

Rice Cultivation Project Protocol

Version 1.1



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Public Webinar

June 19th 10:00am-12:00pm PDT



Agenda

- Welcome / Introductions
- Brief overview of major elements of protocol
- Presentation of major changes from V1.0 to V1.1
- Q+A / Discussion





Why Version 1.1?

- Incorporate errata and clarifications
- Incorporate policy memos issued since 2011
- Respond to stakeholder feedback
- Increase the usability of the protocol
- Increase flexibility where possible
- Bring in line with other protocols





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Protocol Overview





Protocol History

- V1.0 of Rice Cultivation Project Protocol (RCPP) was adopted by the Reserve Board in December 2011
 - Developed over an 11 month process w/ participation from a multi-stakeholder workgroup process
 - Drew heavily from and built upon the seed document methodology developed by EDF and Terra Global Capital
- Errata & Clarifications: Released Jan 29th 2013
- V1.1 of the RCPP was released June 3, 2013.





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Project Protocol Components

Background on rice cultivation	Section 2
Define the GHG reduction project	Section 2
Determine eligibility	Section 3
Establish the GHG Assessment Boundary	Section 4
Calculate GHG reductions	Section 5
– Baseline emissions / Project emissions	
Monitoring	Section 6
Reporting & Record Keeping	Section 7
Verification	Section 8
Parameter Look up Tables	App A
Step by Step Guide to Modeling RCPP Emissions Using DNDC	App B
RCPP General Quantification Guidance	App C





Protocol Overview

- RCPP high level overview:
 - Project definition
 - Approved project activities – dry seeding &/or baling
 - California only
 - Single Field Project (SFP) / Aggregates allowed
 - Field boundaries – must have homogenous management activities across whole field
 - Eligibility:
 - Start date
 - Anaerobic baseline – 5 prior seasons of rice growing;
 - Performance Standard Test = approved activities;



Protocol Overview



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- Assessment boundary
 - Main focus on primary emissions from soil;
 - Also look at secondary emissions;
- Quant;
 - Quant occurs on field by field basis – for entire cultivation cycle
 - Must use DNDC process based model to quantify primary emissions;
 - When quantifying ERs – must compare data from projects 5 reporting periods against data from original 5 year baseline period;



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Protocol Updates





Defining Field Boundaries

(Section 2.2.1)

- Clarifies that any field that is not homogenous may simply be split into smaller fields that are homogenous
- More clearly defines 'homogenous' field management
- Most significant change – added requirement that fields must have homogenous crop residue management
 - Crop residue management within the field boundary must be homogenous across the field area within a reporting period. For example, any burning or baling that occurs on a field must occur across the entire field; there can be no fields that have been partially burnt or baled.
- Verifiers must use professional judgment to determine whether fields meet definition



Defining Cultivation Cycle

(Section 2.2.2)



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- Cultivation cycle defined as the period starting the day immediately after harvest of one rice crop and ending the last day of the next rice crop harvest the following calendar year;
- Since protocol only applicable to annual rice crops - cultivation cycle is further defined as approximately 365 days





Defining the Project Developer

(Section 2.3)

- Minor changes to language used in section;
- Also extended requirement with respect to project developers on leased fields – giving notice to field owners:
 - PD must notify and owner with a Letter of Notification of the Intent to Implement a GHG Mitigation Project on the respective field.
 - Sufficient evidence must be given to the verifier to demonstrate that such a letter was sent (e.g., evidencing the use of certified mail).





Defining Project Location (Section 3.1)

- **High Carbon Content Soils** - Reduced the depth to which Soil Organic Carbon (SOC) must be measured in order to determine eligibility, from 30cm to 10cm (Section 3.1.2);
- **Fields Using Nitrification/Urea Inhibitors & Controlled Release Fertilizers** – fields on which such products used are not eligible – as DNDC not validated for such fields (Section 3.1.3);





Defining Baseline (Sections 3.3 & 3.4)

