Comments and Responses on SOCCR/SAP 2.2 Draft 1 (May 2006)
CHAPTER 10

COMMENT FROM PEER REVIEWERS						AUTHOR'S RESPONSE						
Comment Number	Reviewer ID	Chapter	Page	Line	Comment Text	Acknowledged, but no further reponse or revisions are required	Revisions have been incorporated as suggested in the comment	Agree, but see "Notes on Response"	Agree, but elaboration is precluded by length limitations	Disagree; see "Notes on Response"	Beyond scope of report/chapter	Notes on Response
10-001	16	10	General		I think that the authors contributing to this chapter have done an excellent job summarizing (in a logical, easy to read manner) how the bidirectional exchange of CO2 and CH4 in/out of these landscapes is being affected by climate and changing land management.	X						
10-002	16	10	General		While the title is succinct, I am left to ponder whether "Arid Lands" really belongs in it? I scanned the paper a few more times after the initial read of it, and I would estimate 99% of what is written are in relation to agriculture, pastures, and grasslands. There is minimal discussion of woody encroachment, and very little attention paid directly to arid lands in the context that there is something distinctly different about C cycling on Arid Lands to warrant its separation in the title. Would it be better to add "Pastureland" (or grazing lands) into the title instead? I encourage the authors to think a bit more as to whether a better title needs to be constructed.					X		The reviewer was correct, that arid lands were a minor component of this report. We the authors extracted our title from titles given for what was originally all or part of three chapters: (1) Agriculture, (2) Grass and Rangelands, and (3) Shrublands, Arid Lands (and Urban Ecosystems). Arid lands are not covered elsewhere in the document, but we have addressed the comments regarding woody encroachment (comment 10-027) and fire (comment 10-026) which are the only specific comments related to arid lands. We have changed the title to better reflect the text of the chapter.
10-003	16	10	General		I wrote out the overall outline of Chapter 10, and noted that the major headings are: (1) Inventory, (2) Drivers and Trends, (3) Options for Management, and (4) Research and Development Needs. This seemed appropriate, although within (3) above, I thought that the subheadings "Economics and Policy Assessment", and "Other Policy Considerations" might be deserving of their own separate major heading (relating to policy). However, I am guessing you are trying to adhere to a standardized outline given for constructing these report chapters so it's probably OK to leave as is. In present form, there really isn't a disruption to the flow of the chapter, so it's probably a minor point.					X		As this reviwer suggests, this is a minor point and we have decided to leave the heading organization as is to correspond with other chapters.
10-004	16	10	General		I particularly liked the last section (4) that highlights the urgent need for a more organized & expanded network of field monitoring sites. Halleluiah! Currently, it seems as if it's real easy to establish eddy covariance flux towers to measure short timescale fluxes (it's the attractive and very fundable thing to do if you are filling a data void for an obscure ecosystem), but why doesn't it seem to be just as easy to get an organized monitoring array of field study sites established for measuring soil C stocks (when this is something that actually tells us the integral of many years of flux measurements)? Hopefully NACP starts to change that.	X						
10-005	16	10	10-21	Table 10-1	Caption: I think this could be worded better considering the first line starts off "Carbon pools for undisturbed native systems were derived…" and the table is showing C pools for ag/grazing lands. While I know you have a story to tell as to how you derived these values, it might be best to not start it off the way you currently have it. Maybe something like: "Current soil C stocks are secondary quantities derived from an initial starting point of undisturbed native ecosystem C content, which were quantified using the intersection…These undisturbed ecosystem stock values were then multiplied…		X					Rewrote caption based on reviewer suggestions

