A	7	42	7	42	10% (??) must be completed (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Completed.
8-96	A	7	43	7	43	Improve the Figure 8.3.1. adding the source of data. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Completed for SOD.
8-97	A	8	8			Rice plants do not emit methane. Rice paddies do. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Changed wording.
8-98	A	8	11	8	11	Did Mosier and Kroze consider the same 2 sources (increased fertilizer use and increased animal manure production) for their analysis of N2O emissions? (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. Reworded.
8-99	A	8	13	8	13	This chapter does not specify any developments in developing countries but only in regions dominated by developing countries. I assume this was made deliberately, but may be a little bit simplistic (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. This has been addressed in the rewrite and developed vs. developing countries are now considered explicitly – new tables 8.3.1 and 8.3.2 do this. See also 8-106.
8-100	A	8	17	11	44	It would be useful to have a clearer structure to each region and a similarly structured section at the beginning or end highlighting differences beteen region. I therefore suggest breaking the discussion of each region into approximately 3 paragraphs with parallel content. Currently, these sections contain only one paragraph and run on for up to 80% of a page. I suggest making the first paragraph a summary of the pressures, including economic growth, population growth, and whether population has become dominantly urban (or a substantial labor pool remains in agricultural areas). The second paragraph would then be emissions and emission trends, and the third would be a discussion of mitigation expectations and	Accept. Section reorganised and new source data used (US-EPA, 2006 – not available for the FOD).

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						opportunities. The elements on pressures and directions of future mitigation would seem very important, but is currently difficult to interpret across regiona as some specifics are mentioned for various regions but not others. How do I know if East Asia is more urban than Oceania, and if so is it a net importer or exporter of food? The concept of regions as net importors or exports of food (and perhaps fertilizer) would be a useful concept to include. (W. Troy Baisden, Landcare Research)	
8-101	A	8	17	11	44	Europe is not discussed at all in section 8,3,3 Regional trends. (Bas van Wesemael, Université catholique de Louvain)	Accepted. Regional coverage improved and section rewritten. See response to 8-100.
8-102	A	8	17			Chapter 8.3.3: It is noted that Europe (EU-25) is not covered in this chapter. It is also noted that the dependence on the outcome of negotiations under the WTO has not been considered. However, there might be relevant literature on the impact of changing the market conditions with significant shift in production. It might be also relevant to consider the possible increasing demand for biofuels due to introduction of additional regulations. (Radunsky Klaus, Umweltbundesamt)	Accepted. See response to 8-100
8-103	A	8	17	11	44	Why are South Asia and West Europe totally ignored in this section? (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. See response to 8-100
8-104	A	8	21	11	44	Missing Europe here. Even though emissions may go down trends could include production elsewhere and as such change controls over emissions and mitigation efforts (Peter Kuikman, Alterra)	Accepted. See response to 8-100
8-105	A	8	21	8	21	It should be included countries of Oceania (New Zealand, e.g.) since they increased substantially the use of fertilizer N, as commented in the page 7, paragraph 35. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. See response to 8-100
8-106	A	8	23	8	24	What can be said on the changes of emissions of greenhouse gases as industrial production of animal products gets more common (intensive versus extensive production methods and production on – or off – land)? As demand for food and energy from agricultural production go up so do emissions of greenhouse gases but what are the changes per area or unit of product. Such information is crucial for mitigation of emissions (Peter Kuikman, Alterra)	Noted. This has been addressed in the rewrite and developed vs. developing countries are now considered explicitly – new tables 8.3.1 and 8.3.2 do this – see also 8-99.
8-107	A	8	25	11	45	When discussion regional trends it's strange that for every region a different time-span it taken. This makes comparison difficult. It should be explained why the time span is different. (Berien Elbersen, Alterra)	Accepted. Treatment of different regions has been made more homogeneous. See response to 8-100

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8-108	A	8	33	8	40	Delete this text, because it seems to be out of this matter. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. See response to 8-100
8-109	A	8	35	8	36	"386 billion m3" maybe trunk volume, and "422 billion tonnes" maybe green weight including branches. A bit confusing. Change "global trunk volume of forest". (Mario Tonosaki, Forestry and Forest Products Research Institute)	**Not a comment on Chapter 8 – presumably should be Chapter 9**
8-110	A	8	48	8	48	It is proposed to insert "pressure" after "increasing". (Radunsky Klaus, Umweltbundesamt)	Accepted. Section has been reworded. See response to 8-100
8-111	A	8	48			Insert "pressure" between "increasing" and "to" (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Section has been reworded. See response to 8-100
8-112	A	9	24	9	24	Why the CH4 emissions are smaller in north China compared with south China? It must have a technical reason for this division. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Regional analysis of emission trends has now been based on US-EPA database (US-EPA, 2006), and section has been reworded. See response to 8-100
8-113	A	9	25	9	26	According to official Chinese statistics, nitrogen fertilizer consumption reached 25.8 Mt nutrient in 2004. This represents a 13.6% increase from the 22.t Mt consumption that IFA recorded for 2000. However, IFA has forecast that the growth in China's demand for N fertilizers will slow down in the medium term. Please contact Patrick Heffer for more details. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Regional analysis of emission trends has now been based on US-EPA database (US-EPA, 2006), and section has been reworded. See response to 8-100
8-114	A	9	26	9	26	It should be added a percentage of the reduction of N fertilezers used in China, which would give a more exact figure. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Regional analysis of emission trends has now been based on US-EPA database (US-EPA, 2006), and section has been reworded. See response to 8-100
8-115	A	9	32	9	32	I would suggest: 'Therefore, the direct and indirect GHG emission from …' (Bas van Wesemael, Université catholique de Louvain)	Accepted. Section has been reworded. See response to 8-100
8-116	A	9	35	9	40	I agree with this statement, but the other side of the medal is that introduction of fossil fuels for heating and cooking causes extra GHG emissions. The use of crop residues for cooking could also be considered as a use of 'biofuels'. This should be mentioned. (Bas van Wesemael, Université catholique de Louvain)	Accepted. Section has been reworded. See response to 8-100
8-117	A	9	44	10	15	Compared with other regions, there are less comments on GHG emission trends for Oceania region. The most part of the text mention present and past situation. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Treatment of different regions has been made more homogeneous. See response to 8-100
8-118	A	9	45	10	6	Need references to be cited for these quantitative statements (Roger Gifford, CSIRO)	Accepted. Section has beeen reworded and references added to support quantitative

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							statements. See response to 8-100
8-119	A	10	1	10	1	livestock BREEDING' (Bas van Wesemael, Université catholique de Louvain)	Accepted. Section has been reworded. See response to 8-100
8-120	A	10	6	10	7	Although the reduction of methane emissions per unit of product is na important mitigation strategy, it must be considered the total sum of the methane emissions from the animal population in each country or region. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Section has been reworded and emissions scenarios based on new data from US EPA (US-EPA, 2006). See response to 8-100
8-121	A	10	16			Section 8.3.3 The text on Europe is small by comparison with other regions! This needs to be enhanced to include western Europe. (Frank McGovern, Environmental Protection Agency)	Accepted. Treatment of different regions has been made more homogeneous. See response to 8-100
8-122	A	10	17	10	43	Need references for this material; (Roger Gifford, CSIRO)	Accepted. Section has been reworded and emissions scenarios based on new data from US EPA (US-EPA, 2006). See response to 8-100
8-123	A	10	20	10	20	Retype 2010. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. See response to 8-100
8-124	A	10	20	10	20	It is proposed to substitute "20100" by "2010". (Radunsky Klaus, Umweltbundesamt)	Accepted. See response to 8-100
8-125	A	10	20			What is the source of this forecast? (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Section has been reworded and emissions scenarios based on new data from US EPA (US-EPA, 2006). See response to 8-100
8-126	A	10	22			explain relationship of "decreased resource supply" to improved agricultural management (Norman Rosenberg, 0)	Accepted. Section has been reworded. See response to 8-100
8-127	A	10	23			What is a subsidiary farm? (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Section has been reworded. See response to 8-100
8-128	A	10	25	10	25	Why are the small farms unlikely to increase (it is missing an explanation for this afirmative). (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Section has been reworded. See response to 8-100
8-129	A	10	39	10	41	What is the source of this forecast? Over what timeframe is the change expected? (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Section has been reworded and emissions scenarios based on new data from US EPA (US-EPA, 2006). See response to 8-100
8-130	A	10	45	11	3	treatment of N. America is inadequate; compare for example treatment of USSR and L. America	Accepted. Treatment of different regions has been made more homogeneous. See response

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						(Norman Rosenberg, 0)	to 8-100
8-131	A	10	45	11	3	Limited information for North America, so that is notable an unbalance of regional trends descriptions. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accept. Treatment of different regions has been made more homogeneous. See response to 8-100.
8-132	A	10	45	10	48	The level of N fertilizer use is not a valid indicator for productivity and crop intensity because it disregards N fertilizer use efficiency (FUE), which has had a dramatic impact in North America. Fertilizer use in the United States has remained flat since the late 1980s -- the application rate per hectare has increased marginally -- but fertilizer use efficiency has increased massively. CASE STUDY 1980 N application rate per treated acre – 130 lbs. % of acres treated – 96 Acres planted – 84.043 million acres Total computed N use – 5.244 million tons Total corn production – 6.395 billion bushels 2003 N application rate per treated acre – 136 lbs. % of acres treated – 96 Acres planted – 78.736 million acres Total computed N use – 5.140 million tons Total corn production – 10.114 billion bushels This means that 58% MORE corn was produced (factors included increased plant density, better seeds, greater water efficiency, etc.) in 2003 than in 1980 using 2% LESS N. This is a huge increase in FUE. Detailed statistics can be found in PPI/PPIC/FAR Technical Bulletin 2002-1: Plant Nutrient Use in North American Agriculture. Potash & Phosphate Institute, Norcross, GA, USA. • www.ppi-ppic.org and www.ppi-far.org. ISBN 0-9629598-4-7. Pages 26-29 and related annexes are the most relevant. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Section has been reworded and emissions analysis based on new data from US-EPA (US-EPA, 2006). See response to 8-100
8-133	A	10	47	10	48	This sentence is not clear: Should 'is indicated' be replaced by 'as indicated'? (Bas van Wesemael, Université catholique de Louvain)	Accepted. Section has been reworded. See response to 8-100
8-134	A	11	2	11	3	The development of biofuel crops is also important. Although this has an economic	Accepted. Section has been reworded. See

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						aspect, it is also being driven by policy goals to increase the amount of bioenergy in national portfolios. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	response to 8-100
8-135	A	11	5	11	44	Need reference citations (Roger Gifford, CSIRO)	Accepted. Section has been reworded and new references added. See response to 8-100
8-136	A	11	6	11	6	Why the time period for the analyis of emissions trends in Latin America is based on 36 years, while for the other regions the analysis was made only after 1990 or for the last decade (North America)? If we consider the last 17 years (1988-2005), livestock numbers in Brazil, e.g., accounts for only 17% of increase in the beef cattle population and 7.3% of increase in the swine population. Brazil is the most important producing region in that continent, beyond Argentina, Uruguai and Chile, so it gives a very representative picture about livestock sector in that continent. In my view, that report should not consider the evolution of livestock numbers since 1961 in Latin America, differently of the period of time used for the other regions. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. We have now made the regional analyses more homogeneous. Sectoral trends are mainly based on FAO statistics running since 1961 (to enable best visualization of long-term trends), and emission trends are mainly based on US-EPA dataset, with a time series between 1990 and 2020. See response to 8-100
8-137	A	11	29	11	29	Are these estimatives officials, since 1961 !!?? Does exist references or data source for these estimates? (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. See response to 8-100. Yes - data exist on agricultural practices from FAO from 1961.
8-138	A	11	31	11	32	Switching from Tg to Gt from one line to the next is confusing for the reader. Use units consistently. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. See response to 8-100
8-139	A	11	41	11	44	Caution must be used in affirming that point of view, basically because there is no acurate estimate about the past and present situation of the C stock in no till areas and in terms of CO3 removals. Very recent research studies have been carried out to get more precise information on the soil and biomass C stocks and CO2 releases in the region. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. See response to 8-100
8-140	A	11	41	11	41	30 Mha of crops every year in the region... Add please the information on data source. Would be this figure (30 Mha) constant since 1970 or did it evolute since then? Currently, no tillage is widely used in Brazil over an area of 14 million ha (Pereira, 2002), and is a widely accepted practice by farmers, both by smallholders (< 50 ha) and large scale intensive production farmers in Brazil (Machado and Silva, 2001). (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Section has been reworded and better backed by new references. See response to 8-100
8-141	A	11	0			Section 8.4 has a strong technical focus on the field level but fails to link to the decision making level at the farm scale. No clear reference is made to the farming	Accepted. The link to the decision making level at the farm scale is made through the

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						system or farm household level. This level is crucial in defining mitigation strategies because at this level technical, economic, social and environmental issue come together and. (jan verhagen, plant research international, wageningen ur)	costs and potentials analysis and the barriers analysis in the corresponding sections of the chapter.
8-142	A	12	9			Section 8.4.1.1.1 & Table 8.4.1.2a The table identifies "Management of Organic Soils" as having the greatest mitigation potential of all the non-livestock options, by at least an order of magnitude. However, little emphasis is place on this mitigation option in Section 8.4.1.1.1. It would be useful to identify the activities, specifically relating to organic soils, which are causing the emissions, which show this potential for mitigation? (Frank McGovern, Environmental Protection Agency)	Accepted. More details on cultivated / drained organic soils are now given in section 8.4.1.3.
8-143	A	12	10			It is technically correct but misleading to state that "Carbon dioxide is lost from agricultural soils by the decomposition of soil organic matter', since C stocks are determined by the balance of plant (and other) inputs and decomposition losses. Therefore the second sentence is a useful beginning for this section. I suggest inserting 2 sentences after this stating that, "Historically, considerable organic matter has been lost from agricultural soils due enhanced rates of decomposition following tillage (Miller, A.J. et al 2004. Biogeochemistry, 67: 57-62). Much of the mitigation potential of agricultural soils is associated with restoring this lost soil organic matter through reduced tillage practices that may also reduce soil erosion." (W. Troy Baisden, Landcare Research)	Accepted. Wording changed and “mechanisms” section removed.
8-144	A	12	10	12	26	Section 8.4.1.1.1 is weak being too descriptive. It needs to be made more quantitative. (Roger Gifford, CSIRO)	Accepted. Wording changed and “mechanisms” section removed.
8-145	A	12	10	12	26	In the humid tropical regions, SOM decomposition trends to be intense due to high temperature and precipitation, especially under intensive soil tillage. Maintenance of soil organic carbon concentration is critical in soils of these areas, because of its importance to soil fertility and cation exchange capacity. Conversion of plow till to conservation tillage can lead to sequestration of soil organic carbon (SOC) and improvement of soil quality (Lal, 2001). (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. We discuss soil tillage and disturbance in section 8.4.1.1 (c).
8-146	A	12	10	12	26	Decomposition of soil organic matter (SOM) is especially increased by physical disturbance with tillage, which disrupts macroaggregates and exposes previously protected soil to microbial processes. Studies comparing crop rotation and no	Noted. We discuss soil tillage and disturbance in section 8.4.1.1 (c).

