June 29, 2014

Ms. Mary Nichols
Board Chairman
California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

Submitted via web

Re: Environmental Defense Fund on the Discussion Draft of the Rice Cultivation Projects Compliance Offset Protocol released June 20, 2014

Dear Ms. Nichols:

Please accept the following comments from Environmental Defense Fund (EDF), the California Rice Commission (CRC), and the White River Irrigation District (WRID) on the Discussion Draft of the Rice Cultivation Projects Compliance Offset Protocol (Rice Protocol), released June 20.

We appreciate the updates and revisions the California Air Resources Board (ARB) has made to the March 14 version of the Rice Protocol. ARB has a long reputation for developing informed and scientifically sound policies and this protocol is no exception. We believe that the Rice Protocol is an important step in the generation of offsets from agriculture. Furthermore, the rice industry is one of the most progressive when it comes to both feeding the world and protecting the environment. With one rice project already listed on the American Carbon Registry and another in development in the Mid-South, we are hopeful that other projects will follow suit, providing capped entities with high-quality offsets from U.S. rice growers.

In response to the ARB's June 20 workshop and version of the protocol, EDF, CRC and WRID provide the following changes, edits, and actions to improve the Rice Protocol:

- **I.** Include the ability of multiple growers to report on a single Offset Project Data Report
- **II.** Allow for risk-based and randomized verification of projects
- **III.** Fast-track the development to streamline the DeNitrification DeComposition (DNDC) model
- **IV.** Clarify and modify the sampling requirements for Early Drainage and Alternate Wetting and Drying
- **V.** Clarify description in DNDC input parameters default values table
- **VI.** Include an Early Action Protocol
- **VII.** Address specific typos and inconsistencies
- **VIII.** Conclusion

I. Reporting Consolidation

For agricultural offset projects to be effective, growers need to group their GHG emission reductions into quantities large enough to be cost effective to implement and sell to compliance entities. There are two main drivers important to making this grouping successful – reporting and verification.

There are significant data collection requirements necessary to produce an Offset Project Data Report (OPDR) from rice cultivation activities. In addition, the reductions per acre are forecasted to be small – less than one ton per acre. To address these two challenges, we recommend that the ARB allow multiple growers, identified as Offset Project Operators (OPO) in the regulation, to report their GHG emission reductions on a single OPDR submitted by an Authorized Project Designee (APD). Data for each OPO would be clearly identified and grouped by OPO in the OPDR. This would reduce the overall time and paperwork required to create a project.

II. Risk-Based and Randomized Verification

Verification is the single largest and most time consuming cost of developing agricultural offset projects. According to EDF's economic analysis, this cost is typically 50% of the total project development cost. In order for the agricultural sector to participate in California's Cap-and-Trade program, risk-based and randomized verification is necessary. As no voluntary projects have generated offsets from land-based agricultural practices, we recognize this is a challenging proposition. Therefore in order to learn how to do this effectively for all parties involved, we would support a pilot where traditional verification and risk-based and randomized verification are conducted side-by-side and the results of the two are compared. The results from this pilot would be useful in developing specific

verification regulations for agricultural projects. More details about risk-based and randomized verification are in the next two paragraphs.

A risk-based and randomized verification procedure requires the verifier to review the APD's business and data management processes including the types of supporting evidence, evidence collection and evidence storage in order to develop a thorough risk-based sampling plan. This sampling plan could include confirmation data such as remote sensing. Statistically randomized sampling allows for science-based verification. Under this approach, the verifier would develop a verification plan based upon their assessment of the projects risks in much the same way as verifiers currently develop their Sampling Plan as required under section 95977.1(b)(3)(G) of the Cap-and-Trade regulations.

As a part of risk-based and randomized verification, the verifier would be required to visit the APD's office in order to conduct a thorough review of all processes, procedures, controls, and records for rigor, consistency, and accuracy. The verifier may interview some or all of the OPOs in a project depending upon their risk assessment identified through the Sampling Plan. If the Sampling Plan results in an Adverse Offset Verification Statement or a Qualified Positive Offset Verification Statement, the verifier and the APD would have the opportunity to increase the number of OPOs visited in order to determine errors with the report and to generate a Positive Offset Verification Statement.

We believe that this approach is consistent with the design and intent of the Cap-and-Trade regulations and would encourage the development of offset projects from rice producers and allow for greater participation of the agriculture sector in meeting the state's GHG reduction goal.

