

## **EMERGING ISSUES COMMITTEE MEMBERS:**

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## **PROJECT DESCRIPTION:**

The AAQTF Emerging Issues Committee is tasked with discussing new issues that impact the agricultural community and identifying any recommendations for action. Climate change was selected as a topic for the committee to assess. While the policy and science surrounding climate change is evolving rapidly, we developed a synopsis that reflects the current status of this issue and propose actions to be approved by AAQTF at their February 2006 meeting.

### **I. Summary of May 2004 Council for Agricultural Science and Technology Task Force Report on Climate Change and Greenhouse Gas Mitigation: Challenges and Opportunities for Agriculture**

Greenhouse gases include carbon dioxide, methane, nitrous oxide, and several synthetic gases. These gases have properties that trap solar radiation in the atmosphere. Greenhouse gases are accumulating in the Earth's atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise. The climate of the United States has warmed by an average of 0.6 degrees Celsius during the past century. Models project warming of 2-5.5 degrees Celsius by 2100.

Agriculture is both a source and a sink for GHGs. Three of the major GHGs -- carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>) -- account for >80% of the human induced warming effect of all GHGs and are emitted to and/or removed from the atmosphere by agricultural activities. Of these gases, CO<sub>2</sub> is the most abundant in the atmosphere and has the greatest effect on warming. Large amounts of CO<sub>2</sub> are exchanged annually between the Earth's surface and the atmosphere through plant uptake (photosynthesis) and incorporation into biomass and soil respiration.

Nitrous oxide is a stable gas occurring at much lower concentrations than CO<sub>2</sub>, but has approximately 300 times stronger effect on warming – a value referred to as Global Warming Potential (GWP). Concentrations are increasing by 0.2-0.3% per year. Nitrogen cycles through agricultural ecosystems and is a critical nutrient for plants; its largest repository is as organic N in soil organic matter.

Methane also is present in the atmosphere at low concentrations and has a GWP approximately 20 times that of CO<sub>2</sub>.

Crops can be impacted by climate and GHG changes in a variety of ways. Increasing CO<sub>2</sub> concentrations can be beneficial for many plants by increasing photosynthesis and plant water use efficiency. Assessments of global crop production suggest that warming temperatures and longer growing seasons may benefit higher latitude regions, whereas warming at lower latitudes may have a negative influence by hastening maturity and shortening growing periods. Studies in the U.S. suggest that overall production of the major grain crops can be maintained. Climate change is likely to include changes in climate variability, however, with adverse effects on production. For example, extremes of precipitation (droughts or floods) increase the risk of crop failure.

### **Emissions and Mitigation of GHGs**

Carbon dioxide is emitted from soil by plant roots, microorganisms, and soil fauna—collectively referred to as soil respiration. Soil respiration is a large flux in the global C cycle and this flux is balanced roughly by net C uptake by photosynthesis. Soil respiration is influenced by soil physical, chemical and biological conditions and by soil disturbance. Factors that increase C inputs and decrease respiration will favor the accumulation of C in soils, creating a sink for atmospheric CO<sub>2</sub>.

Nitrous oxide is produced in soils by denitrification and nitrification—ubiquitous microbial processes in most soils. Ongoing research is trying to improve estimates of the magnitude of N<sub>2</sub>O emissions from N inputs and soil disturbance. The ARS GRACEnet Project is addressing the relative magnitudes of various management strategies.

Methane is produced in soils under anaerobic conditions, such as flooded rice fields, and from the decomposition of manure such as occurs in manure lagoons. Methane is also produced through enteric fermentation in livestock, especially ruminants.

Agricultural based mitigation of GHGs can be achieved by (1) decreasing emissions of GHGs and/or (2) taking CO<sub>2</sub> from the atmosphere and sequestering it in biomass and soils. Improved N-use efficiency is key to decreasing N<sub>2</sub>O emissions. Methane emissions can be captured for energy use. Production of agricultural biofuels provides opportunities for offsetting fossil energy CO<sub>2</sub> emissions.

Carbon sequestration is favored under management systems that (1) minimize soil disturbance and erosion (i.e. reduced or no-tillage), (2) maximize amounts of crop residue return, and (3) maximize water and nutrient use efficiency of crop production. No-till farming practices are noted for increasing soil C by as much as 0.7 metric tons/hectare/year.