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						tillage effects in a Rhodic Ferralsol from southern Brazil showed that no tillage had a more similar distribution of aggregate size classes and TOC to the forest soil than to the conventional tillage (disc ploughing followed by light disc harrowings). The most pronounced difference between tillage systems was observed in the surface soil layer (0-5cm). In this layer, no tillage had higher aggregate stability, higher values of agrregate size distribution and had on average 28% greater TOC in alll aggregate size classes than conventional tillage. Also, crop rotation did not have a significant effect on soil aggregate distribution and TOC. In conclusion, by increasing macroaggregation no tillage increased organic carbon accumulation in soil ((Madári et al., 2005). Madári, B.; Machado, P.L.O.A.; Torres, E.; Andrade, A.G.; Valencia, L.I.O. No tillage and crop rotation effects on soil aggregation and organic carbon in a Rhodic Ferralsol from southern Brazil. Soil & Tillage Research, v. 80, p. 185-200, 2005. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	
8-147	A	12	10	12	26	Other studies in Brazil indicate that continuous cropping and reforestation with pine led to a clear reduction of SOM contents, whereas pasture and eucaliptus reforestation increased both the amount and quality of SOM in relation to the Cerrado (savanna) control treatment (Neufeldt et al., 2002). Nelfeldt, H.; Resck, D.V.S (2002); Ayarza, M.A. (2002). Texture and land-use effects on soils organic matter in Cerrado Oxisols, Central Brazil. Geoderma, v. 107, p. 151-164. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. Reforestation not relevant in this chapter.
8-148	A	12	12	12	14	I question why some sections do not have references but others do. In this case, the statement on erosion is well written and brief but should be referenced. Early in the sentence describing a local gains and losses, the following references would be appropriate: Harden, J. W. et al, Global Biogeochemical Cycles 13(4): 885-901; AND Manies, K. L et al.(2001). Global Change Biology 7: 545-55; and Page, M. J.et al. (2004) Agriculture Ecosystems & Environment 103: 561-579. At a national scale (end of sentence) the following two papers should be referenced: Stallard, R. F., 1998 Global Biogeochemical Cycles, 12: 231-257 AND Scott, D. T. et al (2006). Geophysical Research Letters, 33: L01402. To be slightly richer and more accurate, statement could be revised slightly to read: "Soil erosion can also result in the loss or gain (through burial) of carbon locally (Harden et al 1999, Manies et al 2001, Page et al 2004), but the net effect of erosional carbon losses on atmospheric CO2 at national scales is unclear (Stallard 1998, Scott et al 2006). Finally, I encourage the authors to make sure that references appropriate to grazing lands remain included because these lands are often steeper and more erodible than	Accepted. Section rewritten in terms of practices rather than mechanisms and citations improved for all practices.

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						cropland. (W. Troy Baisden, Landcare Research)	
8-149	A	12	19	12	20	The words 'harvest procedures' should be modified to read simply 'harvest'. Harvest, or harvest index is often one of the single most important variables influencing C storage (Kucharik, C. J. 2001, Ecosystems, 4, 237-258; Baisden and Amundson 2003, Ecological App. 3:649-663.) Although harvest procedures is relevant, that is encompassed in harvest, and it is far more important to recognise that an ever-increasing proportion of plant production is harvested and removed from the ecosystem than it is to describe how this material is harvested. (W. Troy Baisden, Landcare Research)	Accepted. Section rewritten in terms of practices rather than mechanisms and citations improved for all practices.
8-150	A	12	25			The "assumed" short life of carbon in harvested products could be better referenced. (Frank McGovern, Environmental Protection Agency)	Noted. Section moved and reworded.
8-151	A	12	35			The text on aerosols, plus copious references, is a bit confused and does not really add to this section on "reducing CO2 losses from biomass burning". This is an important issue but there may be other ways or sections of this report to better introduced and highlight this idea. As written the reader may get a view that cloud condensation nuclei etc, produces a positive forcing. This should be avoided. The text may best be reduced and focused on to "black soot" or "light absorbing aerosols" and perhaps link to a section that shows is mitigation potential. (Frank McGovern, Environmental Protection Agency)	Accepted. Section rewritten and clarified – global dimming is important and all potential impacts have been considered.
8-152	A	13	2	13	2	Type agents instead of agencies. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted.
8-153	A	13	5	13	11	In considering the GHG emission implications of liming it is necesray to factor in the organic C storage implications of the increase producutivity engendered by liming. (Roger Gifford, CSIRO)	Accepted – section removed as potential is negligible compared to other measures.
8-154	A	13	5	13	11	The practical value of what is suggested here is limited for several reasons. 1) Liming improves the pH of soils with benefits on chemical, physical and biological soil properties. These improvements can in turn foster greater fertilizer use efficiency (FUE), which would then reduce N2O emissions. It is therefore important to consider the net effects of lime on greenhouse gas emissions from arable land. 2) Ammoniacal fertilizers used in combination with nitrification	Accepted – section removed as potential is negligible compared to other measures.

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						inhibitors or controlled-release products allow a high level of control over the nitrifciation process. Eliminating the use of "acidfying" fertilizers could actually result in lower fertilizer use efficiency and thus more than counter any benefits of reduced lime use. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	
8-155	A	13	8	13	8	Type both compounds instead of each compounds. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted – section removed as potential is negligible compared to other measures.
8-156	A	13	8			As written, this statement is untrue because not all fertilizers acidify soils. The acification potential for different fertilizers ranges from zero to 500 kg caCO3 per 100 kg N applied. For more on this, see p. 13 of IFA, 1992. World Fertilizer Use Manual. Paris, France. This same information can be found on pages 9-10 of the pdf version of the introductory chapter, which is downloadable at www.fertilizer.org/ifa/form/pub_det.asp?id=909. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted – section removed as potential is negligible compared to other measures.
8-157	A	13	12			Section 8.4.1.1.3 Liming of Soils Would suggest that the text should indicate that management of soil pH is important for maintaining crop productivity. Poor crop development implies less efficient usage of applied fertiliser. The N not taken up by the crop is a lost to the environment (effecting water quality as well as GHG emissions) and a cost to the farmer. (Frank McGovern, Environmental Protection Agency)	Accepted – section removed as potential is negligible compared to other measures.
8-158	A	13	27	13	27	Add the word globally. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Reworded.
8-159	A	13	31	11	33	animal production to produce these products': This phrase contains three times 'produc'. (Bas van Wesemael, Université catholique de Louvain)	Accepted. Reworded.
8-160	A	13	39	13	39	It is proposed to substitute "of" by "or". (Radunsky Klaus, Umweltbundesamt)	Accepted. Reworded.
8-161	A	13	41	13	42	Guo and Gifford's meteanalysis concluded that planting conifer trees onto pastures generally decreases soil carbon rather than sequesters C in soil as stated here. (Roger Gifford, CSIRO)	Accepted. Cited Guo & Gifford (2002) here
8-162	A	13	45	14	25	In the discussion on Biomass crop mixes there is no mention of the expected technology improvements (second generation) making the ligno-cellulosic crops used as feedstock for bio-energy (especially fuels) more attractive. This is expected from 2010 onwards. But this may also shift land use for biomass production tomards a higher share of perennials. In terms of mitigation capacity this will	Noted and now discussed in 8.8.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						certainly be a good development as C-input capacity in soils by perennials is much higher than for most rotational arable crops. Perennials also have lower input levels (fertilizers, pesticides) and require less mechanisation (tillage). In this section, this is not discussed here nor in the mitigation sections. The higher share of perennials from 2010 will generally also be more beneficial for farmland biodiversity. (Berien Elbersen, Alterra)	
8-163	A	13	45	14	22	The success in offsetting fosil fuel using biomass feedstocks would largely depend on price relationships as well as the amount required to switch from one technology to a less agressive one (Francisco Meza, Facultad de Agronomia. Pontificia Universidad Catolica de Chile)	Noted. Dealt with in sections 8.4.3 and 8.4.4.
8-164	A	13	0			Section 8.4.1.1.5 Incerasing non-soil pool is a continuing mitigation theme as it should be, but the IPCC report does not stress the importance of balance on other resources. Does it make sense to plant water using trees in areas where water availability is declining? Where is the balance in the current position in 8.4.1.1.5? (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	Noted. These constraints are discussed in the trade-offs and benefits section.
8-165	A	13	0			8.4.1.1.6: Similar comment to the previous one. Why not make the tie to reducing biomass burning by suggesting conversion of biomass that would have been burned to biofuel? Again, balance of the system is not being mentioned where it should be emphasized with all the weight IPCC has to offer. Balance between biomass burning and biofuel comes in again on p 14, line 20-23. (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	Noted. Biomass burning in the field versus burning biomass for energy has now been clarified.
8-166	A	14	2	14	2	Carbon or CO2? (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Changed to CO_2 for consistency.
8-167	A	14	3	14	3	Your statment that the use of feedstocks for ethanol production offsets a smaller percentage (10 -30%) isn't correct. In the case of sugarcane the offset is around 85%. Ethanol is being produced today half by sugarcane and half by corn. Furthermore, remember that sugarcane bagasse is burned to provide the heat and electricity for sugar mills with a significant surplus of electricity injected in the grid and consequently avoiding further CO2 emission from fossil fuel-based generators (Moreira, 2005, Global biomass energy potential. Mitigation and Adaptation Strategies for Global Change(Special Issue, forthcoming)..) (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Noted. This text has now gone. We use bio-energy estimates from Chapter 4.
8-168	A	14	8			After "…for biodiesel", insert "and (d) direct incineration of biomass to produce heat or electricity plus heat, which is probably the most efficient way to produce	Noted. This text has now gone. We use bio-energy estimates from Chapter 4.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						energy from biomass." Direct incineration of agricultural biomass (e.g. cereal straw) is already technically feasible and common practice in some countries, for instance Denmark. For more details, please contact F. Brentrup. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	
8-169	A	14	20	14	22	Removal of crop residues for bio – energy generation not only removes organic matter offsetting CO2 mitigation but also may remove nitrogen that need to be replenished at the expense of fertilizer and associated energy (CO2) and N2O (check i.e. Robertson, G.P., E.A. Paul and R.R. Harwood. 2000. Greenhouse gases in intensive agriculture: Contributions of individual gases to the radiative forcing of the atmosphere. Science 289:1922-1925 and others) (Peter Kuikman, Alterra)	Noted. This text has now gone. We use bio-energy estimates from Chapter 4.
8-170	A	14	30	14	30	Probably crop and livestock yields are already close to the maximum level considering limitatons of each agricultural system, uner any economic regime producers tend to maximize utilities usually by means of maximizing yields (Francisco Meza, Facultad de Agronomia. Pontificia Universidad Catolica de Chile)	Noted. But not according to FAO statistics which still show a year-on-year 1% increase in yield (FAO, 2005).
8-171	A	14	32	14	34	Increasing fertilizer use efficiency has several positive knock-on effects for energy efficiency: less product is needed to achieve the same yields, which means that less net energy is used during fertilizer production to achieve the yield; more efficient fertilizers mean less energy expended on transport per unit of yield, etc. This will further increase the positive energy balance of fertilizer use: life-cycle studies in Europe already show that the amount of energy obtained through the increase in harvested biomass due to N fertilization exceeds by at least five times the energy input through N fertilizer application. For more details see Küsters, J. and J. Lammel, 1999. Investigations of the energy efficiency of the production of winter wheat and sugar beet in Europe. Published in the European Journal of Agronomy 11(1999) 35-43. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. This text has now gone. Section 8.8. deals with these co-benefits and trade-offs ina more concise way.
8-172	A	15	1	15	8	The paragraph is extense and not exactly clear. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Reworded.
8-173	A	15	2			Schneider/McCarl reference missing (Norman Rosenberg, 0)	Accepted. Inserted.
8-174	A	15	10	15	35	No-till management is discussed, but no mention is made of the effects on mitigation of long- and short term fallow. This is however a very relevant mitigation measure considered in EU policy. More attention should therefore be given to this issue, especially in relation to the length of the fallow period.	Accepted. This is now included (with an example for Latin America) in section 8.3.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Berien Elbersen, Alterra)	
8-175	A	15	10			8.4.1.1.8 Reducing nitrous oxide emissions from agricultural soils Whole farm and integrated analysis of GHG emissions are of interest. Studies of grassland suggest that emissions of N2O due to N-fertiliser application to pastures may be offset by enhancement carbon uptake and may be GHG neutral c.f. Managed grasslands: A greenhouse gas sink or source? Leahy P, Kiely G, Scanlon TM, Source: Geophysics. Res. Letters 31 (20): No. L20507, 2004 (Frank McGovern, Environmental Protection Agency)	Noted. But a top down approach is necessary for global estimates. We have noted that mitigation practices will differ between regions, according to local circumstances. See also response to 8-2.
8-176	A	15	12	15	37	This section introduces the relatively high uncertainty in estimates on nitrous oxide emissions as these may very annually and seasonally. Despite this uncertainty, the direction of change of emissions following mitigation measures or management changes may very well be effective and predictable. Quantification of effect may remain difficult but the (direction of) change may be effective at all times and in all cases and predictable indeed. As such we should not overlook such options for mitigation. Could the authors address the issue as to what could be done to reduce uncertainte here? Is more measurements the appropriate direction (extend the Bouwman database) and if not, what is? SEE ALSO P. 33, line 16 - 29 (Peter Kuikman, Alterra)	Noted. We note that the uncertainty is high and where possible this has been quantified. It is not the purpose of the AR4 to make research recommendations. so we have not done so. We have made revisions to the text and provided a new plot (8.4.3c) to show uncertainty (as far as it can be quantified).
8-177	A	15	35	15	37	Difficult to understand and may need to be detailed. Indeed, the quantification of nitrous oxide has many difficulties. One certainly is that only general sources (animal manure, fertilizer) have been recognized and emissions from subsets, i.e. differents qualities of fertilizers or manure are not included in the emission calculations and as such effective mitigation does not show in inventories. How to deal with this problem? (Peter Kuikman, Alterra)	Accepted. Section rewritten.
8-178	A	16	6	6	11	Heading appears to be inserted one paragraph early. (W. Troy Baisden, Landcare Research)	Accepted. One paragraph was repeated.
8-179	A	16	8	16	10	Remove this paragraph (repeated). (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. One paragraph was repeated.
8-180	A	16	8	16	10	This sentence is mentioned already just above. (Bas van Wesemael, Université catholique de Louvain)	Accepted. One paragraph was repeated.
8-181	A	16	10	16	40	Description is too technical and detailed. This detail is not needed to explain the mitigation options discussed further on. (Berien Elbersen, Alterra)	Accepted. Simplified, reduced and better-referenced for SOD
8-182	A	16	13	16	39	There is an uncharacteristic level of detail here on the processes of ruminant	Accepted. Simplified, reduced and better-

