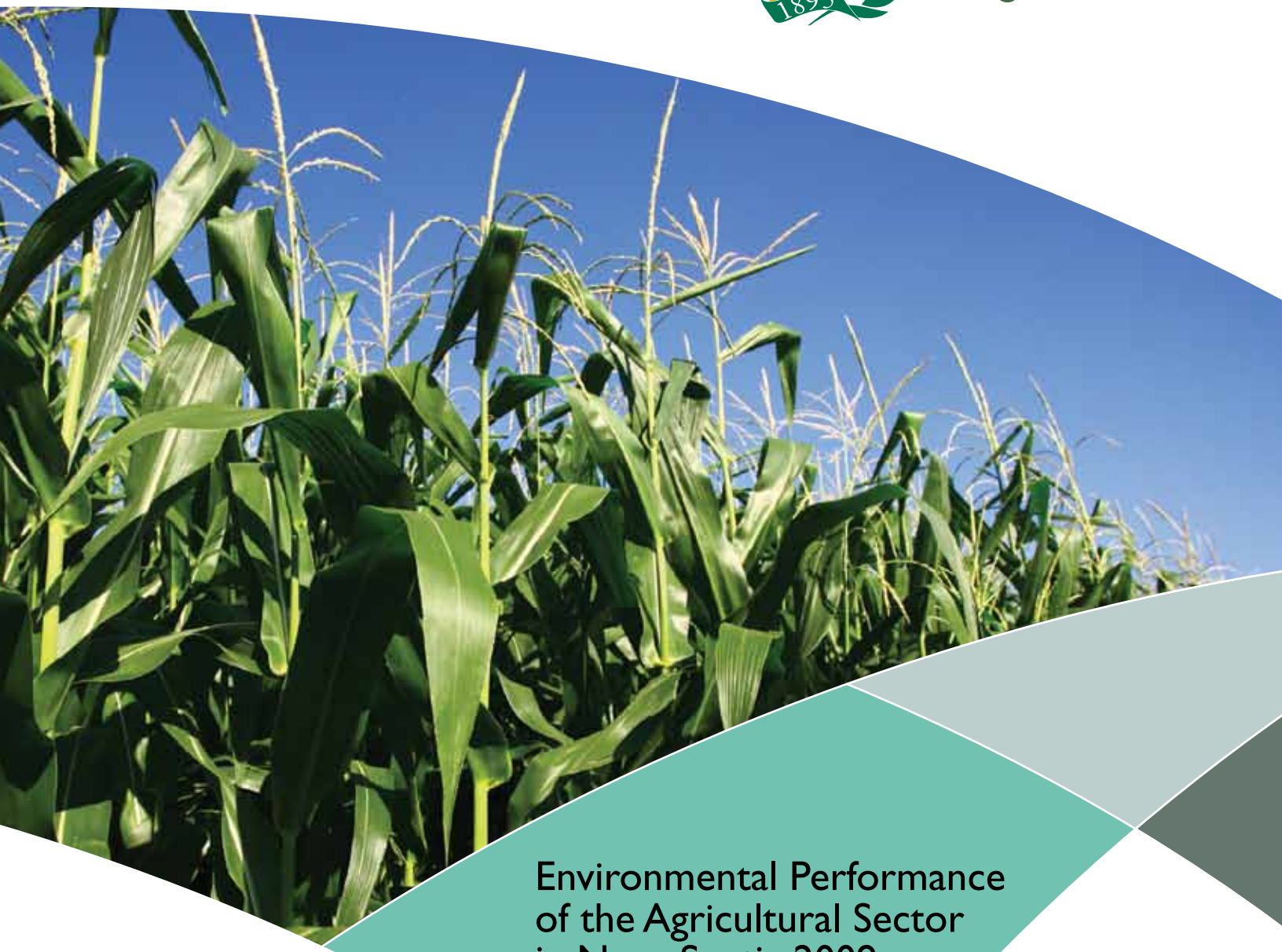
Nova Scotia Federation of Agriculture



Environmental Performance of the Agricultural Sector in Nova Scotia 2009

a report card

A **REPORT CARD**
PREPARED BY

