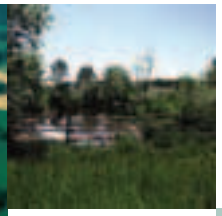
Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada
Agriculture, Food and Rural Revitalization

Saskatchewan Agri-Environmental Scan

A Preliminary Assessment of Agri-Environmental Issues for Soil, Water, Air, and Biodiversity



Canada
Government of Saskatchewan

Introduction:

A preliminary assessment of agricultural impacts on soil, air, water and biodiversity indicates that most agricultural landscapes in Saskatchewan are not at significant risk. However, while the province's agricultural sector has a strong record of environmental stewardship, there are still areas where improvements can be made to address environmental issues.

Saskatchewan producers continue to be leaders in the adoption of beneficial management practices for agriculture within Canada. Since the mid-1980s, producers have continued to adopt crop management systems involving reduced tillage, and have significantly decreased their use of summerfallow. Recent data from PFRA field surveys conducted after seeding (see Figure 1) shows that conservation seeding of both stubble and fallow fields rose dramatically, from 17 per cent to 40 per cent of surveyed sites from 1997 to 2002.

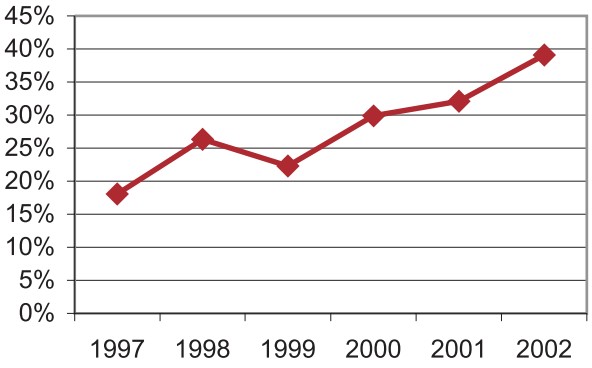


Figure 1: Percentage of fields in conservation tillage (1997-2002)

The widespread adoption of conservation tillage, conversion of marginal cropland to perennial forage (see Figure 2), and use of practices such as decreased summerfallow and improved liquid manure storage and handling systems, have gone a long way toward mitigating agricultural impacts on Saskatchewan's soil, water, air and biodiversity.

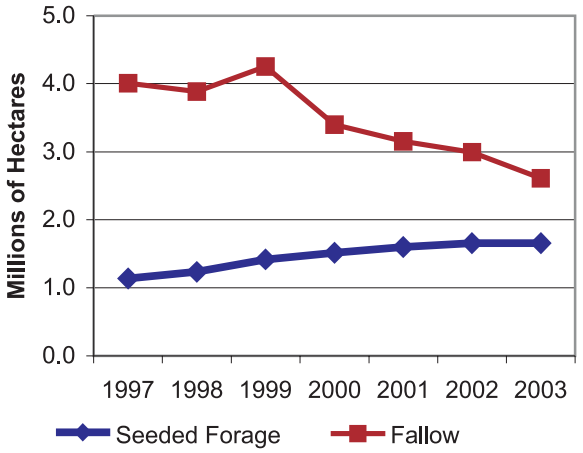


Figure 2: From 1997 to 2002, the total area of summerfallow decreased by more than 1.4 million hectares, and the area of perennial forage was increased by 0.6 million hectares.

Beyond these accomplishments, producers and society would benefit from continued attention to environmental stewardship concerns. Maintaining the sustainability of Saskatchewan's agricultural sector requires ongoing attention to the sector's environmental performance.

Scan Initiative

The objective of Saskatchewan's agri-environmental scan is to assess land resource and stewardship issues related to agricultural production in the province. The analysis also provides a scientific basis for implementing Environmental Farm Planning (EFP) and the National Farm Stewardship Program. These programs are designed to enhance the environmental sustainability of the agricultural industry and build upon the tradition of stewardship in this province.

The scan identified the potential for agricultural impacts on Saskatchewan's environment. The scan did not include quantitative measurement and monitoring of impacts.

The Saskatchewan scan is the result of a joint initiative under leadership from Agriculture and Agri-Food Canada and Saskatchewan Agriculture, Food and Rural Revitalization. Scan workshops and individual scan teams included representatives from other federal and provincial departments and agencies.

The scan process was undertaken in accordance with the National Model for Agricultural Planning for Environmental Action under the Agricultural Policy Framework. This model established priority themes of soil, water, air and biodiversity and associated key elements to be considered in the development of environmental programming.