Nitrous oxide fluxes are potentially mitigated by better synchronizing N supply with plant needs, better timing and placement of fertilizers, and nitrification inhibitors.

Globally, agriculture is estimated to be responsible for almost one-half of all CH<sub>4</sub> emission, with the major sources being ruminant livestock, livestock manure, and rice production. Opportunities for decreasing CH<sub>4</sub> emissions from intensively managed cattle are limited somewhat in the United States because these operations are currently quite efficient. Research is underway to see

if improvements can be achieved however through better-feed efficiency, increasing feed digestibility, and inhibiting methane bacteria. Methane produced from the anaerobic decomposition of manure represents a potential energy source that could be recovered. Covering of lagoon and large-scale digesters are technologies that can capture CH<sub>4</sub>. Options for decreasing CH<sub>4</sub> emissions from rice being investigated include water management, nutrient management and adoption of new rice cultivars.

### **Policy Options and Design**

Acceptance and success of agricultural GHG mitigation programs will increase if programs address four key concerns: (1) accounting, (2) observability, (3) timing, and (4) adoption.

Accounting for GHG emissions should be across GHGs and across locations (full land accounting). Because a given management practice can affect more than one GHG, the need for full accounting is clear. Observability has to do with the fact that individual emissions are difficult to observe, although aggregate emissions can be observable. Observations can be based on knowledge of aggregate emissions and individual actions. Timing refers to fact that C stock gains for a particular change in practices have a limit and are reversible thus they are temporary sinks. Some sinks are permanent. Adoption by farmers of GHG mitigation programs will occur only if sufficient incentives are provided.

Ultimately, GHG mitigation policies in agriculture must be consistent with domestic agricultural policy and acceptable to the international agricultural policy community. Conservation provisions like CRP and EQIP are broadly consistent with GHG mitigation goals. If GHG mitigation becomes a more prominent policy objective, then environmental performance could be tied more closely to crop payment and insurance subsidies (as already contained in the Swampbuster and Sodbuster programs).

In the global context, agriculture presents many opportunities for C sequestration and multiple GHG emission decreases and for producing biofuels. Costs vary widely but many mitigation options could be implemented at C costs below \$30/ton. Ongoing conservation tillage research in California is finding that it costs about \$67 to mitigate a ton of CO<sub>2</sub>. In Europe, carbon credits are being traded for \$34/ton predominantly using Kyoto protocol. Bundling GHG mitigation with other environmental benefits should increase its cost efficiency.

## **II. Overview and Current Status of Kyoto Protocol**

The Kyoto Protocol to the United Nations Framework Convention on Climate Change is an international treaty on climate change which has been ratified by 156 countries (representing 61% of global emission). Only thirty industrialized countries are legally bound as of February 16, 2005 to reduce their collective emissions of GHGs or engage in emissions trading if they maintain or increase emissions of these gases. The goal is to lower overall emissions from six GHG –carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFC's and PFC's-calculated as an average over the five-year period of 2008-12 to a level that would prevent dangerous anthropogenic (man-made) interference with the climate system.

The European Union, for example, is to cut its combined emissions by eight percent, while Japan should reduce emissions by six percent. For many countries, achieving the Kyoto targets will be a major challenge that will require new policies and new approaches. Only two major

industrialized countries have not yet ratified the Kyoto Protocol: they are Australia and the United States. Australia and the United States have stated that they do not plan to do so; together they account for over one third of the GHG emitted by the industrialized world. Developing countries, including Brazil, China, India and Indonesia, are also Parties to the Protocol but do not have emission reduction targets.

Recognizing the problem of potential global climate change, the World Meteorological Organization and the United Nations Environment Programme established the Intergovernmental Panel on Climate Change (IPCC) in 1988. The role of the IPCC is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation. The IPCC does not carry out research nor does it monitor climate related data or other relevant parameters. It bases its assessment mainly on peer reviewed and published scientific/technical literature.

