RESPONSE TO PEER REVIEW COMMENTS

COMPLETED FEBRUARY 2014

Overall comments on the methodology / module

	1st review	Response	2nd review	Response	3rd review
1.1	I found the mishmash of units distracting, especially the bastard units like kg/gallon. Can the document restrict itself to SI units and add a unit conversion table at the front or back?	Point taken. In places we have now provided conversions, e.g. acres to hectares and lbs/acre to kg/ha for N applied. In other places we have retained the English units, e.g. acre-inches of water, since this seems to be the common unit of irrigation water measurement in the Midsouth and the potential SI conversions (cubic meter, hectare-meter, liters?) all seem cumbersome. In the case of units like tCO_2-eq per Gallon of diesel for the EF_{fuel} emission factor obtained from the EPA's *Emission Factors for Greenhouse Gas Inventories*, we have retained the mixed unit since this is how EPA presents their emission	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
		factors. To require projects to convert the EPA emission factor to kgCO_2-eq/liter and then convert their gallons of diesel to liters also, just to avoid English units, we think increases the potential for errors. Similarly for electricity, eGRID reports emission factors by region of the grid in lbs CO_2/MWh; Project Proponents will need to convert lbs to metric tons CO_2 when using this emission factor. Verifiers spot-checking Project Proponent's calculations will check for unit conversion errors. We have added clarifying notes to the text on unit conversion.			
1.2	I can't help but think about who your stakeholders are in this. If the grower, they will have a hard time sussing out the details and technicalities; if state or federal regulators, or VVB, it probably works very well. As a suggestion, (you have probably thought of this already), but are there plans to initiate a "step by step" video that provides an illustration of how a grower could implement the program? Certainly there is no shortage of social networks that the video could be posted on.	While those actually implementing the GHG mitigation practices will be the rice growers, we do not expect the rice grower him/herself will be using this methodology. Rather, a carbon project developer familiar with GHG methodologies and the carbon offset project registration process will likely be working with multiple rice growers and aggregating their activities into a larger project registered on ACR. The project developer ("Project Proponent" in the document) will use the methodology, run the DNDC model to calculate credits, prepare the required GHG Project Plan, and interact with the third-party validation/verification body (VVB). So the intended audiences of this document are 1) a carbon project developer (Project Proponent) with experience designing carbon projects and using methodologies, 2) a VVB validating the GHG Project Plan and verifying GHG reductions claimed for specific reporting period, and 3) the California Air Resources Board which is developing its own Rice Cultivation Compliance Offset Protocol and using this methodology as a source document. We have no current plans to prepare a step-by-step video, since we don't think rice growers will be directly using the	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
		methodology, and assistance implementing the practices should come through more appropriate channels such as Cooperative Extension. ACR has presented a webinar on the methodology, for which the PowerPoint and recording are posted on ACR's website.[1]			
1.3	Overall, the calibration module methodology does a good job of providing a platform for state agencies and scientific professionals to initiate GHG emission reductions for the southern delta region. A couple of overall points: Please make sure the table numbering is consistent throughout (Table numbers shift in the document). Also if possible, it might be useful (unless you have done this in another document), to provide a sort of timeline graph to help the grower understand how these steps outline in the module could be implemented.	Thank you. The table numbering has been corrected. We agree such a timeline could be useful and will work on developing it as a separate document. We don't think it belongs in the module itself, since methodologies generally focus on providing requirements and guidance, in as brief a format as possible, for the Project Proponent (as noted above, probably not the grower him/herself) using the methodology.	Provide a link between documents if possible.	Both documents will be posted on the ACR website for Project Proponents to reference.	Accepted

A. Introduction

	1st review	Response	2nd review	Response	3rd review
2.1	Statements regarding the module's purpose or goal, and	Good suggestion. The following paragraph has been added to section 1:	Accepted.	n/a	n/a

[1] On the rice methodology webpage at http://americancarbonregistry.org/carbon-accounting/carbon-accounting/emission-reductions-in-rice-management-systems.

