Committee on Agriculture
U.S. House of Representatives
Biographical Form

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If you are responding on behalf of an organization, please list the capacity in which you are representing that organization, including any office or elected position you hold or if you are a volunteer.

I am the executive director of the Land Stewardship Project (LSP). We do not work with forestry systems and therefore do not include them in the discussion.

Part I: Carbon Reduction Program Design

1) Members of Congress have introduced numerous bills to address the wide spectrum of climate change issues. Do you think Congress should enact a program that uses carbon taxes/fees, a cap-and-trade program, or a hybrid of these two approaches? Why?
   Please respond in 600 words or less.

Even with aggressive action by industrialized and developing countries, the United States will need to cut its emissions by at least 80 percent from 2000 levels by 2050 (Cleetus 2009). The Next Generation Energy Act passed in Minnesota similarly put into law cutting the state's greenhouse gas emissions (GHG) 15% below 2005 base levels by 2015, 30% by 2025 and 80% by 2050. This will take swift, effective action along with a commitment to long-term change. Whether we do nothing or take action now, our economies are going to change. The US has an opportunity now to plan and ease the pain for low income people and for businesses that reduce energy use in their processes. Katrina and the current economic crisis showed that waiting and reacting is foolhardy, much more costly and leads to a more injustice across society.

Significant economic and ecological change will probably require a hybrid approach between cap and trade and carbon taxation, coupled with policies requiring much greater energy efficiency throughout society. A well-designed cap-and-trade program would need to put a price on carbon emissions that reflects the true costs of global warming. A carbon tax could also be part of the solution. But, it would not guarantee the necessary level of emissions reductions without an emissions cap in place (Cleetus 2009). A progressive reduction in caps is also likely to be necessary.

Stronger efficiency standards, incentives, and public investment in clean technologies and infrastructure will also be needed. The latter includes sustainable agriculture approaches that significantly reduce fossil fuel energy used in inputs into agriculture and food. In addition, policies encouraging smart growth are likely to be needed to protect farm and ranchland from development and control wasteful energy use.

It would be a huge mistake to think that agriculture can benefit from these policies without having to make significant adjustments within the sector. Even absent this strong signal from climate change legislation, powerful changes to industrial farming systems will be driven by major disruptive forces caused in part by climate change. These changes threaten the ability to continue to produce large amounts of food and energy with current approaches. Kirschenmann (2009) identified three sources of disruption: the end of cheap concentrated fossil fuel energy, depletion of fresh water reserves, and the loss of a period of relatively stable climate for which the dominant agriculture was designed to function.

Hatfield et al. (2007) reviewed research on potential impacts of higher temperature and carbon dioxide levels on agricultural production in the U.S. and constructed mathematical

response functions where possible. They predicted varying responses, depending on the species of plants. Irrigation needs in the U.S. were predicted to rise by 35% for corn and 29% for alfalfa at the same time as water supplies are getting tighter and energy will cost more. Outbreaks and northward migration of a wide variety of weeds, insects and pathogens are likely. It is notable that few horticultural crop and pasture studies were available to evaluate the effects related to global warming.

The dominant monocultural agriculture systems and related conservation systems were designed for what the National Academy of Sciences called an abnormal period of stable climate (NAS 1975) that we no longer have. Scientists at the USDA's National Soil Tilth Laboratory worry that the intense rainfalls brought on by climate change will wipe out the benefits created by practices such as no-till agriculture, if they are not part of a more complex conservation system (DeVore 2005).

2) Should the agriculture and forestry sectors be covered under a carbon reduction program? Why or why not?

Please respond in 300 words or less.

Agriculture's share of US GHG comes from nitrous oxide (60 percent), primarily related to nitrogen (N) fertilizer applications and manure management, and methane (31 percent) primarily related to enteric fermentation and manure management. Large-scale monocultures of annual row crops (corn or corn/soybean rotations) in the Corn Belt require significant levels of N fertilizers and other GHG producing and costly off-farm inputs. This applies to varying degrees to other monocultural crop production systems.

The largest industrial agriculture operations causing GHG emissions should face a price for those emissions (Metcalf and Reilly 2008). Including them in the mandated reductions, with only a small amount of compensatory offsets for these operations, is needed to induce innovations such as use of cover crops and dispersal of animals back on the land. Definitions for large industrial crop farms could be based on the percent land cover in monoculture annual crop by a landowner relative to the average size of farms in a given geographic area. Large confined animal feeding operations (CAFOs) are already defined by the Environmental Protection Agency to have at least 1000 animal units. Methane emissions from dairy cow and pig manure have increased by 50% and 37% respectively between 1990 and 2005, due primarily to the adoption of liquid manure systems of the type used in CAFO systems (EPA 2007).

2. There are significant opportunities for agriculture (and forestry, too) to reduce GHG emissions and store carbon in the soil through voluntary offsets. For example, the Rodale Institute found a 15-28% greater organic matter accumulation in organic systems as compared with conventional fields (Pimentel et al. 2005). Similarly, comparative studies at universities have found reduced energy use, soil carbon improvements, and lowered cost of production by including cover crops and resource conserving crop rotations, and integrating crops and livestock on the land in pastures (Boody et al. 2009).

