

PROMOTING SOIL CONSERVATION AND CONSERVATION AGRICULTURE THROUGH FARMER ASSOCIATIONS

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Abstract

Farmers are central players in the promotion of soil conservation and conservation agriculture. In South, Central and North America, farmers have organized into associations to promote conservation agriculture and improve the management of soil, water and air. Two such organizations, the Confederation of American Associations for a Sustainable Agriculture (CAAPAS) and the Soil Conservation Council of Canada (SCCC) developed independent of each other, but now network with the objectives of enlarging this network into a global organization, so that all producers can learn from each other's conservation achievements.

Two case studies are presented. The first describes the remarkable successes of the CAAPAS network for promotion of no till agriculture for improved productivity, competitiveness, and sustainability in several Latin American countries. The second demonstrates how Canadian producers have organized into an effective, national soil conservation organization that is now working with government, policy makers and scientists to develop conservation agriculture into an effective strategy for the promotion of soil conservation and sequestration of soil carbon.

Additional Keywords: carbon sequestration, farmer associations

Introduction

Most farmers by nature are stewards of the land. Farmers make their homes and raise families on the land which provides them with economic return and social livelihood. Their desire to live and work in a clean environment results in a close relationship with the soil, water, air, and wildlife associated with their farming operations. It is common that farmers develop social groups and discuss their operations, and the general business of farming. In this way new techniques are learned and passed on among farmers in an unregulated form of information extension. When more knowledge of farming practices was desired, scientific experimentation was developed and the results passed back to the farmers for implementation. However, the value of on-farm innovation and local knowledge of farm operations remained vital, and in many cases influenced research and led to new kinds of experiments.

Agricultural intensification and mechanization took place in North and South America at different times and at different rates. In the course of time, many grasslands and forested lands were converted into a plough based agriculture. This was a natural response to the increased demand for cereal grain and other agricultural products. Progressively, however, the process resulted in more and more power being made available for ploughing and cultivating the soil. This has resulted in the eventual deterioration of soil quality that has become increasingly evident.

The first farmer associations for conservation agriculture began to appear in the early 1930's in response to massive evidence of land degradation and drought. However, these concepts soon spread to other parts of North, Central and South America, but often without sharing information among the groups because of poor communication facilities.

The Confederation of Agricultural Producers for Sustainable Agriculture (CAAPAS); Progress in South America

By the beginning of the 1900's, farmers in different South American countries clearly recognized that intensification and the expansion of agricultural activities based on conventional tillage (plough and disk harrow) were the main causes of soil and agro-ecosystem degradation. The main problems were soil erosion, deterioration of soil structure, and depletion of soil fertility. Crop productivity was declining, and coincidentally, significant increases of fertilizers and other inputs were being applied in an attempt to restore the productivity of the degraded agro-ecosystems. Improved techniques of tillage and planting were necessary otherwise farmers risked bankruptcy as the soil resource deteriorated (Peiretti, 2001b). However, to achieve this, farmers had to change their opinion on what constitutes good agriculture and how to better relate to their agro-ecosystems. As a result, a group of farmers from several South American countries founded CAAPAS, on March the 26, 1992, during the "First Inter

American No Till Congress" organized by AAPRESID (Argentinean No Till Farmers Association). From the beginning, no-till farming was the cohesive force among the members, and a new farming model, named the MOSHPA (Modern Sustainable High Productive Agriculture) model, was developed through farmer experimentation. The main concept is producing with nature while working within the existing markets, thus requiring a high degree of knowledge, close association with the soil, and respect for the environment. The objectives are to improve productivity, profitability and competitiveness in the short term, within a production system that improves the quality of the soil in the medium and long term (Peiretti, 2001a; Trebugge, 2001). These objectives fit well into the paradigm of no till. Initially, much of the work proceeded on the basis of observational information gathered from existing members, with CAAPAS as a facilitating organization and a permanent discussion forum. The annual meetings, involving both farmers and local scientists, are opportunities to discuss problems, evolve solutions, and promote faster development and adoption of the no till farming systems. The expanding membership of the CAAPAS organization is clear evidence of the usefulness of the organization to its farmer members.