The IPCC has predicted an average global rise in temperature of 1.4°C to 5.8°C between 1990 and 2100. Some current estimates indicate that even if successfully and completely implemented, the Kyoto Protocol will reduce that increase by somewhere between 0.02°C and 0.28°C by the year 2050 (source: Nature, October 2003). Because of this, many critics and environmentalists question the value of the Kyoto Protocol, should subsequent measures fail to produce deeper cuts in the future. Proponents note that Kyoto is a first step as requirements to meet the emission reduction targets will be modified until the objective is met, as required by Article 4.2(d).

### **III. Current USA Plan on Climate Change and USDA Implementation**

#### **USA/Federal Plan**

The Bush administration supports voluntary initiatives and research on alternate energy source and other methods to reduce GHG emissions. On February 14, 2002, President Bush announced the Administration's Global Climate Change Initiative. A key goal of the Climate Change Initiative is to reduce U.S. GHG intensity by 18 percent between 2002 and 2012. The Bush administration has called for a voluntary reduction in GHG intensity ("a measure of the amount of emissions in relation to the level of economic activity"). Included in the Administration's climate change plan is research on alternate energy sources. The USA has extensive research on alternate energy sources (<http://www.usgcrp.gov/>) and is under the direction of the DOE, EPA, and USDA.

More recently a new international non-treaty agreement called the Asia-Pacific Partnership for Clean Development and Climate, also known as AP-6, was announced July 28, 2005 at an Association of South East Asian Nations (ASEAN) Regional Forum meeting and launched on January 12, 2006 at the Partnership's Inaugural Ministerial meeting in Sydney. AP-6 member countries account for around 50% of the world's GHG, energy consumption, GDP and population and include the United States, Australia, the People's Republic of China, India, Japan and South Korea.

Foreign, Environment and Energy Ministers from partner countries agreed to co-operate on development and transfer of technology which enables voluntary reduction of GHG emissions. Ministers agreed on a Charter, Communique and Work Plan that "outline a ground-breaking new model of private-public taskforces to address climate change, energy security and air pollution."

The partnership is consistent with efforts under the United Nations Framework Convention on Climate Change and will complement, but not replace, the Kyoto Protocol. President Bush called it a "new results-oriented partnership" that he said "will allow our nations to develop and accelerate deployment of cleaner, more efficient energy technologies to meet national pollution reduction, energy security and climate change concerns in ways that reduce poverty and promote economic development."

Methane-to-Markets is another international partnership designed to address greenhouse gases. The Methane-to-Markets Partnership is designed to promote cost-effective, near-term methane recovery internationally through partnerships with fourteen other countries, including Russia, China, the United Kingdom, Italy, Mexico and Brazil. Under this initiative, USDA is promoting international adoption of technologies to reduce methane emissions from animal manure management systems.

### **USDA Implementation**

*"We will look for ways to increase the amount of carbon stored by America's farms and forests through a strong conservation title in the farm bill. I have asked Secretary Veneman to recommend new targeted incentives for landowners to increase carbon storage."*

*-- President George W. Bush, February 14, 2002*

USDA is providing incentives and supporting voluntary actions by private landowners to reduce greenhouse gas emissions and increase carbon sequestration through the portfolio of conservation programs administered by the Department. USDA's actions include financial incentives, technical assistance, demonstrations, pilot programs, education and capacity building, along with measurements to assess the success of these efforts. Major elements of the USDA actions to reduce greenhouse gases are as follows:

**Environmental Quality Incentives Program (EQIP):** EQIP provides cost-sharing and incentive payments for conservation practices on working farm lands. The Natural Resources Conservation Service (NRCS) delivered guidance to its state offices to reward and recognize actions that provide greenhouse gas benefits within the EQIP ranking systems. By including this ranking criterion, NRCS can provide cost-share assistance to livestock producers to install greenhouse gas mitigating technologies, including construction of methane digesters. Producers who improve the quality of their nutrient management systems by achieving a higher level of nitrogen use efficiency can also be rewarded.

**Conservation Reserve Program (CRP):** The Conservation Reserve Program encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. The Farm Service Agency has issued a new rule that codifies existing policy, which allows the private sale of carbon credits for lands enrolled in the CRP. In addition, the rule will add trading of environmental credits as a permissive use on CRP acreage. FSA has modified the Environmental Benefits Index used to score and rank offers to enroll land in the CRP to give more points for installing vegetative covers that sequester more carbon. The agency announced it will target 500,000 acres of continuous signup enrollment toward hardwood tree planting.