3) If a cap-and-trade program is chosen, how should emission allowances be distributed? For example, should they be at no cost, auctioned, or a combination of both? How should Congress prioritize the distribution of available allowances? Should allowances for the agricultural and forestry sectors be allocated at no cost, if so, should there be a limit on the number of no-cost allowances?

Please respond in 600 words or less.

Cleetus (2009) and Metcalf and Reilly (2008) believe allowances should be auctioned, not given away. Auctions allow the marketplace to set a price. Giving away allowances could distort the market and result in windfall profits to favored polluters. This would be the wrong signal to send to these polluters. Industrial agriculture operations such as large CAFOs that by their design rely on heavy use of fossil fuel-based inputs and rely on N fertilizers for feed crops such as corn should be subject to these costs.

Grass-based livestock operations with animals on the land consuming pasture require little in the way of fossil fuel-based N fertilization. These may or may not be Animal Feeding Operations. Grass pastures that are well managed and store carbon over many decades should not be disadvantaged through a GHG emissions reduction program.

4) Should a cap-and-trade program or a carbon tax/fee program be linked to existing or emerging U.S. regional or other carbon reduction programs (i.e. RGGI or individual state programs)? If so, which programs and why?

Please respond in 600 words or less.

States or regions should be allowed to have stronger programs. It is critical that a US program support regional efforts or international efforts by allowing only limited offsets to be traded with other uncapped sectors or regions or countries without GHG caps (Cleetus 2009.

5) If a cap-and-trade program is established, should an existing government agency regulate it or should a new agency be created? Please explain.

Please respond in 300 words or less.

The Environmental Protection Agency could be the lead agency with strong cooperation from USDA's Natural Resources Conservation Service, Agricultural Research Service, Economic Research Service and the research arm, the Agriculture and Food Research Initiative. It is important to learn from the recent past. The Government Accountability Office (GAO) found that combining substantial regulatory and technical assistance roles in one agency like Natural Resources Conservation Service (NRCS) can be problematic at the level of field staff and mission focus (GAO 2003). More specifically the GAO found that NRCS was inconsistent in enforcing violations of the swampbuster and sodbuster compliance provisions written into the 1985 Farm Bill and beyond. They also found that the Farm Services Agency often waived the noncompliance findings and did

not withhold subsidies for those found in violation of swampbuster and sodbuster provisions (GAO 2003).

6) If a derivatives or futures market in carbon reduction arises in the wake of the creation of a cap-and-trade program, should the Commodity Futures Trading Commission (CFTC) continue its role as the regulator of this derivative carbon market, or should there be a different regulator? Please explain.

   Please respond in 300 words or less.

   The program should be transparent and not rely on Wall Street or other financiers using arcane instruments that are primarily focused on making money through financial instruments that do not directly tie to GHG reductions. Whatever agency regulates this should rely on holistically formulated scientific judgments from teams of economists, climate scientists, ecologists, agricultural scientists and sociologists about whether the use of such instruments will actually contribute to GHG reductions. If not, the agency must be able to block the use of proposed instruments. Such expertise and willingness to act may not be housed in the CFTC or other financial regulators at this time.

7) Currently, derivatives of energy-based commodities can be traded through: a) highly structured instruments on regulated, transparent futures markets accessible to anybody and anyone; b) flexible instruments on lightly regulated, transparent derivative markets accessible to only major market participants, or; c) flexible instruments on unregulated, opaque over-the-counter markets accessible only to major market participants.

   Should derivatives markets in carbon reduction arising in the wake of the creation of a cap-and-trade program also be permitted to develop under similar options as for energy-based commodities?
   Please respond in 600 words or less.

   No comment

8) Will enactment of a carbon reduction program have negative impacts for regions or populations whose welfare is of special interest to the agriculture community? Such groups could include: residents of rural areas; populations served by USDA nutrition programs; agricultural producers and forest landowners; or input, transportation, and processing sectors of agriculture and forest products.

   Please respond in 600 words or less.

The poor and working poor in rural or urban communities, who because of lack of investment in transportation alternatives are now forced to rely on cars for transport, could suffer disproportionately. However, a recent MIT analyses (Paltsev et al. 2008) estimated a $340 average annual cost for a family of four in the US to achieve 80% reductions of GHG emissions in the US by 2050.

The costs of doing nothing will lead to more dramatic impacts over time that foreclose the options for the poor and vulnerable in society more than for those in higher economic strata.

Critics of LSP's recommendations might assert that including large industrial agriculture crop and livestock operations in GHG programs could result in reduced production, thereby exacerbating world food shortages and increasing prices to consumers. Reducing GHG production and fossil energy for agriculture and its inputs might reduce the total production of certain commodities such as corn, soybeans and large CAFO produced livestock products. That does not necessarily mean less food will be grown.

A University of Wisconsin 13-year trial comparing high input specialized livestock or grain systems with limited input integrated grain-livestock systems found that once the transition was complete, yields of corn, soybeans, and winter wheat in organic systems were 90% of the levels of their conventional counterparts. Organic forage crops yielded as much dry matter as conventional crops and with sufficient quality to produce as much milk in dairy cows (Posner et al. 2008).