- **Pre-project baseline period** - Pre-project baseline retained for subsequent crediting periods (Section 3.1.3)
- **Anaerobic Baseline Conditions** (Section 3.1.4)
 - 1) continuous rice cultivation:
 - If fallow season within 5 cultivation cycles prior to project – must show rice cultivation for 5 of the 6 cultivation cycles;
 - 2) flooding:
 - If cant meet requirement due to circumstances beyond PDs control – show 100/+ days of flooding is common practice for the field





Legal Requirement Test (Section 3.5.2)

- Each field need only pass LRT once at start of crediting period
- Clarify that aggregators only need to submit a new Attestation of Voluntary Implementation for new fields joining aggregate



Ecosystem Services Payment Stacking

(Section 3.5.3)



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- Clarified eligibility vis-à-vis receiving NRCS funding (for CPS 344A or CPS 329):
 - Fields not included in NRCS funding agreement = eligible;
 - Fields previously received NRCS funding at least 1 year prior = eligible;
- Included new Table 3.2 outlining payment stacking scenarios / eligibility





Regulatory Compliance (Section 3.6)

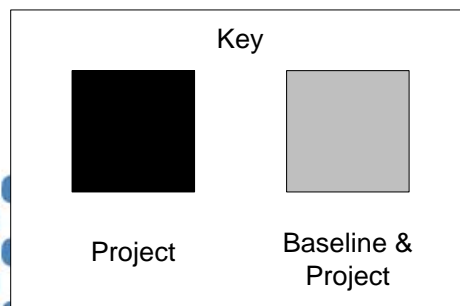
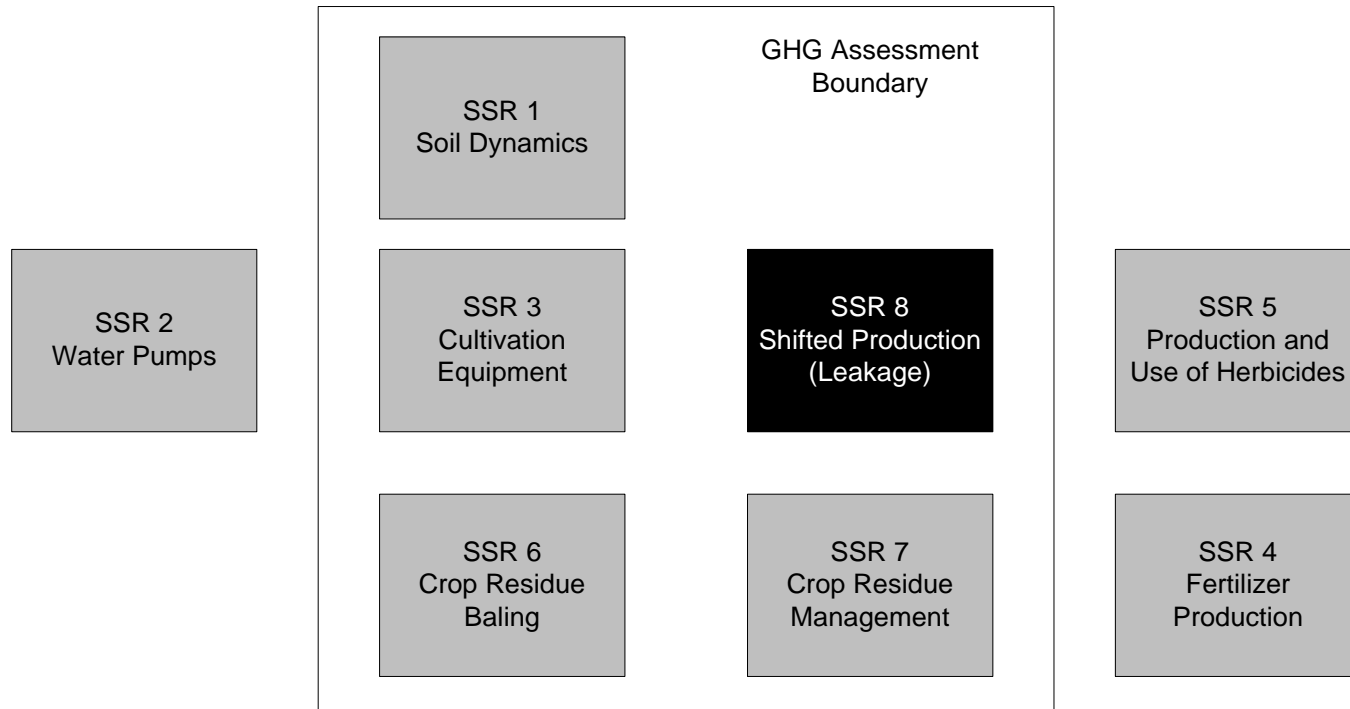
- New language under Regulatory Compliance section to bring in line with Reserve's *Environmental and Social Safeguards Policy Memo (9/27/2012)*
- Activities occurring on project fields (including but not limited to project activities) must not cause material violations of applicable laws;
- Must disclose in writing all instances of legal violations whether, material or not;