	1st review	Response	2nd review	Response	3rd review
	identifying potential users would help set the context for the document.	The purpose of this module is to provide requirements and guidance for a Project Proponent using the ACR methodology *Voluntary Emission Reductions in Rice Management Systems* to design, implement and register a rice GHG offset project in the Midsouth U.S. Rice-Growing Regions covered in this module. The primary intended audiences are Project Proponents, Validation/Verification Bodies (VVBs), regulators, and other stakeholders. The authors expect that rice growers implementing the GHG mitigation practices eligible in this module will work with a Project Proponent, potentially serving as the aggregator of multiple rice growers, to use the methodology and prepare a GHG Project Plan.			
2.2	The premise that baling hay in the "southern" rice producing states is an economical proposition is questionable given the extremely limited market for baled rice straw.	The authors agree that rice straw baling and removal is only marginally economic, and uneconomic in many years. We understand the economics vary depending on drought conditions and the need for feed supplements in livestock producing states. Other markets (e.g. cellulosic biofuels) may change these economics in the future, but have not developed to a significant extent as yet. However the module makes no claims as to the economics of straw baling, or any of the practices. It simply presents an opportunity for a rice grower who is considering straw baling to secure an additional small revenue stream from the sale of GHG offset credits, which combined with revenues from the straw itself may or may not make baling cost-effective in a given year. Additionally, the practice is voluntary; the grower makes no upfront commitment to bale straw every year, and if a grower decides not to do so in a given year, there is no penalty other than receiving no credits for straw baling that year.	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
2.3	Intermittent irrigation, depending on how it is defined, carries with it a high risk for increased loss of applied N, increased weed competition, and decreased rice yield.	The inclusion in this module of intermittent flooding was based on research and demonstration projects by Dr. Joe Massey at Mississippi State University, working with growers in Mississippi, who found over several years of intermittent flooding that yield remained the same or increased, and weed competition was not a significant problem. We emphasize ACR is not making any agronomic recommendations and all practices in this module are fully voluntary. We expect a grower interested in exploring GHG credit markets will do so initially on a trial basis, in consultation with his/her crop advisors, perhaps implementing intermittent flooding on one or two fields in the first year to make sure there are no negative yield, weed or other impacts, and if there are not, incrementally expanding the practice over time. If conditions in a particular year make it impossible to continue the practice (e.g. a grower is not willing to drain down a field allocated to intermittent flooding because they fear not having access to water to flood up again), there is no penalty other than receiving no credits for intermittent flooding that year.	Accepted.	n/a	n/a
2.4	The suggestions about multiple inlet systems and conversion from contour to precision or zero grade are reasonable and have been broadly accomplished in Texas. Installation of soil moisture sensors is an interesting idea, but not sure about its practicality. Rice has adapted to growing in a saturated soil environment and will	The installation of soil moisture sensors is being pilot tested by the White River Irrigation District in Stuttgart, AR, working with several large growers in central Arkansas. Some of these growers are finding that moisture sensors provide valuable data for management decisions, and incidentally may provide a means to facilitate and verify the GHG mitigation practices in this module, particularly intermittent flooding and early drainage, by tailoring water applications to plant needs. On the comment on maintaining soil saturation: note that intermittent flooding as defined only requires that irrigation is ceased and the flood is allowed to subside naturally to the	Response is fine, just wondering if you could emphasize somewhere (perhaps in the introduction) that the goal is to reduce GHG emissions, but NOT at the expense of economic yield. This could alleviate grower concerns up front (i.e. don't assume).	The following paragraph has been added to the Introduction: The goal of the practices described in this module is to reduce GHG emissions in order to create marketable GHG offset credits. The included practices are included because they may decrease GHG emissions relative to the baseline scenario without,	Accepted

	1st review	Response	2nd review	Response	3rd review
	experience a major yield loss if a saturated soil environment is not maintained after about the 8th leaf stage. How can soil sensors be used when the soil must be saturated to maintain economic yields?	point where no standing water exists in the paddy. The soil may remain saturated and there is no requirement to dry the field completely. The goal of intermittent flooding is to stop the anaerobic conditions that produce methane, not to dry the field completely and certainly not to endanger yields. Any significant loss of yield would more than counteract the incremental revenue from GHG offset credits, and moreover would have to be accounted for as leakage (see the parent methodology section 12.1). We assume no grower will implement intermittent flooding if they expect a loss in yield (or as suggested above, will only experiment with it on a few fields until they are comfortable there is no loss in yield or milling quality).		according to studies available to the authors, decreasing rice yield or milling quality. The goal is not to implement any practice that decreases yield or milling quality. We emphasize ACR is not making agronomic recommendations and all practices in this module are fully voluntary. If conditions in a particular year make it impossible to continue the practice, there is no penalty other than receiving no credits for the practice in that year.	