III. DNDC Model Streamlining

We believe that process-based biogeochemical models, such as DNDC, are important tools to quantify GHG emission reductions from agriculture-based offset projects. These models generate detailed and accurate emission reduction calculations for biological systems. The challenge is that these models require a large number of inputs and generate a large number of outputs. For the Rice Protocol, we feel that default values for California and Mid-South rice fields can be pre-set in the model.

ARB has conducted extensive due diligence in reviewing and selecting the DNDC model in the Rice Protocol. However, for the DNDC model to be used by APDs beginning January 1, 2015, we recommend that ARB fast-track the development of a tool to streamline the inputs and outputs to the model. This will lower the barriers to the adoption of the protocol.

IV. Project Activities

On March 17, 2014, the first rice cultivation project was listed with the American Carbon Registry under the California module of the *Voluntary Emission Reductions in Rice Management Systems* methodology. This demonstrates an interest from the rice industry in participating in the Rice Protocol under development by ARB. In addition, through our Conservation Innovation Grant, EDF and WRID have been working with growers on projects which reduce GHG generation in Arkansas. Thus, we have been analyzing the ARB's Rice Protocol with an eye to our experiences in implementing rice cultivation projects and with input from our rice partners.

A. Early Drainage Activities

We reviewed the Early Drainage Activities with Cass Mutters, University of California Cooperative Extension farm advisor with over 25 years of experience with rice. We recommend the following edits to the Early Drainage criteria to reflect in-field realities:

- "Fifty percent heading" implies that fifty percent of all of the rice panicles collected from three samples taken have their panicles fully exposed from the boot. One sample may have more than fifty percent of its panicles exposed and another may have less than fifty percent of its panicles exposed, but on average, fifty percent of the total rice panicles collected must be fully exposed from the boot.
- As for the criteria that "at least one sample must be taken within 50 feet of the water inlet," it is unclear why this would be a requirement (2.2(b)(2), page 10). Similar to the approach laid out in Appendix A of the ARB's *Compliance Offset Protocol for U.S. Forests*, OPOs should take representative samples around the field. Samples should *not* be taken within 50 feet of the water inlet, as this sample is not be representative of the field and is not used by producers for crop management decisions.
- The statement that "there must not be standing water present within a 50 foot radius of the water inlet" should be rewritten to reflect appropriate early drainage activities (2.2(b), page 10).
- To increase clarity around eligibility requirements, we suggest reformatting 2.2(c). Below, we suggest modifications that would indicate that at least 10% of an Early Drained field's perimeter must not be in contact with any or all of the listed infrastructure or land types.
- Also, we recommend that the definition of a "Drained field" be changed to incorporate the requirement that a drained field will have no standing water but the soil is still saturated and wet to ensure that yield will not be negatively impacted (1.2 (a)(11)).

- "Drained field" means a field with ~~exposed~~ saturated soil and no standing water.

- Finally, we suggest that there be a definition of a public road (2.2.(c)).
  - "Public road" means a paved road on which any vehicle may drive.

B. Modify language in Section 2.2. Early Drainage Activities

Given the clarifications summarized above, we recommend the following specific edits be made to Section 2.2. Early Drainage Activities:

(b) For early drainage activities, there must not be standing water present:
  (1) within ~~a 50-foot radius of the water~~ the inlet check of a participating field in California 24 days after fifty-percent heading; or
  (2) within a 50-foot radius of the water inlet of a participating field in the Mid-South at the time indicated by the DD50 model.

(c) While the participating field will be drained, the soil must still be saturated to ensure that yield will not be impacted.

(d) Each field must be sampled to determine fifty-percent heading using the following criteria:
  (1) At least three one-square foot samples representative of the stand must be taken across a participating field and outside a 50-foot radius of a cold water inlet. No samples should be taken from inside a 50-foot radius of a cold water in order to prevent unnecessary sampling of rice that does not represent the status of the field. ~~At least one sample must be taken within a 50-foot radius of the water inlet; and~~
  (2) Fifty percent of panicles collected in these samples must be fully exposed from the boot. ~~At least two thirds of the samples must meet fifty-percent heading~~
  (3) Standard procedures must be used for the collection of field samples. These procedures must be detailed enough so that any qualified agronomist would be able to accurately repeat the previous determination of fifty percent heading.

(e) For wildlife conservation purposes in the California Rice Growing Region, in order to be eligible for crediting, at least 10% of a participating field's perimeter must not be shared with
  (1) a public road,
  (2) another field employing early drainage activities, and/or
  (3) land zoned for commercial, industrial, residential, planning, special, or mixed use.

