Chapter 6: Preparing for Growth

Agricultural Growth Issues

The Prairie agricultural industry must find a balance between the demands of economic viability and growth and managing the land to ensure long-term resource sustainability. However, it is economic considerations which will drive demand for, and production of, primary and processed goods. World trade in agriculture and food commodities is expected to rise dramatically over the next five to ten years in response to population growth and demand for food and non-food agricultural products. The Canadian Agri-food Marketing Council has challenged primary producers, processors and governments to significantly increase Canadian agriculture and agri-food exports to 4% of the world market. Managing the socioeconomic and environmental impacts associated with increased agricultural production will be critical to the long-term expansion of Canada's agricultural industry.

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Expansion of Canada's Prairie agricultural industry is required to feed a growing world population and to capture a larger portion of global agricultural trade. It has been suggested that a significant portion of Prairie agricultural land has not reached its full productive capacity (Morrison and Kraft 1994). Increased agricultural production will require more intensive land use and improved productivity on existing crop and forage lands. However, there is a risk that more marginal lands will be brought into cultivated agricultural production. Improving landowner decision-making to match land use with land capability, as well as increasing efficiency and productivity, will be crucial to ensuring the ongoing sustainability of Prairie agriculture.

Review of Agricultural Impacts on the Resource Base

This document has highlighted the state of current Prairie land resources and emphasized the importance of proper land management in reducing the risks of environmental degradation associated with some agricultural practices. Four key resource groups have been identified:

- cultivated land
- rangeland/forage
- water quality
- riparian areas.

For each resource group, a number of potentially negative impacts and risks have been discussed, all of which could increase under conditions of agricultural expansion and growth. This report has also highlighted the many benefits of conservation farming. Both positive and negative impacts are critical in assessing agricultural growth potential.

For example, while intensification can increase production on a fixed land base, it also creates land management challenges. Intensifying livestock production on marginal lands and crop production on non-marginal lands may increase the risks for erosion, and soil and water quality degradation, as well as negatively impact wildlife habitat. Practices such as conservation tillage, precision farming, integrated pest management, and range and riparian management systems are playing an important role in reducing environmental impacts resulting from agricultural intensification (Day 1996). Continued promotion and implementation of conservation practices will be essential to ensure that long-term export capabilities in both the grain and livestock sectors are not hindered by poor land management.

Cultivated Land

The effects of erosion on crop yields and soil productivity can

be significant. Erosion removes the soil fractions that contribute to nutrient availability and a good physical environment for plant growth. Erosion depletes the soil's capacity to grow crops, increases crop yield variability within fields and causes off-farm environmental impacts such as reduced water and air quality.

Conservation tillage minimizes these impacts and can improve soil productivity. Universal adoption of reduced tillage and low disturbance seeding systems would not eliminate soil erosion, but would significantly reduce its risk. Soils will still be exposed to erosion risk after low residue crops, drought, disease, fire, or excessive straw harvesting. Permanent soil conservation practices are required to supplement crop residue management systems. Further work is needed to identify areas which are unsuitable for annual crop production. Producers in those areas should be encouraged to convert to, or maintain, appropriate land uses such as perennial forages and cattle production.

The effects of intensification on soil organic matter and soil salinity are also of concern. Improper management can reduce soil organic matter quality and quantity, causing a reduction in soil productivity. Not only is soil organic matter a vital component of the soil fabric, it also provides a valuable sink for atmospheric carbon. Since Prairie soils have the capacity to store large amounts of CO_2 as SOM, they could play an important role in off-setting greenhouse gas emissions through carbon sequestration.

Better range management would reduce erosion potential, create wildlife habitat, and replenish deteriorated soil carbon levels.

Salinity can hinder the growth and productivity of most crops. To make most effective use of saline lands, they must be managed according to their salt content. Conservation practices and proper crop selection need to reflect the history, current salinity status and productive potential of the land.

Rangeland/Forage

Recent survey results suggest that a significant proportion of Prairie rangelands are in less than good condition. A number of factors contribute to this situation including economic pressures in the agricultural community to maximize production, limited extension activity in range management and a perception that there is no economic incentive to maintain good range condition.

Rangeland can, however, be managed to improve its condition and there are sound economic reasons to do so. Implementation of planned grazing systems, along with proven range management techniques, could significantly improve overall range condition. Better range condition will allow higher carrying capacities, with the potential for higher land values. Such a shift in range management would reduce erosion potential, create wildlife habitat and replenish deteriorated soil carbon levels. Improvements to range management will be essential to support the anticipated future expansion of the beef sector.

Water Quality

Water quality is critical to the health of all living organisms, from fish and aquatic insects, to wildlife and humans. It varies dramatically in streams, lakes, rivers and groundwater across the Prairies, reflecting the many differences in landscapes and land uses. In some areas, agricultural activities have been shown to produce significant localized effects on water quality. Agricultural sources of water contamination include:

- erosion and runoff from fields to which fertilizers, pesticides and manure are applied

- runoff and wastewater from livestock operations
- leaching of land-applied nutrients and chemicals to groundwater.

In general, the ecological and health-related impacts on water quality resulting from Prairie agriculture have received little attention. It is accepted, however, that the greater the level of agricultural intensity, the greater the risk to ground and surface water quality (Canada Alberta Environmentally Sustainable Agriculture Water Quality Committee 1998). This is a significant conclusion, given current objectives to expand and intensify agricultural production across the Prairies.