B. Step 1. Definition of Included Project Activities

	1st review	Response	2nd review	Response	3rd review
3.1	Straight levees are still contour levees; distinction is between precision graded and ungraded ground. Some people precision grade and still survey so levees are not straight, where do they fit?	Thanks for this distinction. We have changed the Table 1 definition of the first example under Increased Water and/or Energy Use Efficiency from the prior wording: (1) conversion of contour levees to straight levees, straight levees to zero grade or contour levees to zero grade, to read: (1) conversion of ungraded fields to precision grade, precision grade to zero grade, or ungraded fields to zero grade And accordingly re-worded other instances throughout the	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
		module.			
3.2	Early drainage could possibly work; however, yields will be negatively impacted if the drainage occurs too early. Regarding the use of DD50 to indicate when further irrigation is not needed, this approach will provide general information, but not for field-level management. Where a ratoon crop production system is practiced, the control of ratoon crop development can be manipulated by 10 days or more by when the first ratoon crop "N" application is made. For example, a late planted field can be "sped up", thereby making a ratoon crop feasible, timing the first ratoon crop fertilizer application to occur 3 or more days before main crop harvest. Instead of using a DD50 model, it makes more sense to use a process-based rice model such as RicePSM or ORYZA, which can respond to "N" management. DD50 models are phenological	The inclusion of early drainage in this module was based on work by Dr. Paul Counce of the University of Arkansas - Rice Research and Extension Center, showing that early drainage, when implemented based on growth stages, can be done without loss of yield or milling quality.[2] We recognize that in the early stages these practices will appeal most to the more innovative growers who are also interested in the potential water savings from a practice like this. Again, ACR is not making any agronomic recommendations and all practices in this module are fully voluntary. We expect a grower interested in exploring GHG credit markets will do so initially on a trial basis, in consultation with his/her crop advisors, perhaps implementing early drainage on one or two fields in the first year to make sure there are no negative yield, milling quality or other impacts, and if there are not, incrementally expanding the practice over time. In the case of early drainage, the module particularly notes (in footnote 2) that growers should consult extension staff or other experts to determine a drainage date that is appropriate for their specific circumstances. On the comment regarding DD50: the module does not prescribe use of DD50 to identify the Conventional Drainage Date, on suggests this as an option. We added process-based models such as RicePSM or ORYZA to the list of options for determining the Conventional Drainage Date. This change is reflected in the Table 1 definition of Early Drainage, as well as in the description of this parameter in	See earlier comment. Emphasize that recommendations are not being made at the expense of seed yield.	See response to 2.4 and paragraph added to the Introduction.	Accepted

[2] P.A. Counce, K.B. Watkins, K.R. Brye and T.J. Siebenmorgen. 2009. A model to Predict Safe Stages of Development for Rice Draining and Field Tests of the Model Predictions in the Arkansas Grand Prairie. Agronomy Journal 101: 113-119.

	1st review	Response	2nd review	Response	3rd review
	in their focus and do not respond well to changes in "N" management.	section 9.			
3.3	Many of the proposed water/energy use efficiency are feasible and are being used by the better growers. The use of soil moisture sensors will not work, expect possibly for early season flush of water prior to permanent flooding.	As noted above the use of soil moisture sensors is being pilot tested by the White River Irrigation District in Stuttgart, AR, working with several large growers in central Arkansas. Some of these growers are finding that moisture sensors provide valuable data for management decisions, and incidentally may provide a means to facilitate and verify the GHG mitigation practices in this module, particularly intermittent flooding and early drainage, by tailoring water applications to plant needs. Adoption of all the practices in this module is voluntary and we expect that these practices will first be adopted by the more innovative farmers. In addition, the calculation of credits is based on monitored results of water use. If the water use did not decrease through the use of the practices, no spurious credits will be generated.	Accepted.	n/a	n/a
3.4	The assumption that intermittent irrigation is a viable solution to rice growers is faulty. The only way this option can be credibly proposed is to include in the document a detailed cost/benefit analysis that quantifies the specific conditions under which intermittent irrigation provides an economic benefit. Such an economic analysis could include both a cost-benefit analysis at the grower enterprise level as	See responses to 2.3 and 2.4. In particular note that intermittent flooding as defined only requires that irrigation is ceased and the flood is allowed to subside naturally to the point where no standing water exists in the paddy. The soil may remain saturated and there is no requirement to dry the field completely. The goal of intermittent flooding is to stop the anaerobic conditions that produce methane, not to dry the field completely and certainly not to endanger yields. Any significant loss of yield would more than counteract the incremental revenue from GHG offset credits, and moreover would have to be accounted for as leakage (see the parent methodology section 12.1). We assume no grower will implement intermittent flooding if they expect a loss in yield (or as suggested above, will only	Accepted, but see earlier comments.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
	well as at a level where environmental costs are internalized. Intermittent irrigation obviously reduces greenhouse gas emissions, but it also decreases nitrogen utilization efficiency and at a farm-scale it usually decreases yields and decreases net profits. Intermittent flooding will only work if the soil is not allowed to dry beyond the saturation point. This is a real challenge, given that each paddy will differ in its exact elevation change between levees, which will inevitably result in some areas of paddies drying out excessively and thereby reducing yields. The authors are correct in stating "A drying out cycle potentially increases nitrous oxide emissions". This represents a cost to growers and reflects a decrease in fertilizer use efficiency, as well as a decrease in yields.	experiment with it on a few fields until they are comfortable there is no loss in yield or milling quality). On the suggestion of cost-benefit analysis: we agree this is needed but do not think a GHG methodology is the appropriate place for it. GHG methodologies generally focus on providing requirements and guidance, in as brief a format as possible, for the Project Proponent (as noted above, probably not the grower him/herself) using the methodology. However the Environmental Defense Fund, which is working with ACR on a Conservation Innovation Grant related to rice sector GHG reductions, has conducted economic analysis for the proposed GHG mitigation practices in California rice production, and will be conducting similar analysis for the Midsouth. This will be published separately from the module itself.			
3.5	The use of footnotes in Table 1 does help explain the details; perhaps an additional footnote clarifying "Soil moisture	In the methodology we prefer not to further specify the particular type of soil moisture sensor lest this be interpreted as prescriptive. The examples (1) through (5) under Increased Water and/or Energy Use Efficiency are just	If so, then make it explicit in the text.	Added the text into Table 1: Any technology or measure a grower can adopt that demonstrably increases water	Accepted