C. Modify language in Section 6.2.2. Documentation for Early Drainage Activities

Given the clarifications summarized above, we recommend the following specific edits be made to Section 6.2.2. Documentation for Early Drainage Activities:

In California: At least four digital photographs taken from various vantage points at the inlet check to clearly show the established stand with no standing water present on day 24 after fifty percent heading was recorded. Each photograph much be taken using a device that has geotagging feature to include date and geocoordinates in the metadata of the photograph.

In the Mid-South: At least four digital photographs taken from various vantage points within a 50-foot radius of the water inlet of a the participating field to clearly show the established stand with no standing water present at the time indicated by the DD50 model. Each photograph much be taken using a device that has geotagging feature to include date and geocoordinates in the metadata of the photograph.

D. *Alternate Wetting and Drying Activities*

We reviewed the Early Drainage practices with Merle Anders and Dennis Carman. Merle Anders is a Rice Systems Agronomist at the University of Arkansas with more than 34 years of experience with agricultural systems and more than 16 years of experience in the Mid-South region. Dennis Carman is a Registered a Professional engineer with more than 40 years of experience with water, water management and all related fields. He has more than 25 years working with water management and rice production. The majority of this time was spent in various positions with the Natural Resource Conservation Service assisting growers with their water issues. Based on this review, we recommend the following general edits to the protocol:

- In zero-grade fields water moves on-to the field from all sides. Both the field and the water are perfectly level. When the rice canopy grows, there is more transpiration in the field than at the edge of the field. Therefore taking a reading at any place around the edge of the field will be the most conservative reading for the field.
- For precision leveled fields, it is possible to calculate the dryness of a field at any location in the field. This is because the water is level and the grade of the field has been precisely graded, for example, fields are often graded to 0.15 foot per 100 feet. By taking a water level measurement at any point in the perimeter ditch, it is possible to calculate how much of the field is flooded.
- We believe there must be a starting point for field moisture. We suggest, as outlined in edits below, that all percentages are labeled as a percent of fully saturated field moisture (flooded field).
- Work conducted in Arkansas shows that by reducing water to 60% of fully saturated field moisture, there is an insignificant loss of yield and a very large reduction in methane generation. This work has been approved for publication in *Global Change Biology*.

- We do not believe there needs to be a lower moisture limit stated. The OPO or APD only needs to prove that the field is sufficiently dry to reduce GHG emissions through DNDC modeling. As soon as the soil is not "fully saturated," methane emissions are reduced. One hard dry-down (40% of full saturated remaining) will reduce GHG by as much as 50% but that continuing these dry cycles throughout the season will result in yield losses to a point most growers will not participate. In reality producers will probably implement one good dry-down and perhaps some additional lesser dry cycles, both of which would decrease methane emissions. An upper limit of soil moisture is realistic both in terms of GHG reductions and growers' perceptions.

E. Modify language to the Alternate Wetting and Drying (AWD) Activities (2.3):

(c) For AWD activities, the following requirements apply and soil moisture readings ~~samples~~ must be taken as specified below.

~~(1) At the end of each "drying," the top 10 centimeter soil must reach a non saturated point, but maintain a moisture level above thirty five percent.~~

(2) To be accepted as a "drying cycle", less than 50 percent of a field must not be saturated as measured by a flood depth gauge or equivalent device in the perimeter ditch.

(3) At the end of each "drying cycle," areas of the rice field that are still fully saturated with water or with a moisture level ~~below thirty-five percent~~ within 15 percent of fully saturated are ineligible for crediting.

~~(4) For fields that are not zero-percent graded but sloped towards the water outlet at least one soil moisture sample must be taken within a 50-foot radius of the water outlet.~~

~~(5) For fields that are zero-percent graded, the following requirements apply:~~

~~(A) A field that is less than or equal to 50 acres must have at least three equally spaced soil moisture samples taken, including one within a 50-foot radius of the water inlet and one within a 50-foot radius of the water outlet; or,~~

~~(B) A field that is greater than 50 acres must have at least five equally spaced soil moisture samples taken, including one within a 50-foot radius of the water inlet and one within a 50-foot radius of the water outlet.~~

(6) Standard procedures must be used for the collecting of field readings. These procedures must be detailed enough so that any qualified agronomist would be able to accurately repeat the previous measurements. These procedures must include a description of the types of sample procedures and equipment used to collect field measurements and location of readings.