Added GHG Assessment Boundary Diagram (Figure 4.1)



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Section 5 - Updates

- Implemented a significant reorganization of Section 5.
- Detailed requirements for application of the DNDC model were moved to (and expanded upon) in a newly created Appendix B.
- Remaining guidance in Section 5 was expanded upon and reordered in chronological order.
- Consolidated v1.0 Sections 5.4 and 5.5 (and Equations 5.2 and 5.3) on modeling baseline / project emissions - into a single Section 5.4.1 and single Equation 5.2.
- A new Table 5.1 was introduced, providing a summary of quantification steps (Section 5, Appendix B).

Clarifications to the Reporting Period

(Section 5.1)



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- For SFPs – defined using dates corresponding to beginning and end of cultivation cycle for particular field
- For aggregate projects – uniform reporting period used – start Oct 1 –end Sep 30 following calendar year;
 - Fields participating in an aggregate must report ERs for whole cultivation cycle against the corresponding aggregate reporting period – even if dates don't completely overlap;





Baseline Modeling Inputs (Section 5.2)

- To set baseline inputs for each cultivation cycle during the first crediting period, must use field management data from five cultivation cycles prior
- Subsequent crediting periods continue to set baselines using data from the five cultivation cycles immediately prior to the project.
 - For a project commencing Oct, 1, 2013 , the baseline for the FIRST cultivation cycle must use data from the 2008-2009 cultivation cycle;
 - For the 2017-18 cultivation cycle, the LAST baseline cultivation cycle of the crediting period must use data from the 2012-13 cultivation cycle;
 - For the next crediting period, the FIRST baseline cultivation cycle must still use data from the 2008-2009 cultivation cycle



Deriving Cultivation Cycle Emissions from Calendar-Year Modeling Results

(Section 5.3)



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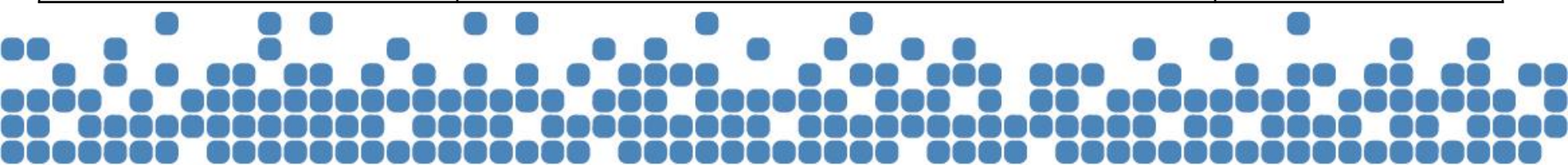
- As DNDC operates on calendar years, as opposed to Oct-Sep cultivation cycle, the PD must model 2 calendar years of data for each cultivation cycle
- To simplify MRV – Reserve encourages PDs to use Julian dates (used in modeling results) in addition to calendar dates wherever possible.