Implementation of proper land management practices will play an important role in reducing risks to surface and groundwater quality. These practices include implementing conservation tillage to reduce erosion and runoff, monitoring of nutrient application rates and ensuring livestock operations are properly designed within environmental standards.

Riparian Areas

The lush vegetation bordering rivers, creeks, streams, lakes and wetlands are described as riparian areas. They are a significant feature of the landscape formed from the interaction of water, soil and vegetation (Adams and Fitch 1995).

Riparian areas provide fish and wildlife habitat, dissipate stream energy, filter sediments and nutrients, stabilize streambanks, store water and contribute to aquifer recharge and provide vegetation amenable to livestock grazing.

Intensification of agriculture without the adoption of appropriate soil and water conservation practices can result in increased soil erosion, sedimentation and contamination of river systems by pollutants such as nutrients and pesticides. Fortunately, riparian areas can be restored through effective management such as creating buffer strips to rejuvenate vegetative growth. Buffer strips have proven to be an efficient method of controlling agricultural runoff. Their function is to provide localized erosion protection and to filter nutrients, sediments and other agricultural pollutants before they reach the water.

Review of Agricultural Trends and Issues

To plan for the future, it is important to have a solid understanding of the present state of land resources and the driving forces behind the ever-changing agriculture and agri-food sector.

The recent trends in government policy towards the removal of subsidies is resulting in increased diversification on the Prairies. Bradshaw and Smit (1997) suggest that subsidy removal may negatively impact environmental health in the long term due to increased individual risk, reduced income security and increased economic pressure to maintain marginal returns. However, the removal of grain transportation subsidies may encourage a more sustainable change in land use through conversion of cultivated land to perennial forages.

Technology has resulted in increased efficiency of production along with numerous conservation achievements in management of soil nutrients, manure and pesticides. However, intensification of agriculture has also been linked with environmental degradation. Higher use of inputs such as pesticides, fuels, fertilizers and irrigation have the potential to contribute to environmental degradation if improperly managed.

Growing awareness of the general public concerning environmental issues, along with increasingly stringent environmental legislation, will pose a challenge to the future of agricultural expansion. Significant attention to land management issues will need to be given to ensure agricultural expansion occurs in an environmentally sustainable manner.

Many environmentalists assume that sustainability cannot be

achieved through intensive agriculture. However, Avery (1999) suggests that attempting to meet world food demands through low-input agriculture would result in the production of less food on more land, thereby reducing the availability of land for other potential and competing uses.

An expanding agricultural industry will find itself competing for water and land resources with rural and urban populations, other land uses and with other industries. Greater production and the continuing shift to speciality crops will require more water for irrigation, livestock and food processing. Increased pressure on the water supply could impact water quality, drive up water delivery costs, and reduce water availability. As a result, water could become a limiting factor for the expansion of the agriculture and agri-food sector on the Prairies (Morrison and Kraft 1999).

The consolidation of farm units, agricultural intensification and biotechnology are contentious issues that will affect the future expansion of the agricultural industry. Despite the potential of biotechnology and intensification practices to increase agricultural production and efficiency, public acceptance (locally, nationally and internationally) will ultimately determine their fate in the agriculture industry. Effective policies and strategies for communication and public education strategies need to be developed and implemented to gain public trust, understanding and acceptance.

Matching Land Use to Land Capability

To increase agricultural production across the Canadian Prairies in both an efficient and sustainable manner, the relationship between land use and land capability must be clearly established. The potential of different management systems and different landscapes to adapt to future economic and environmental changes can then be determined.

The Land Practices Groups are based on the clustering of SLC polygons linked to the 1996 Census of Agriculture. The analysis of areas containing similar agricultural practices and land uses has provided a basis for identifying the range of landscapes which can support a given set of farming practices. The LPG also provide a means for comparing and analyzing future landscape uses.

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Future Actions

Global markets will guide Prairie agricultural growth. However, through a consultative process with the agriculture and agri-food industry of Western Canada, a consensus-based agriculture industry growth scenario has been developed. A Scenario Analysis Model (SAM2) was also developed to assist PFRA in determining the potential impacts and implications of agricultural expansion, based on the current state of resources on the Prairies. Output from the model can be linked to Land Practice Groups. As a result, relationships between the crop and livestock production required to meet growth projections and potential changes in land use can be determined using a geographic information system.

A second modelling system has also been developed for PAL to assess the sustainability of management practices on annual cropland in relation to soil erosion and SOM. Output from this system can also be iteratively linked to the SAM2 model through the use of GIS.

PFRA will use the resource information contained within this technical document, along with output generated from the modelling systems, to help the agricultural sector realize its growth potential. The implications of predicted growth on rangeland and forage resources, cultivated land, water quality and riparian areas will be determined. Analysis of the opportunities will contribute to the development of strategies aimed at ensuring sustainable agricultural growth across the Prairies. The strategies will identify sensitive or priority areas that could benefit most from new programming, land use planning and resource conservation efforts. Ultimately, the strategies will aid in the development of effective agricultural policies.

A separate document entitled *Prairie Agricultural Landscapes: Foundations For Growth* will focus on the resource management implications arising from the growth projections. The *Foundations* report will discuss the scenario analysis modeling and its relation to the land practice groups developed by PFRA. It will identify resource management implications of growth targets. More importantly, the document will outline appropriate actions required to ensure the sustainability and integrity of Prairie agricultural landscapes in the face of unprecedented growth in the industry.