	1st review	Response	2nd review	Response	3rd review
	sensors" (top of page 4) and their use would be useful.	examples; any technology or measure a grower can adopt that demonstrably increases water and/or energy use efficiency is eligible here, and will be demonstrated through a verified improvement in water use efficiency or reduction in diesel consumption.		and/or energy use efficiency is eligible here, and will be demonstrated through a verified improvement in water use efficiency or reduction in diesel consumption.	

C. Step 2. Rice Growing Regions

	1st review	Response	2nd review	Response	3rd review
4.1	Why not add the Texas Gulf Coast region now? Excluding this region but including all of the other rice producing regions is odd.	As of the date of drafting the Midsouth module, the authors did not have sufficient data for calibration and validation of the DNDC model in the Texas Gulf Coast Rice-Growing Region. An explanation has been added to the text. However, we have now located some cal/val data for the Texas Gulf Coast region. We are evaluating this and hope to be able to use it so that the Texas Gulf Coast rice-growing region will be eligible in the version of the module we will provide in December. If so, the Texas Gulf Coast rice-growing region will be listed as eligible in section 3, and Tables 6 and 7 will have added columns for the Texas Gulf Coast rice-growing region.	Accepted; you explain this in the cover letter (email).	n/a	n/a

D. Step 3. Development of performance standard (optional)

	1st review	Response	2nd review	Response	3rd review
5.1	Full-time certified crop advisor: how does the fact that a person is "full-time" versus "part-time" affect their credibility; how is it	Agreed. "Full time" deleted.	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
	defined? A school teacher who is certified and "scouts" in the summers is often more credible than someone who takes on too many acres to get the income level they want.				
5.2	Table 3: No disrespect intended, but does Dr. Reba "have at least 5 years of relevant experience in rice agronomy"?	No we think not. However we have now fleshed out Table 3 considerably, after consulting with several additional experts whose names are included in the comment box.	Accepted.	n/a	n/a
5.3	Table 3-early drainage: since there is no clear definition of "conventional" what are the experts saying?	The question posed to the experts was: "How many growers are draining their fields at least 5 days before a Conventional Drain Date, as determined by a conventional method such as the DD50 model or other models, or industry experts?" The experts' consensus was that less than 5% of growers are implementing early drainage thus defined. Note that as with all the practices in Table 3, it is only important to ascertain whether the experts agree the practice is at less than or greater than 5% adoption – not to distinguish more specific adoption levels (e.g. 1% or 3%) below this threshold. Practices at less than 5% adoption, whether determined through survey data, remote sensing, or expert opinion, are eligible for the Common Practice Baseline and simplified additionality procedures in the parent methodology.	Criteria says "≤4%" is cutoff for requiring survey, so expert value of "<5%" is practically worthless. If only dealing in integer percentages could be re-stated as ≤4% to avoid confusion	Thanks for catching this. The experts were comfortable that all practices for which we indicated <5% adoption were actually at far lower rates of adoption than 5%. It was just an oversight on our part that the requirement is actually written as <4% when using expert opinion. The values in Table 3 have been adjusted accordingly. The exception to this is zero grade, which has been adopted according to the experts' estimates on around 5-6% of acres. Those values have not been revised.	Accepted
5.4	Table 3-efficiency: big discrepancy between experts 2 & 3 (remove Anders' initials); 2	Thanks – initials "MA" removed for Expert 3. We consulted Expert 2 again. Her estimate of 50% for precision leveled or zero grade in AR comes from a 2008	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
	seems low to me and don't know what 3 is referring to (non-precision graded acres that could qualify?)	Arkansas report by Wilson et al.: "Between 2006 and 2008, about 51% of the total rice acreage in Arkansas were in contour levees, 43% in straight levees and 6% in zero grade fields."[3] (We have added this citation to the module). Expert 2 notes that the percentage in precision and zero grade is higher is some segments of the state than others but across the rice producing areas, 50% appears a good estimate. We held a follow-up consultation with all of the experts identified in the comment box for Table 3. Their consensus is now presented in Table 3. This included consulting with the Natural Resource Conservation Service on the amount of land leveling (precision and zero grade) they have conducted in Arkansas over the past five years. This amounts to about 70,000 acres, about half precision grade and half zero grade, which represents a relatively small percentage of the total rice acres – but only represents work done over the last five years. Overall, the consensus of the experts was that the total amount in precision grade + zero grade is significant – perhaps 40-50%; at any rate well above the 5% threshold for simplified procedures in the module; while zero grade alone may be around 5% of the acres, but could not comfortably be set below the 5% threshold. Note that we have included estimated adoption rates, based on discussion with all the identified experts, for all practices in Table 3.			
5.5	The goal statement "The analysis	Agreed. The goal statement was toned down as follows:	Accepted.	n/a	n/a