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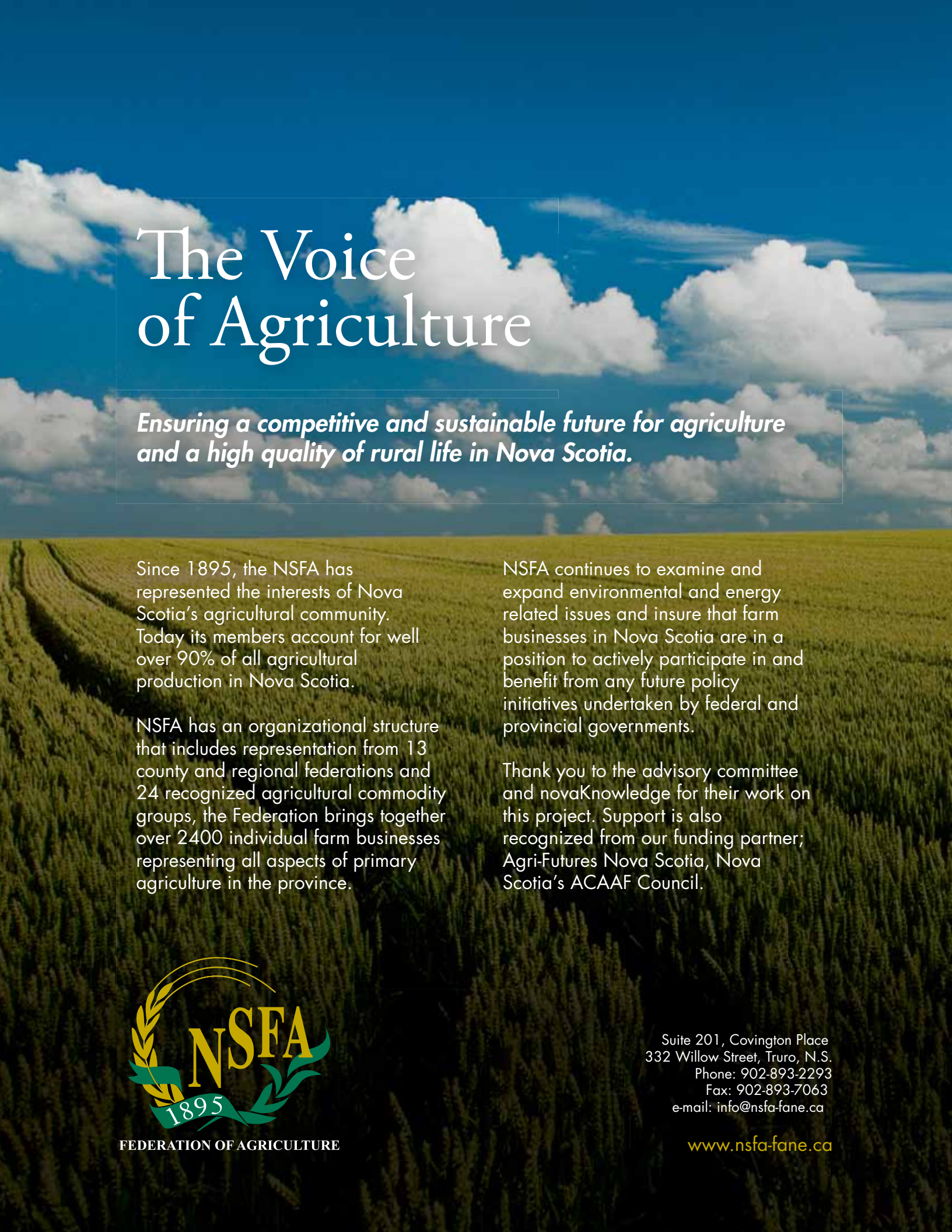

The Voice of Agriculture

Ensuring a competitive and sustainable future for agriculture and a high quality of rural life in Nova Scotia.

