

## Policy and Program Response to Land Management Issues

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The major policies and programs that influenced soil conservation activity on the Canadian Prairies and eventually led to the universal adoption of conservation tillage and direct seeding are identified and discussed in this paper. Generally the policy focus was on the broader issue of soil conservation and the programs contained the elements which more directly focused on conservation tillage and direct seeding. Both will be discussed within the timeframe of the last eight decades.

From an economic policy perspective, it was not a case of domestic policy dictating minimum till or direct seeding but policy that drove the bottom line on farm operations indirectly causing the need for change in on-farm production systems. In contrast domestic environmental policy was more direct and thus more identifiable. Environmental policy clearly targeted soil conservation, signifying government attention and funding levels which were most typically correlated with significant drought events. Economic policies drove the practice change, while the awareness was created by environmental policy with significant climatic events being the catalyst. The policy chronology is continuously expanded where the programming efforts of on the ground activity occurred. Certainly program design was important, but implementation factors such as government resource levels, existence of partnerships, credibility and persistence of extension staff or other programs were critical to the overall success of technology adoption.

The origins of the soil conservation debate in Western Canada can be traced back to 1857 when Captain John Palliser was required to report upon the geology of the region and the nature of its soil, its capacity for agriculture, the quantity and quality of its timber and any indications of coal or other minerals. Most notably, in terms of soils and agriculture, he defined the Palliser Triangle as a desert. Palliser's observations were quite different to those of John Macoun, who in 1882 concluded in his book "Manitoba and the Great North West", that the area was favorable for agriculture but noted a scarcity of water. Seemingly these different assessments were the first attempt at describing Prairie Canada's drought cycles.

Within this context the government of John A. MacDonald pursued a settlement policy in the late 1800s which set in motion an annual cropping agriculture (a wheat monoculture) based on European agronomy. In reality this became the underpinning of soil conservation efforts for the next century. Annual cropping agriculture rapidly transformed the landscape. In 1934, after eight years of falling grain prices, unrelenting drought, severe wind erosion, and the resulting wide scale abandonment of farms, the Bennett Government set up a committee to study the situation and make recommendations. This led to a critical policy step when Royal Assent was given to the *Prairie Farm Rehabilitation Act* on April 17, 1935. The Act covered a 4 to 5 year period and had an initial appropriation of approximately five million dollars. By 1937, the need for a permanent organization had become apparent and the PFRA legislation was extended.

The summer of 1937 saw the most severe drought in the history of the West and resulted in the policy decision that the most erosion-prone lands could only be stabilized and protected with permanent cover. Beginning in 1938, large tracts of eroded or abandoned land were directly seeded with crested wheatgrass to convert it to livestock production under what has become known as the Community Pasture Program (CPP).

By 1939, even though it was believed that the menace of soil drifting was largely under control, PFRA's financial appropriations were increased, and the five-year limitation in the Act was removed. In the early years, PFRA was little more than an extension of the Experimental Farm system. In fact, the two worked hand in hand. L.B. Thomson was named Superintendent of the Swift Current Experimental Farm in 1935 and in 1948 he assumed the role of PFRA's second Director General, a position he held until his death in 1956. L.B. Thomson could ignite enthusiasm in farm audiences and instil them with hope and confidence that their livelihood could be saved. He believed in taking the fruits of modern science to the farms and showing the farmers how to use them; the approach PFRA perfected.

Coupled with policy decisions to establish institutions to deal with soil conservation were other market factors which in turn guided producers to the new production systems which incorporated minimum till and direct seeding. The energy crisis of the 1970s was a motivation to use less energy and it led to concerns over declining natural resources such as soil. Farmers started to look seriously at ways of reducing fuel use and adopting conservation measures. In 1974, Monsanto introduced the broad spectrum herbicide Roundup (glyphosate) that controlled a wide range of weeds. Farmers were able to substitute herbicides for one or two tillage passes, which would reduce both wind and water erosion while also reducing fuel costs. The price of Roundup started to decline in the 1990s as the patent expiry date approached in 2000. This was one of the factors that led to the increased adoption of direct seeding. The role that glyphosate and other herbicides have played in the adoption of soil conservation practices is best described as one of facilitation, rather than specifically leading or following the trend of soil conservation. However, Monsanto did actively promote the agronomic and economic benefits of zero and minimum tillage systems and the role that Roundup played in those systems in the late 1990s

In the late 1970s and early 1980s farms were specializing as well as increasing in size. The larger fields and intensive tillage was contributing to increased soil degradation. The larger farms pursued ways of reducing the amount of labour required for conventional tillage systems and some started looking at one pass or direct seeding systems. However, many of the early attempts were unsuccessful due to inadequate seeding equipment, methods for handling crop residues, and fertilizer placement. Many of the early adopters of this period became leaders in modifying seeding equipment and promoting the adoption of direct seeding in the 1990s.