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						emission. It is useful, but could be condensed by half, unless a subtantial justificaion based on the information in lines 36-39 is provided and this information moved to the start of the section. (W. Troy Baisden, Landcare Research)	referenced for SOD
8-183	A	16	48	16	48	I suggest that you add a new sentence here with the following content: 'However, in a range from 0 to 50% concentrate in the diet, the mitigation effect of added concentrate is small and is counterbalanced by simultaneously enhanced emissions from the manure (Hindrichsen et al. 2006 - reference given below). Much more attention also has to be given to the carbohydrate composition of the concentrate in this respect (Hindrichsen et al., 2005 reference below). (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. Section revised and new figures used not available for FOD.
8-184	A	17	1	17	12	The focus is methane emission, and it is not being considered the balance of gases in the whole production system (other inputs and outputs). (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. Full GHG balance considered for all practices.
8-185	A	17	5	17	5	Change text to 'of certain oils and whole crushed oilseeds which can reduce methane emissions (e.g. Machmüller…' (or Machmueller) (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. Section revised and new figures used not available for FOD.
8-186	A	17	6	17	6	…is a problem with unattended grazing of ruminants… There are lots of grazing systems where regular supplementary feeding is possible (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. Section revised and new figures used not available for FOD.
8-187	A	17	8	17	8	…reducing emissions per unit of animal product (Leng…)'. Actually, a better pasture quality is associated with a higher fibre digestibility and therefore with a higher methane emission per kg of feed and especially per hectare (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. Section revised and new figures used not available for FOD.
8-188	A	17	19	17	20	replace 'methanogenic bacteria' by 'methanogenic archaea' or 'methanogens' since these are no bacteria. There has to be mentioned that 'public concerns against chemicals in feeds of livestock would prevent its use anyhow' (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. Section revised and new figures used not available for FOD.
8-189	A	17	28			Is it not possible to give a more informative update of the current prospect of a succesful application of this research? (Roger Gifford, CSIRO)	Noted. Section revised and new figures used not available for FOD.

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8-190	A	17	29	17	29	BSt - in some countries its use is prohibited (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted.
8-191	A	17	30	17	30	change to '…but can to a certain, very limited, extent reduce methane… (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. Section revised and new figures used not available for FOD.
8-192	A	17	36	17	37	Clarify better the text (avoid using terms as " perhaps..") (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. Section revised and new figures used not available for FOD.
8-193	A	17	39	17	39	supplement '…lifetime emissions, but requires more reproductive animals for their delivery.' (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. Section revised and new figures used not available for FOD.
8-194	A	17	42	17	42	Biogas plants should be mentioned (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. New section (and emissions estimates) included under manure management.
8-195	A	17	44	17	49	Text was already used before in some place. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. Text improved.
8-196	A	18	1	18	1	Khalil and Shearer (2005; see below) recently mentioned that one important reason for the reduction of methane emission also seems to be the exchange of organic (manure) by anorganic N fertilizers since this reduces C sources; the unfavourable side-effet is that nitrous oxide emissions increase (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted.
8-197	A	18	1	18	20	The use of no-tillage used for rice producing (flooded conditions) should be explored, since some studies indicate a slight reduction in CH4 emissions (Costa et al. (2003)). COSTA, F. S., LIMA, M. A., BAYER, C., FRIGHETTO, R. T S, BOHNEN, H., MACEDO, V. R M, MARCOLIN, E. Methane emissions from a flooded rice field in the south of brazil In: 3rd international methane and nitrous oxide mitigation conference, 2003, Beijing. Proceedings of the 3rd international methane and nitrous oxide mitigation conference. 2003. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. This was explored in the Smith et al. (2006a) and US-EPA (2006a) studies now cited in the SOD.
8-198	A	18	1	22	5	Sections 8.4.1.1.13 and 8.4.2 should incorporate a recently accepted paper utilizing the DNDC model to assess the biophysical mitigation potential of rice CH4 (along with N2O and soil C) for China: Li et al. (2006) "Assessing Alternatives for Mitigating Net Greenhouse Gas Emissions and Increasing Yields from Rice Production in China Over the Next 20 Years", Journal of Environmental Quality (forthcoming).	Accepted. This paper will be cited if published in time. We have used the US-EPA (2006a) estimates based on the Li et al. paper cited.

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						(Francisco de la Chesnaye, USEPA)	
8-199	A	18	3	18	20	Information about possibilities of mitigating methane emissions from rice cultivation is now available from a number of studies since the 1980's. Those are summarized and evaluated the potentials of the mitigation options, which are published in several review papers, e.g., Yagi, K., Tsuruta, H., and Minami, K. (1997): Possible options for mitigating methane emission from rice cultivation, Nutr. Cycling Agro-Ecosys., 49, 213-220; Wassmann, R., Lantin, R.S., Neue, H.U., Buendia, L.V., Corton, T.M., and Lu, Y. (2000): Characterization of methane emission from rice fields in Asia. III. Mitigation options and future research needs, Nutr. Cycle. Agroecosys., 58, 23-36. Those reviews should be refered and cited in the text. Also, summarization with the table attached, for example, would be useful (Kazuyuki Yagi, National Institute for Agro-Environmental Sciences)	Accepted. We have now used figures from US-EPA (2006a) and used in Smith et al. (2006a). These papers are now cited.
8-200	A	18	24	18	28	In some developing countries (Brazil, e.g.) social constraints must be considered, since many rural workers depend on these jobs, which involve the burned residues of sugar cane. Many discussions have been spent on this matter in the country, and the social and economic pressures on the existing regional laws become them ineficients still today. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Social and other constraints are now listed in co-benefits and trade-off section (8.8). See also 8-201.
8-201	A	18	28	18	28	At this point it could be useful to say that sugarcane harvesting in Brazil is being pushed to mechanization due legislation that forbids pre-harvest burning. Presently, 30% of the sugarcane is machine harvested and should reach 100% by the year 2020. Brazil sugarcane area is 1/4 of total world area. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Accept. Social and other constraints are now listed in co-benefits and trade-off section (8.8). See also 8-200.
8-202	A	18	32	19	21	There is a startling mismatch of the discussion here and the main thrust of the Table 8.4.1.2a to which it refers. Taking the Table on face value, the main message is that all the non-livestock mitigation optiosn are trival alongside the one that stands out as dominat - namely"Management of organic soils", which overwhelms all other numbers in the Table. Yet when you look at thre footnote for that entry you find that it is based on IPCC defalut methodology, while the other etsimates are based on more solid information. This requires cpomment and analysis. If the default methodolgy is reasonable then there is a huge conclusion to bedrawn for the role of agricultural management to reduce GHG emisisons. If the deflaut methodology is evaluated as erroneous then that needs to be spelled out very clearly and if possible some approaches to improve it suggested. Either way this mismatch between the content of the text and of the table must be fixed. (Roger Gifford, CSIRO)	Reject. Misunderstanding. See communication with the reviewer below. “Dear Pete, Thank you for checking up on what I was arguing. My comments were based on Table 8.4.1.2a from the downloaded draft Chapter. The third column (first column of numbers) is the emission reduction potential from various activity categories...Ah-ha! As I write I have just noticed that that is the potential per **hectare,** not a total figure. So that resolves the issue. I am wrong. While the potential per unit area for organic soils is huge there isn’t much organic soil. My apologies for that

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							oversight. It did seem odd and I should have been more alert. Good luck with your trying task. Roger"
8-203	A	18	41	18	41	Ogle et al 2005: missing in reference list (Bas van Wesemael, Université catholique de Louvain)	Accepted. This is now added.
8-204	A	19	1	19	4	In my point of view, it does not make sense to separate livestock and not livestock-based options. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. We do not assume that they happen independently; we simply assess the GHG impacts separately.
8-205	A	19	3			Footnote of Table 8.4.1.2b: replace 'Machmuller et al. (2004)' by 'Machmüller et al. (2003)'. (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted.
8-206	A	20	5	20	10	Why does the biomass potential assessment only rely on IMAGE model calculations? There are several other potential studies for global biomass which should also be involved in the assessment. Preferably models which have worked with less course input data than the IMAGE model does. (Berien Elbersen, Alterra)	Accepted. We now use bio-energy figures from Chapter 4.
8-207	A	20	9			Given the rapid changes in the bioenergy production, it would be highly desirable to cite a much more recent source. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. We now use bio-energy figures from Chapter 4. The IMAGE 2.2 reference has been updated to Strengers et al. (2004) when used later in the chapter.
8-208	A	20	17			Figure 8.4.2 seems to be missing. But presumably the management of organic soils works out as ovewrwhelmimg the potential of all the rest combined. (Roger Gifford, CSIRO)	Noted. It is not missing. It does show a large potential (mean estimate) but not overwhelming. Although the per-area estimates are high, the areas affected are relatively small. See response to comment 8-202.
8-209	A	20	20	20	22	I don't see why is impossible to implement a certain action at a rate higher than 20% over the next years. Take a look in the rate of increase in production of ethanol from sugarcane in Brazil and from corn in USA and it is very clear that annual increase of 10% per year has been achieved during several years period. Thus, if there is pressure to obtain a particular product, the implementation rate can be over 20%. Such implementation may be driven by the lack of fossil fuel and thus very little related with CO2 financial value. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Noted. We have dropped the 10-20% implementation assumption. Now we use on a CO_2-eq. price / cost based response.
8-210	A	20	28			Figure 8.4.2a:The role of livestock seems surprisingly low in this graph. Please	Noted. Livestock figures reanalysed in Smith

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						check again if this is not a calculation error. Independent from that, psychologically this is not ideal and also not entirely true to separate livestock from grazing land and, cropping land, since management of grazing land and, partially, of cropping land is in reality a livestock-related activity (feeding). (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	et al. (2006a) based on new FAO and US-EPA (2006a) numbers. Livestock numbers comparable to US-EPA (2006a) estimates for the same cost.
8-211	A	20	29	20	36	The discussion of biodiversity could be improved by making it clear that the effects of forest management on biodiversity are very site specific and can often be mitigated by selection of appropriate management methods. References illustrating the opportnities for maintaining and enhancing biodiversity through proper forest management are (1) Bird, S. et. al., "Impacts of silvicultural practices on soil and litter arthropod diversity in a Texas plantation", Forest Ecology and Management 131 (2000) 65-80. and (2) Wilson, M.D. and Watts, "Breeding bird communities in pine plantations on the coastal plain of North Carolina", The Chat, published by teh Carolina Bird Club, West Columbia SC, Winter 2000 - more references are listed below (Reid Miner, NCASI)	**Not a comment on Chapter 8 – presumably should be Chapter 9**
8-212	A	20	29	20	36	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (7) Tucker, J.W., et. al., "Managing mid-rotation pine plantations to enhance Bachman's sparrow habitat", Wildlife Society B u l l e t i n 1998, 26(2):342-348, and (8) Rosenfeld, R.N., "Breeding distribution and nest-site habitat of northern Goshawks in Wisconsin", Journal of Raptor Rresearch Vol 32 (3): 189-194 September 1998,, published by the Raptor Research Foundation, OSNA, Waco TX (Reid Miner, NCASI)	**Not a comment on Chapter 8 – should be Chapter 9**
8-213	A	20	29	20	36	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (5) Tappe P.A. et. al., "Breeding bird communities on four watersheds under differetn forest management scenarios in the Ouachita Mountains of Arkansas", in in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p and (6) Carnus, J_M, et. al., "Planted forests and BIodiversity," UNFF Intersessional Experts Meeting on the Role of Planted Forests in Sustainable Forest Management, 24-30 March 2003, New Zealand, available at http://www.maf.govt.nz/mafnet/unff-planted-forestry-meeting/ - More references are listed below	**Not a comment on Chapter 8 – should be Chapter 9**