Since 1895, the NSFA has represented the interests of Nova Scotia's agricultural community. Today its members account for well over 90% of all agricultural production in Nova Scotia.

NSFA has an organizational structure that includes representation from 13 county and regional federations and 24 recognized agricultural commodity groups, the Federation brings together over 2400 individual farm businesses representing all aspects of primary agriculture in the province.

NSFA continues to examine and expand environmental and energy related issues and insure that farm businesses in Nova Scotia are in a position to actively participate in and benefit from any future policy initiatives undertaken by federal and provincial governments.

Thank you to the advisory committee and novaKnowledge for their work on this project. Support is also recognized from our funding partner; Agri-Futures Nova Scotia, Nova Scotia's ACAAF Council.

NSFA 1895

FEDERATION OF AGRICULTURE

Suite 201, Covington Place
332 Willow Street, Truro, N.S.
Phone: 902-893-2293
Fax: 902-893-7063
e-mail: info@nsfa-fane.ca

www.nsfa-fane.ca

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Executive Summary

This report card is the first step in on-going evaluation of agriculture's interface with the environment in Nova Scotia. Its purpose is to evaluate the industry's environmental stewardship agenda, set benchmarks, assess progress and communicate findings. In the absence of empirical data on which to base true indicators, surrogate indicators have been identified based on available data, against which the agricultural industry's performance will be measured.

The industry, through the leadership of the Nova Scotia Federation of Agriculture (NSFA), has worked with government and researchers to develop programs and initiatives to assess and address concerns of agro-environmental risk. Nova Scotia's farmers have a vested interest in being environmental stewards. They are continuously implementing positive on-farm environmental practices and it is a sense of stewardship and sustainability, as well as a desire to limit risk, that have led farmers to adopt new practices to protect air, soil and water resources.

There are almost 3,800 census farms in Nova Scotia that hold 403,000 hectares of land (7.3% of the total), set within geography that offers hills, lakes, rivers, wetlands and reclaimed marshland, and surrounded by neighbours less familiar with the practice of farming and more concerned with environmental issues than previous generations. To their credit, farmers identify both the local community and the agricultural industry as beneficiaries of their efforts to protect the environment.

Farmers have made these positive strides while facing significant financial challenges. Since 1999 farm debt in Nova Scotia has increased 59%, compared with a 17% increase in farm cash receipts and a trend toward negative net income. A broad range of commodities are produced by agri-businesses across the province, with 182,000 hectares cropped and 197,000 hectares of Christmas tree land, woodland and wetland. Farm-owned woodland and wetland sustains biodiversity and sequesters over 70,000 tonnes of carbon a year.

In what areas have we been successful?

There has been a cultural shift over the past decade as agri-business operators embrace environmental sustainability and incorporate agro-environmental considerations as part of their everyday management practice in the business of agriculture. Moreover, Nova Scotia's environmental acts and regulations support these changes by encouraging compliance and by establishing a culture of self regulation, minimizing the need for a harsh regulatory approach. Most importantly, the industry, through the Nova Scotia Federation of Agriculture, has taken a leadership role and collaborative approach bringing together government, researchers and the industry to support and achieve a common goal of environmental sustainability in agriculture. The Environmental Farm Plan (EFP) and Nutrient Management Plan (NMP) process is seen as an innovative model by other provinces and at the national level, as is the provincial policy approach of self-regulation over mandatory compliance.

What progress have we made in Nova Scotia over the past 10 years?

Currently, almost half of registered farms in Nova Scotia (1,100) have voluntarily completed an EFP. Since 2005, when Nutrient Management Planning was offered, 430 farms have completed NMPs. Soil and tillage conservation practices have seen modest but continued uptake.

Where is more attention required?

