Greenhouse Gas Market Opportunities for Rice

Courtesy of the California Rice Commission

California climate regulation and emerging carbon markets have the agricultural community examining opportunities to reduce greenhouse gas (GHG) emissions and participate in carbon offset markets. In 2007, Environmental Defense Fund (EDF), in partnership with the California Rice Commission (CRC), was awarded a three-year USDA Conservation Innovation Grant to explore and identify management practices that could potentially reduce GHG emissions from rice fields without negatively affecting yields. The project was based on a comprehensive approach: combining science, economics, modeling, and on-the-ground application to ensure that all recommendations were operationally and economically feasible. Since its completion, the project partners and other stakeholders have developed a methodology to account for GHG reductions and lay the groundwork for rice producers to generate carbon offset credits.

EDF and CRC Partner to Reduce GHGs and Support Farmers

EDF and CRC turned to Applied Geosolutions, LLC to run the DeNitrification-DeComposition model (DNDC) for California rice. The model provides scientifically reliable results while reducing the need for soil samples and GHG measurements on every rice-producing field, thereby lowering costs. After careful calibration with field measurements and other data, the DNDC model allows users to easily change input variables and calculate changes in GHGs from implementing a number of alternative management practices. In addition, economists from the University of California, Davis, analyzed the costs and benefits of the various management practices at both the farm-level and regional perspective, as well as break-even price calculations for carbon credits. Eight scenarios were examined, with different combinations of practices including winter flooding, straw removal, dry seeding (as opposed to flooding) and mid-season drainage. Of the management practices examined, scientific and economic modeling efforts

Why California Rice?

The California rice industry is poised to join statewide and national efforts in the fight against climate change:

- California is the nation's second largest rice producing state, with rice growing on approximately 500,000 acres.
- California rice contributes $1.3 billion to the state's economy.
- Because California air quality rules allow a maximum of 25% of rice straw (plant residue left after harvest), most farmers incorporate rice straw into the soil, flood the fields in the winter, and allow anaerobic fermentation to break down the organic material. This straw incorporation process produces methane, a GHG 20 times more potent than carbon dioxide.
- California rice is already a leader in addressing environmental concerns:
  - 230 wildlife species use rice fields, with an estimated $1.5 billion in habitat value for wintering waterfowl alone.
  - 60 percent of the waterfowl in the Pacific Flyway use rice fields and adjacent wetlands as wetland habitat.

EDF ENVIRONMENTAL DEFENSE FUND Finding the ways that work

RICE

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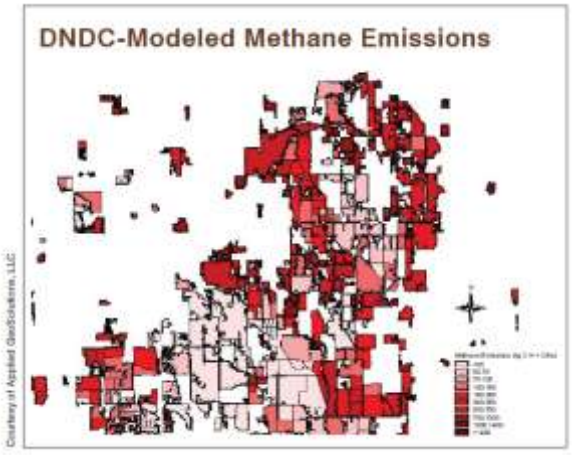
identified three practices—reduced winter flooding, straw removal, and dry seeding—that have GHG benefits and are most likely to be adopted by farmers in California.



Modeling results indicated that the practices could mitigate between 0.13-0.47 tCO_2e/acre and break-even costs for winter flooding and straw removal would be at carbon prices of $3 and $79/$tCO_2e$, respectively (excluding baled straw sales). Current prices for offsets on the voluntary market range from $3-7/$tCO_2e$, while pre-compliance offsets (those approved by California Air Resources Board) are currently trading at around $8/$tCO_2e$ and are likely to rise once traded within California's cap-and-trade system in 2012. As a result, these three practices—reduced winter flooding, straw removal, and dry seeding—have been included in a GHG methodology developed by EDF, Terra Global Capital, LLC., CRC, and Applied Geosolutions, LLC.

GHG Reduction Methodology

The methodology, specifying how GHG emission reductions from the alternative practices can be calculated, has been submitted to three leading carbon standards for approval and protocol development. Additional rice cultivation practices implemented across the U.S. may be added to the methodology in future revisions with further practice validations.

By using the DNDC model, farmers will not need to undertake expensive field measurements of GHG emissions. To make sure that the model does not over-predict GHG reductions, the credit amounts are reduced based on the level of uncertainty of the model results, which is calibrated based on a rigorous comparison of modeled and measured gas fluxes on California test sites. In addition, projects must demonstrate that changes in management practices would not have happened in the project's absence by providing details on previous management and analyzing common practice for rice cultivation in the region. Every five years, project participants update the common practice analysis to ensure that the changes in practices remain additional to the common practice. To avoid the environmental impact from a loss in waterfowl habitat associated with reduced winter flooding in accordance with this program, the flooded area cannot be reduced by more than 10%.

A curlew foraging in a California rice field.

Different farmers managing several fields may team up in one carbon project, reducing monitoring requirements and the uncertainty associated with credit calculations, and sharing costs of third-party verification.

Next Steps

We anticipate that a rice protocol will be approved by a carbon registry in 2011. Our next steps will be to implement one or more pilot projects to demonstrate how the protocols may be used and to develop user-friendly technology that will reduce transaction costs for project developers.

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