There are some tenuous and indirect links between the Canadian Wheat Board's (CWB) marketing decisions and the adoption of soil conservation practices in western Canada as well. Some suggest if the CWB had increased efforts in marketing winter wheat it is likely there would be more acres grown with its superior conservation benefits. Some would also argue the CWB's delivery quota system and the way summerfallow acreage was handled throughout the time period in question retarded the adoption of continuous cropping. Another discussion revolves around pulse crops and the CWB's influence on allocation of system capacity. In conclusion,

however, CWB policy was mostly reactive and it is hard to document that the CWB policies were as influencing as many suggest.

The realization that change was a necessity, agronomically as well as economically, fed into continued institutional developments. With the recurring droughts of 1977, 1980 and 1981, PFRA began to revitalize its historic soil conservation role with the establishment of a long term, holistic planning and policy approach for soil and water conservation under the leadership of Dr. Harry Hill. After a period within the Department of Regional Economic Expansion, in 1982 PFRA returned to the Department of Agriculture and in 1983 published the ground breaking report entitled, "Land Degradation and Soil Conservation Issues on the Canadian Prairies". Wind and water erosion, salinity and declining organic matter were identified as the major soil degradation issues. The report identified that the farming practices of bare fallowing and intensive tillage on the prairies led to the inefficient use of soil moisture and the practices increased soil erosion, organic matter decline and increased salinity. PFRA recommended that the most effective methods of conserving soil moisture for crop use was through snow management, trash cover, minimum or zero tillage systems and reduction in summerfallow.

In 1984 the Honourable H.O. Sparrow chaired the Senate Standing Committee on Agriculture, Fisheries and Forestry which examined the issue of soil degradation. The recommendations in the report, "Soil at Risk - Canada's Eroding Future" brought the issues of soil degradation and conservation before the general public. The report made 20 recommendations, including; "That a comprehensive federal soil and water conservation policy for Canada be developed and adopted immediately." The report also identified the need to provide technical assistance and financial incentives to farmers, through federal-provincial agreements, to defray the costs of conservation practices. The Sparrow report in conjunction with soil science research, the PFRA report, and other reports (Science Council of Canada) resulted in soil conservation funding under the Economic Regional Development Agreements (ERDA) with the provinces.

PFRA Soil Conservationists implemented the ERDA funding through local conservation groups to enable farmers to try new practices on a single field. Despite relatively low adoption up to that point conservation tillage quickly became the most popular practice, particularly conservation fallow. The price of Roundup was too high for wide scale adoption over the entire farm, but the ERDA funds gave farmers the opportunity to gain experience and knowledge with this practice by using it on one or two fields each year. At the same time obstacles which constrained low disturbance direct seeding were addressed, such as the inability of seeding equipment to clear crop residue and accurately place seed and fertilizer. While the first machines tried by farmers under ERDA were heavy with high draft requirements, these demonstrations helped lay the foundation for developing improved no till seeding technology.

During the four field seasons under ERDA (1985 to 1988) the number of groups and producers receiving incentives steadily increased and built momentum for the next round of programming. The soil conservation accords and agreements in 1989 resulted in the National Soil Conservation Program (NSCP) which funded practices similar to those under ERDA, but the delivery model changed slightly. Resources were provided for delivery groups to hire a technician to deliver the program at the local level. PFRA Soil Conservationists were responsible for managing the funds for a number of groups within larger regions in each province. As with ERDA, conservation

tillage was the most popular practice under NSCP. Conservation fallow was still dominant, but starting in 1990 the number of low disturbance seeding projects started increasing as new air seeders and air drills started coming on the market.

PFRA started allocating a portion of these funding programs to support provincial and national producer groups. These included the Soil Conservation Council of Canada (SCCC), Saskatchewan Soil Conservation Association (SSCA), Manitoba-North Dakota Zero Tillage Farmers Association (ManDak), Alberta Conservation Tillage Association (ACTS), Reduced Tillage Linkages (RTL), the Eastern Canada Soil and Water Conservation Centre (ECSWCC), and others. In the Prairies the groups conducted awareness, extension, and demonstration projects for conservation tillage through workshops and field days; some with attendance of over 1000 in the mid 1990's.

As the conservation tillage revolution was gaining momentum, there was an increasing awareness of broader environmental issues linked to agriculture, such as water quality, greenhouse gases (GHG), and biodiversity. Recognition of broader agri-environmental issues was reflected in subsequent programming; Green Plan, National Soil and Water Conservation Program (NSWCP), Agri-Food Innovation Fund (AFIF) in Saskatchewan, Canadian Adaptation and Rural Development (CARD) fund, and the Greenhouse Gas Mitigation Program (GHGMP). In general the programs that followed Green Plan did not provide money for direct producer incentives, but did support conservation tillage through specific applied research projects, watershed based initiatives, or support to provincial or national producer groups.