[3] Wilson, C. E., S. K. Runsick, and R. Mazzanti. 2008. Trends in Arkansas Rice Production. In R.J. Norman et al. editors, B.R. Wells, Rice Research Studies 2008. Arkansas Agricultural Experiment Station, Division of Agriculture. Research Series 571. Fayetteville, Arkansas. ISSN: 1931-3764. pp 13-23.)

	1st review	Response	2nd review	Response	3rd review
	must be set up so that a precision of 10% with 90% confidence is attained" is commendable, but is currently impractical. The only place such data exists is through either FSA or in a survey mode in Texas through the Texas Rice Crop Survey. A problem with FSA data is with obtaining records in a timely manner and in a sub-county spatial sense. A problem with NASS data is major errors associated with digitization (Yang et al. 2013).	"The survey must be designed to achieve a relative precision that is better than ±25% with 90% confidence, i.e. 90% of the time. In addition, procedures must be in place to minimize digitization errors. It is acceptable that the final survey ultimately has less precision on the condition that project proponents can demonstrate that this smaller precision was not impacted by systematic errors."			
5.6	The adoption rates listed in Table 3 appear to be accurate. In the case of straw baling and removal, and intermittent flooding, they reflect the economic reality of these methods usually not being economically viable. For the proposed analysis platform to have legitimacy requires that a cost-benefit analysis be included.	See responses to 2.2, 2.3 and 2.4. Economics of these practices will vary from year to year and if a grower decides not to implement a given practice in a given year, the only penalty will be receiving no credits for that practice in that year. We do not think a GHG methodology is the appropriate place for cost-benefit analysis. The Environmental Defense Fund, lead on a Conservation Innovation Grant related to rice sector GHG reductions, has conducted economic analysis for California and will be conducting economic analysis for the Midsouth. However this will not be added to the module itself, since GHG methodologies generally focus on providing requirements and guidance, in as brief a format as possible, for the Project Proponent using the methodology.	Accepted.	n/a	n/a
5.7	The second sentence in the section beginning, "If survey	This sentence was rewritten as: "The survey must be designed to achieve a relative precision that is better than	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
	data or remote sensing data are used" should be rewritten. You are not looking for a precision of 10% but implementation of a practice with a +/- 10% precision 90% of the time.	±25% with 90% confidence, i.e. 90% of the time"			
5.8	It might be useful to emphasize that in the development of performance standards, that economic return was taken into consideration—i.e. development of these standards does not come at the cost of reduced seed yield.	See responses to 2.2, 2.3, 2.4, and 3.4. ACR is not making any agronomic recommendations and all practices in this module are fully voluntary. We expect a grower interested in exploring GHG credit markets will do so initially on a trial basis, perhaps implementing a practice on one or two fields in the first year to make sure there are no negative yield or other impacts, and if there are not, incrementally expanding the practice over time. If conditions in a particular year make it impossible to continue the practice, there is no penalty other than receiving no credits for intermittent flooding that year. Any significant loss of yield would more than counteract the incremental revenue from GHG offset credits, and moreover would have to be accounted for as leakage (see the parent methodology section 12.1). We assume no grower will implement practices if they expect a loss in yield (or will only experiment on a few fields until they are sure there is no loss in yield).	See earlier comments.	See response to 2.4 and paragraph added to the Introduction.	Accepted

E. Step 4. Identification of Critical and Non-Critical Management Parameters

	1st review	Response	2nd review	Response	3rd review
6.1	Table 4 is interesting, but it is not clear as to how you concluded that some were	A Critical Management Parameter is defined in the parent methodology as a model parameter that is impacted by the Project Activities, either directly or indirectly. A Non-Critical	Is this difference made explicit in the text?	Critical and Non-Critical Management Parameters are defined in the parent	Accepted