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						(Reid Miner, NCASI)	
8-214	A	20	29	20	36	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (3) Fox, T.F. et. al., "Amphibian communities under diverse forest management in the Ouachita Mountains, Arkansas", in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p.and (4) Shipman, P.A. et. al., "Reptile communities under diverse forest management in teh Ouachita Mountains, Arkansas", in in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p - more references are listed below (Reid Miner, NCASI)	**Not a comment on Chapter 8 – should be Chapter 9**
8-215	A	20	46			If about 90% of the total agricultural mitigation potential calculated derives from the IPCC default methodology for organic soil management, surely this desreves comment as to a) its significance of true or b) the credibility of the estimates for orgqnic soil management. Given this it is quite misleading to compare this overall figure with other etsimates without looking at the composition of the overall figures being compared. (Roger Gifford, CSIRO)	Reject. See comment 8-202.
8-216	A	21	25	21	30	In each argument, floor area data is necessary. (Mario Tonosaki, Forestry and Forest Products Research Institute)	**Not a comment on Chapter 8 – should be Chapter 9**
8-217	A	21	30	32	22	In relation to the calculation of the mitigation options through biomass crop production (IMAGE) it should be made clear what type of land use categories are assumed to be converted to biomass crop production. Is the starting point land in agricultural statistics? If so what type of land is included? Is it assumed that e.g. abandoned farmlands, semi-natural grasslands, forests are converted to biomass crops? If so has the clearing and ploughing up of such lands be accounted for in terms of CO2 losses and other biodiveristy losses? (Berien Elbersen, Alterra)	Accepted. We now use bio-energy figures from Chapter 4.
8-218	A	21	30	32	22	In relation to the calculation of the mitigation options through biomass crop production (IMAGE) it should also be made clear what type of biomass crop mixes are assumed in space and in time. (Berien Elbersen, Alterra)	Noted. We now use bio-energy figures from Chapter 4.
8-219	A	21	32			p21, calculation of technical potential fossil fuel offset in 2025 (100-2070 MT	Accepted. We now use bio-energy figures

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						CO2eq/yr). Calculation to be made comparable with Ch4 p.39, l.49 solving the discussion with ch 9 authors, who state in ch.9, p22. line 12 that there is no sink. Note also that in several places of the report, including the glossary biomass has been given a classifier "carbon neutral". (Peter Bosch, IPCC TSU WGIII)	from Chapter 4.
8-220	A	21	34	21	34	The assumed yield of 4 and 12 dry t/h/yr are small compared with results from sugarcane. Sugarcane yield in well managed crop is 100 tonnes/há/yr from which total sugars represent 13.5% and dry biomass 14%. On top of that, sugarcane residues adds another 14% to the yield of dry matter. All these together represents 13.5 tonnes of sugar, 14 tonnes of dry bagasse and 14 tons of dry residues, yielding near 40 tones of matter per hectare per year. It is expected that most biomass for energy will be produced from high yield crop like sugarcane, instead of corn. When using fast growing trees it is expected to obtain yields of 20 tonnes of dry wood from eucalyptus plantation per ha per yr. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Accepted. We now use bio-energy figures from Chapter 4.
8-221	A	21	35	21	45	In the case of alcohol from sugarcane total net CO2 displaced by its use in automobiles is 2.6 tCO2/m3 of ethanol (Macedo et al., 2004). Assuming 13.5 tonnes of total reducible sugar it is possible to produce 7500 l/há, displacing 19.5 t CO2/há. On top of that surplus electricity is sold to the grid at a rate of 80kWh per tonne of sugarcane processed, or 8MWh/ha. Assuming a C-electric average grid intensity of 0.5 tCO2/MWh, this represents 4tCO2/ha. Total displacement is 23.5tCO2/ha(19.5 + 4), or 0.9tCO2/tonne of dry matter. Based in sugarcane grown in 60Mha it should be possible to produce 2400M tonnes of biomass, instead of the 230 to 1700Mtonnes quoted. Regarding CO2 abatement it would yield 2100Mtonnes of CO2 instead of the figures ranging from 360 to 2730<tCO2 quoted. All the results presented are from Macedo I., 2004 valid for sugarcane in Brazil and they already include net CO2 emission, that is CH4 and N2O emitted from biomass burning is already accounted. This amount of biomass (60Mha at 7,500l of ethanol and 8MWh per ha) represents a final energy of 12EJ /yr instead of 2EJ. Regarding the upper value it would be 120EJ/yr. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Accepted. We now use bio-energy figures from Chapter 4.
8-222	A	21	35			More key references regarding the opportunities to improve a structure's carbon footprint by using low-carbon materials and systems. (4) Peirquet, P., Bowyer, J., and Huelman, P. 1998. Thermal performance and embodied energy of cold climate wall systems. Forest Products Journal 48(6):53–60, (5) Lenzen, M., and Treloar, G. 2002. Rejoinder to: Greenhouse gas balanced in building construction:	**Not comments on Chapter 8. These belong in Chapter 9.**

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						Wood versus concrete from life-cycle and forest land-use perspectives. Energy Policy 30(2002):249-255, (6) Sarri, A. 2001. Environmental specifications of building parts and buildings (in Finnish). TKK Rakentamistalous [Helsinki University of Technology, Construction Economics and Management]. Published by Rakennustietosaatio RTS [Building Information Foundation RTS], Helsinki. Sponsored by Rakennustieto Oy [Building Information Ltd.]. http://www.rts.fi/Ymparistoselosteet.pdf. (Reid Miner, NCASI)	
8-223	A	21	35			Additional references for this section include; (1) Borjesson, P., and Gustavsson, L. 2000. Greenhouse gas balanced in building construction: Wood versus concrete from life-cycle and forest land-use perspectives. Energy Policy 28(2000):575 588, (2) Lippke, B., Wilson, J., Perez-Garcia, J., Bowyer, J., and Meil, J. 2004. CORRIM: Life-cycle environmental performance of renewable building materials. Forest Products Journal 54(6):8 19, (3) Scharai-Rad, M., and Welling, J. 2002. Environmental and energy balances of wood products and substitutes. Food and Agriculture Organization of the United Nations (FAO). http://www.fao.org (June 4, 2005). More references on this list are shown in the cell below (Reid Miner, NCASI)	**Not comments on Chapter 8. These belong in Chapter 9.**
8-224	A	22	5	22	10	This item is based only the Kyoto Protocol or also in other iniciatives? (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. We now use bio-energy figures from Chapter 4.
8-225	A	22	7	23	25	Section 8.4.3 should include a recently accepted paper looking at the global ag mitigation potential for CH4 (from livestock management, manure, and rice) and N2O (from croplands) at different costs using an engineering approach to develop marginal abatement curves: DeAngelo et al. (2006) Methane and Nitrous Oxide Mitigation in Agriculture, Energy Journal (forthcoming). (Francisco de la Chesnaye, USEPA)	Accepted. This is now used extensively and figures derived in Smith et al. (2006a) which also include CO2, are compared to the US-EPA figures upon which the DeAngelo et al. paper is based.
8-226	A	22	7	23	25	Section 8.4.3 should include a new report that was not available to the authors at the time of writing. This report is focused on the U.S. and assesses effectiveness of agricultural (as well as forestry) net GHG mitigation options in response to different price incentives and different price paths over time: U.S. EPA (2005) Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture, EPA 430-R-05-006, Washington, DC. Available at: www.epa.gov/sequestration (Francisco de la Chesnaye, USEPA)	Accepted. Now included for US comparison.
8-227	A	22	11	22	23	This discussion of biomass energy is unnecessarily negative in tone and potentially misleading in that it attempts to blur the distinction between the carbon in biomass fuels and the carbon in fossil fuels. Biomass fuels are fundamentally different than	**Not comments on Chapter 8. These belong in Chapter 9.**

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						fossil fuels in that biomass carbon is returned to the atmosphere only years to centuries after having been removed from the atmosphere. The benefits of biomass fuels depend on several things, most importantly on whether the biomass is used to avoid the use of fossil fuel and whether it is used efficiently. Biomass carbon is destined to be recycled to the atmosphere whether humans intervene or not. By diverting biomass through an oxidation pathway that allows us to displace fossil fuels, we can benefit the global carbon (providing we do not deplete global forest carbon stocks in the process). Whether the benefit can be sustained depends on a continuous supply of biomass. We recommend that the paragraph be replaced with several sentences that say simply that the value of biomass fuels depends on how efficiently they are used to displace fossil fuels. (Reid Miner, NCASI)	
8-228	A	22	25		30	The discussion of biodiversity might better focus on the fact that the effects of intensive forest management on biodiversity are very site specific and can often be mitigated by selection of appropriate management methods. References illustrating the opportnities for maintaining and enhancing biodiversity through proper forest management are (1) Bird, S. et. al., "Impacts of silvicultural practices on soil and litter arthropod diversity in a Texas plantation", Forest Ecology and Management 131 (2000) 65-80. and (2) Wilson, M.D. and Watts, "Breeding bird communities in pine plantations on the coastal plain of North Carolina", The Chat, published by teh Carolina Bird Club, West Columbia SC, Winter 2000 - more references are listed below (Reid Miner, NCASI)	**Not comments on Chapter 8. These belong in Chapter 9.**
8-229	A	22	25		30	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (7) Tucker, J.W., et. al., "Managing mid-rotation pine plantations to enhance Bachman's sparrow habitat", Wildlife Society B u l l e t i n 1998, 26(2):342-348, and (8) Rosenfeld, R.N., "Bredding distribution and nest-site habitat of northern Goshawks in Wisconsin", Journal of Raptor Rresearch Vol 32 (3): 189-194 September 1998,, published by the Raptor Research Foundation, OSNA, Waco TX (Reid Miner, NCASI)	**Not comments on Chapter 8. These belong in Chapter 9.**
8-230	A	22	25		30	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (5) Tappe P.A. et. al., "Breeding bird communities on four watersheds under differetn forest management scenarios in the Ouachita Mountains of Arkansas", in in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management	**Not comments on Chapter 8. These belong in Chapter 9.**

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						research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p and (6) Carnus, J_M, et. al., "Planted forests and BIodiversity," UNFF Intersessional Experts Meeting on the Role of Planted Forests in Sustainable Forest Management, 24-30 March 2003, New Zealand, available at http://www.maf.govt.nz/mafnet/unff-planted-forestry-meeting/ - More references are listed below (Reid Miner, NCASI)	
8-231	A	22	25		30	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (3) Fox, T.F. et. al., "Amphibian communities under diverse forest management in the Ouachita Mountains, Arkansas", in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p.and (4) Shipman, P.A. et. al., "Reptile communities under diverse forest management in teh Ouachita Mountains, Arkansas", in in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p - more references are listed below (Reid Miner, NCASI)	**Not comments on Chapter 8. These belong in Chapter 9.**
8-232	A	22	30			Another reference discussing the use of wood ash to replenish forest nutrients is Vance, E.. "Land application of Wood-fired and combination boiler ashes: An overivew", Journal of Environnmental Quality, Vol,. 25, No. 5, September 1996 (Reid Miner, NCASI)	**Not comments on Chapter 8. These belong in Chapter 9.**
8-233	A	23	10			The discussion of studies of forestry-related mitigation opportunities in North America should include EPA 2005, "Greenhouse gas mitigation potential in U.S. forestry and agriculture," Report EPA 430-R-05-006, November 2005, which is perhaps the best study of this issue ever performed for the US. (Reid Miner, NCASI)	**Not comments on Chapter 8. These belong in Chapter 9.**
8-234	A	23	37	23	41	This is an important paragrpah that desrves greater prominance, (Roger Gifford, CSIRO)	Noted. We have already done this by putting it in the summary (both the text and table) and in the TS.
8-235	A	24	5	24	10	In addition the positive effects of agro-forestry for biodiversity should also be mentioned. Agro-forestry habitats are very rich in biodiversity (e.g. Dehesas and Montados in Spain and Portugal). (Berien Elbersen, Alterra)	Accepted. Now dealt with in the new table 8.8 and revised supporting text.

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8-236	A	24	5	24	32	It should be discussed the influence of external markets on the mitigation options. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. Already done. That is what section 8.4.3 is devoted to.
8-237	A	24	9	24	9	MA, 2005 is not included in the references. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Added to the list.
8-238	A	24	15	24	31	A sentence could be added to introduce shadow pricing and methods for valuing environmental impacts such as effects on production or health, preventive costs, replacement costs, travel costs, wage differences, proprty values, proxy marketed goods, artificial markets, contingent valuation, benefit transfer, etc. Details may be found in (MM 1992); (IPCC 2000); (MMRS 2005); or Freeman, M. 1993. The Measurement of Environmental and Resource Values: Theory and Methods. Resources for the Future, Washington D.C. (Mohan Munasinghe, Munasinghe Institute for Development (MIND))	Noted – but could not find appropriate place to place the sentence – perhaps it should go in one of the cross cutting chapters.
8-239	A	24	35	25	19	The interactions between adaptation and mitigation deserve more discussion than given in the FOD and identification of do's and don't's on the basis of literature should be feasible. (Peter Kuikman, Alterra)	Accepted – section rewritten and focussed better on agriculture.
8-240	A	24	38	24	38	Conversely, actions to enhance adaptation... (add some examples) (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted – section rewritten and focussed better on agriculture.
8-241	A	24	41	24	42	Statement "Mitigating GHG emissions has global benefits regardless…" needs to be restated many time in this chapter. I suggest adding it to sections 8.1.1 and 8.4.1.1 in a highly visible spot, maybe at the beginning of the lists of "mechanisms" and "practices". (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	Reject. Repetition is not necessary. This is covered in section co-benefits and trade-offs and is apparent from the sections where the greatest impact on agricultural mitigation is shown to be in non-climate policy, rather than climate policy.
8-242	A	24	0			The information in section 8.5 is not very well worked out and could perhaps move to the introduction of the chapter. Also here the farm level is not mentioned. (jan verhagen, plant research international, wageningen ur)	Accepted – section rewritten and focussed better on agriculture.
8-243	A	25	21	33	29	A number of statements are made about other sectors. This is good in principle, but the authors must be careful to make the link to mitigation in the agricultural sector explicit. (W. Troy Baisden, Landcare Research)	Accepted – section rewritten and focussed better on agriculture.
8-244	A	25	24	26	41	What about Asia? (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted – Asia now included.
8-245	A	25	41	25	42	As far as I know there are no specific policies targeted at reducing GHG emissions from agriculture in Belgium. However, several authors have evaluated the effect of agro-environmental policies (designed for other purposes) on the potential for GHG	Accepted. Wording has been changed.