The number of hectares covered by no till in American countries associated to CAAPAS, had grown more than five fold during the last ten years, from approximately 10 million hectares to more than 50 million hectares. This represents approximately 75% of the area covered by no till worldwide. Most of this is due to the collective action of farmer and farmer associations, supported by national scientific institutions. However, much still remains to be done. Soil degradation is still prevalent over large areas of the world, and thus the achievements to date are viewed as the launching pad for greater efforts in the future. No till, crop rotations, improved fertilization, and integrated pest management are fundamental to mitigate soil degradation and improved environmental performance, and greater efforts must be made to spread these technologies world wide.

The Adoption of No Till in Argentina

Soil erosion and degradation became widespread problems in Argentina by the middle of the last century (Casas, 1997; Buschiazzo and Aimar, 1998). Argentine farmers were urgently searching for solutions, and traditional approaches to erosion control were not producing the results they wanted. The objectives had to be to control erosion, but also to improve productivity and increase profits. With these objectives, the farmers began to examine and experiment with no till, with backstopping from soil scientists. The first trials started in the 1970's, and within 20 years, the adoption jumped from a few thousand hectares, to more than sixteen millions hectares. This accounts for about 65 % of the Argentine grain cropped area (Figure 1.)

The rapid rate of adoption of no till in Argentina (similar successes have been achieved in Brazil, Paraguay, Uruguay and other countries), is due in no small part to the intimate involvement of farmers in the development of the technologies, including the design of experiments. As a result, the upscaling was supported by groups of dedicated, highly motivated and innovative farmers, providing information the farmers trusted. AAPRESID, Argentine No Till Farmers Association, grew up from this, but similar farmer associations were being formed in

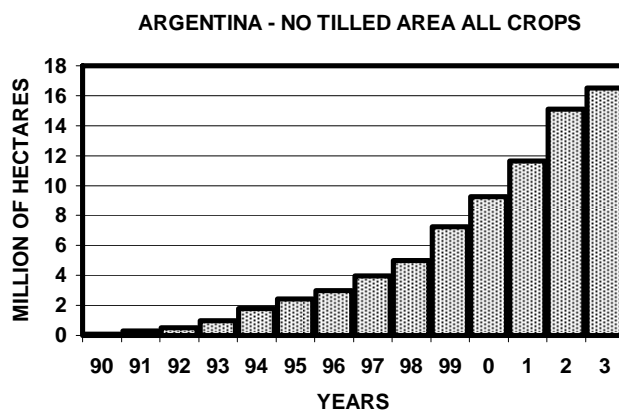


Figure 1. Adoption of No Till in Argentina

neighboring countries in South America. Eventually, these were brought together to form CAAPAS (Peiretti, 2003). This revolution in soil cultivation, based on no till technologies, is the single most significant event in soil conservation in the history of Argentina.

Improvement in Soil Quality with No Till

The introduction of no-till results in improved soil physical characteristics, such as aggregation, bulk density, etc., as well as improved soil pH, nitrogen and phosphorous levels. From work of Rossel, 1990; Landriscini, 1997; Aguilera, et al., 1999, and others, the pH of the soil at all depths under no till is closer to neutral than with conventional tillage. This may be due to the increased organic matter and its buffering capacity. Also, organic carbon and soil organic matter increase in the surface layers, and total nitrogen shows a clear tendency to be higher in the no tilled situation. In addition, the nitrogen efficiency ratio (kilograms grain per kilogram nitrogen applied) is regularly higher for no till than for conventional tillage. In most of the cases, there are improved levels of soil phosphorus in the upper parts of the soil, which may be due to improved mycorrhizal activity (Wright, 1998).

