The Science and Policy of Sustainability

An Exploration of the Conservation Stewardship Program

• Without the implementation of soil conservation practices, extreme consequences from unrestrained agricultural production, like the Dust Bowl of the 1930's, can occur.

• Continued use of resource conservation practices on agricultural lands will enable us to attain food security for future domestic and international generations.

• Seven percent of the last Farm Bill was allocated toward conservation programs including the Conservation Stewardship Program (CSP).

• CSP encourages conservation practices regarding: air, plant, water quality, soil quality and erosion, animals, and energy.

• The current Farm Bill is being written under financial constraints and conservation programs are threatened to receive large funding cuts.

• **Recommendations:** We suggest that the CSP continue to be funded, be simplified to facilitate better producer-program interface, and provide funding for monitoring of results.

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http://weru.ksu.edu/new_weru/multimedia/dustbowl/dustbowlpics.html

Dust bowl storm approaching Stratford Texas, 1935

The Farm Bill: An Answer to Impacts of Agricultural Production

The beginning of the 20th century was a time of vast growth, development, and prosperity for the United States. In order to keep up with the growth, many agricultural practices were employed that were detrimental to ecosystems and soils. In 1931, there was a record wheat harvest across the nation, deflating the grain's price across the board. Subsequently, farmers implemented extreme tillage and other practices to compensate for the decreased prices. However the farmers were unaware that an extended drought was setting in. The drought, coupled with extreme tillage of croplands across the nation, led to dust storms that indefinitely crippled the nation's agriculture sector. The infamous Dust Bowl of the 1930's was one of the most significant events in the history of American agriculture. As a result of these tumultuous times, Congress was forced into passing legislation to assist farmers (Egan, 2006). The Soil Conservation Act of 1935 was passed as a direct result of dust storms from the heartland reaching the nation's capitol, and it is now better known as the original Farm Bill.

The Farm Bill came about to provide equity and stability to the farmers of the United States. Effectively, the farm programs were designed so that farmers could be sustained given the highly cyclical nature of agriculture. The ramifications of Farm Bill policy reach many corners of society and agriculture. Farmers are provided with a safety net from the risks of factors that they cannot control (i.e. weather patterns, global prices). Farm Bill programs can also promote environmental management on farms, in particular subsidising improvements for water quality, soils, and wildlife through a variety of programs.

Maintaining Food Security

As the world's population continues to grow, numerous countries have increased their grain production over the last few decades in an attempt to keep up with the rising demand (Rosenberg, 2001). To avoid exhausting natural resources that are fundamental to agriculture production, a balance between conserving those resources and production must attained.

After the dust bowl, soil conservation became a national security issue. Such a problem became a priority concern and was promptly addressed. The next challenge faced by the agriculture sector was attaining maximum yields, and after much research and focus, the agriculture sector can now produce maximum yields.

The issue agricultural producers face now is developing sustainable production methods. To aid in researching and developing these methods, programs such as the CSP must continue to develop and assist producers in attaining their goals.

Image by Karin Neff

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Encouraging Conservation through Monetary Incentives

Under the 2002 Farm Bill, Congress established the Conservation Security Program (CSP) and then later renamed and modified it to the Conservation Stewardship Program in 2008. The CSP is a voluntary conservation program that rewards farmers who use conservation practices on their farmland by using pay-for-practice incentives (Keeney and Kemp, 2003). The Conservation Stewardship Program is administered by the Natural Resource Conservation Service (NRCS) and is funded through the Commodity Credit Corporation (Cowan, 2008). Those who sign up for CSP are financially rewarded for employing resource conservation farming and ranching strategies. These stewardship incentives allow the individual producer to protect the environment while also creating an economically viable, income-producing farm (National Wildlife Federation, 2007). Through the CSP, environmental issues such as surface water quality, fish and wildlife habitat, soil quality, air quality, and plant biodiversity were addressed and changed by implementing specific agricultural practices. These practices included diversified crop-rotation systems, no-till, cover cropping, conservation grazing, windbreak buffers and other resource conservation strategies (Keeney and Kemp, 2003).

How it works

NRCS ranks application and partially determines payout using the Conservation Measurement Tool (CMT). Under CMT each application is given a point value for current conservation practices, proposed conservation practices, priority resource concerns addressed, and non-priority resource concerns addressed for each land use on the applied property. Each of the four sections is weighted against potential conservation practices and multiplied by 0.25 to give each application a CMT point score. The application with the highest CMT score is accepted into the program until all allocated acreage for the state are filled. Under each land enhancement and conservation practice is a potential point value that can be rewarded to the CMT score for each priority resource concern that it addresses. Any land enhancements the property can potentially benefit from are considered potential conservation practices and are weighted against the CMT score. (NRCS, 2010)

Enhancements to Promote Pollinators

Many agricultural areas suffer from a lack of sustainable pollination systems, resulting from a shortage of managed, indigenous, or imported pollinators (Kevan et al., 2001). An example of how CSP enhancements can improve wildlife habitat and increase recruitment of certain species is PLT01: improving habitat suitable for insects.