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						emissions. Details can be found in Dendoncker et al. (Agriculture, ecosystems and environment, 2005; Sleutel et al. submitted and Smith et al. 2005 in Global Change Biology) (Bas van Wesemael, Université catholique de Louvain)	
8-246	A	25	43	25	44	Otherwise, EU imports more and more meat from Brazil, which production systems are more traditional (grazing) (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted. Leakage is discussed in the barriers section.
8-247	A	26	15	26	15	Typo error. Oceania (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Accepted.
8-248	A	26	17	26	19	This statement seems out of step with continuing decrease in forest planting in New Zealand. At present, net forest planting rates may become negative! News reports make it clear that rancor between the forestry sector and the government over Kyoto credits and liabilities, and particularly uncertainty of liabilities is retarding planting and replanting. Also, how does this relate to agricultural mitigation -- presumably through competition for the same land and more sustainable use of agricultural steepland. (W. Troy Baisden, Landcare Research)	Noted – non-agricultural text dropped.
8-249	A	26	24	26	35	Last year (2005) Ministry of Agriculture, Livestock and Food Supply in Brazil, created the Program Crop-Livestock Integration, which is a new proposal for funding agricultural projects that contribute with the rehabilitation of degraded lands, by the intensification of livestock and/or cropping, in a temporal sequence, for sustainability of the production. The aim is to increase soil organic matter, reduce erosion process, minimize pathogens, improve soil chemical fertility for pastures, and promote the use of no tillage cropping. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. Added to new table 8.7.3.
8-250	A	26	24	26	35	Also, in Brazil, the Ministry of Agriculture, Livestock and Food Supply diffunded new Resolutions (decisions) that favours the sustainable use of farms. For example, Resolution n.3.295, which deals with alterations in investing programs, supported by the National Treasure and the National Bank of Economic and Social Development (BNDES), as well as about credit sectors of the Finame Agrícola Especial (FAE). Among the activities to be funded are the Modernization of Agriculture and Conservation of Natural Resources Program (Moderagro) which includes finantial support for environmental adjustment projects of rural proprieties and also the implementation of soil conservacionist practices. According to the Resolution 3296, which deals with Adjustments in funding rules to the support of	Noted. Space constraints mean that not all policies for each country can be included – but a selection are added in new table 8.7.3.

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						controlled resources of rural credit, starting from 2005/2006. The limits of credit established at the MCR 3-2-5, an other fund programe, were raised to 15%: a) to benefit users which prove the physical existence of legal reserves and permanent preservation areas foreseen in the legislation, or which presents a rehabilitation plan with the approval of the "Secretaria Estadual do Meio Ambiente do Instituto Brasileiro do Meio Ambiente" and of the "Recursos Naturais Renováveis (Ibama)" or of the "Ministério Público Estadual. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	
8-251	A	26	27	26	27	Authors should provide with evidence tat supprts the idea that caros sequestration in agricultural soils is the CC mitigation opting with the highest potential (Francisco Meza, Facultad de Agronomia. Pontificia Universidad Catolica de Chile)	Reject. Already done. The evidence is already presented in section 8.4.3.
8-252	A	26	43	27	49	I am surprised at the brevity of this section. If, as stated earlier in the chapter, the realistic potential of agricultural mitigation technologies is only 10-20% of the biophysical potential, there are substantial barriers blocking adoption of mitigation technology. These deserve a fuller discussion and some indication of their relative importance. (Lenny Bernstein, L. S. Bernstein & Associates, L.L.C.)	Noted. The 10-20% assumption has been dropped.
8-253	A	26	0			section 8.6.2 Adoption by farmers, land owners and land managers does also depend on how easy changes in management etc can be implemented in existing systems. Again farm level research can provide insight in how make these transitions. (jan verhagen, plant research international, wageningen ur)	Noted. Already dealt with. See response to 8-2.
8-254	A	27	35	27	36	Measurement and monitoring costs could be huge if new methods for analysis of carbon stocks are not adopted. This is one section of the report that could be augmented to include a brief discussion of soil carbon analysis, at least. Conventional methods (dry combustion, etc.) have relatively high detection limits (i.e., can't detect low carbon easily or small change in carbon over time) and are relatively costly (3 to 15 US$ per sample using estimates from US labs). New methods of analysis are either available or nearly so that could change the accuracy, precision, cost-effectiveness, and decrease uncertainty in soil carbon estimates. These methods need to be mentioned. Here are 8 recent references: 1. Cremers, D. A., M. H. Ebinger, D. D. Breshears, P. J. Unkefer, S. A. Kammerdiener, M. J. Ferris, K. M. Catlett, and J. R. Brown. 2001. Measuring Total Soil Carbon With Laser-Induced Breakdown Spectroscopy (LIBS). J. Environmental Qual. 30:2202-2206. 2. Ebinger, M. H., M. Lee Norfleet, D. D. Breshears, D. A. Cremers, M. J.	Noted. Soil carbon analysis and the costs of verification have been thoroughly reviewed before (e.g. Smith, 2004) and this is not the place for an in depth discussion on the topic. However, it has been given more prominence in the text and review of new innovations to measure SOC added.

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						Ferris, P. J. Unkefer, M. S. Lamb, K. L. Goddard, and C. W. Meyer. 2003. Extending the Applicability of Laser-Induced Breakdown Spectroscopy for Total Soil Carbon Measurement. Soil Sci. Soc. Am. J. 67:1616-1619. 3. Christy, C.D., P. Drummond, and D.A. Laird. "An on-the-go Spectral Reflectance Sensor for Soil." ASAE Paper 031044. Proceedings of the 2003 ASAE annual meeting July 27-30, 2003. Las Vegas, NV.. 4. Brown, D.J., R.S. Bricklemyer, P.R. Miller, 2005. Validation requirements for diffuse reflectance soil characterization models with a case study of VNIR soil C prediction in Montana. Geoderma 129:251-267. 5. McCarty, G.W., J.B. Reeves, III, V.B. Reeves, R.F. Follett and J.M. Kimble. 2002. Mid-infrared and near-infrared diffuse reflectance spectroscopy for soil carbon measurement. Soil Sci. Soc. Am. J. 66:640-646. 6. Shepherd, K.D. and M.G. Walsh. 2002. Development of reflectance spectral libraries for characterization of soil properties. Soil Sci. Am. J. 66:988-998. 7. Wielopolski L., I. Orion, G. Hendrey and H Roger H. 2004a. Soil Carbon Measurements Using Inelastic Neutron Scattering, IEEE Trans. Nucl. Sciences, 47, 914-917. 8. Wielopolski L., S. Mitra, G. Hendrey, I. Orion, S. Prior, H. Rogers, B. Runion, and A. Torbert, 2004c. Non-destructive Soil Carbon Analyzer (ND – SCA), BNL Report No.72200-2004. (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	
8-255	A	27	41	27	44	Another important consideration corresponds to perceptions of changes in productivity. If GHG mitigation is seen as something that will increase costs and/or reduce productivity it is less likely that the startegy will be implemented (Francisco Meza, Facultad de Agronomia. Pontificia Universidad Catolica de Chile)	Noted. Already dealt with in barriers section and included in the costs analysis in section 8.4.3.
8-256	A	28	1	28	8	An important polcy that bears onGHG emissions is population policy. While it has become relatively unfashionable to tlak about population limitation,population remains the biggest driver behind grwoth in GHG emissions and should not be sidestepped. It deserves a section of its own. (Roger Gifford, CSIRO)	This is more appropriate for IPCC WGI. Population is considered as a driver throughout the text – we consider the mitigation against a baseline (i.e. without the mitigation implemented). All mitigation is against this baseline with population increase in both baseline and mitigation scenario.
8-257	A	28	12	28	19	Are there no examples from countries other than China? (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted.
8-258	A	28	13	28	16	It is proposed to check the sentence. Something seems to be missing. (Radunsky Klaus, Umweltbundesamt)	Accepted. English corrected in section rewrite.
8-259	A	28	16	27	16	This sentence really makes no sense. It looks as though it were poorly translated or	Accepted. English corrected in section rewrite.

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						if key words are missing. (Jeff Price, California State University, Chico)	
8-260	A	28	16	28	16	I think there are either words missing or doubled in this sentence. (Bas van Wesemael, Université catholique de Louvain)	Accepted. English corrected in section rewrite.
8-261	A	28	19	28	19	will have increases': I suggest to replace by 'will increase' (Bas van Wesemael, Université catholique de Louvain)	Accepted. English corrected in section rewrite.
8-262	A	28	31	28	32	in production' Do you mean that the productivity of alternative fuels increases? (Bas van Wesemael, Université catholique de Louvain)	Noted. No – just that renewables will become important – reworded to make meaning clear.
8-263	A	28	36	28	44	It should be mentioned that under reform of CAP it can be expected that stocking densities, especially for beef, dairy cows and sheep are likely to further decrease in most parts of the EU. See e.g. EEA (2004). Agriculture and the environment in the EU accession countries. Envi-ronmental issue report No 37. EEA, Copenhagen. http://www.eea.eu.int/; EEA (2005). Agriculture and environment in EU-15-the IRENA indicator report. EEA Report, no. 6/2005.; EuroCare (2004). Outlooks on selected agriculture variables for the 2005 State of the Environment and the Outlook Report. EEA/RNC/03/016; Freibauer, A; M.D.A. Rounsevell, P. Smith, A. Verhagen, Carbon sequestration in European agricultural soils, Soil Science Review, 2004 ; DG Agriculture of the EC (2005). Prospects for agricultural market and income 2005-2012. Bruxelles.; (Berien Elbersen, Alterra)	Accepted. We consider the mitigation against a baseline (i.e. without the mitigation implemented). All mitigation is against this baseline with changes in livestock numbers included in both baseline and mitigation scenario. This is explicitly accounted for.
8-264	A	28	0	35		(Not clear which paragraph, TSU) It is proposed to revisit the basic message of this paragraph. This is because the price fluctuations of the oil price and associated price of natural gas is not comparable to uncertainties related to precipitation, solar radiation or wind speed. Usually the yearly means of precipitation, solar radiation and wind speed fluctuate considerable less compared to the oil price and it is recommended to address the issue of long term trend. That assessment would clearly demonstrate the different character of the price for fossil fuels compared to fluctuation of the potential for renewables. (Radunsky Klaus, Umweltbundesamt)	**Noted. Not clear to which part of the text this comment refers. Comment on another chapter? Perhaps the energy chapter?**
8-265	A	29	11			There is either a number missing here or "by" should be deleted. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Word “by” removed
8-266	A	29	16	29	16	1010' should read '2010' (Bas van Wesemael, Université catholique de Louvain)	Accepted. Typo corrected
8-267	A	29	30	29	31	What about the rest of Asia, which is rather large? (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Other Asia now considered.
8-268	A	29	38	29	40	The statement that "There is a general expectation that establishment of	Noted. Water markets now included.

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						comprehensive water markets will over time result in reductions in the size of industries such as rice and irrigated dairy with consequent reductions in the emissions from these sectors" needs to be supported by the literature and a specific citation for this claim is necessary. (Spencer Edwards, Australian Greenhouse Office)	
8-269	A	30	1	30	8	Please, if you want to include the example of PROALCOOL it is necessary to update the description. Just after (Moreira and Goldemberg, 1999) include the following: "After 1990, incentives were progressively removed and sales of neat ethanol car reduced drastically up to the year 2000. Consequently, the use of neat ethnaol decreased while anhydrous ethanol blended at 25% to gasoline increased due the increase in automobile fleet. Nevertheless, since 2000, neat ethanol cars sales started to recover due the higher price of oil and significant reduction in alcohol price. By 2003 with the introduction of flexfuel cars, able to run on 100% hydrated ethanol up to gasoline blended to 25% ethanol, significant retake in the consumption of ethanol was observed. At the end of 2005 more than 70% of all cars sales are dominated by flexfuel models." (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Reject. We have now summarized the policies in table format. Too much country specific detail – not appropriate here.
8-270	A	30	6	30	8	The development of flex-fuel cars, which now account for half of car sales in Brazil, have surely been a factor as well. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. Text removed.
8-271	A	31	13	31	14	These references are missing from the reference list (Bas van Wesemael, Université catholique de Louvain)	Accepted.
8-272	A	31	14	31	14	I suggest to add a sentence on the effect of the stricter environmental regulations in Belgium and their impact on GHG emissions: 'At the same time, regulations to prevent NO3 leaching have become stricter leading to a reduction in manure production and consequently a decrease in N2O emissions and an emission from CO2 from soils (Dendoncker et al., 2005). (Bas van Wesemael, Université catholique de Louvain)	Reject. We have now summarized the policies in table format. Too much country specific detail – not appropriate here.
8-273	A	31	18			Use surplus straw for increasing C stocks in soil is possible but is also in competition with biomass use for bioenergy. Should maybe mentioned. (Berien Elbersen, Alterra)	Accepted. This is now noted.
8-274	A	31	35			Despite having members who regularly report on the agricultural situation in the region, we are not aware of any bans on fertilizer application in Russia, Belarus and the Ukraine. Please explain what you mean here and provide a reference. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. Text revised: “Water quality initiatives such as the Water Codes of the Russian Federation, Ukraine and Belarus encourage reforestation and grassland establishment and ban ploughing in riparian zones which