No till results over time in the formation of a surface mulch which is high in plant nutrients, but which also protects the soil from erosion, and shelters and feeds the micro and meso flora and fauna which thrive in these conditions. This increases the agrobiodiversity and the soil biotic load. Generally, the longer the soil is under no till the more healthy and more productive the agroecosystem becomes. Erosion and soil deterioration disappear, fertility and productivity improves, water quality improves, and wildlife habitats for nesting birds, rodents, etc. improve. At the same time, higher production is achieved with less inputs, resulting in higher profit margins. No till is a classic “win-win” situation for agriculture and the environment.

The Evolution of the Soil Conservation Movement in Canada

In the early years following conversion of native lands to agriculture, soil tillage with the plough and disk harrow, caused few problems as the level of soil organic matter and the inherent soil fertility was sufficient to mitigate yield declines due to erosion. However, with mechanization, larger tractors, and as field sizes became larger, the increasing intensive soil tillage became more destructive, with the oxidation of soil organic matter, depletion of soil fertility, and increased soil erosion.

Farmers and scientists noticed these problems long before they became serious. A report on soil fertility in a Dominion of Canada Department of Agriculture Bulletin No. 23 (Shutt, 1923) indicated that a potential problem was occurring. However Shutt's warning went unheeded as the Canadian government rapidly moved forward to settle the prairies. The intensive tillage that was practiced ultimately resulted in severe loss of organic matter and soil erosion. By the 1980's farmers were forming self-help groups for community action and information exchange in attempts to reverse the trends. Groups such as the Warner-Dryland Salinity Control Association in Alberta, the Manitoba North Dakota Zero Tillage Farmers' Association, the Huron Soil and Water Conservation District in Ontario, and Soil and Crop Improvement Associations are typical of local bodies that were established as farmers looked for appropriate solutions to degradation problems (Sparrow, 1984).

In 1984 the Standing Senate Committee on Agriculture, Fisheries and Forestry was authorized to examine soil and water conservation in Canada. The extensive study that resulted concluded there was an urgent need to develop programs to promote soil and water conservation across Canada, and the Soil Conservation Council of Canada was formed in 1987 as a result. The Council has been actively involved in the design and delivery of the National Soil Conservation Program and the Sustainable Agriculture Component of the Federal Green Plan. While much of the work done by the council has focused on national issues, it has worked closely with regional and provincial organizations to help organize conservation efforts.

Climate Change, Global Warming and Conservation Agriculture

Canada has ratified the Kyoto Protocol, and it is committed to reduce GHG emissions to 6% below its 1990 levels. The Government has created a Climate Change Secretariat, which in turn has developed a process to assess climate change mitigation options, and also has initiated a \$500 M Action Plan 2000 on Climate Change (AP-2000). Under AP-2000, Agriculture and Agri-Food Canada (AAFC) received \$33 million over five years for programs to address agricultural emissions of GHGs. Of this amount \$21 million was allocated to the Greenhouse Gas Mitigation Program for Canadian Agriculture (GHGMP) to address agricultural GHG emission reduction in the areas of soil, nutrient, and livestock management. The program is a "get started" initiative to contribute towards the goal of reducing agricultural GHG emissions during the Kyoto commitment period of 2008-2012.

Agriculture and forestry are unique components of Action Plan 2000 since both have the potential to remove carbon dioxide from the atmosphere. About seven percent of Canada's land mass supports agriculture and the agriculture industry accounts for about 10% of Canada's GHG emissions. Unlike other sectors, these emissions are almost completely from non-energy sources eg. nitrous oxides from fertilizers, and manure and methane from livestock account for 96% of agricultural emissions.

Canadian Producer Groups Demonstrate Climate Change Beneficial Management Practices

Farmer associations in Canada have been active in promoting soil conservation practices for many years, and their actions have been recognized by Canada's policy makers in developing the measures to be undertaken through Action Plan 2000.

The most recent initiative of the Soil Conservation Council of Canada (SCCC) is helping deliver the Greenhouse Gas Mitigation Program for Canadian Agriculture (GHGMP), a five-year producer directed program to promote beneficial management practices aimed at mitigating the effects of greenhouse gas emissions. The adoption of good soil husbandry, including no till, improves the capacity of soils to retain or absorb CO₂.