F. Modify language in Section 6.2.3. Documentation for Alternate Wetting and Drying Activities

Given the clarifications summarized above, we recommend the following specific edits be made to Section 6.2.3. Documentation for Alternate Wetting and Drying Activities:

(a) For each round of wetting and drying, at least four digital photographs per field ~~'check'~~ taken from various vantage points when dry~~during flood-up and draining, respectively~~. The pictures must clearly show the established stand and at least one must show the flood depth gauge or equivalent device in the perimeter ditch. ~~Draining p~~Pictures need to clearly show no standing water or water puddles present. Each photograph much be taken using a device that has geotagging feature to include date and geocoordinates in the metadata of the photograph.

(b) For each round of wetting and drying, flood depth gauge or equivalent device measurements ~~soil moisture samples~~ must be taken following the requirements specified in section 2.3(c). The following parameters must be monitored and documented for each participating field:

(1) A diagram that includes dimensions and shows where samples are taken in a field;
(2) The date when the field was flooded or received water;
(3) The date when the soil moisture samples were taken; and
(4) The field grading status.

G. For all of the Project Activities, we propose the following changes to Appendix A to decrease the redundancy in general field information requirements:

(a) General information for each participating field:

(1) Field geographic coordinates, county, and state for each field, and parcel number;
(2) Flooding[1] and drainage[2] dates (during the growing season and during post-harvest period);
   a. Specifically for seeding preparation and enhancement, dates of flooding relative to the planting date
(3) Begin and end date of harvesting on the participating field;
(4) Post-harvesting residue management (e.g. burning, incorporation or baling) description and dates;
(5) Amount of herbicides applied for the baseline period cultivation cycle and the project scenario cultivation cycle;[3]

[1] For each **participating** field, the flood date shall be the date that the flooding starts.
[2] For each **participating** field, the drainage date shall be the date that the drainage starts or soil is exposed without standing water if there is no overt action that starts drainage.
[3] Amounts of herbicide used in the baseline scenario cultivation cycle do not need to be verified.

(6) Fertilization types, amounts, rate and application methods and dates for each application;[4]
   a. Including dates of all fertilization events relative to planting date (both pre-flood and top-dressed after flooding);

~~(7) Harvest date;~~

~~(8) Mass of crop residue removed after harvest, the fraction of removed crop residue;~~ Estimate of crop residue remaining in the participating field, depending on the post-harvesting residue management practice indicated above.
   a. If a participating field is not baled, one can estimate the crop residue remaining, **"non-baled CRR"** (remaining above ground biomass), by dividing the grain harvest weight (or yield) **"HW"** by a predetermined harvest index **"HI"** (the percentage of the rice plant which is harvested versus left on the field) and then subtracting the grain harvest weight (or yield) **"HW"**.

$$\boldsymbol{non-baled\ CRR\ =\ \frac{HW}{HI}-\ HW}$$

      i. For California, the harvest index for non-baled field is 50%. Therefore, the remaining above ground biomass will be the harvest weight (e.g. 8,000 of grain harvest weight is 8,000 of CRR).
      ii. For the Mid-South, the harvest index for a non-baled field is TBD%.
   b. If participating field is baled, one can estimate the crop residue remaining, **"baled CRR"** (remaining above ground biomass), by dividing the weight of the removed bales **"B"** plus the grain harvest weight **"HW"** by a predetermined harvest index **"HI"** and then subtracting the weight of the removed bales **"B"** plus the harvest weight **"HW"**.

$$\boldsymbol{baled\ CRR\ =\ \frac{(B+HW)}{HI}-(B+HW)}$$

      i. For California, since the grain harvest weight is the CRR, the baled CCR = the grain yield – total baled rice straw weight.
      ii. For the Mid-South, the baling harvest index is TBD%.

~~(9) For seeding preparation and enhancement, dates of flooding relative to the planting date;~~

~~(10) Dates of all fertilization events relative to planting date (both pre-flood and top dressed after flooding);~~

~~(11) Dates of all fertilizer applications;~~

~~(12) Rate, type of fertilizer and application method for each fertilizer application; and~~

[4] The fertilizer type must correctly reflect its ammonium-nitrate composition.

(13) Dates and depth of all tillage events for preparing the fields for planting and post-harvest residue management.

(b) Additional information for dry~~ing~~ seeding projects:
  (1) Planting preparation description and date;
  (2) Planting date and method; and
  (3) The date a field is fully flooded in preparation for seeding.

