Rice Cultivation Project Protocol
Public Comments Set 1

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P18-19 Table 4.1

SSR 1: How many validation data sets exist in which CO2, CH4, and N2O were simultaneously measure?
More specifically, what are the data sets used to validate DNDC for these CA rice systems? Does the model validation include comparison against observations for the modified practice of dry seeding?
For example in Qui et al. (2009 Global Biogeochemical Cycles vol 23), seasonal simulation of N2O and CH4 tracked the rough pattern of observations, but the timing of N2O and CH4 simulated release did not accurately match observations and the magnitude of gas release was also not always modeled. Similarly, in Babu et al. (2006 Nutrient Cycling in Agroecosystems 74:157-174), DNDC application to rice systems in India demonstrated variable ability to simulate observed CH4 flux; in some cases the simulations track seasonal observations, in other applications peak events are not simulated. In this Indian rice system, large peaks of observed N2O flux were not simulated.

In the discussion of model uncertainty in Appendix C aggregated CH4 outcomes are discussed. But, the details of seasonal observation-simulation outcome comparisons are the data necessary to support model accuracy in system representation. Without the seasonal information it is not clear that all applications in Table C.1 are robust descriptions of the rice system.

SSR2 and SSR3: why is fossil fuel reduction from reduced flooding excluded while farm equipment fossil fuel changes are assessed? In dry grain systems, irrigation accounts for about half of farm energy use, while farm equipment is less than 10%. What is the distribution of energy use in a flooded rice system?

P23-24 Soil Data.
What is the rational for the 10 year limitation on soil physical properties? A 10-year limit would be justifiable if soil measurement is required, but not if SSURGO is accepted as a source of soil information. Field measurement of clay content and soil texture will be more accurate than SSURGO estimates. Soil physical composition does not radically change over decadal time scales. The bulk density can change from compaction due to management. But, a 10-year estimate would likely be more accurate than SSURGO as well. Even for soil chemical properties (such as pH and SOC) 10-year measurements would be preferable to SSURGO estimates. SOC and pH do change in response to management, but under a long-term management protocol a relative SOC steady state would be achieved based on cropping inputs and soil properties. Given the sensitivity of DNDC outcomes to soil properties, requiring a soil sample from each

field would be preferable to SSURGO data. Soil samples can easily be processed for texture and C content by state USDA labs. A single composite sample of 10-20 cores would give a reasonable estimate of field soil properties.

P39 Soil sampling.
These are very rigorous expectations. Per my comments above if this level of soil description accuracy is desired, then field sampling should be required.

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Table 5.7, Figure 5.2
What is the justification for the structural uncertainty relationship?
More generally, the notion of reducing outcome uncertainty by simulating a larger area addresses parameter uncertainty, not structural uncertainty. Structural uncertainty is generally addressed by comparing results across different modeling approaches.

P 66 Appendix C
'The DNDC model has been shown to predict greenhouse fluxes without bias, when correctly calibrated.'
This is a very strong statement. The GHG records against which DNDC has been calibrated are not long enough time series for rigorous calibration and validation. Most data-model comparison is against 1 or 2 growing seasons. From such a limited temporal series, it is difficult to robustly conclude that the model is definitively validated. It is possible that the model is over-fit to the limited calibration data.

GHG production is a highly non-linear process. Depending on the aerobic status of the soil, very different emissions are possible. Because management is directly affecting field moisture state, it is not reasonable to assume that there are only linear differences between the project and baseline GHG outcomes.

Similarly it is not reasonable to assume DNDC response to changes in input data is linear. Since soil properties drive soil moisture and aerobic state, mis-estimation of soil properties can lead to non-linear mis-estimation of GHG emissions.

General comment on Section 5. As a researcher experienced in DNDC development and application, I am concerned about the resources required to accurately apply the DNDC model. There are many points in the process where errors can enter the analysis. Will the individuals applying the DNDC model be sufficiently trained in model application?

Rice Cultivation Project Protocol
Public Comments Set 2

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1. How do these two statements below fit together? How difficult is it – and how much does it cost – to establish and maintain an account with the reserve? How realistic is it for most growers to do this? To what extent do growers become beholden – not just legally but in terms of routines they adopt – to a middle-man for this process to work?

> The project developer is an entity that has an active account in good standing on the Reserve..
>
> An individual rice grower may serve as his/her own Aggregator or as an Aggregator for a group of fields.

2. What happens if a project participant loses that authority? Are there ways they could lose that authority involuntarily?

> Project participants must have authority to make cultivation management decisions on their fields that are enrolled in the project aggregate

3. Seems to emphasize a paperwork function. Is that how you view the main responsibilities of aggregators?

> Aggregators… responsible for submitting all required forms and complying with the terms of the this protocol.
>
> "the this" – TYPO on page 9, 2nd full paragraph
>
> Do the forms, by themselves, ensure integrity to the technical analyses and results?

4. What happens if this scope in the end falls short of what the reserve requires – but the contract between participant and aggregator has been signed? What happens to the participant?

> The scope of aggregator services is negotiated between the project participant and the aggregator

5. So in the case below, you could in effect have 3 fields in an aggregate – technically 5 but 2 excluded from verification for some time (maybe several years)?

> Aggregators also have the discretion to exclude individual fields enrolled in their aggregate from participating in verification activities for any given reporting period;

however, in such cases there can be no CRTs claimed by those fields in the aggregate total.