A University of Minnesota study similarly showed corn and alfalfa yields of over 90% of conventional, soybean yields of over 80% of conventional and equivalent oats yields to those of conventionally managed plots (Porter et al. 2006). Organic and reduced input systems also resulted in better overall soil quality than zero or high input systems. The organic systems were equally profitable to the conventional systems when no organic premium was included, and more profitable with a premium (Porter et al. 2006).

Stepped up research is needed on farming systems based on resource conserving crop rotations, integrated crop and livestock operations, and sustainably managed fruits and vegetables. Food production needs to be maintained or increased while making sure such systems are resilient in the face of drought and excess rainfall, warming temperatures, increasing atmospheric carbon dioxide levels and related impacts. The Rodale Institute has developed a system that uses cover crops and a roller to create weed-suppressing soil-saving mulch in organic fields –essentially organic no-till (Hepperly et al. 2008). That may help boost organic yields in wet spring periods.

The government will need to track the impacts on low income Americans to be able to properly ameliorate the increased costs of GHG reduction.

9) How might revenue generated under a carbon reduction program be best used to offset any negative impacts?

Please respond in 300 words or less.

Investment of some of the proceeds from sale of allowances in energy efficiency, green jobs in sustainable agriculture and community-based food and energy systems could provide new job opportunities in rural and urban areas. Paltsev et al. (2008) and Metcalf

and Reilly (2008) found that the revenues from auctioned allowances could be used to relieve the burden on lower income households (and by extension small and mid-sized farms).

LSP encourages investments of revenue from sale of allowances and/or carbon taxes in significantly expanded research on sustainable farming systems, rural job creation through development of community-based food and energy value chains, expanded public transportation and high speed internet links, and rebates or other approaches to care for lower income people who can not manage the increased costs related to GHG reductions throughout the economy. Some of those rebates may need to be specifically targeted to food assistance programs for the purchase of high quality food.

Changing food habits may reduce health care costs over time. Clancy (2007a,b) points to possible links between improved human health and healthful fats in grass-fed cattle and pasture-raised hogs and poultry.

Income to farmers and ranchers may be able to be maintained or improved by shifting from high production to production of high quality food without antibiotic or pesticide residues.

Indeed for many years the certified organic marketplace has been the fastest growing segment of the food marketplace. That is backed up by other consumer surveys and that show a significant portion of the population is willing to pay more for healthful food grown with high levels of stewardship and that supports family farmers. For example Welle (2001) conducted a random statewide mail survey in Minnesota to learn if and what people were willing to pay per household for reductions of 50% in soil erosion, 25% in small to moderate flooding, and 20% in GHG, and a 50% increase in wildlife habitat. On average, the 394 respondents indicated they were willing to pay $201 annually per household above what they already paid for agriculture and food programs through their taxes.

10) Should businesses that are affected (either indirectly or directly) by higher overall costs due to a carbon reduction program receive transitional assistance?
Please respond in 300 words or less.

A level playing field in agriculture created by not continuing to subsidize energy inefficient industrial farming systems and associated input supply and marketing businesses. See our recent report Industrial Livestock at the Taxpayer Trough: How Large Hog and Dairy Operations are Subsidized by the Environmental Quality Incentives Program (December 2008). New businesses will arise to take the place of those that can not adapt to significantly reducing GHG emissions and sequestering carbon for the long term.

With regard to employees of those businesses it might be helpful to offer educational retraining, e.g., in sustainable agriculture, solar or wind power engineering, community-based food value chain development and engineering, etc.

Programs to assist rural community development and whole systems research that integrate ecological, economic and social considerations and integrated crop and livestock and organic systems should be expanded in USDA. Community assistance programs such as Beginning Farmer and Rancher Development Program , Value-Added Producer Grant Program and micro-enterprise loans that support value-chain development should be significantly expanded. Research on small institutional or community-scale energy systems that utilize cellulosic biofuels from deep-rooted perennial crops could be quite helpful.

11) What role should public lands play in helping to sequester carbon and/or reduce greenhouse gas emissions?

Please respond in 300 words or less.

Public lands must be used to sequester carbon whenever possible and reduce GHG emissions. They should be retained or planted to deeply rooted perennial cover through mixed species grasses, forests or wetlands. McLauchlan et al. 2006 estimated that establishing perennial grasslands can increase soil organic carbon to levels of unplowed prairie in 55 to 75 years. Public lands can also be used for high quality management intensive rotational grazing and possibly mixed species perennial biomass production.

12) Should carbon prices be determined exclusively by market forces or should limits on carbon prices be established? Please explain.

Please respond in 600 words or less.

Prices should be allowed to go up or down according to market forces within the context of a well regulated cap-and-trade program. There will likely need to be decreasing GHG caps over the years.

13) What, if any, lessons can be learned from the European Union's Emission Trading System (ETS) or any other carbon reduction program already underway or being developed? Do any international carbon reduction programs currently exist for agriculture and forestry?

Please respond in 600 words or less.