	1st review	Response	2nd review	Response	3rd review
	critical and some were non-critical. Greater detail as to how the classifications were derived would be useful.	Management Parameter is a model parameter that is related to agricultural management but not impacted by Project Activities. In filling out Table 4, we considered which model parameters were likely to be impacted by Project Activities (i.e. to differ between the baseline and project scenarios). E.g. taking the first parameter, Harvesting Date will be unaffected by implementing the project activity in the case of Straw Baling, Increased Water and/or Energy Use Efficiency, and Intermittent Flooding, but will be impacted in the case of Early Drainage.		methodology and those definitions are not repeated in the module.	
6.2	Table 4 is difficult to follow and comprehend. This may be, in part, because some of the non-critical parameters are non-critical because they are non-applicable. Also if you have a column with only one critical element, can that activity be expressed as a sentence, (e.g., increased water and/or energy use efficiency is only critical with respect to fuel and energy efficiency of the pumping system." I would urge the authors to try and simplify this table.	We feel it is useful to maintain the table format and include "C" or "NC" for every parameter because this will provide guidance to Project Proponents who are trying to specify which model parameters may change between the baseline and project activity. In addition, this table follows the layout of the parent methodology. The layout enables the Project Proponent to easily compare which parameters are critical and which ones aren't among different project activities. This ability to compare would be much more difficult with having the table been replaced in sentence format.	Accepted.	n/a	n/a

F. Quantification of GHG emissions from energy use

	1st review	Response	2nd review	Response	3rd review

	1st review	Response	2nd review	Response	3rd review
7.1	Peer-reviewed literature: excuse me for splitting hairs, but there is an important distinction between "peer-reviewed" and "refereed peer-reviewed". B.R. Wells series is peer reviewed (a couple of experts read it over and suggest mainly cosmetic improvements); Agronomy Journal is refereed (much more detail; experts also recommend whether or not to publish based on the procedures, etc.). Not sure where engineering handbooks come in for baseline water pumped unless it's to estimate previous amounts pumped from electric/fuel records.	Agreed; "refereed" added in sections 6 and 9.	Accepted.	n/a	n/a
7.2	The value of this document would be greatly increased were the author(s) to include an economic analysis to document the costs and benefits associated with the proposed mitigations.	See responses to 3.4 and 5.6. Economic analysis is underway but we feel it is more appropriate to publish separately rather than include in a GHG methodology.	Understood, but would urge the authors to link both documents at some future date.	Economic analysis is underway and this will be made available on the ACR website on the same webpage as the parent methodology and this module.	Accepted
7.3	Some specific examples of potential energy savings would be useful.	There are many potential energy savings. Some are listed in Table 2. The module is not prescriptive on which energy-saving practices or technologies are eligible, rather only provides examples. Any practice that reduces diesel consumption – either by reducing irrigation water requirements, improving the efficiency of existing diesel motors, or switching from diesel to electric – will result in	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
		lower CO_2 emissions from diesel combustion, which is the goal here.			