Both industry and government must focus continued efforts to see all arable land managed under EFP and NMP. Better data identification and collection on agricultural activities and resource status will reduce risk and enable a better understanding of farm management practices, specific to receiving environments. A manure inventory will help industry stakeholders develop better management of excess manure as a nutrient and energy source. Improved soil testing data collection and re-examining the feasibility of a nitrogen soil test will support effective nutrient management, benefitting both the farmer and the environment. Farmers have done a good job of reducing their environmental

impact, but are modest in communicating their successes. Public outreach and stakeholder education, enabled through effective communication strategies, are part of doing business in any sector of the economy and agriculture is no exception.

How will we respond to future changes and challenges?

Future changes and challenges should be approached in a manner that continues to build on established relationships and leadership practices. The industry has assumed a leadership role, while consulting and collaborating with researchers and seeking the support of government through effective policy and targeted programs. This positive approach allows the agricultural industry to move forward, to build on past accomplishments, to create successes with every stakeholder group and, more importantly, to safeguard the health of the natural environment and all Nova Scotians.

How Are We Doing?

Good

Good but needs improvement

Fair

Poor

Indicator	How are we doing?
EFP Completion	
NMP Completion	
Implementation of Soil Conservation Practices	
Implementation of Tillage Practices	

RATIONALE

EFP completion – demand is still strong for new EFPs and this program has become the centre piece of industry's interest in environmental issues, even with the introduction of compliance requirements.

NMP completion – uptake has been relatively slow even though there are a number of trained NMP Planners in the province and financial assistance from government programs. A concern is the poor renewal plan history with less than a third of eligible farms having renewals completed in 2008.

Soil Conservation practices – Trends indicate improvement, particularly in crop rotations. However, only about a third of reporting farms have adopted the practices.

Tillage practices – Trends indicate improvement., but over two thirds of reporting farms are still using conventional tillage methods.

Introduction

Farmers operate in close association with the environment and their production decisions and systems can have both a positive and negative effect on that environment. Over the last several decades public concern and awareness of environmental issues have changed. Today most human activities are assessed in the context of their environmental effects and impacts. Agricultural activities are no exception; in Canada farming practices have evolved and changed in response to more stringent regulations and public expectations towards environmental management of agricultural resources.

A sense of stewardship and sustainability, as well as a desire to reduce risk, has driven farmers to adopt new measures and technology that mitigate the environmental impact of their operations. Best management practices directed towards protecting soil, air and water quality have been developed and widely implemented across Canada, and through many parts of Nova Scotia. The extent and impact of these best management practices, as well as stewardship activities within the agricultural industry, have not been adequately evaluated. What progress have we made towards better environmental management of our agricultural resources in Nova Scotia? In what areas have we been successful; and where is more attention required? How will we continue to respond to future changes and challenges?

This report attempts to address some of these questions by providing an overview of the changes in agriculture that have taken place in response to increased environmental awareness.

Project Objectives

The purpose of this project is to develop, in the report-card format, an evaluation of the industry's environmental stewardship agenda, and assess Nova Scotia's progress toward environmental sustainability in agriculture. The resulting report catalogues some of the environmental sustainability efforts by the agricultural industry in Nova Scotia and provide a guide for the industry to meet targets as set out in the province's Environmental Goals and Sustainable Prosperity Act. This report is intended to assist in informing future policy decisions.

The objectives of the report card are to:

1. Analyze and understand key factors driving the environmental sustainability of the province's agricultural industry;
2. Define baseline measures and recommend benchmarks for key indicators in order to track progress over time;
3. Identify areas of opportunity and weakness, such that informed action can be taken by stakeholders; and
4. Communicate key messages clearly and simply to leaders in business, education, government and communities, particularly those who would not normally read, or have ready access to, economic reports and scientific data.

i) Impact of Changes in Regulatory Requirements and Societal Expectations on Nova Scotia Farmers – Environmental Component, Kelco Consulting Ltd. for Nova Scotia Federation of Agriculture, July 2006.

ii) Identification and Assessment of the Provision of Environmental Goods and Services by the Primary Agricultural Sector and Determining Societal Expectations of the Farm Community Component I Report, Kelco Consulting Ltd. for Nova Scotia Federation of Agriculture, March 2009.