No comment. See MIT and Union of Concerned Scientists for analyses

Part II: Carbon Reduction Program Administration and Implementation

The administration and implementation of an offset or allowance program will be a major topic during any potential climate change discussion. Please answer the following questions regarding the scale, scope, and limitations of any program as part of the larger carbon reduction debate.

14) What options or combination of options would be most effective for agriculture and forestry sectors in a carbon reduction program: a voluntary offset program, bonus allowances for selected agriculture and forestry activities, or agreed upon performance standards for segments of the agriculture and forestry sectors?

Please respond in 600 words or less.

Mandated caps for large industrial crop and large CAFO operations were discussed above. Compliance offsets should be tightly controlled as mentioned above to induce GHG reduction in those operations.

Other agricultural producers that adopt farming systems that reduce GHG used in production and store carbon over the long-term should be encouraged to participate in the compliance offsets and also voluntary offsets.

Land Stewardship Project (LSP) believes that GHG offsets from agriculture should be analyzed as part of the potential ecosystem services they provide in a given geographic area--a multiple benefits approach. Key ecosystem services that might make a given GHG credit worth more in a given area include reduced N use, reduced P use, increased water storage, native biological diversity enhancement or protection, and decreased direct fossil fuel use. See Boody et al. 2005 for a fuller discussion of this approach.

A GHG program should move over time toward a performance based system. Payments would be linked to realized or predicted results. Such a program could (1) improve environmental consequences of conservation practices, as well as their cost-effectiveness, (2) provide a foundation for both green payment programs and non-point source trading programs, and (3) maintain farmer options for participation.

Keeney and Boody (2005) proposed the following components of a performance based system:
- A baseline must be established at some reasonable point of time.

- Payments That Are Fair To Taxpayers and Farmers
If farmers are reducing the number of marketable products they can sell while they increase the number of public benefits, then compensation should reflect that exchange. As new private markets develop it is an appropriate government role to assure those markets are verifiable, quantifiable, enforceable and have an equitable price structure for small and moderate sized farms, and avoid unintended impacts that concentrate farm ownership.

- Continuous Progress
Standards such as those promulgated by the Food Alliance are based on the idea of continuous progress. Similarly, performance systems need to be created in a context where farmers, their technical and financial advisors, researchers, agency staff and the community work together to redefine acceptable outcomes as we learn more. It may be premature to provide blanket protection from further regulations, which implies that we have found long-term solutions to given problems, despite rapidly changing circumstances. Yet, it is important to acknowledge good faith efforts.

- Assurance of Improvements and Continuing Performance
Agro-ecological and social systems are dynamic. Farmers need flexibility to adjust to changing circumstances. However, benefits such as carbon sequestration in soil can be lost if practices are not continuously maintained. That has to be taken into account in the program design.

- Graduated Payments Commensurate With GHG and other Multiple Benefits
The higher the public good provided for GHG reduction along with other environmental co-benefits the greater the payment should be.

15) Should the total number of offsets issued annually by the government be limited? If so, how much?
Please respond in 300 words or less.

UCS proposes that voluntary offsets should not be limited. If farmers adopt pasture-based systems or resource conserving crop rotations that at a minimum reduce off-farm N purchases and GHG emissions, and those systems are documented and maintained, they could be paid for contributing to reductions. The equivalent value of those voluntary offsets in terms of GHG or carbon sequestration would then be removed from the pool of allowances available to capped entities (See Cleetus 2008).

Compliance offsets should be limited in order to induce GHG reduction in the operations that already have high GHG emissions.

16) How should Congress prioritize the distribution of available offsets (who gets them and how much)?
Please respond in 600 words or less.

LSP believes we need to keep working farmland working. We favor keeping offsets for small and medium sized farmers that adopt resource conserving crop rotations, organic systems, management intensive rotational grazing systems with perennial pastures, integrated systems with diversified crops and livestock on the land, conversion of annual row crops to mixed species perennials in sensitive areas for biomass energy production, agroforestry systems and adoption of continuous living cover in annual crops.

17) What should the criteria be for measuring (quantification, verification, and monitoring) and accounting for the legitimacy of offsets under the program?
Please respond in 600 words or less.

Criteria

1. The systems reduce GHG emissions or reliably store carbon over the long-term based on quantified estimates. Information should be based on valid studies that verify and monitor changes over time on-farms or at nearby experimental sites.
1.a. Conversion of annual crops to perennials or continuous living cover does sequester carbon.
A recent study by University of Minnesota scientists reviewed the literature to estimate the potential for carbon sequestration by different changed land uses to address Minnesota's official goals of reducing greenhouse gases by 80% by 2050 (Anderson et al. 2008). Converting cropland to forests and grasslands was estimated to lead to high levels of carbon sequestration (rates of > 0.9 Mg C ha-1 yr-1). Conversion of annual crops to perennial grassland was estimated to increase soil C by mean rates of 0.99 Mg C ha-1 yr-1. The study concluded that no-tilling row crops did not reliably sequester carbon, but that adding cover crops into rows did at a mean rate of 0.49 Mg C ha-1 yr-1. They determined that the conversion of row crops to pasture/hayland increased soil C by a mean rate of 0.25 Mg C ha-1 yr-1. However, Conant et al. (2003) found that RG led to the greatest soil C content among different management intensive rotational grazing (MIRG) grazing treatments in Virginia, averaging 0.41 Mg C ha-1 yr-1 and substantially higher rates of as much as 2.9 Mg C ha-1 year-1 on new pastures.