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
							potentially encourage soil sequestering practices. The banning of fertilizer application in these areas may also reduce N_2O emissions (Belarus) Sources: Water Code of the Republic of Belarus, No. 191-3, 15 July 1998. Article 77 Water Code of the Russian Federation, No 167, 16 November 1995. Articles 105,111 Water Code of Ukraine, No 213/95-BP, 6 June 1995. Article 91."
8-275	A	31	46	32	4	What about India, Japan or any Asian country besides China? (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Other Asian countries now included. to be considered.
8-276	A	32	31	32	34	the word 'However' in "However this change in land management is only partly driven by public policy……" this conveys the notion that enlightened self interest is somehow a negative rather than the most effective force in achieving progress (Norman Rosenberg, 0)	Accepted. That was not the implication but it does read that way. Removed word "however" in the rewrite.
8-277	A	32	32	32	34	Successful adoption of no-tillage systems mainly in Latin America is evident, particulary in Brazil, where farmers are willing to adopts this conservation tillage system. Farmers see no-tillage systems as a less laborious and less risky procedure enabling fuel and machinery savings with consequent cost reductions (Machado & Silva, 2001). According to these authors, "despite being experimentally sucessful in West and Central Africa, no-tillage adoption by farmers is prevented by the prohibited costs of herbicides, the meagree availability of no-till seeding machines or hand jab planters and the deficiency of seeds of cover crops with simultaneous research on the feasibility of mulch management". (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Noted.
8-278	A	32	32			More than 50% of the cropland of Argentina is now under no-till farming. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. Figures on no till in Latin America now given and caveat about the uncertainty about how much of that area is under permanent no till is also included.
8-279	A	32	41	32	41	However, there are groups in some countries that are developing carbon trading schemes based on ecosystem services. (Jeff Price, California State University, Chico)	Noted. New text added in the climate policy section (end of 8.6.1).
8-280	A	32	46			Increasing fertilizer consumption in Africa would result in more crop residues being incorporated into the soil. This would both improve soil fertility and increase	Reject. This is contrary to many other estimates (e.g. Schlesinger, 1999). This is an

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						C sequestration. Due to farming intensities that are not compensated by fertilizer use, Africa currently loses nutrients worth USD 4 billion from its soils annually. Sanchez, Pedro A. 2002. "Soil Fertility and Hunger in Africa". Science 295: 2019-20. In 1998, E. Solberg estimated that 10 to 12 pounds of carbon can be sequestered for every pound of nitrogen applied as fertilizer. Solberg, E, 1998 Alberta Agriculture, Food and Rural Development, Edmonton Canada, cited in: Political Challenges and Opportunities Facing the Global Fertilizer Industry in the 21st Century. Presented at the IFA Annual Conference, Toronto, ON, Canada, May 1998. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	overly simplistic argument. Already discussed in the co-benefits / trade-offs section (8.8).
8-281	A	32	48	34	38	Section 8.8 Co-benefits and trade-offs of mitigation options would benefit by incorporating a study quantifying the water quality co-effects of GHG mitigation actions in U.S. agriculture: Pattanayak et al. (2005) "Water Quality Co-effects of Greenhouse Gas Mitigation in U.S. Agriculture," Climatic Change 71(3): 341-372. (Francisco de la Chesnaye, USEPA)	Noted. This section has been rewritten and a new table included (8.8).
8-282	A	32	48			Chapter on co-benefits and trade-offs offers significant added value in a very reader-friendly manner. (Radunsky Klaus, Umweltbundesamt)	Noted. Thank you. This section has been rewritten and a new table included (8.8).
8-283	A	32	0	37		Generally in section 8.8, its quite useful to see both co-benefits and tradeoffs listed for different activity areas. Some of the subsections (esp. 8.8.8 through 8.8.17) would benefit from a bit more development (e.g., citing relevant literature, assessing the current state of knowledge - what do we know now?, and noting where further research is needed - what don't we know?). (Mark Heil, U.S. Environmental Protection Agency)	Accepted. This section has been rewritten and a new table included (8.8).
8-284	A	33	4	33	6	This claim needs credible referncing. It has become a received wisdom, but is it true? (Roger Gifford, CSIRO)	Accepted. This section has been rewritten and a new table included (8.8).
8-285	A	33	16	33	20	no-till leading to greater use of herbicides--more porius soils, greater leaching (Norman Rosenberg, 0)	Accepted. This section has been rewritten and a new table included (8.8).
8-286	A	33	23			why "sudden" CO2 release? Presumeably this section is about soil C. It is much more likely that sudden releases will occur from oceanic and geological deposits than from soils (Norman Rosenberg, 0)	Accepted. Removed the word “sudden” in the section rewrite.
8-287	A	33	25	33	28	the need for "newly-cultivated cropland elsewhere" will be offset by significant yield improvments in the future (Norman Rosenberg, 0)	Noted. This is just an example.

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8-288	A	33	33	33	43	Riparian zones may have benefits in terms of less nitrate leaching but also are zones of high but (relatively uncontrolled) denitrification with the intermediate – product N2O. Here is a clear trade – off between different pathways of losses of nitrogen and this provide risk. Some suggest that like in industrial processes denitrification and formation of N2 is an effective measure to tackle high nitrate leaching or ammonia volatilization. Whether this works in ecosystems such as agriculture or riparian zones where N2O is produced in rather uncertain amount remains to be seen and deserves warning in my view. (Peter Kuikman, Alterra)	Accepted. This section has been rewritten and a new table included (8.8). This effect has been noted.
8-289	A	33	33	33	33	I am unclear as to what field biodiversity is. Perhaps the authors mean species richness of plants? Perhaps just using the term biodiversity with no modifier before it? (Jeff Price, California State University, Chico)	Accepted. Removed word “field” in section rewrite.
8-290	A	33	34			"reduction in fertilizer applications" should be replaced by "more efficient fertilizer use" (see note from p.4 of this chapter). (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Reject. The riparian zones receive no fertilizer so this is a case of reduction in use, not improved efficiency – not explicitly mentioned in the SOD in any case.
8-291	A	33	36			Due to global pressures for food, de-intensification in one location is likely to trigger greater intensification elsewhere, so the net effect is uncertain. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. Discussed under “leakage / barriers section.
8-292	A	33	40	33	41	Delete the last sentence of this paragraph. Because gains in fertilizer use efficiency are gradual, they are likely to be offset by growth in fertilizer demand that is necessitated by the growing population, at least for the foreseeable future. IFA forecasts no declines in overall fertilizer consumption in the medium term. For more information on demand forecasts, see International Fertilizer Industry Association (IFA), 2005: Summary Report -- Medium-Term Outlook for Global Fertilizer Demand, Supply and Trade. Paris, IFA, June 2005. Available at www.fertilizer.org/ifa/publicat/PDF/2005_kl_ifa_summary.pdf. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. We have looked at these projections and they are only for 2010 so cannot be used for the 2030 projections here. However, the increased use on N is taken into account in the new figures we use (US-EPA, 2006a). Mitigation is compared to the baseline of where mitigation is not used – therefore the increased N appears in both the baseline and the mitigation scenario so is included explicitly.
8-293	A	33	43			should we worry about potential negative effects on the fertilizer industry if N demand is reduced? Other such examples abound in this section ad absurdum. Should the global agricultural economy be concerned if I decide to eat less as a matter of weight control? Other examples of this kind of reasoning appear in p.36, lines 4-5. Should we be concerned about competition for inputs if restoration of degraded lands brings about important societal and environmental benefits? Should	Accept. The whole section has been revised and a new table added (8.8).

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						we worry about (p. 36, lines 14-15) that "increased production of bioenergy crops might negatively affect the oil industry?" I thought that's exactly what we should hope to do--reduce petroleum consumption. And what about the poor coal industry? Overall Section 8.8 is weak and unconvincing. To be made useful, all of the tradeoff discussions need some (even primitive) estoimations of quantitative and economic consequences (Norman Rosenberg, 0)	
8-294	A	33	47	33	47	Many types of agro-forestry also reduce biodiversity. Giving a single reference and a single sentence does not do justice to the complexity of this issue. However, it is covered better in chapter 9 so the authors could consider simply referring readers there for a better overview. (Jeff Price, California State University, Chico)	Accepted. We have referred to the relevant section in Chapter 9
8-295	A	33	49	33	50	This trade off should be formulated more carefully: It should be added that this additional pressure on land only applies to situations where there is a choice. In situations where water scarcity is high and irrigation is limited (e.g. arid (Mediterranean) regions) agro-forestry is often one of the few agricultural practices possible without the need for additional irrigation. (Berien Elbersen, Alterra)	Accepted. We have referred to the relevant section in Chapter 9
8-296	A	33	0	42		There are excellent summaries of ideas, applications, etc. in these pages. However, the report in this chapter (and overall) falls short in one very important area: recommendations on adopting various mitigation strategies. With the kinds and depth of information reported in Ch. 8 (as well as the other sector-related chapters), it would not be difficult to develop a ranking or prioritization (or several based on general land types, climate change scales) based on the different scenarios coupled with mitigation options. I don't suggest the IPCC do the analysis of these options or strategies, but IPCC has a definite role in stating how some of the "mechanisms" and "practices" couple with powerful modeling approaches and the useful scenarios discussed elsewhere in the report to suggest implementation of options that fulfill IPCC goals. Why not try to guide the people who are the ones who will be developing policy/working the cropland-forestland to feed the world population in the next decades? (Michael Ebinger, Atmosphere, Climate, & Environmental Dynamics (EES-2))	Noted. We have outlined generic options and discussed the implications of selecting them, without being policy prescriptive.
8-297	A	34	1	34	10	These paragraphs seem to be missing a header since these are not agroforesty-related. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Subheading was lost in TSU edit. Now included as option (f) of 8.4.1.1 on Cropland Management.
8-298	A	34	17			"increased soil bulk density from reduced tillage". Th opposite is implied on p. 33,	Accepted. Addressed in the section rewrite.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						lines 16-20. (Norman Rosenberg, 0)	
8-299	A	34	18	34	18	Type herbicide instead of pesticide. According to Machado & Silva (2001), the reliance of no-tillage systems on herbicides mainly in the first 5-7 years raises some concerns about the system being environmentally sound; further investigations must exploit the efficiency of different cover crops as weed killers (i.e. allelopathy) combined with herbicides and evaluate the potential hazard on surface and ground water caused by intensive use of herbicides. (Magda Aparecida Lima, Brazilian Agricultural Research Corporation - Embrapa)	Accepted. This reference is now included.
8-300	A	34	18	34	19	The phrase "potential for rapid, or by-pass…" is unintelligible for the reader. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Reworded in the section rewrite.
8-301	A	34	31			Replace "If nitrogen fertiliser use is reduced" by "If nitrogen fertiliser use efficiency is increased". As discussed above, lower fertilizer use does not necessarily translate into fewer unwanted impacts. Furthermore, there are some areas of the world (notably Africa) where a paucity of crop nutrients have devastating environmental consequences (desertification) and carbon sequestration could be increased. As well as the references provided above, please also consult the materials of the International Nitrogen Initiative (www.initrogen.org). (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. All now discussed under improved nutrient management – part “b” of 8.4.1.1 and part “c” of 8.4.1.2.
8-302	A	34	33			Replace "N" by "urease and nitrification". (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Text gone in the rewrite.
8-303	A	34	34			After "If productivity is increased by greater additions of nitrogen fertiliser" insert "without improving nitrogen use efficiency accordingly" and then continue with "ammonia emissions (air quality)…" (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Text gone in the rewrite.
8-304	A	34	36	34	37	the Schlesinger paper in Science (1999) was strongly criticized in letters to that journal by Izaurralde et al and others w/resp. to organic C. Amonette also countered Schlesinger's speculations w/resp. to inorganic C. (Norman Rosenberg, 0)	Noted.
8-305	A	34	36			After the reference to the Schlesinger paper, add "However, life-cycle studies show that the net capture of carbon from fertilizer use far exceeds the amount of CO2 released through the production, transport and application of fertilizers combined. Küsters, J. and J. Lammel, 1999. Investigations of the energy efficiency of the production of winter wheat and sugar beet in Europe. Published in the European Journal of Agronomy 11(1999) 35-43. Furthermore, fertilizer helps increase the yields of bioenergy crops, which would support the reduction of CO2 emissions	Noted. We now reflect both points of view.

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						related to energy production. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	
8-306	A	35	1	35	2	The benefit of reducing methane by water management in rice cultivation with comparing the trade-off of the enhacement of nitrous oxide emissions is quantitatively evaluated in Akiyama, H., Yagi, K., and Yan, X.: Direct N2O emissions from rice paddy fields: summary of available data. Global Biogeochem. Cycle , 19, GB1005, doi:10.1029/2004GB002378 (2005). I am attaching pdf version of the paper. (Kazuyuki Yagi, National Institute for Agro-Environmental Sciences)	Noted. Yagi et al. paper is used and water management now considered explicitly in analysis as per US-EPA (2006a).
8-307	A	35	4	35	11	It is true that CO2 carbon costs of pumping irrigation water can be great. However, it should be investigated if the energy demand cannot be based on renewables (e.g. wind power). (Radunsky Klaus, Umweltbundesamt)	Reject. Any energy could always come from renewables.
8-308	A	35	41	35	41	…and indirectly increase nitrous oxide emission in the case of co-fertilization with organic fertilizer (this is for instance inevitably the case with grazing) (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. Addressed in the section re-write.
8-309	A	35	45	35	45	The authors need to either provide an example of improvement to biodiversity or provide a reference. (Jeff Price, California State University, Chico)	Accepted. Addressed in the section re-write.
8-310	A	36	4	36	5	(Norman Rosenberg, 0)	No comment.
8-311	A	36	9	36	10	Biodiversity as a benefit, I am also aware of two studies if I'm correct that mention that with large-scale energy crops the biodiversity first decreases before increasing, one for the world, one for EU (MNP/RIVM, 2006 and EEA, 2004?). In addition, you do mention non CO2 GHG emissions, but do not refer that there might be a difference between short rotation or one-year crops. Would that not make a large difference?? (Monique Hoogwijk, Ecofys)	Noted. We have included a reference to EEA 2005.
8-312	A	36	10			Smith et al. 2001 is not in reference list (Berien Elbersen, Alterra)	Accepted. Reference list checked for SOD.
8-313	A	36	10			8.8.11 This section is very sparse, co-benefits might include maintaining the land in economic production, keeping rural community structures viable, improving energy security. (Frank McGovern, Environmental Protection Agency)	Accepted. Addressed in a rewrite of the section of the SOD.
8-314	A	36	13	36	14	Currently grown bioenergy crops include maize, sugarcane and rapeseed, which have high nutrient demands, so this statement is false, or at least imprecise.	Accept. Distinguish between different energy crops and note the diversity of LCA outcomes