**Conservation Security Program (CSP):** The Conservation Security Program is a voluntary program that provides financial and technical assistance to promote conservation on working

cropland, pasture, and range land, as well as forested land that is an incidental part of an agriculture operation. NRCS is providing enhancement payments under the CSP to promote energy conservation and the production and use of renewable fuels and electricity.

**Renewable Energy:** In September 2004, USDA announced \$22.8 million to support renewable energy initiatives in 26 States. The grants support 167 projects including financing for anaerobic digesters and small and large wind power ventures.

**1605b Voluntary Greenhouse Gas Registry:** In February 2002, the President directed USDA to develop new accounting rules and guidelines for crediting carbon sequestration. USDA is finalizing for public comment comprehensive new accounting rules and guidelines for forest and agriculture greenhouse gas emissions and carbon sequestration.

**Carbon management evaluation tool (COMET-VR):** A voluntary GHG reporting tool that is a decision support tool for agricultural producers, land managers, soil scientists and other agricultural interests. COMET-VR provides an interface to a database containing land use data from the Carbon Sequestration Rural Appraisal (CSRA) and calculates in real time the annual carbon flux using a dynamic Century model simulation. Users of COMET-VR specify a history of agricultural management practices on one or more parcels of land. The results are presented as ten-year averages of soil carbon sequestration or emissions with associated statistical uncertainty values. Estimates can be used to construct a soil carbon inventory for the 1605(b) program: <http://www.cometvr.colostate.edu/tool/>.

#### **IV. Examples of Private Sector and State Activities**

As of May 2004, twenty-eight states and Puerto Rico have voluntarily completed state action plans to reduce net GHG emissions. Climate change action plans <http://yosemite.epa.gov/OAR/globalwarming.nsf/content/ActionsStateActionPlans.html> help states identify and evaluate feasible and effective policies to reduce their GHG emissions through a combination of public and private sector policies and programs. By taking a proactive approach to planning GHG emissions reductions, states can lower their GHG emissions, reduce their energy costs, protect air quality and public health, and improve the economy and environment. California (see Section V) is considering legislation with mandatory programs and targets to reduce GHGs and legislation has been introduced in Congress concerning GHGs. Regional activities include the Western Governor's Coalition (CA, OR, WA) and the 10 Northeastern states Regional Greenhouse Gas Initiative (RGGI) program to reduce CO<sub>2</sub> emissions from power plants which was announced on December 20, 2005.

**The Chicago Climate Exchange (CCX)** is a voluntary, pilot GHG emissions trading program targeting emissions and offsets in North America (US, Canada and Mexico) as well as limited offset projects in Brazil. The work is being carried out under the direction of Environmental Financial Products, LLC. Appropriate practices and technologies that can be monitored, documented, verified, and certified to receive credits, include several possible options:

- Agricultural soil and forest carbon sequestration
- Agricultural and wastewater CH<sub>4</sub> and N<sub>2</sub>O emission reduction
- Renewable energy production and energy improvement

For more information visit [www.envifi.com](http://www.envifi.com), [www.chicagoclimateexchange.com](http://www.chicagoclimateexchange.com). The Iowa Farm Bureau is working to aggregate carbon credits from Iowa farmers and throughout the U.S. for sale on the Chicago Climate Exchange. Carbon sequestration in soil and biomass will be

recognized on the CCX through credits generated by projects that are registered and verified on the Exchange. In order to include carbon sequestered from improved tillage practices, EFP has been working with several design phase participants including agricultural cooperatives and other organizations that will act to aggregate credits generated by individual farmers, primarily in the Midwest US. Additional on-farm GHG emission reduction activities, such as methane capture and reduced nitrogen application, are also targeted for inclusion. See [www.iowafarmbureau.com](http://www.iowafarmbureau.com) for more information.