1.b. High levels of added fertilizer N should be reduced to reduce carbon loss from the soil in cropping systems and reduce nitrogen oxide gas emissions.
A long-term study by University of Illinois scientists followed soil carbon in corn-corn, corn-oats (followed by corn-soybeans starting in 1967) and corn-oats-hay rotations over 100 years beginning in 1904. They found that despite massive inputs of residue carbon (ranging from 81 to 277 Mg C ha-1 yr-1) and high NPK fertilizer rates over 40-50 years there had been a net decrease in soil organic carbon in all rotations between 1955 (or 1967 for the previously corn-oats rotation) and 2005. On the other hand, the corn-oats and corn-oats-hay rotations with added manure, rock phosphate and limestone fertilizers prior to 1967 or 1955, respectively, increased soil C in the plow layers up until high NPK fertilizers were used (Kahn et al. 2007). De Gryze et al. (2009) modeled alternative management systems for GHG and carbon sequestration in California and compared the results to monitoring. They found that alternative systems with cover crops and manure instead of fertilizer performed well in reducing GHG and increasing SOC in both predicted and modeled situations.

1.c. Tillage by itself is not a good measure for carbon sequestration
Some believe that widespread adoption of conservation tillage within United States could sequester a lot of carbon. However, Baker et al. (2007) noted that many estimates of carbon sequestration from no-tillage systems were based on shallow sampling. In studies with deeper sampling (> 30cm) the majority of studies they reported on found similar levels of soil organic carbon in no-till and conventional tillage systems. The authors believe there is not compelling evidence for carbon sequestration in reduced tillage systems.

2. Quantify when possible or qualitatively analyze impacts on other ecosystem services related to local or downstream ecological goals and that preserve the ability of the land to produce for generations into the future. See Boody et al. (2005) and Santelmann et al.

(2004) for examples. A GHG program should not make it more difficult to address total maximum daily loads, regional conservation plans, clean air standards or maintain existing wetlands, prairie or pastures.

18) What should be the criteria for assessing offset projects?

Please respond in 300 words or less.

The following chart offers a set of criteria for assessing offset projects that could be modified to include locally important criteria and regionally appropriate studies. In this approach criteria should include at least a medium confidence in the mean, a high certainty that carbon sequestration is greater than zero, decreasing fuel use, and GHG reduction that is greater than zero. The analysis and table below is adapted from Anderson et al. (2008) in a report submitted the Minnesota Department of Natural Resources to the Minnesota Legislature called: "The Potential for Terrestrial Carbon Sequestration in Minnesota" (described above).

The best projects will also be those that provide mostly moderate or high additional ecological functions for a given area.

Carbon and GHG benefits						Environmental co-benefits			
Land use/cover change	GHG Emission ↓	Fuel use ↓	Soil C seq. rate Mt/ac/yr	Level of Certainty In C Seq. Mean	>0	Soil loss ↓	Inputs ↓	Habitat ↑	H20 qual. ↑
Annual row crops to pasture/hay	+/- +/++ for MIRG	++	0.1	High	High	+++	+++	++	++
Annual row crops to perennial grassland	+++	+++	0.4	Low	High	+++	+++	+++	+++
Annual row crops to agroforestry	+++	++	1.5	High	Very High	++	++	++	+++
Prairie pothole (wetland) restoration	+/-	+++	1.2	Low	High	+++	+++	+++	+++
Cover crops in annuals	+	+/-	0.2	Medium	High	++	++	+/-	=

Conventional to conservation till	+/-	+	0.1	Low	Very low	++	++	-	=

Legend Symbols refer to comparison of multiple benefits for each land use with previous practices: +++ High ++ Moderate + Low = No Difference - Decrease.

19) How should Congress design a system for verifying offset projects?

Please respond in 300 words or less.

A new approach to landowner compensation based on performance-based conservation payments requires several components.

1. It requires an explicit goal or outcome by which to measure performance against for the program and a specific allowance or offset.
2. Indicators of GHG reduction or carbon storage are needed. Casey and Boody (2006) noted that measuring the performance of a program is different than measuring and outcome. A GHG program should move toward performance based systems for achieving stated environmental goals.

2.a. One proxy indicator that is particularly relevant to GHG reduction and carbon sequestration is the amount of continuous living cover, along with records of fossil fuel-based inputs used (Glover 2003, Cox et al. 2006) The cost of indicator generation will be lower than conducting periodic biological surveys or using process models.

2.b. The second general type of indicator is the output from "process models". Process models usually take on-farm land management and production practices, and then "predict" soil parameters, pollutant loss from the system. It is critical to have correct inputs or assumptions for the process models that are predicting GHG or carbon storage in agricultural systems. Boody et al. 2005 made several adjustments to the Agricultural Drainage and Pesticide Transfer water quality model to accurately estimate the effects of management intensive rotational grazing systems that maintain high canopy cover in pastures.