Under the Agriculture Policy Framework (2004 to 2008), the concept of Environmental Farm Planning (EFP) resulted in a new approach. Integral with EFP was the establishment of the National Farm Stewardship Program (NFSP) whereby producers could receive cost-share funding to implement Beneficial Management Practices (BMPs) such as conservation tillage through equipment modifications or enhancements.

In addition to program funding, PFRA also conducted a number of studies to better understand issues associated with conservation tillage adoption. For example, through a multi-year Saskatchewan wide survey in the mid 1990s, PFRA was able to provide evidence for the accuracy and credibility of the tillage data in the Agriculture Census, which is used in many situations for policy and program analysis and development, such as the National Agri-Environmental Health Analysis and Reporting Program (NAHARP) and the National Soil Carbon and Greenhouse Gas Accounting and Verification System (NCGAVS). In 2005, PFRA conducted an extensive series of meetings with no till producers to identify constraints and potential opportunities for further conservation tillage adoption across Canada. Some key findings were that no till may not be adaptable to some specialized cropping systems or regions, and that even successful no till producers require flexibility for periodic discretionary tillage. One example is the need to use tillage to repair wheel ruts resulting from poor trafficability under wet soil conditions.

The widespread adoption of conservation tillage is indisputable. This adoption is the result of various policy / program initiatives, technological developments, and economic / social forces influencing this trend simultaneously. Conservation tillage is closely linked with a number of

other beneficial crop and soil management practices such as diverse crop rotations, reduced fallow, and more effective weed, nutrient, moisture and crop residue management. A number of specific economic benefits for producers associated with conservation tillage include reduced labour, reduced energy consumption, improved crop yields, improved soil productivity, and higher fertilizer efficiency. Environmental benefits associated with conservation tillage include reduced soil erosion, reduced GHG emissions through increased soil organic matter, and in some cases increased biodiversity and improved water quality.

Overall adoption trends of conservation tillage and some other closely associated practices demonstrate:

- The rate of no till seeding has increased dramatically from < 15% in all ecozones in 1991, to 61% in the brown and dark brown soil zones of the prairies, about 45% for black soils, 40% for gray soils, and 26% in the mixed wood plains (southern Ontario /Quebec) by 2006.
- Similarly the rate of herbicide only fallow (chemfallow) has increased from <5% to 13, 24, 41, and 52% in the gray, black, dark brown, and brown soil zones, respectively, over the same time period.
- The practice of reduced till, which is a transition between conventional tillage and no till, has remained fairly constant around 30% since 1991.
- The amount of land in fallow has been declining since 1971, but the largest decline in the brown and dark brown soil zones has occurred after 1991 when no till seeding started to increase.
- The increased adoption of conservation tillage on the prairies has been accompanied by increased crop diversification with oilseeds and pulses. While increased crop diversification began before conservation tillage, diversification after 1991 has been more pronounced with pulses on brown and dark brown soils, and oilseeds on dark brown soils.

In summary, there appears to be about a six year lag time between when conservation tillage programming began to directly impact producers (1985) and when adoption began increasing dramatically (1991).

A lot has been accomplished already but there is much more to do. Initial research on conservation tillage focused on soil conservation benefits but in the past fifteen years the emphasis has been more on greenhouse gas (GHG) removals through soil carbon sequestration. AAFC, including PFRA, has been involved in a number of initiatives related to development of carbon credits for offset markets from conservation tillage. However, considerable challenges still remain in the development of a nationally recognized carbon credit system for conservation tillage and other beneficial agricultural practices.

Environmental Goods and Services (EG&S) has received considerable attention as a future policy and programming instrument, and conservation tillage has been included with a number of other BMPs as possible candidates for inclusion. There are considerable similarities in the policy debate between EG&S and carbon credits, with both having some common challenges.

Despite the rapid and high adoption rate of conservation tillage, a recent study by PFRA identifies a number of constraints that may prevent adoption in some regions and specific cropping systems. Researchers, program technicians and policy makers will have to be vigilant in watching for opportunities to address these ongoing constraints and at the same time recognizing the producer needs for flexibility and adaptation as they manage conservation tillage systems in an ever changing environment.

Are yesterday's institutions up for the challenge? After 73 years of working with Canadian producers, PFRA began the process of evolving into a new Branch of AAFC in January 2008. The PFRA & Environment Branch is an amalgamation of PFRA, the National Land and Water Information Service (NLWIS), the Agri-Environmental Policy Bureau, and the land resource specialists from Research Branch. This reorganization has transformed the original Prairie focused PFRA into a national branch within AAFC. How this will augment the culture of PFRA and provide for future contributions to soil conservation efforts within the Agriculture sector in the decades ahead can best be described as a work in progress.