Image provided by texasbees.com

According to the 2011 CSP Montana Enhancement Workbook, this is accomplished by seeding vegetation that is favored by insect pollinators, such as species reliant on insect pollination for reproduction. These plants are seeded in non-cropped areas, like field borders, buffer strips, riparian vegetation, and other cover buffers. The increase in pollinators can lead to higher quality fruit and productivity per acre. This improvement in habitat will also provide a food base for additional wildlife species and may increase populations of other beneficial insects, reducing the need for pesticides. By implementing such practices and observing the favorable responses, agricultural production can be efficiently increased while decreasing its detrimental effects on the surrounding environment.

Improving Soil and Water Quality through Conservation Practices

Soil quality refers to a soil's ability to perform specific ecological functions, including sustaining biological activity and diversity, water storage, filtering/buffering to change, and nutrient storage and cycling (Seybold, 1999). The rate of soil loss due to agriculture is much greater than that of soil formation (Fig. 1). Some conservation practices that address soil quality:

• Tilling on the contour reduces slope length by creating buffers of vegetation perpendicular to flow paths, to catch water and sediments.

• Intercropping reduces the area of soil that is exposed to water and wind erosion (A. Sigler, personal communication, 2010). Alternating rows of cereals and legumes enhances soil structure and increases water storage by reducing evapotranspiration and contributing organic matter.

• Crop rotations can enhance soil structure by alternating shallow rooting crops with deep rooting crops. Deep rooting legumes such as alfalfa can aid in breaking up otherwise compacted soil, increasing water infiltration, and replenishing nitrogen when used as a green manure.

• The use of pulse crops can increase the quality of the soil by protecting it from degradation. In addition, total nitrogen and available water increases slightly in a pulse crop system compared to a low till system (Miller, 2001).

• Reduced tilling decreases soil compaction, allowing roots to penetrate deeper into the soil profile. This subsequently encourages the development of soil structure that is more conducive to increasing the water holding capacity of the soil as well as enabling greater nutrient uptake by crops (Shamsabadi, 2008).

Decreased loss of soil and nutrients by erosion and leaching will increase water quality and decrease overall cost of inputs and soil maintenance. These methods allow the producer to continue to protect the agricultural lands from further degradation while progressively increasing production.

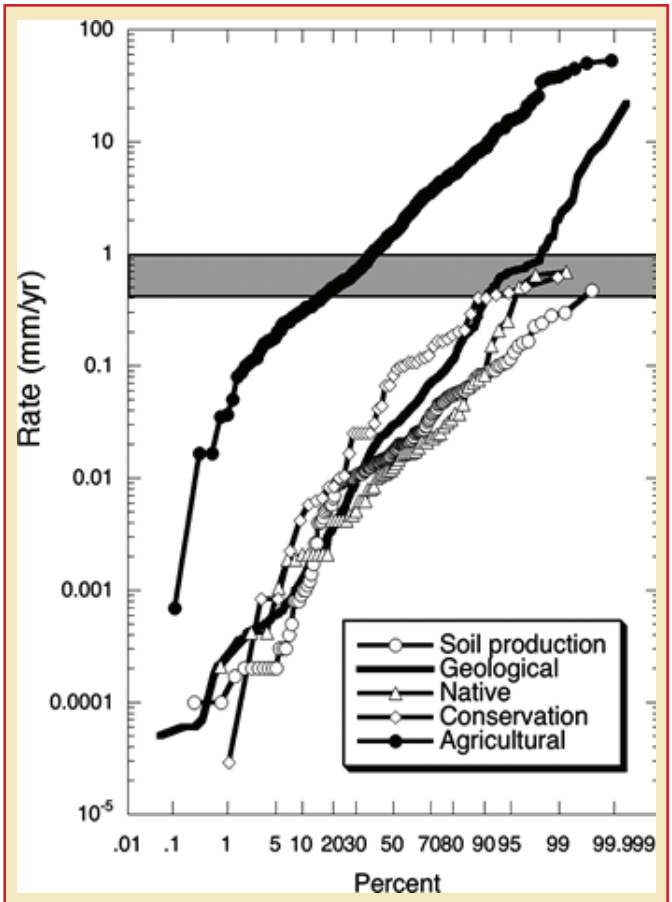

Figure 1.
Probability plots of rates of soil erosion from agricultural fields under conventional (e.g., tillage) and conservation agriculture (e.g., terracing and no-till methods), with erosion rates from areas and plots under native vegetation, rates of soil production, and geologic rates of erosion (Montgomery, 2007).

Variable Rate Fertilization

Enhancements that limit the amount of nutrients that are applied to crops prevent excess nutrient runoff into water bodies.

For example, precision agriculture nutrient application is a farming management concept based on observing and responding to field variations. It relies on new technologies like satellite imagery, information technology, and geospatial tools. It requires that farmers locate precisely themselves in a field using satellite positioning system like GPS.