2.c. The results of the environmental processes models must be verified. For example recent soil carbon studies that have shown that in soils under no-till, SOC gains from no-till that are based only on near-surface samples disappear when deeper samples are also included (Baker et al 2006). However process models usually predict high SOC under no-till.

3. On farm observation and citizen science can be helpful. Organic certification, Conservation Stewardship Program application requirements, and the Monitoring Team (2001) suggest possibilities.

20) Should Congress establish a standards-based approach with pre-calculated values or a project-based approach that measures field results for establishing eligible offsets under the program?

Please respond in 600 words or less.

More than likely it will have to be some combination of both that varies by area of the country and depending on the availability of new tools. Minimum standards for entry will likely be necessary. However a GHG program needs to be more adaptable than a strictly standards approach might allow.

Project based approaches might utilize on-farm prediction tools.

The Soil Management Assessment Framework (SMAF) could be developed to give a robust analysis of GHG implications. It is a tool that land managers, conservationists, and producers could use to better understand the multiple interactive effects that their soil management decisions are having on the resource. It examines biological, chemical, and physical data independently or when combined. The goal of the SMAF model is to improve soil assessment efforts by evaluating the impact of soil management practices on soil function. This tool allows researchers to continually update and refine the interpretations for many soils, climates, and land use practices, thereby making it more conducive for use as an indicator on which to base a performance-based payments. Soil carbon storage and GHG emissions are a function of soil quality, including biological life in the soil and soil management including inputs, crops, tillage, and water. The SMAF has been implemented as part of the Conservation Effects Assessment Project (CEAP). Combining the SMAF and a CEAP survey approach appears to be a successful method for identifying soil quality risks at the watershed scale. (Andrews et al 2004).

Currently NRCS uses a number of tools to analyze farm applications to the Conservation Stewardship Program. For example the Soil Conditioning Index (SCI) predicts the effect of cropping systems and tillage practices on Organic Matter (OM). One significant drawback with the SCI is that it undervalues organic farming by focusing only on tillage. The SCI is currently used is an applicant screening tool and is not yet employed as an indicator to measure performance.

Public on-farm participatory research is needed to the adaptive management of a GHG trading or carbon tax program.

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21) What should be the relationship between offsets and allowances?

Please respond in 600 words or less.

As mentioned earlier, a cap-and-trade program should be designed to encourage the voluntary renewable energy market and GHG reduction market. For instance, if individuals or businesses voluntarily install solar panels or other renewable energy systems on their property, or adopt sustainable agriculture systems such as resource conserving crop rotations, organic systems, grass-fed livestock raised outside, pasture raised hogs or poultry operations with minimal or no mechanical ventilation in structures, or organic high tunnel production, then amounts representing equivalent emissions reduced through these projects

should be removed from the entire pool of allowances available to capped entities. This in effect, lowers the total emissions cap and spurs further investment in clean energy and lower energy use agricultural and food system technologies.

22) Describe the most important factors in establishing the permanence and duration of offsets under the program, including contract length and flexibility?

Please respond in 300 words or less.

Agricultural GHG emissions can be curbed by increasing soil organic carbon, decreasing nitrous oxides and methane emissions and decreasing fuel use by field equipment and livestock housing.

Fang and Easter (2003) found that longer-term practices (10-20 years) were more effective than short-term annual practices for predictable P reductions that could be used in trading. Certainly that will be even more critical in the case of GHG and carbon storage for the purposes of permanently reducing global warming potential. Grass-based livestock and organic production, and conversion to other perennials are generally long-term investments that can maintain production over time (Cox et al. 2006). Carbon storage from reduced tillage and cover crops, however, is reversible when the soil is plowed again (De Gryze et al. 2009). In any soil system there will also be a limit to how much carbon can be stored and that will have to be considered as well.

De Gryze et al. 2009 pointed out that reduction of nitrous oxides through reductions in nitrogen applications are avoided emissions from that period and are therefore permanent. Resource conserving crop rotations, organic production systems and pasture-based systems could reduce GHG emissions compared to conventional approaches (Pimentel et al. 2005 and Boody et al. 2005, 2009). Fossil fuel use, despite additional tillage in organic systems, can nevertheless be reduced (Pimentel et al. 2005).

Durability. A farmer should be allowed to swap equivalent practices from one field to another on the same farm as long as equivalent amounts of GHG reductions or carbon storage are maintained on the farm (with documentation). Also a farmer could perhaps be part of a county level or coop structure that would guarantee the pledged units for the pledged period of time even though those practices might shift from farm to farm. This could be for a reduced "rental" contract for the given duration.

Paying farmers to maintain existing perennial cropping systems makes sense because the lower GHG emissions continue as long as the system is in place.

23) How should Congress address existing offset projects or credits established through a voluntary market or system (e.g., the Chicago Climate Exchange or an emission registry)?

Please respond in 600 words or less.