6. This strikes me as a good legal backstop but also as not entirely sufficient. The volume of junk mail is just too great; it's too easy for an unexpected piece of mail to fall through the cracks and not receive careful attention. Maybe mail and also a phone call to follow up and make sure the landowner got and read the letter? That would at least be an improvement. Maybe the lessee needs to attest that s/he has discussed the matter with the landowner? I don't have a strong recommendation exactly what this process should look like, but a letter alone seems like a recipe for problems.

In the case of project activities taking place on leased fields (e.g. the project participant is not the land owner, but rather a lessee), the Aggregator must notify the land owner with a Letter of Notification of the Intent to Implement a GHG Mitigation Project on the respective field.

Is it possible to 'exceed regulatory requirements' without complying with all applicable laws? Does Rule V add something new?

Eligibility Rule IV: Additionality *Exceed regulatory requirements*

Eligibility Rule V: Regulatory Compliance *Compliance with all applicable laws*

7. This needs to be more specific. You can validate DNDC against yield, for example, but that does not mean it will provide sound estimates of methane emissions. I recommend rewriting to say: "validated with field data on methane fluxes collected over at least 3 field seasons and showing strong fits between measured and modeled peak emissions in both timing and magnitude."

Projects must be located in approved rice growing regions for which the DNDC model has been validated.

8. Where does the "3% " SOC threshold come from? Why not 2%? 4%? Is there a table? A review paper? What is the basis for this choice of threshold?

There is a big difference between soil samples and SSURGO data. What is the reliability of SSURGO data at different spatial scales, and how does it compare to the size of relatively small fields eligible to participate in this protocol?

High Carbon Content Soils:

Because nitrous oxide (N2O) emissions are potentially more variable with increased soil carbon content, fields that have soil with organic carbon content greater than 3% in the top 30cm of soil are not eligible at this time. The organic carbon content of the field shall be determined by soil sampling or SSURGO data in accordance with Section 6.2.1.

9. This definition of cultivation cycle may be OK for rice, but we should be careful not to count this in any way as a precedent for other agriculture protocols, as with other crops rotations – which have many advantages and confer a variety of ecosystem services – do not always conform to an annual schedule.

> a 'cultivation cycle' is defined as the period starting immediately after a rice harvest (in late summer or fall), and ending at the end of the next calendar year's harvest.

10. Have adoption rates of any of the approved practices accelerated in the 2009-2011 time frame, compared to, say the 2005-09 period?

> For a period of 12 months from the Effective Date of this protocol (Version 1.0), fields with start dates on or after September 1, 2009 are eligible to register with the Reserve if submitted by December 14, 2012.

11. This is probably covered elsewhere – but do performance standards change between crediting periods? One would hope that common practice 15 years from now is different from common practice today, so the threshold for additionality should change. For a field to be granted a new 5-year crediting period, do the obligations for the manager of that field change or are they grandfathered?

> Reporting periods in which a field does not meet the performance standard (see Section 3.6.1) or is not included in the pool of fields potentially selected for verification for any reason still count towards the five-year crediting period.

12. This seems like it should help ensure the integrity of the credits. Nicely done.

> each field must separately pass the Performance Standard Test in order to be eligible.

13. Did you look at Conservation Stewardship Program payments? If so, do any of them apply to the dry seeding or residue management? Also, CSP and EQIP may well be merged, possibly with other conservation programs, over the next year or so. How will changes in naming and/or administration of the USDA conservation programs be handled?

> **3.5.3 Ecosystem Services Payment Stacking**

14. General question about information sources:
Example: footnotes 3, 4, 5, and 20, all of which support important assumptions/assertions about baseline conditions. Personal communication seems like a rather weak basis. Is stronger documentation available?

> 3 Based on communication with P. Buttner (CalRice), R. Mutters and L. Espino (University of California Cooperative Extension)
> 4 Communication with Paul Buttner.

5 Based on communication with P. Buttner (CalRice), R. Mutters, L. Espino, and G Nader (University of California Cooperative Extension)
20 Personal communication with NRCS field personnel in California.

15. For GHG Boundaries, N2O emissions from nitrification (aerobic) as well as denitrification need to be assessed. How well does DNDC simulate N2O emissions when oxic and anoxic conditions alternate (leading to coupled nitrification and denitrification)? Has DNDC been calibrated for different sequences of flooding and drying on CA rice fields? If not, does the protocol restrict credits to those sequences that have been well-studied and for which DNDC has been well-calibrated?

Table 4.1. Description of All Sources, Sinks, and Reservoirs
N2O A Significant source affected by project activities if fertilizer application amounts and/or dates are changed, or seeding practice is altered.

16. What is the empirical basis for assuming small yield declines lead to increased planting elsewhere? Is it well-established that rice demand remains constant, or will demand shift to other grains if less rice is available? Some of the best gains we can make for agriculture in terms of GHG emissions and other ecosystem services involve growing less of some crops and more of others. To assume that demand for each individual crop is entirely inelastic is a very high bar. What is the best evidence you have seen to support the implicit claim that a 5% decline in rice production in CA will lead to a 5% increase in rice production elsewhere?

If project activity results in a statistically significant decrease in yield, rice production and associated GHG emissions may be shifted outside the project area