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10-006	16	10	10-3	26-27	. . . manipulating species composition and growing conditions. Are you implying irrigation? It might be nice to put in parentheses the examples you are thinking of. If the manipulation of growing conditions is only in relation to irrigation, then I would just state that.		X					added parenthetical statement, pg 10-3, line 28-29.
10-007	16	10	10-3	29-31	I'm not entirely sure that what you state here is indeed accurate, particularly the restricted growing season length argument for croplands, and how this can reduce carbon uptake relative to that in other ecosystems. First, the C uptake of many temperate and boreal forests is occurring at nearly the same time as it is on croplands (let's say roughly April – September) in the central U.S., for example and annual productivity is currently much higher than of many natural ecosystems (see Article "Gross primary production and ecosystem respiration of irrigated maize and irrigated soybean during a growing season" by Suyker et al., 2005, Agric. For. Meteorol., 131: 180-190). Suyker et al. (2005) cite GPP value for maize (1744 g C/m2) that are larger than temperature deciduous forests (1122-1507 g C/m2) and most temperate and boreal coniferous forests (992-1570 g C/m2).			X				This sentence may be confusing, because it attempts to cover all bases by stating that ag systems are among the most productive, but some factors *can* limit production. We have tried to clarify this by making it clear that this is only true in some cases.
10-008	16	10	10-3 & 10-4		My understanding is that another contributing factor for the depleted C stocks in agricultural soils was that low cropland productivity from the mid 1800s – 1930s was replacing higher NPP ecosystems (prairies/grasslands) which had a higher proportion of their assimilated C allocated belowground (e.g., 70-80% for prairies vs. 15% for row crops); thus, this fact coupled with the burning of crop residues and tillage have led to this observed decline in soil C levels. However, now that crop productivity has increased 6-fold, thereby increasing the amount of residue available to go back, and conservation tillage is now used on a large fraction of land, these lands are now realizing their potential to become C sinks (e.g., Buyanovsky and Wagner, 1998). It would be nice to see this minor point covered somewhere in this section, and in the discussion at P.10-4, L8-10.		X					Altered text to include this. Pg 10-4, lines 14-16, pg 10-7, lines 11-21
10-009	16	10	10-4	4	What are the increased decomposition rates attributed to? Increased N inputs, and lower C:N of residue?		X					Disturbance; altered text to explain this. Pg 10-4, line 8
10-010	16	10	10-23	Fig 10-1	It appears that the data presented in Table 10-2 duplicates verbatim the pictorial presented in Figure 10-1. Thus, could the figure be deleted? If I were to have my pick as to which data presentation method to chose, it would be the table because the reader can easily extract quantities without having to guess/interpolate values from a chart. While the Figure is a nice visual display, I am not sure it is adding anything in addition to the table considering the duplication in information.					X		This figure was included in reponse to a suggestion by a previous reviewer that we put this information into a figure in addition to the table. We feel that the redundancy of this key information is not problematic.
10-011	16	10	10-5	27-28	Excellent point.	X						

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10-012	16	10	10-6	19 et seq.	In the first paragraph, you might want to consider mentioning the debate of how much sequestration might be expected, e.g., how much of the gap between pre-settlement levels of soil C and current values can be made up by the trends in current practices. This will a least put things in perspective that it's not expected that we are going to be able to recover 100% of what was once lost, and that it isn't going to happen in the next decade no matter how much land management practices change to deliberately sequester C.			X				The issue of potentials is discussed in the next section. We give two principle citations on the issue of potentials. We also discuss issues of permanance and economics later in the document.
10-013	16	10	10-6	19 et seq.	I am going to suggest that this section be expanded upon a bit; it's very short and it is a bit limited to a discussion of soil C stocks and how they might be affected by warmer temperatures (citing the debate in the literature currently about how decomposition and respiration might be influenced by climate change). It seems there needs to be at least a paragraph or two to balance these arguments, discussing how the uptake of C and inputs to the soils on these lands might be affected by (1) changing temperature regimes also (2) other factors – e.g., more than the brief mention of how climate could perturb productivity (P.10-7, L.13-14) at the end of the section.			X	X			We have included more discussion on CO2, temperature, and genetic advances impacts on crop yields. We think that space precludes us from including more on these issues, but we have cited the relevant literature which readers can consult for more detailed information.
10-014	16	10	10-6	19 et seq.	Some potential discussion points that come to mind: (1) impact that warmer temperatures might have on extending the growing season length in northern locations (e.g., northern Corn Belt, southern Canada, allowing earlier planting) and how this would likely help to increase plant productivity and C inputs; (2) However, warmer temperatures may actually decrease yields and productivity in southern regions that aren't already temperature limited as the longest season hybrids might actually mature more quickly (e.g., progress through their complete phenological phases), and thereby decrease the amount of APAR and the time the plant has to accumulate biomass (you might want to refer to the Lobell and Asner, 2003 paper in Science on trends in yields influenced by management and climate); (3) Continued genetic improvements to crops and an increase in nitrogen use efficiency will allow for yields and residue to gradually			X	X			See previous comment
10-014 (cont)					edge upward, although we might be well-entrenched in the law of diminishing returns as it is getting more and more difficult to increase yields each year. Some additional search of the literature is probably necessary here.							
10-015	16	10	10-6	19 et seq.	The authors might have better ideas on how to fill this section out to present both sides of the story, particularly how temperature perturbations can lead to a very complex net result because increased CO2 efflux might be balanced by more C inputs. You will also have to integrate more discussion here with what is already stated in more general terms on P.10-7, in lines 25-27.			X	X			See previous comment

