Agriculture and livestock protocols

• Reducing N\textsubscript{2}O emissions from fertilizer:
  – ACR DNDC-based fertilizer methodology
  – MSU/EPRI methodology for fertilizer rate reduction

• Reducing GHG emissions in rice cultivation:
  – California and Midsouth modules
  – Reduce methane, manage water and reduce diesel emissions

• Livestock:
  – Manure biodigesters (USDA/CEC funded): combining GHG reductions with air quality improvements
  – ARB Compliance Offset Protocol - Livestock Projects
Agriculture and livestock protocols

• Livestock cont’d:
  – BIGGS: modifying Alberta beef and dairy protocols for U.S.
    • Beef – edible oils
    • Beef – reduce days on feed
    • Beef – lifecycle
    • Dairy – multiple practices
  – Comprehensive livestock grazing systems methodology
    • Initial focus on rotational grazing systems
  – Grassland revegetation in China (under Panda Standard)

• New England:
  – Fertilizer management
  – On-farm energy efficiency, fuel substitution in greenhouses
  – “Whole farm” GHG protocol
N$_2$O emission reductions through fertilizer rate reduction

- Submitted March 2011
- ACR internal review and revisions
- Public comment May-June 2011
  - Comments and responses posted on ACR
- Three rounds of peer review by leading U.S. and Canadian experts on fertilizer N$_2$O emissions
  - Comments and responses posted on ACR
N$_2$O reductions through fertilizer rate reduction (MSU/EPRI)

- Any fertilizer practice following BMPs is eligible, but only reduction in rate is credited
- Standardized approach to additionality: any reduction from BAU fertilizer rate that not mandated by regulations is additional
- Baseline = BAU based on yield-goal based based fertilizer rate, calculated from 1) producer-specific records or 2) back-calculation from NASS crop yields and yield goal rates
- Quantification of baseline and project emissions: Tier 2 equation for 12-state U.S. North Central Region and corn/corn rotations, IPCC Tier 1 default factors elsewhere
- Conservative, practices limited (rate only), but based on strong science and comparatively simple to apply and verify
Emission Reductions in Rice Management Systems

- Public comment and peer review complete for version including:
  - Straw removal after harvest
  - Dry seeding
  - Reduce winter flooding
- Now developing CA early drainage module; greater uptake potential
- Standardized additionality for straw removal and dry seeding based on low adoption rates; project-based for reduced winter flood
- Developing early adopters fix
Demonstrating GHG reductions in California and Midsouth rice

- CIG partnership of EDF, CA Rice Commission, USA Rice, Terra Global, DNDC-ART, UC Davis, UC Coop Ext, Winrock, White River Irrigation District, PRBO

- Road-test protocol, help CA and AR growers register projects, analyze replication potential across Midsouth, analyze wildlife habitat impacts

- CA pilots in dry seeding, straw removal etc. → early adopters

- Midsouth projects → methodology module in development
  - Early drainage
  - Intermittent flooding
  - Water management through side inlets
  - Staggered winter flooding
  - Straw removal after harvest
  - Change varieties
  - Improve diesel pumps / convert to electric

10 growers; minimum 1,000 acres
Key issues

• Standardized benchmarks for additionality
  – What should threshold be? Both dry seeding and straw removal
    ~4% adoption in CA
  – Retain project-specific option for activities for which adoption rates
difficult to calculate, but still can be demonstrated additional

• Baseline approach
  – Baseline setting not necessarily same as additionality approach
  – How to incentivize early adopters? Baseline based on past 5 years
    on own fields, or typical industry practice? Other options?

• Up-front calibration and validation needed to
  prescribe model structural uncertainty adjustment

• Need for user interface and data management tools
  → All key issues for ARB compliance protocol
Road-testing ACR fertilizer protocol on California tomatoes

- CA Farm Bureau, EDF, UC Davis, ACR, DNDC-ART, SureHarvest
- 2 pilots – Yolo and Fresno Counties
  - Shift from furrow to subsurface drip with fertigation; cover crop; shift to 80” beds with 2 rows; use nitrification inhibitors; pre-sidedress test…
- Working with UC Davis to compile calibration data from past projects and collect validation data
- Grower outreach
- Road-test protocol, develop user interface tools, explore aggregation models, inform ARB compliance protocol
Conventional vs. “integrated” N management on tomatoes

• “Conventional”: conventional tillage, furrow irrigation, winter wheat, sidedress N application

• “Integrated”: reduced tillage, subsurface drip irrigation, winter grain cover crop, fertigation
Other tests of ACR fertilizer protocol

• Delta Institute
  – Real-world testing of two fertilizer protocols in IL, MI and OK
  – Efficient aggregation, data management, V/V, registration

• Chesapeake Bay Foundation
  – Region-specific, user-friendly version of DNDC
  – Test N\textsubscript{2}O benefits of soil testing/adaptive management, manure injection, and variable rate technology

• The Fertilizer Institute
  – Evaluate 4R nutrient stewardship for GHG offsets
  – Test ACR, MSU, and Alberta protocols on corn/soy in IA and IL

• New England Farmers Union
  – Potatoes, silage and sweet corn in New England
Challenges of standardized additionality and baseline setting

• Standardized approaches good where feasible; may not want to eliminate option of project-specific
• What works for additionality test may not work for baseline setting
• Positive list / deemed add’l useful but what if not binary choice? Or multiple practice changes implemented together?
• What is “right” threshold for adoption rate?
• Output-based intensity metrics possible for add’l and baseline setting?
• How to reward early adopters, still incentivize “laggards,” and maintain environmental integrity?
• Projects with multiple benefits / revenue streams should not be excluded
• Appropriate intervals for updating adoption rates
• Need for temporal flexibility across crediting period
ARB adoption of compliance offset protocols in agriculture

• ARB on Aug 24, 2011 announced fertilizer and rice protocols will be taken to Board in 2012
• Most analyses show offset supply is short
  – Fertilizer: 0.5 MMT/y California, 20 MMT/y U.S.?  
  – Rice: 0.2 MMT/y California, more from Midsouth  
  – But this supply will take a long time to materialize
• Lot of interest in N$_2$O from agriculture
  – State agencies have funded $2.5 million in research on N$_2$O baselines, mitigation measures, DNDC applications
• ARB likely will design own protocols, building on ACR, CAR etc.
  – Pilot testing in CA and beyond will be key to inform protocol design  
  – Recognition of early action protocols / projects?
Further information

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