Existing voluntary programs such as the CXC will need to be scrutinized on a case by case basis to determine if they meet regulatory program guidelines. For example those being paid through these markets for carbon sequestration from no-till practices may not have been sequestering much carbon, according to Anderson et al. (2008), Baker et al. (2007) and others. It will be important to review each program with a system similar to Anderson et al. 2008 with both quantitative and qualitative indicators where only high confidence that the means are greater than zero and those with significant added multiple benefits are used in this program. See table above
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24) The terms "additionality" and "stackability" are often used when discussing the details of an offset program. How should producers and forest landowners who may have been early-actors and already undertaken activities that sequester carbon or reduce greenhouse gas emissions be treated? Should activities undertaken to reduce carbon emissions also be allowed to count towards other environmental market activities, such as water quality or wildlife habitat creation, therefore allowing landowners to "stack" credits?
Please respond in 600 words or less.

A program could be patterned after the Conservation Stewardship Program with the following features:
- A producer would need to meet a stewardship threshold for GHG, carbon and possibly other natural resources. This threshold could be set by Natural Resources Conservation Service for improving the long-term sustainability of the natural resources on the farm and in a given locale.
- A plan for additional conservation above the entry level could be part of the "additionality" for at least the length of the contract. For example a pasture-based operation could add species into the pasture or otherwise improve its ability to add to the carbon storage.
- Payments for a high level of stewardship such as resource conserving crop rotations, pasture-based livestock systems (for cattle and other species to the degree that grasses can make up all or part of the diet) should receive the highest payments of the program. A resource conserving crop rotation is a system that reduces erosion, improves soil fertility and tilth, interrupts pest cycles, reduces depletion of soil moisture and the need for irrigation in some regions and includes at least one resource conserving crop such as hay or alfalfa. Reducing GHG and increasing the potential for carbon storage could be added for the purposes of this program.

It is important, despite the need for additionality, to reward existing performance of those who are committed to high levels of stewardship. Protecting existing high functioning systems has to be a priority so that the principle of additionality does not cause the public to have to pay instead for reclaiming recently added GHG gases that could have otherwise been maintained if a perennial system were maintained. Payments would help farmers address forgone income for maintaining a systems or a set of practices that if changed to more intensive production could fetch more income from commodity markets.

The CSP approach begins to address stacking credits by including multiple resources of concern in the program. Farmers should be allowed get additional payments if practices for GHG reduction also produce wildlife habitat or protect water quality, etc., or vice versa.

In addition to the CSP, the Minnesota based Reinvest in Minnesota-Clean Energy payment structure might provide another model. While based on the number of species in the following chart, such an approach could be patterned after the number and amounts of GHG emissions that are reduced + the added carbon sequestration potential +other benefits.

EMV	Payments for a 20-yr Easement Based on estimated market value (EMV)
80%	Base payment – one native/cultivar grass or woody species
+5%	Second species
+3%	Third species
+2%	Fourth species
+5%	Diverse prairie of >15 species
Up to +10%	Additional local factors if two or more species planted

25) How should activities that may have been paid for in part by assistance from Federal or state government programs (i.e. cost share, technical assistance) be treated? How should those activities be treated if the practice was not specifically implemented to address carbon sequestration or greenhouse gas emission reduction?
Please respond in 300 words or less.

If the federal government paid a cost-share for the implementation of a farming system or set of practices, a farmer might also be eligible for GHG or carbon storage payments if they keep maintaining a practice or add additional GHG reductions.

Those that put in a practice on their own after a certain baseline period should be eligible on the same principle.

If a state based program did not pay for carbon or GHG then an additional payment should be allowed.

26) Should a producer be required to return revenue or be held liable if an offset project does not sequester carbon or reduce greenhouse gas emissions? How about in the event of a natural disaster or another event uncontrolled by the producer and/or landowner?

Please respond in 300 words or less.

If producers sign up for the program or have to reduce carbon, it is important that they follow through with needed reductions or carbon storage. As mentioned above we believe a farmer should be allowed to swap equivalent practices from one field to another on the same farm or with other collaborating farmers as long as equivalent amounts of reductions or carbon storage are maintained.

If those practices are not able to be maintained and produce the anticipated reduction levels, there should be a cost to the farmer or operation related to the value of the promised offset. If appropriate, farmers could be given an opportunity to repay the cost through additional reductions.

Disaster payments in relation to GHG could have unintended impacts. Farming systems that are based on monoculture crops or large CAFOS should not receive disaster payments year after year if the inherent weaknesses in these industrial systems are not also addressed and changed. Ongoing or periodic disaster payments of this kind could block changes leading to reduced GHG and decreased carbon sequestration.

27) Should the protocols and procedures for the offset program be detailed in legislation, or should authority be delegated to the appropriate government agency to develop regulations? If so, which agency or agencies should be responsible for devising protocols and procedures?

Please respond in 300 words or less.

The cap-and-trade or carbon tax program must itself be adaptively managed to integrate new scientifically derived information about what works or does not work on the land in relation to changing weather and other conditions so that it is able to effectively GHG or store carbon from agriculture on a long-term basis.

If too many protocols or procedures are detailed in the legislation, the possibility to create a program that can be managed adaptively to respond to new information and real time effects on GHG and social and economic impacts is less likely.

28) What are the obstacles faced by agricultural producers and landowners to implement practices and technologies?

Please respond in 600 words or less.