Table 5.1. Overview of Quantification Steps (Section 5.4)



Step	Overview	Equation
<p>1. Calculate primary emissions for baseline scenario and project scenario for each field</p>	<p>Calculate average cultivation cycle baseline and project scenario GHG values.</p> <p>This involves:</p> <ul style="list-style-type: none"> • Conducting 2,000 Monte Carlo runs of the DNDC model for both calendar years within which the cultivation cycle falls, for both the baseline and project scenarios (4 years total); • Extracting data from DNDC modeling results corresponding to the cultivation cycle; • Calculating cultivation cycle GHG parameter values for each Monte Carlo run; and • Averaging these values across the 2,000 Monte Carlo runs for both the baseline and project scenarios. 	<p>Equation 5.2</p>





Step 1 – Calculate Primary Emissions for Each Field (Section 5.4.1)

- New guidance for extracting DNDC results to quantify emissions;
 - Consolidated V1.0 Sections 5.4 and 5.5 (and Equations 5.2 and 5.3) on modeling baseline / project emissions - into a single Section 5.4.1 and single Equation 5.2.
 - Perform 2000 Monte Carlo runs, each calendar year, each field;
 - Extract GHG parameter values for dates within cultivation cycle;
 - Calculate single value for each GHG parameter for cultivation cycle;
 - Input values into Equation 5.2 – to calculate average across each 2000 Monte Carlo run;
 - Note: Equation 5.2's SOC parameter also updated to focus on SOC value on last day of cultivation cycle;





Table 5.1. Overview of Quantification Steps (Section 5.4)

Step	Overview	Equation
2. Calculate primary effect emission reductions for each field (unadjusted for uncertainty)	Preliminary primary effect emission reductions for each field are calculated using results from the baseline and project modeling calculations in Step 1.	Equation 5.3
3. Calculate uncertainty-adjusted primary emission reductions for each field	Apply soil and structural uncertainty deductions to preliminary primary effect emission reductions for each field to calculate final primary effect emission reductions.	Equation 5.4
4. Calculate increased emissions from cultivation equipment	Choose from two alternative approaches to calculate emissions from increased fuel emissions from cultivation equipment.	Equation 5.5 or Equation 5.6



Step 2 – Calculate Primary ERs for Each Field (Unadjusted for Uncertainty)

(Section 5.4.2)



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- PDs must compare baseline and project cultivation cycle emissions calculated in Step 1;
- Divided Version 1.0's Equation 5.4 into two distinct equations to allow for the project developer to calculate the total primary effect emission reductions (now Equation 5.3), prior to adjusting for uncertainty in the following step (Step 3, now Equation 5.4);
- Clarified that quantification of SOC requires comparison of $(SOC_{B,LDcc,i} - SOC_{P,LDcc,i})$



Step 3 – Calculate Uncertainty Adjusted Primary ERs (Section 5.4.3)

- Includes a new section with consolidated guidance on structural uncertainty and soil input uncertainty deductions
 - Guidance on how to calculate soil input uncertainty deduction provided in Appendix B
- Equation 5.4 - new parameter PER_{ud} , distinguish between total primary effect ERs adjusted and unadjusted for uncertainty (PER_{ud} and PER_i , respectively).



Steps 4 & 5 - Quantifying Secondary Emissions (Section 5.5)

- Moved calculation of total Secondary ERs to end of Section 5.5;
- **Step 4 Calculate Project Emissions from Onsite Fossil Fuel Combustion (Section 5.5.1):**
 - Clarified that there is no need to quantify emissions from cultivation equipment if no change in type / hours of cultivation equipment usage due to implementation of the project;
 - Provided optional alternate quantification method for calculating emissions from cultivation equipment (now called “Approach 1”, Equation 5.5) and renamed the existing quantification method “Approach 2”, Equation 5.6
- **Step 5 emissions from rice straw management/use (Section 5.5.2)**



Table 5.1. Overview of Quantification Steps (Section 5.4)



Step	Overview	Equation
5. Calculate emissions from rice straw end use	Calculate emissions associated with changes in rice straw management, using default emission factors provided in Appendix A.	Equation 5.7
6. Calculate emissions from activity leakage	Calculate emissions associated with any shift in rice production outside of the project boundary, attributed to reductions in project yields.	Equation 5.8 Equation 5.9 Equation 5.10
7. Calculate total secondary effect emissions for the project	Sum together emissions from increased fossil fuel usage, alternative residue management activities, and activity leakage.	Equation 5.11





Step 6 – Calculate Project Emissions from Leakage (Section 5.5.3)