Background

The Nova Scotia agricultural industry took the lead in the mid-1990s, through the Nova Scotia Federation of Agriculture, to develop a comprehensive Environmental Farm Plan. Agricultural producers worked closely with the Nova Scotia Departments of Agriculture, Environment and Natural Resources to ensure the EFP process would reduce agriculture's impact on the environment. The industry followed up that initiative by supporting the development of a Nutrient Management Planning framework in cooperation with various provincial government departments and Agriculture and Agri-Food Canada (AAFC).

Nova Scotia farmers own 7.3% of the land base in the province and many farmers have exhibited their environmental stewardship through their actions and capital investments. Farmers have changed crop and livestock management systems, upgraded livestock and manure handling facilities and purchased specialized equipment to carry out cropping activities to reduce their environmental footprint. Surveys of farmers, completed in 2006[i] and 2008[ii] indicate that farmers who take actions in response to environmental issues do so for several reasons, including:

- Compliance with regulatory changes;
- To protect neighbours from negative impacts on their health and quality of life;
- To protect the environment in general; and
- Because it benefits the environment in which they live.

Farmers consistently identified the local community and the agricultural industry as major beneficiaries of their efforts to protect the environment.

Many farmers have implemented these actions to address environmental issues while facing serious financial challenges. **Figure 1** provides total provincial farm cash receipts, net income and provincial farm debt outstanding for the last decade; with net income being negative for five of the last seven years. BSE (mad cow) was discovered in Western Canada in 2003 driving down the farm-gate price of red meat; high energy prices increased major input costs such as fuel, fertilizer and feed; and feed costs have increased as a result of the growth of grain-based ethanol production. Total farm debt in Nova Scotia has increased 59%, compared to a 17% increase in farm cash receipts and a trend toward negative net income.

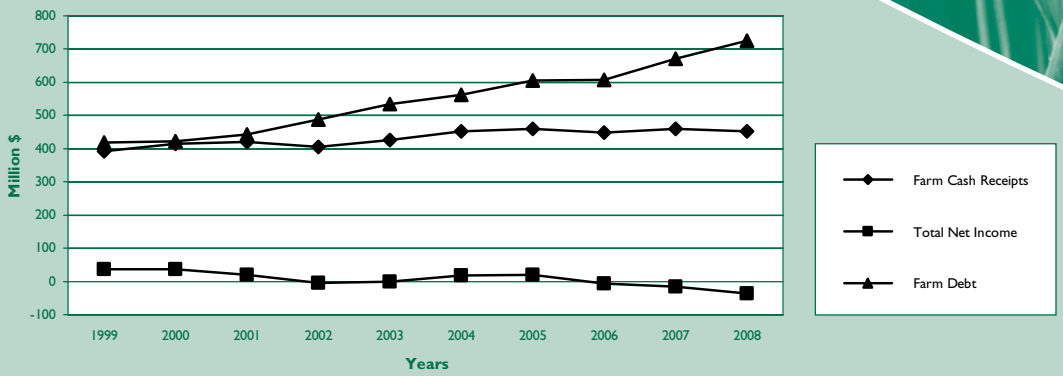


FIGURE 1:
Nova Scotia Farm Cash Receipts, Net Income and Farm Debt (1999-2008)

Source: Statistics Canada catalogue no. 21-010-XIE

While many Nova Scotia farmers have made positive strides to safeguard the environment, the industry has much more to do to ensure environmental protection. For example over 1,100 farmers have completed EFPs, but there are over 2,300 provincially-registered farms and almost 3,800 census farms as of the 2006 census. The large numbers of farms that are not involved in various environmental-protection programs and activities is a concern for both the industry and the province as a whole. Farmers who are not involved in environmental programs and activities miss the educational opportunities, the expertise of well-informed industry professionals and the funding for risk-reducing capital investment.