Training, technical assistance and incentives (or the removal of disincentives) are crucial. LSP believes the Beginning Farmer and Rancher Development Program is an example of a program that can help incoming farmers plan for low GHG emission farming.

29) Do existing conservation and forestry programs provide sufficient incentives to encourage the adoption and implementation of practices that mitigate climate change impacts, sequester carbon and/or reduce greenhouse gas emissions? If not, what might Congress consider offering as additional financial incentives and technical assistance to speed up adoption/implementation?

Please respond in 300 words or less.

Present U.S. conservation programs operate within the much larger system of income- and commodity-support programs focused on maximizing production. The current commodity support system works against expanded sustainable farming, including more grass-based systems, by creating a risk management system with price supports, insurance, and the related research and market subsidies focused on selected annual crops (GAO 2007). For example, from 1983 to 1997, 0.68 Mha in South Dakota were enrolled in CRP while 0.74 Mha were converted from grassland to cropland. Paying farmers who recently intensified production before the new GHG program to then reduce those emissions does not make sense for taxpayers.

To move toward sustainable agriculture and low GHG emissions from agriculture, "joined up" policy will be needed. Joined-up policy refers to agriculture policy that supports public goods, does not distort markets, treats all farmers (small or large) equitably, and where income supports for farmers does not overwhelm conservation-oriented program goals. Rather than supporting commodity production, government policy could be changed to support agricultural diversification to enhance nonmarket ecosystem services. Farm programs should be fundamentally reformed to reward farmers for environmental benefits, provide appropriate safety nets for farmers, and offer incentives to help restore vibrancy and diversity to the working landscape and rural community economies. These policies could integrate across ecological, food, and energy goals to develop a more holistic program to deliver the multiple benefits of agriculture.

Part III: Carbon Reduction Program Additional Thoughts

Please use the next 1000 words to provide additional comments on subjects which may not be have covered by the questionnaire, such as a low-carbon fuel standard, life-cycle analysis, leakage, or biofuel incentives.

Renewable energy that involves farmers and rural landowners, either in direct production of energy on the land, as with wind turbines, or in the growing of crops to produce

energy, or in the disposition of animal wastes from livestock must be sustainable. LSP therefore supports the following principles:
-Conservation and energy efficiency should be the keystones of all U.S. energy policy.
- Wind, solar and plant-based biomass should be given priority as sources of renewable energy through incentives for research and development.
- Plant-based biomass systems for energy production should provide the environmental benefits of sustainable agriculture. Key considerations should be given to:
    - The diversity of native perennial species integrated into rotation systems,
    - The siting of perennial biomass systems on highly erodible lands,
    - Protection of soil, water and biodiversity.
- Animal-based biomass should be governed by the highest sustainable use principle, ensuring net environmental benefits and safeguarding animal, human and community health.
- Renewable energy systems should be locally controlled and address the economic needs of rural communities and family farmers.

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Please list specific types of ***forestry practices*** that should be available as offsets, and then use the terms provided to evaluate the practices.				
Type of Practice	**Effectiveness** at *sequestering carbon or reducing* GHG emissions *(Excellent, Good, Moderate)*	**Ability** to *verify* carbon sequestration or GHG emission reductions *(Excellent, Good, Moderate)*	**Cost** for agricultural producers and private forestland owners to *implement (High, Medium, Low)*	**Capacity** of agricultural producers and private forestland owners to *implement immediately (High, Medium, Low)*

Please list specific types of ***practices associated with livestock operations (e.g. manure management, grazing/pastureland practices)*** that should be available as offsets, and then use the terms provided to evaluate the practices.				
Type of Practice	**Effectiveness** at *sequestering carbon or reducing* GHG emissions *(Excellent, Good, Moderate)*	**Ability** to *verify* carbon sequestration or GHG emission reductions *(Excellent, Good, Moderate)*	**Cost** for agricultural producers and private forestland owners to *implement (High, Medium, Low)*	**Capacity** of agricultural producers and private forestland owners to *implement immediately (High, Medium, Low)*
Management intensive rotational grazing--including organic (manure and land mgmt)	Good to Excellent	Good	Low capital cost	Medium with assistance
Hoop house/pasture hog production (manure)	Good	Good	Low capital cost	Medium with assistance
Continuous grazing	Moderate	Moderate	Low capital cost	High
Large CAFO with digester (manure mgmt only)	Good	Good	High capital and operating	Low

Please list specific types of ***crop production practices*** that should be available as offsets, and then use the terms provided to evaluate the practices.				
Type of Practice	**Effectiveness** at *sequestering carbon or reducing* GHG emissions *(Excellent, Good, Moderate)*	**Ability** to *verify* carbon sequestration or GHG emission reductions *(Excellent, Good, Moderate)*	**Cost** for agricultural producers and private forestland owners to *implement (High, Medium, Low)*	**Capacity** of agricultural producers and private forestland owners to *implement immediately (High, Medium, Low)*
Resource conserving crop rotations	Good	Excellent	Low	High with training

Organic crop production	Excellent	Excellent	Medium	Medium with training
Conversion to multi-species perennial biomass	Excellent	Good	High	Low
Adding cover crops to annuals	Moderate	Moderate	Medium	Medium

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