G. Step 5. Demonstration that the DNDC model simulates fluxes in an unbiased way

	1st review	Response	2nd review	Response	3rd review
8.1	Ten MRD and 40 LGC: seems backwards considering the acreages; are there significant technology advances that would make the older LGC less reliable than the newer data?	We agree that the proportion of rice acreage in MRD vs. LGC is the reverse of the proportions here. Ten datasets on CH_4 annual fluxes for MRD and 40 for LGC merely reflect the data available to the methodology authors at the time of originally drafting this module. More data for the MRD has recently become available and is currently being used to update the model calibration and validation. This has been used to update Tables 5, 6 and 7. Additional MRD cal/val data will become available in November 2013, from studies during the 2013 growing season. We will re-run the cal/val at that time and provide another version of this module to the reviewers in December 2013, with the new MRD datasets incorporated. This will result in revisions to Tables 5, 6 and 7.	Accepted.	n/a	n/a
8.2	What is TOST test?	Two One Sided T tests. We have now spelled this out.	Accepted.	n/a	n/a
8.3	Are Stuttgart and Lindau methodologies comparable? Could Stuttgart be not capturing/accounting for something that Lindau did, in which case the model would not be overestimating, but rather the extrapolation from discrete sample points to annual total would be underestimating?	The Lindau and Stuttgart methodologies were similar. They used static flux chambers for gas sampling and gas chromatographs to measure methane concentrations. They also use similar sampling frequencies (at least 1-2 times per week) which resulted in 19-26 sample dates during a growing season. We applied the same linear extrapolation techniques to estimate annual fluxes. We do not feel that differences in the field collection or extrapolation is the cause for the differences in the model performance.	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
8.4	Please provide a citation for the EDF (2011) reference.	Now provided.	Accepted.	n/a	n/a
8.5	On page 33, lines 683-684, the document "Voluntary Emission Reductions in Rice Management Systems" states "Growers are allowed to change varieties after the Start Date as long as the new variety is well parameterized." This is currently highly impractical, given that growers, let alone researchers, rarely have access to this type of data for individual cultivars. There are only 2 rice researchers in the U.S. who take detailed measurements of organ/structure specific growth rates for rice. Given that I am one of these individuals, to the best of my knowledge only a few of the parameter estimates listed in Table 5 of page 33 of that document actually correspond to the type of physiological measurements that researchers commonly measure for specific cultivars. It would be extremely helpful for the manuscript to include a brief description and an example of how each of the 19 parameters listed in Table 5 are calculated.	We agree that this creates a bottleneck. As a result, the calibration and validation of DNDC was recently updated. A single set of crop parameters was used for each region (e.g. MRD or LGC) due to the lack of detailed information on crop parameters for each of the 15+ different varieties used in the field studies. While this increased model uncertainty, it simplified the methodology by explicitly setting crop parameters by region, and removes the burden for the growers or Project Proponents to collect data on these parameters.	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
	Furthermore, while a relatively small number of rice cultivars are grown in California, approximately 20 commercial cultivars are grown in each "southern" rice producing state. Where will growers obtain this type of data? The obvious answer is that they will use estimates for a reference cultivar. If this occurs, it will eliminate from the analysis cultivar specific effects. It would make sense for the "Voluntary Emission Reductions in Rice Management Systems" document to address how this data bottleneck will be addressed. Practically speaking, individual farmers produce a specific cultivar based on their perception of a cultivars yield, grain quality, and economic profitability. Adding an environmental factor will only work if either 1) an economic benefit to the grower is clear or 2) if a local/state/federal mandate forces adoption.				
8.6	Table 2, like table 4, is difficult to read and interpret, and it seems possible that some consolidation of treatments could occur. For example, rather than specific	Note that we have corrected the table misnumbering so the table referred to here is now Table 5. The purpose of this table is to provide the validation results (measured and modeled) from each site-year for complete transparency. The labeling of specific treatments was done	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
	cultivars, cultivar variation could be listed. Also what is the difference between urea_high and urea_low and urea_000 and Urea_300 kg N? Could those be combined?	to identify separate site-years of data for the validation results. So the urea-high and urea-low represent different experiments and years (1990 versus 1992).			
8.7	For table 2, the modeled and measured values are given as kg C per hectare per year. Is this as carbon or carbon equivalents or CO_2 equivalents as for methane or nitrous oxide? The later might be more useful given the greater warming potential of methane and nitrous oxide. Also could differences in modeled and measured data be given to give the reader a sense of what model aspects might be more accurate?	The units in the table have been updated (were C-CH_4/ha/yr, now revised to CH_4 per hectare per year). We have updated the table to reflect this change. Rice methane fluxes are commonly reported as units of CH_4 or C-CH_4 rather than as units of CO_2eq. The sources of the differences between modeled and measured emissions is extremely difficult to assess on a case by case basis.	Accepted.	n/a	n/a

H. Template .dnd input files

	1st review	Response	2nd review	Response	3rd review
9.1	No suggestion, except it is not practical for most growers to obtain this amount of detailed data. The documents would be greatly improved were it to address how this data will be made available to growers and not assume the growers will generate this data.	There is not the expectation that growers will be asked to provide all the data in the template .dnd input file. (As indicated above, the audience of this methodology is the Project Proponent, not the grower.) Many of these parameters can come from publicly accessible sources (weather stations, NRCS soil databases, published literature, etc.) or can be defaults from the DNDC crop library. It will be up to the Project Proponent to collect as much data as possible from other sources, in order to minimize the data	Accepted.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
		required from the grower. Some input parameters can only come from grower records – dates of tillage, fertilization, flooding events, etc. – and Project Proponents are currently designing efficient methods to collect this data from growers.			
9.2	At the bottom of page 15, the statement, "REPEAT FROM……CREDITING PERIOD" seems out of place. Can you clarify? Do the values that follow have to represent a 30 year trend (average)?	The protocol requires the DNDC model to be run for 20 years prior to crediting period to "spin up" the model. However it is not required to repeat the 5 year rotation during the initial 10 year crediting period.	Accepted.	n/a	n/a