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10-016	16	10	10-24	Fig 10-2	You might want to add to the caption that the default soil C stocks refer to a value of 1.0 – the dotted line – in Figure 10-2. While this might sound a bit ridiculous, I wouldn't take any chances on assuming that everyone is going to know that the dotted line is referring to the conventionally tilled, medium-input cultivated land and/or moderately grazed…		X					Figure 10-2 caption has been modified.
10-017	16	10	10-24	Fig 10-2	You also have a typo for the "temperate wet" in the legend for Figure 10-2.		X					corrected
10-018	16	10	10-8	19	Possibly add as a concluding statement, "But, these obviously come at a cost to the overall net C budget, particularly fertilizer usage and irrigation, because they require fossil fuels in their production and implementation." (or something to this effect).		X					Text added as per reviewer suggestion, pg 10-9, lines 3-4.
10-019	16	10	10-9	18	I would think that keeping these storage tanks "cool" would require some sort of energy demand during warm weather, potentially defeating the purpose in some capacity? Other ideas on how to keep them cool without using additional energy? Is this offset worth mentioning here?				X			Here we have cited emission reduction mechanisms that have been cited in the literature, but we feel we cannot delve into details about the energy balance of cooling tanks and such details. We have changed the text to indicate that cooling tanks*can reduce* emissions from stored manure.
10-020	16	10	10-10	24-27	This sounds like a very important point to be made, but I am not sure if I completely understand the reasoning why this would be the case? Is it worthwhile to elaborate a bit more on this point? You are basically saying that the management improvements that can be made in a farm operation that is already ongoing (and is trying to maximize profitability) can more effectively lead to cheaper sequestration costs than a piece of land that is specifically managed deliberately to sequester C? Does the same hold true for a farm that still has crop/livestock as the major income source, but has 10-20 ha enrolled in CRP? Where would this type of model fall in cost to sequester? This was just a very intriguing statement and might be more deserving of follow-up (even if it's just a few more details).		X					We added a paranthetical statement to clarify this point.
10-021	16	10	10-11	1-8	You lost me here…My interpretation is that the "price required as an incentive for the mitigation activity" is how much would be required to pay all landowners to ensure their participation, or get some percentage of landowners to participate? Are there some other details such as how many participants and how much land would be devoted based on the subsidy offered for participation? Is doesn't appear to be a linear relationship. The bullet point you also make in the "Key Findings" in relation to this idea also doesn't stand alone as well as the other points made. I would encourage you to either reword or add more information so it is clearer.				X			This economic theory is somewhat complex and we have not included all of the details here. We have cited a relevant paper that contains details. Space limitations preclude a full discussion of policy efficiency.
10-022	16	10	10-13	15	Spelling, Ottawa.		X					
10-023	16	10	10-13	31	Typo – I don't think you want "Cynthia" in there.		X					
10-024	16	10	Text Boxes		Text boxes all look OK.	X						