Pacific Northwest Direct Seed Association is a group of dryland wheat farmers in Washington that have entered into a 10-year contract with Louisiana-based Entergy Corporation. Entergy gets credit for CO<sub>2</sub> emissions from the company's power plants in the U.S. The project reduces CO<sub>2</sub> emissions 30,000 tons (\$2.50/ton) over a 10-year period. Farmers receive a single (one-time) payment of \$250, but the contract established the fact that their conservation tillage (CT) farms store carbon. When the contract is up, those carbon credits may be sold to the highest bidder. The carbon credits are leased, not sold in perpetuity because of implications of future land title rights. In order to ensure a high reliance of contract compliance, only 30-40% of sequestered carbon was used in the agreement. Verification involves visual inspection of land by PNWDC, return of a postcard confirming continuation of no-till and inspection by local Conservation districts.

Additional links about the agreement with Entergy can be found at:  
[http://www.agofthemiddle.org/pubs/kupers\\_case.pdf](http://www.agofthemiddle.org/pubs/kupers_case.pdf)  
[http://www.entergy.com/news\\_room/newsrelease.aspx?NR\\_ID=308](http://www.entergy.com/news_room/newsrelease.aspx?NR_ID=308)

The Greenhouse Emissions Management Consortium (GEMCo) is a consortium of Canadian energy companies that entered into an agreement valid until 2012 with IGF Crop Insurance company, the fourth largest crop insurer in the US, to buy up to 2.8 million metric tons of CO<sub>2</sub>e emissions reduction credits (CERC). IGF intends to solicit the CERCs from eligible farmer/landowner participants through its network of crop insurance agents, initially in Iowa, and ultimately nationwide. GemCo press release: [http://www.gemco.org/Iowa\\_Farm\\_Project.htm](http://www.gemco.org/Iowa_Farm_Project.htm)

The Prairie Soil Carbon Balance Project (PSCB) was initiated in 1996 to provide scientific verification that Saskatchewan farmers who had adopted direct seeding were actually storing carbon in their soil. After 3 years the project has shown conclusively that direct seeding does build soil C and therefore can significantly reduce greenhouse gases:  
<http://ssca.usask.ca/conference/2001proceedings/mayerle.html>

PSCB is a research partnership with Agriculture & Agri-Food Canada (AAFC), Alberta Agriculture, Food and Rural Development (AAFRD), Saskatchewan Soils Conservation Association (SSCA), Ducks Unlimited, and the Canadian Cattlemen's Association. The research program involves analysis of new data as well as the large existing pool of historic soil carbon information, and includes the development of a practical model and sampling protocol that will allow the verification of carbon change resulting from a variety of best management practices for annual cropping and for grassland production. The model will also allow for scaling of carbon change estimates for regional forecasts.

California Climate Action Registry (CCAR) is a quasi-state entity. They have developed forestry and power utility reporting and certification protocols and are initiating work to develop a similar protocol for California agriculture.

CCAR is working with the DOE/1605(b) of the 1992 Energy Policy Act and the USEPA Climate leaders Program.

Climate Leaders is an EPA industry-government partnership that works with companies to develop long-term comprehensive climate change strategies.

CCAR forestry protocol:

<http://www.climateregistry.org/PROTOCOLS/FP/>

CARROT (Climate Action Registry Reporting Online Tool):

<http://www.climateregistry.org/CARROT/>

## **V. California GHG Policy Overview**

### **What is California proposing regarding global warming policy?**

Governor Schwarzenegger signed Executive Order # S-3-05 on June 1, 2005. The Executive Order established greenhouse gas (GHG) targets:

By 2010, Reduce to 2000 California Emission Levels

By 2020, Reduce to 1990 California Emission Levels

By 2050, Reduce to 80 percent Below 1990 California Levels

To meet the targets, the Governor directed the Secretary of the California Environmental Protection Agency to coordinate with the Secretary of the Business, Transportation and Housing Agency, Secretary of the Department of Food and Agriculture, Secretary of the Resources Agency, Chairperson of the Air Resources Board, Chairperson of the Energy Commission and President of the Public Utilities Commission.

The Secretary of CalEPA will lead a Climate Action Team made up of representatives from the agencies listed above to implement global warming emission reduction programs and report on the progress made toward meeting the statewide GHG targets that were established in the executive order. Per the Executive Order, the first report was released December 2005 [http://www.climatechange.ca.gov/climate\\_action\\_team/reports/index.html](http://www.climatechange.ca.gov/climate_action_team/reports/index.html) and is due to the Governor and the Legislature in January 2006 (although not expected until February) and bi-annually thereafter. Based on the preliminary economic analysis just released, it appears” that the climate change emission reduction targets can be met without adversely affecting the California economy.” The report essentially surmises that when all the strategies are implemented, those underway and those needed to meet the Governor’s targets, the economy will benefit.