I. Data and Parameters Not Monitored

	1st review	Response	2nd review	Response	3rd review
10.1	Repeat of 7.1 regarding peer-reviewed data	"Refereed" added to sections 6 and 9.	Accepted.	n/a	n/a
10.2	Drainage date: If DD50 is preferred for less ambiguity then why not specify? It's not an onerous thing.	Because in response to comment 3.2 we have added process-based models such as RicePSM or ORYZA as an eligible means to determine the Conventional Drainage Date, we are leaving DD50 as just one of the options rather than specifying DD50 must be used.	Accepted.	n/a	n/a
10.3	Rather exhaustive. It is not practical for an individual grower to obtain this amount of detailed data. The documents would be greatly improved were it to address how this data will be made available to growers and not assume the	Since only three parameters (baseline fuel and/or energy efficiency, baseline water pumped, and conventional drainage date) are included in this section, we assume the reviewer is referring to the Data and Parameters Not Monitored section from the parent methodology, which includes things like soil texture, soil pH, SOC etc. Almost all of the parameters in the Data and Parameters Not Monitored section of the parent methodology can be	Emphasize in the text that these data can be easily accessible.	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
	growers will generate this data.	obtained from publicly accessible sources such as the NRCS SSURGO database or peer-reviewed literature and do not have to be provided by the grower. The Project Proponent will use such sources for the values of as many as possible of the required parameters, so that data collection from the grower can focus on parameters only available from the grower's records -- dates of tillage, fertilization, flooding events, etc.			
10.4	The issue of improved efficiency is given as MTCO2 eq, how does this compare to fluxes described in Table 2?	The column headers in Table 5 (formerly misnumbered Table 2) have been corrected. The units are kg CH_4 ha^{-1} yr^{-1}. In that Table, the measured and modeled fluxes used for validation of DNDC are reported in units of CH_4, not converted to CO_2 equivalent; whereas the reductions from improved water and energy use efficiency come from reduced diesel consumption and are reported in tons of CO_2equivalent. Fluxes in kg CH_4 could be converted to CO_2equivalent by multiplying by the Global Warming Potential of CH_4, but we have not elected to do that conversion in Table 5 since there we are just comparing measured and modeled fluxes in the units in which these are generated.	Accepted.	n/a	n/a
10.5	Specific examples of upgrades/efficiencies with respect to both CO2eq and potential cost savings might be useful.	See response to 7.3. Examples of water and energy use efficiency upgrades are given in Table 2. We prefer not to be more specific than that, since the module is not prescriptive on practices or technologies. Any practice that reduces diesel consumption – either by reducing irrigation water requirements, improving the efficiency of existing diesel motors, or switching from diesel to electric – will result in lower CO_2 emissions from diesel combustion.	Accepted.	n/a	n/a

J. Additional Data and Parameters Monitored

	1st review	Response	2nd review	Response	3rd review
11.1	One pump/multiple fields: will all fields be enrolled so that there can be a check that the estimated proportions add up to the total?	No, there is not currently a requirement to enroll the other fields served by a pump serving one enrolled field. In general we do not want to require growers to enroll more fields than they are comfortable with, since this will initially be an experimental activity for them. We could consider making this a requirement. Alternately we could add some text to the Actual Water Pumped parameter that would say if a pump is serving multiple fields, the Project Proponent shall calculate Actual Water Pumped to the enrolled fields by multiplying by a factor in which the numerator is the acreage of enrolled field(s) and the denominator is the acreage of all fields served by that pump. Which course would the reviewers recommend?	Or require a flowmeter on the enrolled field, my preference; ratio could be very misleading and totally meaningless if some of served fields are in a different crop, which is common.	Agreed. We have added to the "Actual Water Pumped" parameter table the following text: In the event one pump serves multiple fields, only some of which are enrolled in the Project, a flowmeter must be used on the field(s) enrolled in the Project.	Accepted
11.2	Rather exhaustive. It is not practical for an individual grower to obtain this amount of detailed data. The documents would be greatly improved were it to address how this data will be made available to growers and not assume the growers will generate this data.	Since only three parameters (actual fuel and/or energy efficiency, actual water pumped, and conventional drainage date) are included in this section, we assume the reviewer is referring to the Data and Parameters Monitored section from the parent methodology, which includes climate data. Climate data, which can be obtained by the Project Proponent from public sources such as weather stations, so there will not be a need to ask the grower for this information. All the other parameters in the Data and Parameters Monitored section of the parent methodology represent things that can really only be provided by the grower: planting date, harvest date, yield, tillage date and method, fertilizer date, amount and composition, crop residue harvested and left, flooding and draining dates, dates of straw burning events, and end use of baled straw. The authors believe that all of these things are already or can be collected from grower records with a minimum of additional time requirements by the grower. Project	Repeat of earlier comment?	n/a	n/a

	1st review	Response	2nd review	Response	3rd review
		Proponents are currently designing efficient methods to collect this data from growers.			
11.3	The issue of N_2O monitoring is obviously an important one given its GHG potential. However, good estimates of its efflux in conjunction with fertilization and irrigation are lacking. Are there plans to include this parameter in future or current monitoring?	See footnote 6 in the module. N_2O fluxes are calculated by DNDC and included in the estimates of baseline and project GHG emissions generated by DNDC. As more data becomes available from studies directly measuring N_2O fluxes under different fertilization and irrigation treatments, this flux data may be used to continually improve calibration and validation of the DNDC model. However N_2O fluxes are not ignored in the current version.	Make explicit that N2O measurements will be improved with new data; however, also provide information if possible, on the current reliability of N2O measurements (e.g. +/- 20%, 40%?)	We made this explicit by adding to footnote 6: As more data becomes available from studies directly measuring N_2O fluxes under different fertilization and irrigation treatments, this flux data may be used to continually improve calibration and validation of the DNDC model.	Accepted