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10-025	17	10	General		This chapter is an adequate review of the potential C sequestration in agricultural lands, grasslands, shrublands, and arid lands for the most part, but I believe it misses a critical issue related to the close ties of C and N in soils. Nearly all N in soils is tied up in organic matter, and it is not possible to add C to soils without adding N – unless one throws the C:N ratio way out of whack, potentially causing N deficiencies, lowered primary production, and therefore lower ecosystem C sequestration. Maybe N is not such a big issue in agricultural soils in that it is added routinely, but for grasslands, shrublands and even arid lands it is highly relevant and needs to be duly considered in this document.			X				We agree with the comment that for cropland that N addition is not a major issue - there is plenty of N for building soil organic matter. We point out the importance of N in grazinlands by referring to practices that can build C, including fertilization and adding legumes as two of the primary C sequestration practices to sequester C in grazing lands
10-026	17	10	General		Secondly, the role of fire is completely missing in the discussion of grasslands, shrublands and arid lands. Fire is a major issue in these ecosystems, it has an obvious immediate and also a long-term effect on C sequestration, and it needs to be included. A specific point in this regard that appears in the Executive Summary (page ES-7, pages 16-22) and as a key finding (page 10-1, lines 27-28) is the woody encroachment of grasslands – in the Great Basin, at least, this is widely viewed as a negative development and current management practices are aimed at reversing it, potentially taking away this uncertain C sink. I do not mean to argue against this management objective, but do argue that it needs to be taken into account before this C can be "counted".		X					Clarified in Key Finding 3 and in text (10-4, lines 6-8). Added reference to fire on pg 10-3, line 24. We have not addressed this comment in the Executive Summary section, but we feel it should be addressed there.
10-027	17	10	10-1	27-28	Key Finding number 3 (also on page 10-4, lines 3-5): The woody encroachment of Pinyon-Jumiper to grazing lands in the Great Basin is seen as a decidedly negative thing by nearly everyone, and efforts are now underway to convert this back to grazing land with prescribed fire. This should be taken into account when the authors begin to tally the benefits of C sequestration in this ecosystem.		X					Clarified in Key Finding 3 and in text (10-4, lines 6-8).
10-028	17	10	10-4	8-21	Since the range of soil C:N ratios for these systems is generally known, it would be an easy thing to calculate how much N it would take to achieve these levels of C sequestration in soils and to further assess whether that much N is available from atmospheric deposition, fertilizer, and other sources. You cannot store C in soils without storing N as well.			X				See response to 10-025
10-029	17	10	10-8	21-33	What about fossil fuel offsets from growing crops for ethanol production? Should that kind of analyses not be included here?							Biofuels are a potentially important way that fossil fuel emissions could be offset and they should have a prominent place in the SOCCR report. From the perspective of the impact of C stocks on agricultural and grazing lands, the main impacts here seems likely to be conversion from annual cropland to perennial cropland or afforestation. The conclusions we have drawn for cropland will apply for cases in which annual crops are harvest to produce biofuels and the conclusions we have drawn for grazinglands will apply for perennial systems used to produce biofuels. We have not discussed conversion, which we think is the purview of the section III overview, or biofuels, which belong in

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10-030	17	10	10-11	26-29	See comment about N needed for soil C sequestration above.			X				See response to 10-025
10-031	17	10	10-12	31-34	See the comment about PJ encroachment on grasslands in the Great Basin above. This needs to be taken into account. Management policies now aim at reducing PJ and going back to grazing lands.			X				See response to 10-027
SH-004	TOW	10	General		I found that the information synthesized in this Chapter indeed represented the latest work conducted on this body of research.	X						
SH-005	TOW	10	General		The Chapter is succinct and provides the most recent information from sources that I know well.	X						
SH-006	TOW	10	General		As detailed in the following three items, I have three comments. The first is only a comment and does not necessitate any change. The last two comments are suggestions and do not change the overall findings of the report. The authors should feel free to use or disregard these comments, depending on their contribution and usefulness to the overall message being conveyed in the SOCCR report. REF: West, T.O., G. Marland, A.W. King, W.M. Post, A.K. Jain, and K. Andrasko. 2004. Carbon Management Response Curves: Estimates of Temporal Soil Carbon Dynamics. Environmental Management 33: 507-518.	X						
SH-007	TOW	10	10-23	Fig. 10-1	In Figure 10-1, Lal et al. (1998) is cited as the source for information regarding fossil fuel emissions from agricultural inputs. This is likely an adequate estimate. We are currently developing estimates for on-site and off-site fossil fuel emissions at the county and sub-county level for the entire U.S. This will be completed in the near future, but will not be ready for this SOCCR report.	X						
SH-008	TOW	10	10-11	18-19	Use of the term “equilibrium” in this report should perhaps be reconsidered. It is generally agreed upon that this term is more appropriately used in reference to thermodynamic closed systems and does not adequately represent natural ecosystems. It has been argued many times in the ecological literature that “steady state” is a more appropriate term.		X					We replaced one instance of equilibrium.
SH-009	TOW	10	10-11	18-19	The West and Wali (2002) citation is useful here in that it refers to a complex, dynamic model that predicts soil carbon steady state in 15-30 years following the establishment of grasses on reclaimed minelands. While this citation is indeed fitting, the authors may want to consider the West et al. (2004) paper here for the following two reasons. First, this latter paper is a synthesis of many analyses that have looked at the time needed to reach soil C steady state following changes in management. Estimates are provided for changes in cropland tillage and for afforestation. Second, the latter half of the paper discusses the permanence issue and reinforces the policy considerations that the authors discuss on Page 10-11, Lines 13-18. The sentence may be change to something like this: “Soil carbon storage will tend to level off at a new steady state after 15-60 years, depending on the change in land management, after which there is no further accumulation of carbon (West et al. 2004).”		X					W replaced West and Wali (2002) with West et al. (2004)

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