The remainder of this report covers a variety of topics relevant to the discussion of environmental performance in agriculture. In Section 2 the nature of the Nova Scotia agricultural industry is examined. Section 3 identifies the types of environmental risks that industry manages, based on the characteristics of Nova Scotia agriculture. This sets the context for Section 4 with discussion and presentation of a variety of environmental indicators and their past and current status. Further perceptions of environmental performance were acquired from interviews with various stakeholders, which are summarized in Section 5. In Section 6 emerging issues are identified that will influence agro-environmental initiatives in future. In Section 7 we discuss recommendations designed to fill data gaps for future report cards. Finally, case studies are included to showcase examples of best management practices by farmers and their approaches to agro-environmental farm management.

Farm Registration is a voluntary, annual program. Farms eligible to file a farm tax return with the Canada Revenue Agency may register. Farm registration provides for:

- managed access to government programs by farm businesses;
- collection of farm information to develop agricultural policy; and
- stable funding of the Nova Scotia Federation of Agriculture.

(Farm Registration Fact Sheet, Service Nova Scotia and Municipal Relations)

Census Farm: "An agricultural operation that is defined as a farm, ranch or other operation that produces agricultural products intended for sale." (Census of Agriculture: Frequently Asked Questions)

A Pioneer in EFP
(Clover Crest Farm Ltd.)

Jim and Leslie Burrows were already well acquainted with the practice of sustainable agriculture long before having a full-blown Environmental Farm Plan (EFP) in place for their family farm, Clover Crest Farm Ltd., Colchester County, Nova Scotia.

A leader in the agricultural community in Atlantic Canada, Jim was President of the Nova Scotia Federation of Agriculture from 1993 to 1994. That was a time of increasing awareness of the importance of improving environmental farm practices among local, regional, and national leaders in agriculture. This was partly motivated through a sense of environmental stewardship, but also because of an abundance of issues that were changing the way farmers were going to have to work within the environment.

Until that time, the attitude among most of those employed by the industry was, "You are not going to tell me how to operate my farm!" That attitude was about to change.

Adopting environmental practices for their own business meant Jim and Leslie's 360-acre dairy and mixed-crop family farm was beginning a process of change that has continued for nearly 20 years.

Jim says the changes were not difficult. Some capital expenditures were required, mainly related to manure storage and handling. This included additional handling capacity to allow manure to be used at the right time of year rather than when it needed to be cleared out of the manure storage. The Burrows also adopted changes to enable better pasturing practices. Over a two to three year period, particular attention was given to layout and planning of pasturing lands, followed by the installation of fencing, culverts and watering equipment. This design prevented cattle from entering ponds and pooled water on the farm – important to preservation of farm waterways without big costs.

After 20 years of tilling crops using conventional methods, the Burrows shifted to no-till, or as Jim explains "low-till," cropping methods that reduce erosion and maintain soil structure. Now the farm follows minimal till practices, tilling only between corn and soybean rotations.

While Jim says it is hard to measure the net financial impact of better environmental practices, the real outcome has been the attitudinal changes in farm management. The main lesson learned in shifting toward environmental practices is that the process never ends. Jim explains there will always be change in the industry – in the expectations of consumers, neighbours, farmers and regulators – and there will always be change in technologies. In a sense, there will never be an end point. Jim adds that people have to recognize that you do the best you can as you work though the process; the ongoing process of an EFP is probably the most difficult thing for farmers to accept as they resist continually changing their systems.

Although Jim is presently satisfied with his farm, he realizes a "new set of eyes" would see potential for further improvement, therefore he acknowledges the importance of periodic EFP reviews.

Given the farm's history with adopting better on-farm environmental practices, the Burrows farm has been called a pioneer by its peers. The motivation for shifting toward more environmentally responsible practices relates to Jim and Leslie's sense that, when you see things you are doing have a negative impact, you look for ways to improve. You start to question, "Are there better ways to minimize these effects?" Jim and Leslie Burrows and their family are farmers who exemplify better environmental farm management practices.