- Clarified that if a simple summation of project yield (or aggregate yields) shows that yield did not decrease compared to average historical yield, there is no need to estimate leakage;
- Clarified that any fallow year present in the baseline period should be ignored when calculating leakage for that field;
- Provided a new Equation 5.8 “Normalized Yield for Each Year t ”





Step 6 – Calculate Project Emissions from Leakage (Section 5.5.3)

- Updated SOC parameter for Equation 5.9 “GHG Emissions Outside the Project Boundary;”
 - Now $\Delta SOC_{B,i}$ = Change in SOC for field i during baseline cultivation cycle, as calculated in Equation 5.10;
- Provided new Equation 5.10 “Annual Change in SOC in the Baseline;”

$$\Delta SOC_{B,i} = \frac{\sum_{j=1}^{2000} SOC_{LD,cc} - SOC_{FD,cc}}{2000} \times \frac{44}{12}$$

- Step 7 – Calculate total 2ndary emissions





Section 6 Updates

- Mandate use of Field Serial Numbers in file name of all monitoring records;
- Updated Table 6.1
 - guidance on DNDC input parameters;
 - measurement frequency for numerous parameters;
 - Reorganized to better match DNDC GUI;
 - Removed parameters no longer used by DNDC / the protocol;
- New Table 6.2
 - Guidance on field monitoring parameters used in protocol equations



Updates to Reporting / Record Keeping (Section 7)



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- Clarified documentation requirements for submittal / annual reports;
- Simplified guidance for Project Submittal Documentation (Section 7.1).
 - Both SFPs & aggregates must submit List of Enrolled Fields including details of all fields *at the time of submittal*;
 - Aggregators must update List of Enrolled Fields prior to commencement of verification;
 - List of Enrolled fields must be updated for each subsequent verification;





Updates to Reporting / Record Keeping / Verification (Sections 7 & 8)

- Clarified that all DNDC *output files* must be retained for record-keeping purposes (Section 7.3), as well as made available to verifiers (Section 8.1);
- Added requirement (Section 7.2.3) aggregates must submit Field Report to verifier each cultivation cycle, including at minimum:
 - Signed statement by PD that all info is true/accurate;
 - Field management data;
 - Project activity data.
- Clarified that any site visits initiated at the discretion of the VB shall be in addition to the required site visit verification schedule (Section 8.3);



Updates to Table 8.1 Summary of Eligibility Criteria



Eligibility Rule	Eligibility Criteria	Frequency of Rule Application
Start Date	Projects must be submitted for listing before the end of the first cultivation cycle in which the project activity is implemented.	Once during first verification
Location	All fields must be in California.	Once during first verification
	Must not include fields with SOC greater than 3% in top 10cm.	Every verification
	Must not include fields that have used nitrification / urea inhibitors or controlled release fertilizers.	Every verification



Updates to Table 8.1 Summary of Eligibility Criteria



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Eligibility Rule	Eligibility Criteria	Frequency of Rule Application
Legal Requirement Test	Signed Attestation of Voluntary Implementation form and monitoring procedures for ascertaining and demonstrating that the project passes the Legal Requirement Test	Single Field Project: once during first verification Aggregate: once during first verification and once during first verification for new fields that have joined aggregate





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Appendix B:

Step by Step Guide to Modeling RCPP Emissions Using DNDC





Table B.1 Overview of DNDC Modeling

Step	DNDC Modeling Overview	More Info
Step 1: Become familiar with necessary DNDC inputs		
Step 1.1 Overview of DNDC site input parameters	Introduces two typologies used to categorize DNDC input parameters.	DNDC User Guide v9.5 Appendix C
Step 1.2 Defining project & static inputs	Guidance on how to classify DNDC inputs as either project / static inputs and where to source data for such inputs depending on their classification	
Step 1.3 Climate input parameters	Guidance on climate input parameters.	
Step 1.4 Soil input parameters	Guidance on soil input parameters, including further guidance on: <ul style="list-style-type: none">- Using soil inputs from SSURGO;- Using soil input from field samples.	
Step 1.5 Cropping input parameters	Guidance on cropping input parameters, including multiple subcategories.	