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						(Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	(Sims et al., 2006).
8-315	A	36	14	36	15	Delete the sentence regarding the negative impact on petroleum demand. Given the forecasts of future energy demands, this is highly implausible. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Removed.
8-316	A	36	15	36	18	It should be added that the increased demand for biomass for energy may also increase the pressure on land and water resources. May also put pressure on valuable habitats (e.g. (tropical) rain forests, (semi)natural grasslands, agro-forestry areas (Dehesas, Montados), traditional agricultural landscapes with high biodiversity values. (Berien Elbersen, Alterra)	Accepted. This is noted in the section on biomass energy.
8-317	A	36	23	36	34	This sentence should be rephrased to say "energy conservation techniques may be culturally or socially unacceptable in some areas. However, this is difficult to predict in the medium term because attitudes are likely to evolve over time." (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Noted. Energy conservation removed from the chapter as the GHG saving occurs elsewhere (fossil fuel in energy, buildings, transport etc.)
8-318	A	36	32	36	32	This statement is not totally correct in this context: the use of 'oils' in ruminant feeding is not likely to increase the growing of e.g. soybeans, as this oil is not very effective. When e.g. coconut palms are grown, this is even some type of agroforestry (C sink), although not necessarily a sustainable agricultural production forml (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. Addressed in the rewrite.
8-319	A	36	40	36	40	I suggest to add 'chemicals' in this list (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Reject. Chemicals not specific enough. List extended.
8-320	A	37	2	37	2	Additionally, a closed nutrient balance is difficult to maintain (import of concentrate and/or fertilizer is often required (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Noted. Section updated.
8-321	A	37	19	38	32	This section is a roadmap to the chapter, not a discussion of research, development, deployment, diffusion and transfer. A discussion of agricultural R, D,D,D, & T is needed. (Lenny Bernstein, L. S. Bernstein & Associates, L.L.C.)	Accepted. This section has been replaced for the SOD.
8-322	A	37	22			"will" in this sentence seems rather sweeping and presumptuos. It is conceievable that some methods to increase crip yields could increase emission per unit of productyion, if they increased emissions somewhere else in the production chain enough. Eg if the GHG costs of high energy input systems was high enough. It	Accepted. Reworded.

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						needs justification. (Roger Gifford, CSIRO)	
8-323	A	37	25	37	25	It is noted that the report is quiet about the risks of genetically modified crops. It might be appropriate not only mention that GM technology may be unacceptable in some areas but to also inform about the associated risks. This could be added to chapter 8.9 or even better in 8.8.12 or as a separate subchapter of chapter 8.8. (Radunsky Klaus, Umweltbundesamt)	Noted. Without being policy prescriptive we have added some text in the revised technology section – nevertheless – this is not the place for a debate on GM technology.
8-324	A	37	35			Combine p38 line 10-29 with p.37 line 35 to give an overview of main R&D issues for the sector. Rest of text contains paragraphs not immediately linked with RD&D, e.g. p37 line 36- p38 line 8; p38 l.30-33, which can be taken out. . (Peter Bosch, IPCC TSU WGIII)	Accepted. This section has been replaced for the SOD.
8-325	A	38	11	38	11	I suggest that 'replace roughage with concentrate' is omitted here, as this is not the only feeding measure (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. This section has been replaced for the SOD.
8-326	A	38	18	38	18	Change to 'yeast for animal nutrition, and vaccines. Also a careful consideration of whether feeding measures are additive with changes taking place in manure-derived methane or counterbalanced (Hindrichsen et al., 2005, 2006) has to be done for each single measure.' (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. This section has been replaced for the SOD.
8-327	A	38	34	42	17	I would use numbered subheadings in section 8,10. (Bas van Wesemael, Université catholique de Louvain)	Accepted. This section has been replaced for the SOD.
8-328	A	39	15	39	17	This statement needs a good reference. (Roger Gifford, CSIRO)	Accepted. This section has been replaced for the SOD.
8-329	A	39	15	39	15	It is proposed to insert "development" after "agricultural". (Radunsky Klaus, Umweltbundesamt)	Accepted. This section has been replaced for the SOD.
8-330	A	39	22			You should also take into account the impact of rising nightime temperatures, as oppposed to the rise in average temperature, and the associated impact on plant respiration. Because global warming will cause a much greater increase in nighttime temperature compared to daytime temperature or average daily temperature, this is a key issue. The Peng et al 2004 PNAS paper cited in chapter five of what has been produced by Working Group II) is a good example of this potential impact. Other key points here are that we have poor fundamental understanding of the impact of rising nighttime temperatures (as opposed to average temperature) on crop yields, and that most simulation model studies rely	Partly accept. We have added some text on the interactions of mitigation options with climate change (not just this specific point [night-time temperatures] but more generally). Night-time temperatures per se are not the only, or even the main, projected effect. WGII deals with adaptation where this is discussed in more detail and we cross-reference to that chapter.

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						on models that utilize daily or higher time steps (and hence average daily temperatures) to simulate the effects of climate change. A critical research need is to better understand the impact of rising nighttime temperatures on plant respiration. Current models and previous published studies are highly suspect because they do not take into account this important distinction. Contact Ken Cassman for more details (kcassman@unlnotes.unl.edu). (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	
8-331	A	39	27			Replace "reducing N application" with "increasing N use efficiency". Add "using slow-release and controlled-release fertilizers" to the list. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted.
8-332	A	39	27			Insert "per crop unit" between "is required" and "as technologies". (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Section rewritten.
8-333	A	39	29			Insert "urease and" before "nitrification". (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Section rewritten.
8-334	A	39	30			Delete "in the long term". (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Section rewritten.
8-335	A	40	1	40	18	A statement should be made towards the end of this paragraph that, "Additionally, the net effect of erosion on CO2 emissions remains unknown because of the combined uncertainties of burial downslope or downstream and onsite ecovery of the soil organic matter pool (Stallard 1998, Harden et al 1999)". (W. Troy Baisden, Landcare Research)	Accepted. Section rewritten.
8-336	A	40	23	40	24	This last sentence is ambiguous. If what you mean is "Soil C sequestration is temporary whereas CO2 savings from reduced energy consumption can be considered a permanent reduction", you should make that explicitly clear. As it reads, it sounds as though you believe that energy consumption can be reduced indefinitely, regardless of thermodynamic limits, etc. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Section rewritten.
8-337	A	40	26	40	26	Again the Khalil statement on the role of the increasing omission of organic fertilizer should be considered (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. Section rewritten.
8-338	A	41	18	42	17	This section on long term and decision making and particularly nitrous oxide is not to the point and deserves more adequate and to the point review and discussion (and directions) and an outlook into the future in terms of how to achieve major improvements on N efficiency and lower N losses through denitrification and N2O and what kind of decisions are necessary to do this at (super) national level CAP	Accepted. Section rewritten. But we cannot present a global assessment a farm scale. Decisions at farm scale level are addressed through cost-and-potentials and barriers analyses.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						and at farm scale levels. (Peter Kuikman, Alterra)	
8-339	A	41	28	41	28	The use of a default emission factor has been questioned lately. Freibauer et al and Roelandts et al (2005 in Global Change Biology) have demonstrated that specific emission factors for climate and soil conditions give large differences in N2O direct emissions. I would suggest a sentence highlighting thistrend. (Bas van Wesemael, Université catholique de Louvain)	Reject. This is not a place for a critique of IPCC default emission factors – this does not affect mitigation. Reference to default Efs removed.
8-340	A	41	28			After the reference to the IPCC 1997 report, insert "However, in the 2001 FAO / IFA publication Bouwman revised his calculations used in the IPCC reportand asserted that the appropriate emission factor to use is in fact 0.8%" Bouwman, 2001, p. 57. Work done in Canada (by CFI, AAFC, and the Univeristy of Manitoba) regarding the northern Great Plains also shows a much lower rate than 1.25%. Please contact Paul Fixen for the full reference. As a consequence, it would seem necessary to update this section with more recent global figures as well as more site-specific information because the uncertainties related to the contribution of fertilizer-derived agricultural emissions seem understated. (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Reject. This is not a place for a critique of IPCC default emission factors – this does not affect mitigation. Reference to default Efs removed.
8-341	A	41	41			It would be of use to provide more information on modelling tools for estimation of impacts of changing farming practices and mitigation strategies on GHG emissions at a local and region scale. A number of such models exist e.g. DeNitricification DeComposition model (Li, 1992, already reference) or Century which can be used as tools for the better management of farm resources towards more effective and efficient use of nitrogen fertilizers (for example) based on local soil and climate conditions. The use of modelling might be most effective as educational tools, in demonstrating the environmental and economic costs of poor N management. (Frank McGovern, Environmental Protection Agency)	Noted. We do not wish to provide a review of potential models that can be used. This could be very long and is not strictly relevant to mitigation.
8-342	A	42	1			Replace "may" by "will". (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Revised in rewrite.
8-343	A	42	2			Insert a full stop after N2O emissions and then continue "More efficient fertilization techniques will help mitigate the emissions, but the overall contribution of agriculture is likely to increase." (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Revised in rewrite.
8-344	A	43	21			After "FAO", insert "and IFA". (Kristen Elizabeth Sukalac, International Fertilizer Industry Association (IFA))	Accepted. Revised in rewrite.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
8-345	A	45	2	45	4	In addition to "Wood processing waste", waste from disposal of wooden final products, like demolition timber, is to be written. (Mario Tonosaki, Forestry and Forest Products Research Institute)	**Wrong chapter – refer to chapter 9.**
8-346	A	45	37			More key references regarding the work being done on life-cycle opportunities to reduce GHGs through selection of low-carbon building products include (3) Peirquet, P., Bowyer, J., and Huelman, P. 1998. Thermal performance and embodied energy of cold climate wall systems. Forest Products Journal 48(6):53–60, (4) Lenzen, M., and Treloar, G. 2002.Rejoinder to: Greenhouse gas balanced in building construction: Wood versus concrete from life-cycle and forest land-use perspectives. Energy Policy 30(2002):249-255, (5) Sarri, A. 2001. Environmental specifications of building parts and buildings (in Finnish). TKK Rakentamistalous [Helsinki University of Technology, Construction Economics and Management]. Published by Rakennustietosaatio RTS [Building Information Foundation RTS], Helsinki. Sponsored by Rakennustieto Oy [Building Information Ltd.]. http://www.rts.fi/Ymparistoselosteet.pdf. (Reid Miner, NCASI)	**Wrong chapter – refer to chapter 9.**
8-347	A	45	37			Instead of saying that methodologies are still in their early stages of development, it would be more accurate to say that they are becoming available. The list of references can be lengthened to support this point of view. In particular, we suggest adding the references listed below, in this cell and the one below this one.. (1) Borjesson, P., and Gustavsson, L. 2000. Greenhouse gas balanced in building construction: Wood versus concrete from life-cycle and forest land-use perspectives. Energy Policy 28(2000):575 588, (2) Scharai-Rad, M., and Welling, J. 2002. Environmental and energy balances of wood products and substitutes. Food and Agriculture Organization of the United Nations (FAO). http://www.fao.org (June 4, 2005). More references on this list are shown in the cell below (Reid Miner, NCASI)	**Wrong chapter – refer to chapter 9.**
8-348	A	46	48	46	48	I.K. Hindrichsen, H.-R. Wettstein, A. Machmüller, M. Kreuzer, Methane emission, nutrient degradation and nitrogen turnover in dairy cows and their slurry at different milk production scenarios with and without concentrate supplementation, Agric. Ecosyst. Environm. (2006.) in press (corrected proof is available online) (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. Paper consulted for SOD reanalysis. It was not necessary to cite it as the information is available in other papers.
8-349	A	46	48	46	48	I.K. Hindrichsen, H.-R. Wettstein, A. Machmüller, B. Jörg, M. Kreuzer, Effect of the carbohydrate composition of feed concentrates on methane emission from and	Accepted. Paper consulted for SOD reanalysis. It was not necessary to cite it as the

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						their slurry, Environm. Monit. Assessm. 107 (2005) 329–350. (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	information is available in other papers.
8-350	A	48	34	48	34	Add: 'M.A.K. Khalil and M.J. Shearer, 2005. Decreasing emissions of methane from rice agriculture. In: Working Papers of the 2nd Int. Conf. on Greenhouse Gases and Animal Agriculture (Soliva, C.R., Takahashi, J. and Kreuzer, M., eds.). Publication Series, Institute of Animal Science, Nutrition – Products – Environment, ETH Zurich, Vol. 27, 307-315' if quoted on page 18. (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. Paper consulted for SOD reanalysis. It was not necessary to cite it as the information is available in other papers.
8-351	A	48	37			Much of this section is devoted to a discussion of CDM. We wonder whether this is warranted given that the experience with CDM is likely to change quickly in response to the demand for CDM (and other) credits. (Reid Miner, NCASI)	**Wrong chapter – refer to chapter 9.**
8-352	A	49	5	49	6	Why "This project was heavily criticized"? I think readers want to know the reason. (Mario Tonosaki, Forestry and Forest Products Research Institute)	**Wrong chapter – refer to chapter 9.**
8-353	A	50	35	50	35	replace Machmuller by Machmüller or Machmueller (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. Done.
8-354	A	50	38	50	39	replace the entire reference by 'Machmüller, A., Soliva, C.R. and Kreuzer, M. 2003. Methane-suppressing effect of myristic acid in sheep as affected by dietary calcium and forage proportion. Br. J. Nutr. 90, 529-540' (Michael Kreuzer, Institute of Animal Science, Swiss Federal Institute of Technology (ETH))	Accepted. Done.
8-355	A	57	16		35	Suggestion to out line 16-35, because SD definitions are covered by ch 2. (Peter Bosch, IPCC TSU WGIII)	**Wrong chapter – refer to chapter 9.**
8-356	A	61	37	61	46	This paragraph leaves the reader with the impression that current knowledge is insufficient to allow forest owners to sustain site productivity when residues are removed. This is an oversimplification of the situation. In many circumstances, research has helped define management methods, often involving fertilization (in far lower intensity than in agriculture) to ensure nutrients are adequate and site productivity is maintained.Methods used to maintain agricultural site productivity have provided insights into methods useful for managed forests. See Vance, E.D., "Agricultural site productivity: principles derived from long-term experiments and their implications for intensively managed forests," Forest Ecology and	**Wrong chapter – refer to chapter 9.**

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						Management 138 (2000) 369-396, Eslevier publishing. (Reid Miner, NCASI)	
8-357	A	61	38	61	39	The report states that residue retention is critical to minimize risks on soils. This is a rather broad generalization. Indeed, a meta-analysis of available studies in 2001 found that the positive effect on soil C and N of leaving residues seems to be restricted to confierous species. - see Johnson, D.W. and P.S. Curtis, "Effects of forest management on soil C and N storage: meta analysis," in Forest Ecology and Management 140 (2001) 227-238, Elsevier publishing (Reid Miner, NCASI)	**Wrong chapter – refer to chapter 9.**
8-358	A	68	6	68	7	Update reference to: Berndes, G., Hoogwijk, M. and van den Broek, R. (2003). The contribution of biomass in the future global energy supply: A review of 17 studies. Biomass and Bioenergy 25: 1-28. (Göran Berndes, Chalmers University of Technology)	**Wrong chapter – refer to chapter 9.**
8-359	A	70	0	70		Figure 8.4.2b - Please redraft the figure considering that in emergency situation implementation could reach 50% of maximum potential. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Noted. We have revised the analysis to provide all estimates based on CO_2 price, removing the 10-20% implementation assumptions.
8-360	A	70	0	70		Figure 8.4.2a - Please redraft the figure considering bioenergy cropping using sugarcane as the major source of biomass. (Jose Moreira, Institute of Electrotechnology and Energy - University of Sao Paulo)	Reject. We are not displaying potentials at the level of individual options, rather aggregated measures. We have, however, add fossil fuel offsets to non-fossil fuel offsets GHG benefits for energy crops to same figure (Figure 8.4.4.).