Nova Scotia Agriculture – An Overview

Nova Scotia's farm business owners conduct their operations in relatively close proximity to other people and within geography that creates environmental challenges. Nova Scotia has many hills, lakes, rivers, streams and reclaimed marshland. Historically, these water systems were used as part of farm and non-farm businesses (e.g.: transportation, irrigation) with little concern for environmental issues. However, that has changed over the last several decades and Nova Scotia's agricultural sector and provincial government have taken significant action to respond to public concerns about the environment.

The 2006 census reported that Nova Scotia farmers own over 403-thousand hectares of land of which almost 182-thousand are in crops. Another 197-thousand hectares is made up of Christmas tree land, woodland and wetland. This land provides an ecosystem that sustains biodiversity and reduces greenhouse gas (GHG) emissions. Nova Scotia Department of Natural Resources reported that, during the period 1990 to 2004, the provincial carbon balance was a positive average of approximately 0.37 tonnes of forest ecosystem carbon sequestered per hectare[iii]. Farm-owned woodland and wetland sequesters over 70,000 tonnes of carbon annually, a significant benefit to air quality.

The following maps help illustrate some of the environmental issues that face Nova Scotia agriculture by indicating the type and concentration of industry activity by county based on 2006 census data. While agricultural activity is spread across the province, there are areas of concentration that create risks to the environment.

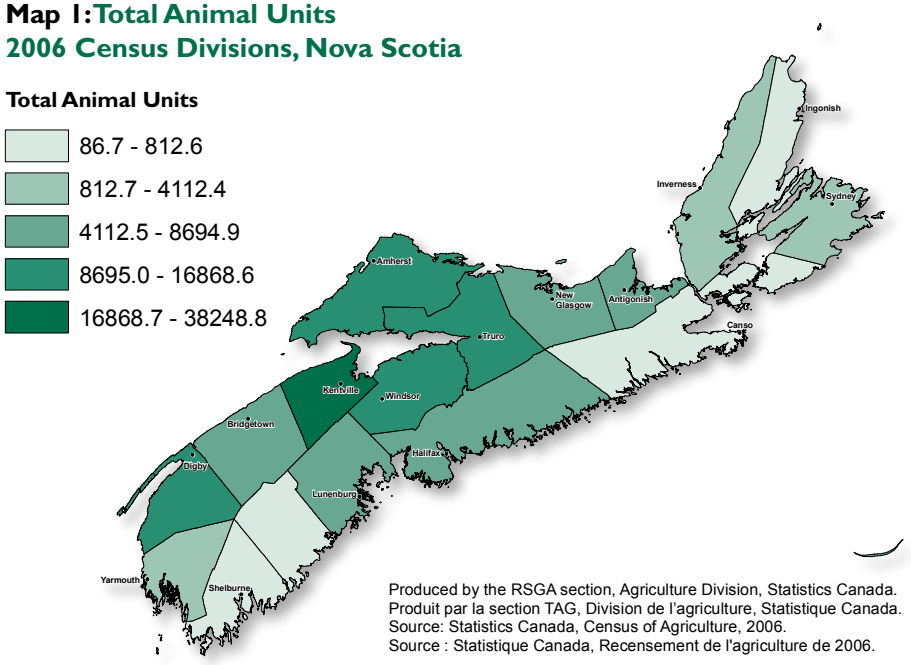
A large portion of Nova Scotia agriculture is based on livestock and poultry, including dairy, beef, sheep, mink, chickens and turkeys. One of the major challenges related to animal agriculture is manure handling. Nova Scotia agriculture generates approximately 1.2 million tonnes of manure annually, which forms a major part of the fertilizer used in cropping systems.