App B – Step 1.1 Overview of DNDC site input parameters



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- Guidance on typology:
 - 3 main categories of parameters – Climate / Soil / Cropping
 - Cropping split into further 6 categories;
 - All parameters further classified into static / project input parameters - Denoting whether data for those parameters sourced from project scenario cultivation cycle only or both project/BL scenario cultivation cycles;
- Guidance on how to use GUI and create and use input files;
- Table B.3 - Overview of DNDC input parameters (whether they are static or project, where to source data etc.)



App B – Step 1.2 Defining Project inputs and Static inputs



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- Only project inputs vary when modeling baseline and project emissions
- BUT some project inputs stay same – only change those related to approved activities implemented on that field

Baseline Practice	Project Input
Flooding at seeding	Dates of flooding relative to the planting date (other than winter flooding)
Residue Management	Fraction of straw removed after harvest (0 if no straw removed)
Fertilizer	Dates of all fertilizer applications
	Rate, type of fertilizer and application method for each fertilizer application
Tillage	Dates and depth of all tillage events for preparing the fields for planting and post-harvest residue management

App B – Step 1.3 DNDC Climate Input Parameters



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- Have added a further site-specific climate parameter (humidity) and changed the file formatting requirements for entering data into the DNDC GUI – now File format 6;
- New Table B.5 – demonstrating the formatting requirements for climate input files;
- Added guidance for several default parameters for which data must be entered directly in the DNDC GUI –
 - N-concentration in rainfall, NH₃ background concentration and CO₂ background concentration;
- New Table B.4 outlining the key climate input parameters and whether they need to be set using defaults or site-specific data;

App B – Step 1.4 DNDC Soil Input Parameters



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- New Table B.6 summarizing soil parameters for which data must be entered into DNDC;
- Guidance on how to set soil texture within the DNDC GUI;
- Depth of soil sampling has been changed from 0-30cm to 0-10cm as DNDC only requires data for 10cm of soil;
- Sampling methodology altered slightly to reflect this – still 20 samples – no longer 2 classes of depth;



App B – Step 1.5 DNDC Cropping Parameter Subcategories: Management Parameters



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- New Table B.7 setting out all DNDC Cropping Parameters by Subcategory – whether data to populate are default or site-specific;
- Further guidance given for each sub-category – including guidance on how to source data for each parameter;
- Further guidance given as to types of evidence verifiers may like to see;





Table B.1 Overview of DNDC Modeling

Step	DNDC Modeling Overview	More Info
Step 2: Prepare input files		
Step 2.1 Missing climate and soil data	Provides a methodology to substitute data in the event that discrete climate or soil data is missing.	DNDC User Guide v9.5 Appendix C
Step 2.2 Historical modeling	Guidance on how to prepare necessary historical data needed to model emissions and to calibrate the DNDC model.	
Step 2.3 Preparing DNDC input files	Guidance on how to create separate input files for baseline / project scenarios, each containing data from both baseline and project scenario.	



App B – Step 2.1 Missing Climate or Soil Data



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- New methodology for how to substitute for missing data
 - For periods when it is not possible to use the data substitution procedure – NO ERs may be claimed;
- Missing climate data:
 - For gaps not exceeding 14 days – PDs shall use average value of previous and following 14 days – from same source;
 - For gaps exceeding 14 days – PDs shall use data for that same region from another source – or data from the nearest alternative weather station;
- Missing soil data:
 - Missing SSURGO data – PD shall use data from STATSGO database – if not available – must use field samples;
 - If using field samples – PD must either resample or use data from SSURGO or STATSGO if SSURGO incomplete;





App B – Step 2.2 Historical Modeling

- For calibration
 - Use 5 years of pre-project data
 - no baseline or project scenario data are needed for calibration
- For modeling emissions
 - use 21 years of data – 20 years of data (4 x 5 year pre-project data) + 1 year of project data



App B – Step 2.3 Preparing DNDC Input Files



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- Guidance on using DNDC GUI and entering data using input files;
 - First enter data using GUI;
 - Once dataset captured within GUI – data saved to input file;
 - Can re-enter / update data using input files;
 - Must not change any defaults provided by DNDC, unless specifically instructed to do so in RCPP;