### **Summary of California Climate Action Team’s Report**

The report identifies four recommendations that require action by the Governor and the Legislature. It is stated that this package is intended to encourage investment in technologies that reduce emissions, create jobs, and encourage economic growth. Legislation is being developed for introduction no later than February 24, 2006 that will include all or some of these recommendations:

1) Mandatory Climate Change Emissions Reporting that builds upon California’s Climate Action Registry and allows this state to track progress towards meeting the Governor’s targets. Collecting emissions data, starting with data from the largest sources of emissions, will allow the



Governor’s targets to be translated into a statewide emission cap for the 2010 and 2020 timeframes (and lay the foundation for a cap and trade program).

2) A Public Goods Charge for Transportation that funds key strategies to reduce climate change emissions and to reduce dependence on petroleum. Overdependence on petroleum fosters undesirable geopolitical, economic, energy, and environmental consequences.

3) A Coordinated Investment Strategy for the State Funding Programs—such as the State Pension System, Public Interest Energy Research fund, and other state investment programs—that works to achieve the many benefits of transitioning to a low carbon footprint. The investment strategy would provide incentives for industry to develop emission reduction technologies for use in California and abroad, thereby maintaining California’s lead in technology development. It should also leverage the talent at California’s universities to develop new technologies for reducing emissions and train the next generation of technicians that will be necessary to operate and service these technologies.

Provisions for Early Action Credit to California businesses that supports the transition to federal and international emission reduction schemes, including a cap and trade program. Such a provision would ensure that companies proactive in advance of such schemes are not penalized.

Table 5-2 is a list of strategies that the Climate Action Team recommends is pursued in the next two years in California. Many of these strategies are currently partially underway and most can be implemented with current authority; most do not require legislation to implement. Implementation of these strategies will provide significant emission reductions.

Agency Responsible	Start Date	Climate Change Emission Reductions (Million Tons CO <sub>2</sub> Equivalent) <sup>1</sup>	
		2010	2020
Air Resources Board			
Other New Light Duty Vehicle Technology Improvements	2006	0	4
HFC Reduction Strategies	2006	2.7	8.5
Transport refrigeration units, Off-road electrification, Port electrification (ship to shore)	2006	<1	<1
Manure Management	2006	1	1
Semi Conductor Industry (PFC Emissions) Targets	2006	2	2
Alternative Fuels: Blends Biodiesel	2006	<1	<1
Alternative Fuels: Ethanol	2006	<1	3.2
Heavy Duty Vehicle Emission Reduction Measures	2006	0	3

Reduced Venting and Leaks Systems	in and Gas Oil	2006	1	1
<b>Public Utilities Commission</b>				
Investor-Owned Utility (IOU) Additional Energy Efficiency Programs/Demand Response		2013	NA	6.3
IOU Combined Heat and Power Initiative		2006	1.1	4.4
IOU Electricity Sector Carbon Policy		2006	1.6	2.7
<b>Integrated Waste Management Board</b>				
Landfill Methane Capture		2006	2	3
Zero Waste—High Recycling		2006		3
<b>Resources Agency</b>				
Forest Management		2006	1-2	2-4
Forest Conservation		2006	4.2	8.4
Fuels Management/Biomass		2006	3.4	6.8
Urban Forestry		2006	0	3.5
Afforestation/Reforestation		2006	0	12.5
Water Use Efficiency		2008	0.4	1.2
<b>Energy Commission</b>				
Building Energy Efficiency Standards		2005	TBD	TBD
Appliance Energy Efficiency Standards		2006	TBD	TBD
Cement Manufacturing		2006	<1	<1
Municipal Utility Energy Efficiency Programs/ Demand Response		2006	1	5.9
Municipal Utility Renewable Portfolio Standard		2006	<1	3.2
Municipal Utility Combined Heat and Power		2006	0	<1
Municipal Utility Electricity Sector Carbon Policy		2006	3	9
Alternative Fuels: Non-Petroleum Fuels		2006	TBD	TBD
<b>State and Consumer Services/CalEPA</b>				
Transportation Policy Implementation		Still Being Considered		
<b>Business, Transportation &amp; Housing</b>				
Measures to Improve Transportation Energy Efficiency		2006	1.8	9