The scan considered these key elements:

- agricultural risks to the health and supply of water resources. Priorities are nutrients, pathogens, pesticides and water conservation;
- agricultural risks to the health of soils. Priorities are soil organic matter and soil erosion caused by water, wind and tillage;
- agricultural risks to the health of air and the atmosphere. Priorities are particulate emissions, odours and greenhouse gas emissions;
- compatibility between biodiversity and agriculture. Priorities are habitat availability, species at risk and economic damage to agriculture from wildlife.

A general environmental assessment of Saskatchewan's soil, water, air and biodiversity.

Soil

An analysis of the potential for organic matter decline, wind, water and tillage erosion in Saskatchewan soils shows that these can be ranked as follows: wind erosion > tillage erosion > organic matter decline > water erosion. The Census data used for the analysis was aggregated at a very large scale and provides only a general assessment of potential impacts.

Analysis of the combined potential for erosion resulting from annual cropping indicates that approximately 44 per cent of cropland in Saskatchewan has a low risk of erosion, 43 per cent moderate and 13 per cent high potential for erosion.

Areas with the potential for rapid decline in soil organic matter are generally those with very high potential for erosion. These include soils subject to water erosion on steep slopes, or coarse textured soils subject to erosive winds.

The areas most at risk for wind erosion are soils developed from coarse textured parent materials and those where management practices result in little soil cover. The majority of such soils are located in south western Saskatchewan and along major rivers.

Areas most susceptible to water erosion are generally located in Southern Saskatchewan within the Missouri Coteau and Wood Mountain uplands and the Souris River valley.

While the analysis does not indicate any areas at high or very high risk for tillage erosion, about one third of Saskatchewan's agricultural land is at moderate risk for tillage erosion. These areas tend to coincide with glacial till deposits within hummocky landscapes.

Despite the relatively low to moderate rates of organic matter decline and erosion, ongoing efforts are required to reduce the impacts of these factors within Saskatchewan. In the long run, even low rates of organic matter decline and erosion will reduce soil productivity.

Continued adoption of soil management practices that minimize erosion rates, either by improving cropping systems or by altering land use, will also help to maintain water and air quality and conserve biodiversity.

Water

The analysis of water priorities for Saskatchewan was developed by combining information for three agri-environmental stressors (manure production, use of inorganic fertilizers and use of agro-chemicals) with data for four agri-environmental issues (potential for contamination by water erosion, and susceptibility of wetlands, streams, and groundwater within a landscape). The analysis assumes that the impact from agri-environmental stressors will occur where they coincide with landscapes that are prone to sediment transport by water erosion and have a high density of streams or wetlands or aquifers.

Based on this methodology, the analysis showed that water resources in a band of land stretching from the northwest to the south eastern portion of the grain belt has a high susceptibility to agricultural impact. There is also a significant area of high susceptibility in the southwest. The scan indicated 46 per cent of the Saskatchewan grain belt as low, 26 per cent moderate, and 28 per cent high susceptibility of water resources to impacts from agricultural practices.

Most management practices that reduce the potential for sediment transport by soil erosion, or the way in which waste materials are utilized or disposed of, will also help reduce agriculture's impact on water.

Actions that protect water sources from contaminants include: improving cropping systems by eliminating summerfallow and reducing tillage; improving how manure is stored, handled and applied; relocating livestock facilities; establishing buffer strips; and managing riparian areas more effectively.

Air

The scan identified agricultural air quality priorities as: dust from soil erosion; smoke from crop residue burning; odour from livestock production; and greenhouse gas emissions from crop and livestock production.

Areas with high potential for blowing dust coincide with areas with high potential for wind erosion. These are areas with coarse textured soils and those where management practices result in little soil cover. Even small patches of cultivated lands on these soils can produce localized dust storm events.

Management practices that reduce dust emissions include reduced tillage, direct seeding into standing stubble, establishing forage in critical erosion areas, seeding of winter cover crops and shelterbelt establishment.

Reduced numbers of "Annual Blowing Dust Days" over the past 20 years (see Figure 3) suggest that the broad adoption of soil conservation practices has significantly diminished the incidence of blowing dust from soil erosion.

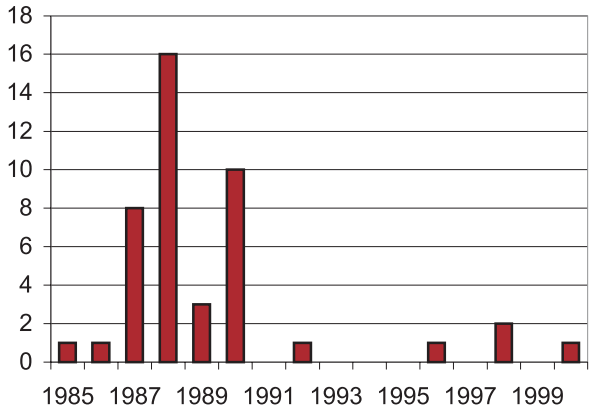


Figure 3: Blowing Dust Days, Kindersley, SK (Environment Canada)

Areas with higher priority for crop residue burning tend to coincide with regions of high residue production and flax production within the Black Soil Zone and Regina Plain. Even with a widespread reduction in crop residue burning, smoke from a single field, during poor weather conditions, may cause major health impacts. Recommended crop residue management practices include chopping and spreading straw or removing surplus residues from the field for livestock or industrial use. In situations where there is no practical alternative to burning, producers should avoid burning at night or near population centres during weather conditions that inhibit good smoke dispersal.