Table B.1 Overview of DNDC Modeling

Step	DNDC Modeling Overview	More Info
Step 3: Calibrate the DNDC model		
Step 3 Calibrating the DNDC model	Provides guidance on how to prepare DNDC for modeling by undertaking the calibration exercises	DNDC User Guide v9.5 Appendix C



App B – Step 3 Calibrating the DNDC model



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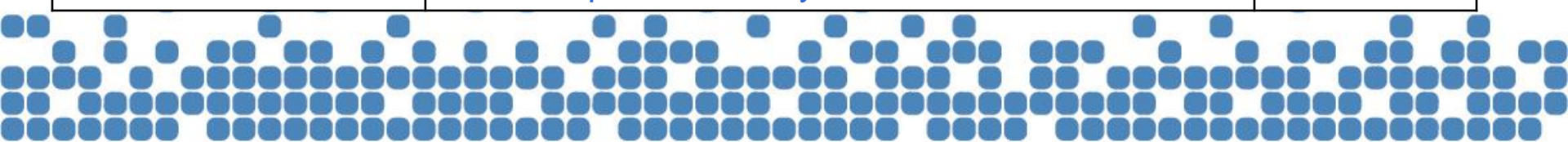
- Clarified which parameters are needed and where to source data;
- Further guidance provided for each calibration steps;
- Removed third calibration step – no longer need to adjust water management;





Table B.1 Overview of DNDC Modeling

Step	DNDC Modeling Overview	More Info
Step 4: Model emissions using DNDC		
Step 4.1 Modeling emissions using Monte Carlo simulations	Guidance on how to conduct Monte Carlo simulations using DNDC, in order to calculate primary emission reductions.	DNDC User Guide v9.5 Appendix C
Step 4.2 Extracting DNDC modeling results for calculating emission reductions	Guidance on how to extract data from DNDC Monte Carlo results and use data to calculate primary emission reductions	
Step 5: Calculate soil input uncertainty deduction		
Step 5 Calculating soil input uncertainty	Guidance on how to use results of same Monte Carlo runs as used to model emissions, to calculate the soil input uncertainty deduction for each field.	Appendix C



App B – Step 4.1 Modeling Emissions Using DNDC



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- Outlines process for modeling BI then P emissions
 - 4 x 2,000 Monte Carlo runs needed for each cultivation cycle being modeled
 - 1 x 2,000 MC runs for each calendar year in baseline cultivation cycle;
 - 1 x 2,000 MC runs for each calendar year in project cultivation cycle.
 - Each MC run needs 21 years of data (20 years historical data) + 1 year cultivation cycle data;
- Updated guidance for specifying MC analysis soil in put uncertainty

App B – Step 4.2 Extracting DNDC Modeling Results for Calculating Emission Reductions



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- Don't use DNDC GUI estimates – extract data from DNDC results files as instructed
 - Use results from modeling of 1 year of cultivation cycle data only;
 - Results saved in 4 x annual summary files;
 - DNDC uses Julian days
 - Extract results from daily results files only for dates that fall within each field's cultivation cycle
 - Results for cultivation cycle added together (for all parameters except SOC) to get single value for each GHG parameter – for each 2,000 MC runs;
 - SOC values taken only for last Julian day in cultivation cycle;
 - Input single GHG parameter results into Equation 5.2 in Section 5.4.1.
- Specific guidance given as to how to extract data for each parameter needed to quantify emissions



App B – Step 5 Calculating Soil Input Uncertainty



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- Updated guidance on developing soil input uncertainty deduction
 - PDs must compare primary emissions from the baseline and project scenarios;
 - $(CH_4 + N_2O + \Delta SOC)$
 - Use CH_4 and N_2O parameter values from Equation 5.3 and SOC value from Equation 5.10 – each converted to CO_2e ;
 - Input uncertainty shall be calculated as the half-width of the 90 percent confidence interval of the difference between the baseline and project cultivation cycle primary emissions



Thank you



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Sami Osman, Policy Manager

213-542-0294

sosman@climateactionreserve.org

Teresa Lang, Policy Manager

213-891-6932

tlang@climateactionreserve.org

Policy Team

213-891-1444 x 3

Policy@climateactionreserve.org