Smart Land Use and Intelligent Transportation	2006	5.5	18
Department of Food & Agriculture			
Conservation tillage/cover crops	2006	TBD	TBD
Enteric Fermentation	2006	<1	<1
Total Potential Emission Reductions		35-40	115-120

The strategies listed in Table 5-2 that could directly impact agriculture include manure management, alternative fuels, conservation tillage and enteric fermentation. A number of forestry management and conservation strategies are included. Emission reductions from manure management are approximated at 1 MMT and could be achieved through the use of biogas digesters along with the production of electricity and/or heating applications. Emission reductions through implementation of anaerobic digesters have yet to be determined.

If the state Air Resources Board would develop regulations to require the use of 1 to 4 percent biodiesel displacement of California diesel fuel they would achieve 0.8 MMT of GHG reductions by 2020. The emission reductions from ethanol use would come from the increased use of E-85 flexible fueled vehicles and increasing the percentage of ethanol now used in California gasoline from 5.7 to 10. It is noted that if ethanol was made from biomass or waste material the GHG reduction benefit would more than double.

Conservation tillage is a challenge in California due to the wide diversity of crops and climate conditions. Before CT can be a viable GHG reduction strategy the potential must be verified through extensive research directly applied to California conditions thus the reductions remain to be determined.

Enteric fermentation is the process of feed digestion by ruminant animals that results in methane emissions. Feed adjustments may be made that reduce GHG emissions.

## VI. AAQTF Recommendations

Current discussions on the 2007 Farm Bill highlight the concept of environmental trading. The focus could be in two areas: First, developing the infrastructure necessary to support the voluntary GHG accounting system. Second, provide incentives through existing conservation and energy authorities, such as CSP and EQIP, to address traditional soil and water quality concerns, as well as emerging concerns in air quality. The 2007 Farm Bill presents USDA with an opportunity to expand on existing GHG efforts and to spur development of carbon markets to reduce GHG emissions, either through new initiatives or by adding new elements to existing programs. This discussion, along with the detailed 1605(b) guidelines, can provide agriculture with an opportunity to participate in GHG environmental credit trading

The Emerging Issues Committee asked that the following actions be approved by AAQTF:

- 1) The Policy Committee develop a recommendation for approval by the AAQTF at the June 2006 meeting that will be submitted to the USDA Secretary supporting a nationwide, economically viable environmental credit trading program for agriculture in the 2007 Farm Bill. This program will expand on existing GHG efforts and spur development of carbon markets to reduce GHG emissions, either through new initiatives or by adding new elements to existing programs. The infrastructure must be developed to support the voluntary GHG accounting system followed by providing incentives through existing conservation and energy authorities, such as CSP and EQIP, to address traditional soil and water quality concerns, as well as emerging concerns in air quality.
- 2) The Research Committee reviews research priorities, including those listed below, and makes a recommendation for approval by the AAQTF at the June 2006 meeting:
  - Continuing soil carbon and nitrogen research activities and incorporating results into the COMET-VR interface are critical to provide reliable estimates for irrigated agriculture and rangeland in the United States. Research activities are ongoing to incorporate nitrous oxide dynamics into the COMET-VR interface. This work will require considerable additional investment of human capital to produce a finished product. Current estimates suggest that a COMET-nitrous oxide model could be ready for testing in early 2007.
  - Incorporating methane dynamics from animal agriculture into the COMET-VR interface.
  - Addressing carbon sequestration potential for trees (forests, agroforestry, silviculture, and orchards/vineyards) in the COMET-VR interface by incorporating parts of the USDA-Forest Service Carbon OnLine Estimator (COLE) model, along with vegetation simulation models. Testing is being conducted by the NRCS in Maine, and the USDA-NRCS West National Technology Support Center.
  - Conducting a thorough review of the published 2006 Intergovernmental Panel on Climate Change revised good practice guidelines, to ensure consistency between US and international methodologies,
  - Determining how improved N-use efficiency can decrease N<sub>2</sub>O emissions.