

Agriculture and Forestry Technical Work Group

DRAFT: March 24, 2006

Draft Policy Option: A4. Nutrient Management

1. Policy Description:

a. Lay description of proposed policy action:

Between 0.2% and 3% of applied nitrogen in agricultural fields is estimated to be lost as N₂O directly from soil emissions (CAST 2004). These N₂O emission rates are directly related to the rates, placement, and timing of applied fertilization. The challenge is to reduce total application of nitrogen without reducing yields or total production.

Agronomic practices that tighten the coupling between soil nitrogen availability and crop growth will improve nutrient use efficiency and reduce the likelihood that nitrogen will escape as N₂O, leach as nitrate into groundwater systems, or be transported to surface water systems. Better synchronization of nutrient applications with active crop needs can be achieved with improved nutrient management. The development and promotion of '*nutrient management guidelines and strategies*' along with support for enhanced extension and outreach of these guidelines can increase adoption of improved nutrient planning and practices, leading to both lower N₂O emissions and lower fertilizer costs.

b. Policy Design Parameters:

i. Implementation level(s) beyond BAU:

Measured reductions in total fertilizer use (on a per acre basis) – and consequently in the N₂O and nitrate flux from agricultural soil emissions – are achievable with improved nutrient management and adoption of specific nutrient management strategies (as described below). An initial policy goal is proposed that aims to reduce excessive fertilization by reducing average annual per acre nitrogen fertilizer use by 10% by 2020.

ii. Timing of implementation:

Implementation is estimated as ½ % incremental reduction from 2006 levels in each year from 2006-2015 and 1% incremental reductions from 2015-2020.

iii. Implementing parties:

New Mexico Department of Agriculture (NMDA) in conjunction with the New Mexico Agricultural Extension Service (NMCES) would be lead agencies.

iv. Other

c. Implementation Mechanism(s): Indicate which mechanisms are to be used, and describe the specific approach that is proposed

i. Information and education

1. NMDA and NMCES would develop fertilization guidance for each major New Mexico crop.
2. NMCES would promote adoption through county extension agents and regional workshops.
3. NMDA would monitor progress and performance toward goal through direct questioning of nutrient management practices during annual NASS survey of state farmers.

ii. Technical assistance

iii. Funding mechanisms and or incentives

iv. Voluntary and or negotiated agreements

v. Codes and standards

vi. Market based mechanisms

vii. Pilots and demos

viii. Research and development

ix. Reporting

- x. Registry
- xi. Other?

2. BAU Policies/Programs, if applicable:

Business as usual would continue current agronomic practices related to nutrient management. In this case, the number of farmers who regularly test soils for nutrient conditions is very roughly and imprecisely estimated at 20-25% (Tim Darden, NMDA, personal communication, March 2006).

Currently the only annually tracked measure of nutrient usage by the NMDA is ‘fertilizer shipped into New Mexico’ – in 2003 this amount was estimated to be 63,844 tons of nitrogen materials (this figure is gross weight and is not adjusted for nitrogen composition of various materials such as anhydrous ammonia, urea, ammonium sulfate etc.).

Major New Mexico crops, 2003 harvested acreage, and their estimated nitrogen application rates are given in the table below:

Crop	NM Harvested Acreage (1000s of acres) (1)	Estimated Applied Nitrogen (pounds per acre actual nitrogen) (2)
Hay	330	0 for alfalfa
Wheat	300	50-75
Sorghum	127	100-120
Corn	124	150-170
Cotton	74.5	80-110
Pecan	43	140-170
Peanut	17	20-100
Chile	15.4	40-60
(1) New Mexico Agricultural Statistics 2003 (USDA, NASS, and NMDA 2004) (2) Estimates based on CROPMAN agronomic simulation model (USDA) and NMSU CES publications.		

3. Types(s) of GHG Benefit(s):

- a. CO₂: *Not applicable*
- b. CH₄: *Not applicable*
- c. N₂O: Savings occur through the reduction in the use of nitrogen fertilizers that lead to N₂O emissions and loss to groundwater/surface water systems. N₂O is produced naturally by microbial processes in the soil. Application of synthetic nitrogen and organic fertilizers leads to increased emissions by augmenting the microbial processes.
- d. HFC's, SFC's: *Not applicable*
- e. Black Carbon: *Not applicable*

4. Types of Ancillary Benefits and or Costs, if applicable:

- a. Reduced rates of fertilizer application could reduce total CO₂ emissions that result from fertilizer manufacture and application – assuming that manufacturing levels are consequently reduced i.e., production is not shifted onto other buyers.
- b. More efficient use of nitrogen fertilizer reduces potential for runoff and leaching into surface- and ground-waters that diminish water quality.
- c. More efficient use of fertilizer could reduce farm operating costs with lower purchases of applied materials; however, there may be increased costs associated with required activities such as soil testing and monitoring.

5. Estimated GHG Savings and Costs Per MMTCO₂e:

- a. Summary Table of:
 - i. GHG potential in 2012, 2020, 2050 [TBD]
 - ii. Net Cost per MMTCO₂e in 2012, 2020, 2050 [TBD]
- b. Insert Excel Worksheet showing summary GHG reduction potential and net cost [TBD]

6. Data Sources, Methods and Assumptions:

- a. Data Sources (see references below)
- b. Quantification Methods
- c. Key Assumptions

- i. The number of farms, acreage, and crops in which soil nutrient conditions are regularly tested and monitored.
- ii. Nitrogen application rates across various crops and regions.

7. Key Uncertainties if applicable:

- a. Benefits: Difficult to measure and monitor adoption rates and management effectiveness of nutrient management guidelines. Measures such as ‘fertilizer shipped into New Mexico’ is a very crude and unreliable performance measure but is the only one presently available to proxy and estimate for total nitrogen use within the State.
- b. Costs: Soil testing costs can range from \$5-\$15 per sample. Nutrient management guidance documents could be prepared based on existing research for most major crops, perhaps at a cost of \$50,000-\$75,000. Printing and distribution would also need to be estimated. Extension training and regional workshop costs could vary significantly depending on scope, frequency, and other factors beyond the present scope.

8. Description of Ancillary Benefits and Costs, if applicable:

Estimates of ancillary benefits and costs are difficult to develop and are very uncertain.

9. Description of Feasibility Issues, if applicable:

Cooperation with funding and personnel etc. with NMDA and NMCES would be required along with other personnel yet to be determined.

10. Status of Group Approval:

- a. Pending
- b. Completed

11. Level of Group Support:

- a. Unanimous Consent
- b. Supermajority
- c. Majority
- d. Minority

12. Barriers to consensus, if applicable (less than unanimous consent):

- a. Description of barrier #1
- b. Description of barrier #2
- c. Etc.

References

CAST 2004, *Climate Change and Greenhouse Gas Mitigation: Challenges and Opportunities for Agriculture*, Council for Agricultural Science and Technology, Ames, Iowa, Task Force Report No. 141.

USDA, NASS, and NMDA 2004, *New Mexico Agricultural Statistics 2003*, New Mexico Department of Agriculture, Las Cruces, New Mexico.