While odours emanating from livestock production are partially a function of management practices, the impact on air quality would tend to correlate with total animal units of intensively raised livestock across the province. Odours can be minimized by reducing exposure of manure to air during storage, handling and field application, and through building design and appropriate separation distances.

Agricultural greenhouse gas (GHG) emissions have become an important issue due to Canada's international climate change commitments. Emissions from livestock tend to coincide with cattle numbers, indicating that the southwest and northwest regions have the highest potential for methane emissions. Since cropland emissions are dominated by nitrous oxide, the normally moister areas with greater crop production and generally higher rates of nitrogen additions may have greater emissions per cropped area. This area roughly coincides with the Black Soil Zone.

Actions needed to reduce net GHG emissions include increased efficiencies in nitrogen management and energy use, improved livestock nutrition, and better manure storage and handling practices. Soil carbon sinks can be enhanced through reduced tillage, increased planting of perennial forages, decreased summerfallow and improved grazing practices.

Practices that reduce particulate emissions, odours, and GHG emissions also tend to bring increased production efficiencies.

Biodiversity

The biodiversity analysis differs from other aspects of the scan in that it focuses on habitat such as native prairie, wetlands and riparian areas, while the soil, air and water scans focus primarily on cultivated land. The definition of an agricultural landscape could thus be expanded to include those native vegetation and wetland areas outside cultivated and productive farmland that are nonetheless impacted by agricultural activities.

Because habitat availability is pivotal to conserving biodiversity, the amounts of uplands, wetlands, and watercourses were examined. Fragmentation of native upland habitat due to cultivation is an indicator of the amount of agri-environmental stress on biodiversity, and is also a measure of habitat quality. As well, the numbers of species-at-risk highlight habitats that are a priority for conservation. The amount of wildlife damage was not included in the scan because damage does not indicate the amount of biodiversity.

The composite priority analysis for biodiversity utilized four data layers for habitat availability and fragmentation, plus a layer for species-at-risk. Information was tabulated for each of the five environmental priority areas to identify whether they were low, medium or high.

The analysis indicates 27 per cent of agricultural areas to be at low priority; 27 per cent at moderate priority, and 46 per cent at

high priority for biodiversity. The amount of area within the high ratings is not surprising, given the emphasis on habitat fragmentation combined with the naturally fragmented nature of Saskatchewan's hummocky glaciated landscapes.

Areas with a mix of native habitat and cultivation have the highest biodiversity priority. These include areas like the Missouri Coteau, the Touchwood Hills and the Allan Hills that have a mosaic of land uses. In these areas, modest amounts of native grassland remain. In these highly fragmented eco-districts, a shift to or from crop production will impact the biodiversity of the area and the integrity of the existing ecosystem.

The areas rated as lower priority consist of mostly cultivated lands and have limited remaining native upland habitat, wetlands or riparian areas. However, specific natural areas within these highly cultivated lands are valuable and attempts should be made to preserve remaining habitat.

Actions that protect biodiversity include conserving existing native habitat, encouraging forage-based agriculture and improving upland, wetland and watercourse management practices. These actions are particularly important in areas where increased connectivity of native habitats will result in larger contiguous habitat patch sizes.

Next Steps:

Under the Agricultural Policy Framework (APF), Environmental Farm Planning and the National Farm Stewardship Program will provide producers with an opportunity to assess and enhance the environmental performance of their farms via completion of an environmental farm action plan. When the plans are completed, producers can then take advantage of incentives to adopt beneficial management practices that address issues specific to their farm.

This preliminary agri-environmental scan provides a general sense of the extent of issues related to soil, water, air and biodiversity, and is the first step in implementation of APF environmental programming within Saskatchewan.

The environmental priorities mentioned within this document apply to Saskatchewan only and are based on available data at the time the scan was initiated. The scan was limited by the need to use 1996 Agricultural Census Data for analysis of many of the issues. Therefore, the scan is only an initial assessment of potential impacts of agricultural practices on the environment. Additional work is underway to update the scan using the most up-to-date data.

For more information, contact:

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