(c) Additional information for early drainage ~~in preparation for harvest projects~~:
  (1) The date that the ~~water~~ board(s) were pulled from the wiers (California only); or
  (2) The flooding of the field was stopped~~; and~~
  (3) ~~Harvest date~~

(d) Information for alternate wetting and drying:
  (1) The date that the ~~water~~ board(s) were pulled from the wiers (California only); or
  (2) The flooding of the field was stopped; and
  (3) Soil moisture ~~sampling~~ reading date, number of readings, and the results of the readings.

V. Clarify description in DNDC input parameters default values table

In Table B.1 entitled "DNDC input parameters default values for crop calibration," the information for the Mid-South is geography based. To be consistent, below California in the second column, the abbreviation should be "CV" for "Central Valley" rather than "All non-wild rice."

VI. Inclusion of an Early Action Protocol

To give credit for the early action taken by the currently listed California rice cultivation project and to encourage other rice producers to take similar action, we strongly encourage the ARB to include the American Carbon Registry's *Voluntary Emission Reductions in Rice Management Systems* Methodology as an Early Action Protocol under 95990(c). We understand that since the ARB has not included baling as a potential project activity within this Discussion Draft, projects developed using ACR's Methodology that include the baling practice would need to re-do their GHG calculations without baling to quantify as eligible early action GHG emissions reductions.

VII. Specific language and edits typos

We noticed the following typos and suggest the following corrections to this Draft of the Rice Protocol:

- ARB uses both "reporting year" and "reporting period" throughout the Rice Protocol. We recommend that "reporting year" be changed to "reporting period" in the following places:
  - 3.7 (c)
  - 3.9 (b)

  - Chapter 5 (c)
  - 5.2.2 (c)
  - 5.2.2.1 (b)
- What is meant by "plastic" and "cutting" information in "…management practices that include crop, tillage, fertilization, manure management, irrigation, flooding, plastic, and grazing or cutting information."? (5.2(c)(3), page 23)
- Formatting consistency for Baseline Scenarios Establishment, change "Tillage Events:" to "Tillage Events are" (5.2.2.1, page 29-30)
- Formatting consistency for Conversion Factors, including abbreviations for acres "acres (ac)" and kilogram "kilogram (Kg)". (Equation 5.4, page 36)
- "date" missing from "Data unit" column for "date of irrigation events" and "Irrigation" parameter row (Table 6.1, page 45)
- Formatting consistency for "Comment" column of Fuel usage "OPO records" should be three separate boxes- one for each row. (Table 6.1, pages 46)
- "check" should not be in quotation marks since it is defined in section 1.2 on p. 5 (6.2.1-3, page 48)
- Add definition of "operational structures" as used in 7.1(b)(7), page 50
- "latitude and longitude coordinate" should be "latitude and longitude coordinates" (7.1(b)(9), page 50)
- Item (15) in 7.1 should be item (14)(D) (7.1(b)(15), page 51)
- "Additional information for drying seeding" should be "additional information for dry seeding" (Appendix A (b), page 56)

VIII. Conclusion

EDF, CRC, and WRID appreciate the hard work that went into the development of the Rice Protocol and we look forward to seeing these recommendations and edits included in the next version of the protocol. This protocol demonstrates the role and opportunity agriculture can play within California's Cap-and-Trade program.

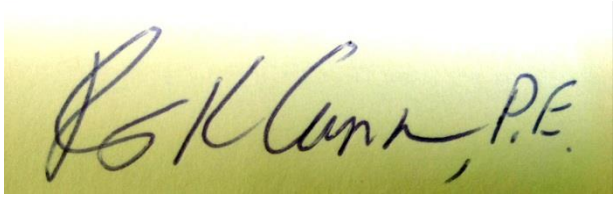
As the ARB finalizes the Rice Protocol, they need to determine how reporting and verification can be implemented in a manner which will allow for the greatest uptake of the practices and the generation of GHG reductions. If approaches to streamline reporting and verification for large numbers of producers with small per acre reductions are not piloted and implemented, this protocol will not meet its potential for adoption. It will simply be too complicated and too expensive for farmers to implement.

We thank ARB for this opportunity to offer comments. We look forward to continued collaboration with ARB and other stakeholders throughout the implementation of this and other agricultural-based offset protocols.

Sincerely,

Robert Parkhurst
Director, Agriculture Greenhouse Gas Markets
Environmental Defense Fund

Paul Buttner
Manager, Environmental Affairs
California Rice Commission



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