Water Quality and Fish Health

Water quality is critical to fish health. Water draining from agricultural lands into surrounding water bodies can cause a buildup of toxins and cause reproductive and developmental problems in fish (Fish and Wildlife, 2011). A significant proportion of a poorly timed nitrogen fertilizer applications can be lost via leaching and runoff before the target crop has a chance to use it (Lory and Cromley, 2006). Once in a stream, nitrogen can become a dissolved gas that becomes problematic if its levels are above 110 percent (Swann, 2011). Gas bubble disease is a symptom of gas super saturation. The signs of gas bubble disease can vary, bubbles may reach the heart or brain, and fish die without any visible external signs. Ammonia, a form of nitrogen in the gas phase, may pollute rivers and can be of agricultural origin, like excess fertilizers and livestock waste (Svobodova, 1999). Molecular ammonia (NH3) can readily diffuse across the tissue barriers where a concentration gradient exists, and can be toxic to fish at high enough levels, affecting their brains (Swann, 2011). Improving nitrogen management improves both water quality and the effectiveness of fertilizer nitrogen for meeting agronomic goals (Lory and Cromley, 2006).

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Minimizing Fertilizer Runoff

The first step to improving nitrogen use efficiency (NUE) is to refine the rates of fertilization (Nelson et al., 2008). This can be accomplished through both timing of fertilization and enhanced efficiency fertilizers (EEFs). EEFs can be either controlled release fertilizers, or nitrification and urease inhibitors. Controlled release fertilizers have a polyurethane coating that allows moisture to dissolve the fertilizer granule, but contains it instead of releasing it all at once.

Nitrification inhibitors constrain the oxidation of ammonium to nitrate, slowing down the natural nitrogen cycle that occurs in the soil. Urease inhibitors are coated on urea fertilizer (46-0-0 NPK) to decrease nitrogen volatilization, the release of nitrogen to the atmosphere.

Additionally, altering fertilizer application timing by, for example, applying two additional fertilizer applications throughout the growing season, can decrease the amount of nitrogen lost through leaching or volatilization, and can result in an increased NUE.

Pesticides and Water Quality

There are also water quality concerns regarding the use of pesticides in agriculture. One herbicide used widely in agriculture is glyphosate. It is a broad spectrum, non-selective, systemic herbicide that works by inhibiting enzyme activity responsible for plant protein synthesis (Schuette, 1998). Several studies indicate that glyphosate can have deleterious effects on aquatic organisms (Folmar et al., 1979), and potentially on human cells as well. However, glyphosate is thought to rarely leach into water systems due to high soil adsorption (Richard et al., 2005).

Several CSP enhancements focus on preserving water quality and limiting the loss of agricultural inputs into water systems, but under CSP no monitoring is required to determine whether practices are actually effective. The lack of monitoring is one aspect of CSP that should be addressed in the 2012 Farm Bill.

Photo by Neil Mauws

Conservation Incentives Balanced with Spending Cuts

Currently, the CSP is threatened to receive drastic funding cuts. When the CSP was enacted, Congress placed a ten-year funding cap on the program. With the 2012 Farm Bill currently being written under a tough economic and fiscally scarce time, funding for conservation efforts will likely be slashed. Some individuals suggest allocating the money used for commodity price support payments and subsidies and putting it towards programs like the CSP. However, on November 15, 2011, House and Senate negotiators reached a compromise deal on a fiscal year 2012 appropriations bill (H.R. 2112) that includes the agriculture appropriations bill. The FY 2012 bill cuts more than $927 million from farm bill mandatory conservation. Conservation and renewable energy were the primary farm bill mandatory programs cut, and crop insurance and export and commodity subsidies were left relatively unscathed. The CSP received a large cut in its spending, totaling $75.5 million, roughly 9% relative to its FY 2012 Farm Bill-mandated level. This large cut may reduce the size of the 2012 CSP sign-up by more than 30% (Wasson, 2011).

Recommendations

• Continued funding of the Conservation Stewardship Program

Programs like the Farm Bill encourage producers to implement conservation practices that will enable their lands to be productive for many years. Without the use of such programs as the CSP, the degradation of agriculture lands will likely continue, potentially leading to reduction in productivity as well as impairing air and water quality.With the continued implementation of conservation practices, we can both maintain the integrity of the landscape and work towards domestic and international food security. With the CSP, American farmers can implement conservation programs that will lead us towards a sustainable agriculture system and a secure food supply.

• Simplify landowner interface and use

While the CSP offers benefits and opportunities to concerned landowners and producers, it is not a perfect system. One of the main drawbacks is that recommended enhancements change every year, making it unpredictable for farmers. Some feel the difficulty and volume of paperwork necessary for the sign-up is not worth the result. If stronger priorities were established and the CSP was made more 'user friendly', CSP could become a more effective tool to increase the use of conservation practices.

• Fund monitoring practices to evaluate conservation methods

By providing a means to monitor the results of conservation methods, we can more effectively address problems that arise from the effects of agricultural production. Being so committed to conservation is encouraging; it shows a significant interest to improve agricultural practices for continued production. Supporting the CSP is one way to reach that goal.

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