The main objective under this program is to conduct demonstrations of Beneficial Management Practices (BMPs) that contribute to the reduction or removal of greenhouse gasses. Examples of soil management BMPs include no-till seeding, reduced fallow, planting perennial forages on marginal land, and shelterbelt establishment. Nutrient Management BMPs include improved timing and placement of fertilizers and manure, improving soil quality and the use of novel fertilizer formulations, i.e. slow release, urease inhibitors. Through these awareness activities it is expected farmers will see the benefits of the practices and adopt them into their operations. As most of the BMPs promoted are also good conservation practices, the benefits of soil and water conservation and economic implications are also emphasized. A second objective is to collect scientific data from the program to measure GHG emissions and verify the effectiveness of the proposed practices.

The Soil Conservation Council of Canada was one of several producer groups selected to deliver the program, in their case because of their nation wide network of producer directed conservation organizations. This network is the key to the successful delivery of this national agriculture program. Each provincial producer organization is given the task of creating a "Taking Charge" team that would conduct the GHGMP demonstrations in their province. Teams are put together with members from the key provincial producer conservation organizations, provincial government representatives, federal and university scientists, and other representatives from key livestock organizations or other agriculture groups. The teams are given budgets, based on the national inventory of emissions for Canada. The teams are asked to develop workplans and yearly cash flow projections that are reviewed, modified, and approved by the SCCC. Contracts are drawn up between a legal organization in each province and SCCC to enable handling of funds at the local level.

Over 1500 on-farm demonstrations are planned in the various regions of Canada to demonstrate BMPs that can potentially reduce GHGs and sequester soil carbon. Also during the program, over 470 meetings and workshops are planned to discuss program results and raise awareness of the proposed practices as effective conservation agriculture strategies as well as climate change BMPs. In addition, over 270 communication packages will be developed such as; exhibits, fact sheets, news articles and training manuals. In total it is expected that over 22000 producers will be exposed to climate change BMPs, and hopefully with concurrent adoption.

Provincial Taking Charge teams initiated their workplans by conducting preliminary field tours of a few existing BMP demonstrations in 2002. In the spring of 2003, the teams initiated the first nation-wide, on-farm demonstrations of climate change BMPs. During 2003, approximately 550 demonstrations were conducted with an estimate of 6900 producers attending tours and field days. During the 2003-04, approximately 147 communication events will be held with over 12,000 producers attending. In addition, approximately 80 communication packages will have been delivered throughout 2003-04.

The initial success of the GHGMP shows that producer directed extension programs are effective and cost-efficient for encouraging adoption of new conservation farming practices. More than anything, producers trust the information from other producers. However, when this information is supported by scientific research, the rate of uptake and adoption at the farm level is much higher. Data are not yet available to support this claim; however the anecdotal evidence from field coordinators working with producers indicates a high level of interest at the farm level for proposed BMPs.

Conclusions

It is clear that agriculture significantly impacts on the environment. As farmers have developed technologies to feed an ever increasing world population, they have also learned about their interactions with the environment. The case studies provide examples of how farmers and their associations have evolved to address land stewardship. In both cases farmers, over many years, became concerned that their farming practices were not environmentally or economically sustainable, and formed self-help groups to initiate and lead actions. With the leadership of farmers, but always with technical backstopping from the scientific community, BMP practices were developed in response to their concerns. Because of the guidance and vetting from farmer associations, the practices were successful in maintaining the goals of increasing productivity, enhancing the environment, and improving competitiveness in a global market. It is interesting to note that the evolution of conservation agriculture in North, Central and South America occurred in parallel but in virtual isolation of each other's knowledge and activities. Regardless, it is encouraging that both groups have reached similar stages in development, promote similar technologies based on many years of experience, and are now being merged into an international farmer association for conservation agriculture. This clearly illustrates that farmers can be mobilized through their associations, and become significant players in assuring global food security and global environmental management.

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