Initially misassigned to chapter 8

hapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
8-58	A	4	47	47		Many sites around the UK and along the north western coast of France that would be suitable for tidal stream generation. Many marine current devices are still at the R&D stage but some of them have been tested and deployed in the sea. One of them is deployed along norvegian coast another in the Messina Straight (see : http://www.worldenergy.org/wec-geis/publications/reports/ser/marine/marine.asp and http://www.marineturbines.com/home.htm or http://www.e-tidevannsenergi.com/index.htm). Two projects are at the R&D stage in France. (MICHEL PAILLARD, IFREMER)	**NO CH9**
8-109	A	8	35	8	36	"386 billion m3" maybe trunk volume, and "422 billion tonnes" maybe green weight including branches. A bit confusing. Change "global trunk volume of forest". (Mario Tonosaki, Forestry and Forest Products Research Institute)	*a*
8-211	A	20	29	20	36	The discussion of biodiversity could be improved by making it clear that the effects of forest management on biodiversity are very site specific and can often be mitigated by selection of appropriate management methods. References illustrating the opportnities for maintaining and enhancing biodiversity through proper forest management are (1) Bird, S. et. al., "Impacts of silvicultural practices on soil and litter arthropod diversity in a Texas plantation", Forest Ecology and Management 131 (2000) 65-80. and (2) Wilson, M.D. and Watts, "Breeding bird communities in pine plantations on the coastal plain of North Carolina", The Chat, published by teh Carolina Bird Club, West Columbia SC, Winter 2000 - more references are listed below (Reid Miner, NCASI)	a, side effects wil be incorporated to the 9.7 ancillary effects & SD
8-212	A	20	29	20	36	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (7) Tucker, J.W., et. al., "Managing mid-rotation pine plantations to enhance Bachman's sparrow habitat", Wildlife Society B u l l e t i n 1998, 26(2):342-348, and (8) Rosenfeld, R.N., "Breeding distribution and nest-site habitat of northern Goshawks in Wisconsin", Journal of Raptor Rresearch Vol 32 (3): 189-194 September 1998,, published by the Raptor Research Foundation, OSNA, Waco TX (Reid Miner, NCASI)	a, side effects wil be incorporated to the 9.7 ancillary effects & SD

hapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
8-213	A	20	29	20	36	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (5) Tappe P.A. et. al., "Breeding bird communities on four watersheds under differetn forest management scenarios in the Ouachita Mountains of Arkansas", in in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p and (6) Carnus, J_M, et. al., "Planted forests and BIodiversity," UNFF Intersessional Experts Meeting on the Role of Planted Forests in Sustainable Forest Management, 24-30 March 2003, New Zealand, available at http://www.maf.govt.nz/mafnet/unff-planted-forestry-meeting/ - More references are listed below (Reid Miner, NCASI)	a, side effects wil be incorporated to the 9.7 ancillary effects & SD
8-214	A	20	29	20	36	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (3) Fox, T.F. et. al., "Amphibian communities under diverse forest management in the Ouachita Mountains, Arkansas", in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p.and (4) Shipman, P.A. et. al., "Reptile communities under diverse forest management in teh Ouachita Mountains, Arkansas", in in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p - more references are listed below (Reid Miner, NCASI)	***CH 9 – 9.4*** References will be considered and used as appropriated (Changing forest management, Biodiversity impacts)
8-216	A	21	25	21	30	In each argument, floor area data is necessary. (Mario Tonosaki, Forestry and Forest Products Research Institute)	***CH 9 – 9.4*** Publications will be checked and see if is possible to extract data per square metre constructed. (Products substitution: Potential magnitude of technical measures)
8-222	A	21	35			More key references regarding the opportunities to improve a structure's carbon footprint by using low-carbon materials and systems. (4) Peirquet, P., Bowyer, J., and Huelman, P. 1998. Thermal performance and embodied energy of cold climate wall systems. Forest Products Journal 48(6):53–60, (5) Lenzen, M., and Treloar, G.	***CH 9 – 9.4*** References will be considered and used as appropriated

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						2002. Rejoinder to: Greenhouse gas balanced in building construction: Wood versus concrete from life-cycle and forest land-use perspectives. Energy Policy 30(2002):249-255, (6) Sarri, A. 2001. Environmental specifications of building parts and buildings (in Finnish). TKK Rakentamistalous [Helsinki University of Technology, Construction Economics and Management]. Published by Rakennustietosaatio RTS [Building Information Foundation RTS], Helsinki. Sponsored by Rakennustieto Oy [Building Information Ltd.]. http://www.rts.fi/Ymparistoselosteet.pdf. (Reid Miner, NCASI)	(Products substitution: Potential magnitude of technical measures)
8-223	A	21	35			Additional references for this section include; (1) Borjesson, P., and Gustavsson, L. 2000. Greenhouse gas balanced in building construction: Wood versus concrete from life-cycle and forest land-use perspectives. Energy Policy 28(2000):575 588, (2) Lippke, B., Wilson, J., Perez-Garcia, J., Bowyer, J., and Meil, J. 2004. CORRIM: Life-cycle environmental performance of renewable building materials. Forest Products Journal 54(6):8 19, (3) Scharai-Rad, M., and Welling, J. 2002. Environmental and energy balances of wood products and substitutes. Food and Agriculture Organization of the United Nations (FAO). http://www.fao.org (June 4, 2005). More references on this list are shown in the cell below (Reid Miner, NCASI)	***CH 9 – 9.4*** References will be considered and used as appropriated (Products substitution: Potential magnitude of technical measures)
8-227	A	22	11	22	23	This discussion of biomass energy is unnecessarily negative in tone and potentially misleading in that it attempts to blur the distinction between the carbon in biomass fuels and the carbon in fossil fuels. Biomass fuels are fundamentally different than fossil fuels in that biomass carbon is returned to the atmosphere only years to centuries after having been removed from the atmosphere. The benefits of biomass fuels depend on several things, most importantly on whether the biomass is used to avoid the use of fossil fuel and whether it is used efficiently. Biomass carbon is destined to be recycled to the atmosphere whether humans intervene or not. By diverting biomass through an oxidation pathway that allows us to displace fossil fuels, we can benefit the global carbon (providing we do not deplete global forest carbon stocks in the process). Whether the benefit can be sustained depends on a continuous supply of biomass. We recommend that the paragraph be replaced with several sentences that say simply that the value of biomass fuels depends on how efficiently they are used to displace fossil fuels. (Reid Miner, NCASI)	a, we will revise the section
8-228	A	22	25		30	The discussion of biodiversity might better focus on the fact that the effects of intensive forest management on biodiversity are very site specific and can often be	a, side effects wil be incorporated to the 9.7 ancillary effects & SD

hapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						mitigated by selection of appropriate management methods. References illustrating the opportnities for maintaining and enhancing biodiversity through proper forest management are (1) Bird, S. et. al., "Impacts of silvicultural practices on soil and litter arthropod diversity in a Texas plantation", Forest Ecology and Management 131 (2000) 65-80. and (2) Wilson, M.D. and Watts, "Breeding bird communities in pine plantations on the coastal plain of North Carolina", The Chat, published by teh Carolina Bird Club, West Columbia SC, Winter 2000 - more references are listed below (Reid Miner, NCASI)	
8-229	A	22	25		30	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (7) Tucker, J.W., et. al., "Managing mid-rotation pine plantations to enhance Bachman's sparrow habitat", Wildlife Society B u l l e t i n 1998, 26(2):342-348, and (8) Rosenfeld, R.N., "Bredding distribution and nest-site habitat of northern Goshawks in Wisconsin", Journal of Raptor Rresearch Vol 32 (3): 189-194 September 1998,, published by the Raptor Research Foundation, OSNA, Waco TX (Reid Miner, NCASI)	a, side effects wil be incorporated to the 9.7 ancillary effects & SD
8-230	A	22	25		30	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (5) Tappe P.A. et. al., "Breeding bird communities on four watersheds under differetn forest management scenarios in the Ouachita Mountains of Arkansas", in in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p and (6) Carnus, J_M, et. al., "Planted forests and BIodiversity," UNFF Intersessional Experts Meeting on the Role of Planted Forests in Sustainable Forest Management, 24-30 March 2003, New Zealand, available at http://www.maf.govt.nz/mafnet/unff-planted-forestry-meeting/ - More references are listed below (Reid Miner, NCASI)	a, side effects wil be incorporated to the 9.7 ancillary effects & SD
8-231	A	22	25		30	More references explaining the opportunities to address biodiversity through proper forest management (continued from above) include (3) Fox, T.F. et. al., "Amphibian communities under diverse forest management in the Ouachita Mountains, Arkansas", in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p.and (4) Shipman, P.A. et. al., "Reptile communities under diverse forest	a, side effects wil be incorporated to the 9.7 ancillary effects & SD

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						management in teh Ouachita Mountains, Arkansas", in in Guldin, James M., tech. comp. 2004. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS–74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 321 p - more references are listed below (Reid Miner, NCASI)	
8-232	A	22	30			Another reference discussing the use of wood ash to replenish forest nutrients is Vance, E.. "Land application of Wood-fired and combination boiler ashes: An overivew", Journal of Environnmental Quality, Vol,. 25, No. 5, September 1996 (Reid Miner, NCASI)	a, will be considered
8-233	A	23	10			The discussion of studies of forestry-related mitigation opportunities in North America should include EPA 2005, "Greenhouse gas mitigation potential in U.S. forestry and agriculture," Report EPA 430-R-05-006, November 2005, which is perhaps the best study of this issue ever performed for the US. (Reid Miner, NCASI)	a
8-346	A	45	37			More key references regarding the work being done on life-cycle opportunities to reduce GHGs through selection of low-carbon building products include (3) Peirquet, P., Bowyer, J., and Huelman, P. 1998. Thermal performance and embodied energy of cold climate wall systems. Forest Products Journal 48(6):53–60, (4) Lenzen, M., and Treloar, G. 2002.Rejoinder to: Greenhouse gas balanced in building construction: Wood versus concrete from life-cycle and forest land-use perspectives. Energy Policy 30(2002):249-255, (5) Sarri, A. 2001. Environmental specifications of building parts and buildings (in Finnish). TKK Rakentamistalous [Helsinki University of Technology, Construction Economics and Management]. Published by Rakennustietosaatio RTS [Building Information Foundation RTS], Helsinki. Sponsored by Rakennustieto Oy [Building Information Ltd.]. http://www.rts.fi/Ymparistoselosteet.pdf. (Reid Miner, NCASI)	a, substitution effect of HWP will be included
8-347	A	45	37			Instead of saying that methodologies are still in their early stages of development, it would be more accurate to say that they are becoming available. The list of references can be lengthened to support this point of view. In particular, we suggest adding the references listed below, in this cell and the one below this one.. (1) Borjesson, P., and Gustavsson, L. 2000. Greenhouse gas balanced in building construction: Wood versus concrete from life-cycle and forest land-use perspectives. Energy Policy 28(2000):575 588, (2) Scharai-Rad, M., and Welling, J. 2002. Environmental and energy balances of wood products and substitutes. Food and Agriculture Organization of the United Nations (FAO). http://www.fao.org (June 4,	a, substitution effect of HWP will be included

hapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						2005). More references on this list are shown in the cell below (Reid Miner, NCASI)	
8-351	A	48	37			Much of this section is devoted to a discussion of CDM. We wonder whether this is warranted given that the experience with CDM is likely to change quickly in response to the demand for CDM (and other) credits. (Reid Miner, NCASI)	unclear comment
8-356	A	61	37	61	46	This paragraph leaves the reader with the impression that current knowledge is insufficient to allow forest owners to sustain site productivity when residues are removed. This is an oversimplification of the situation. In many circumstances, research has helped define management methods, often involving fertilization (in far lower intensity than in agriculture) to ensure nutrients are adequate and site productivity is maintained.Methods used to maintain agricultural site productivity have provided insights into methods useful for managed forests. See Vance, E.D., "Agricultural site productivity: principles derived from long-term experiments and their implications for intensively managed forests," Forest Ecology and Management 138 (2000) 369-396, Eslevier publishing. (Reid Miner, NCASI)	seems a ch 8 comment