Maps 1 and 2 provide information about livestock concentration by county. **Map 1** shows the distribution of farm animals by total animal units, where one animal unit equals one cow plus a calf. Various types of livestock are converted to a representative unit so that concentration across counties can be compared. Map 1 indicates that livestock are concentrated in Kings, Digby, Hants, Colchester and Cumberland Counties. Kings County is the centre for poultry and hog production in NS, with mink concentrated in Digby and dairy and beef throughout Hants, Colchester and Cumberland Counties. Concentrations of livestock increase risks to the environment through manure and livestock handling systems. Manure is a potential source of water contamination and must be stored and managed so that it does not pollute the environment. Livestock need to be managed so that they do not have direct access to surface water such as rivers and streams to avoid pollution and damage to fish habitat. In addition, manure application to crop and forage lands need to follow strict guidelines to minimize overland runoff and surface water contamination.

Map 2 shows total animal units per county divided by total crop acreage on which manure would normally be spread (i.e.: annual crops, forage, pasture, vegetables). High regional concentrations of livestock increase risks of over-application of manure and nutrient build up that can run off or leach from the soil and pollute surface and/or groundwater.

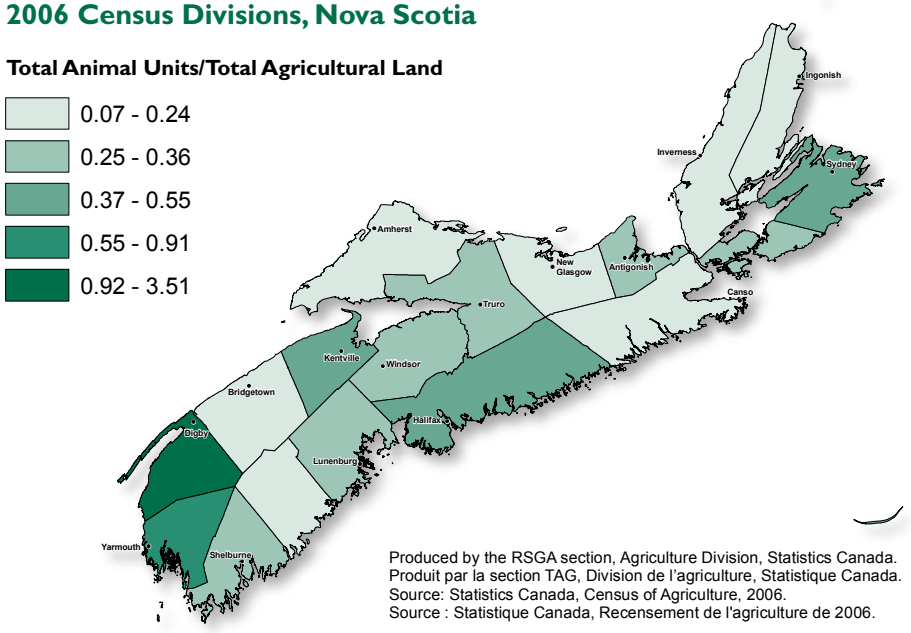
iii) State of the Forests: 1995-2005, Nova Scotia Department of Natural Resources, 2008.

Map 1: Total Animal Units
2006 Census Divisions, Nova Scotia



Produced by the RSGA section, Agriculture Division, Statistics Canada.
Produit par la section TAG, Division de l'agriculture, Statistique Canada.
Source: Statistics Canada, Census of Agriculture, 2006.
Source : Statistique Canada, Recensement de l'agriculture de 2006.

Map 2: Total Animal Units Normalized by Total Agricultural Land
2006 Census Divisions, Nova Scotia



Produced by the RSGA section, Agriculture Division, Statistics Canada.
Produit par la section TAG, Division de l'agriculture, Statistique Canada.
Source: Statistics Canada, Census of Agriculture, 2006.
Source : Statistique Canada, Recensement de l'agriculture de 2006.

Digby, Yarmouth and Shelburne counties have the highest concentration of animals per acre of cropland; however, Shelburne has both few animal units (87) and not much cropland (64 acres). Both Yarmouth and Digby Counties have significant mink production and, at the time of the 2006 Census, Digby County had several sizable hog farms. Relative to their land base, both Yarmouth and Digby Counties have significant animal agriculture, creating manure management challenges.

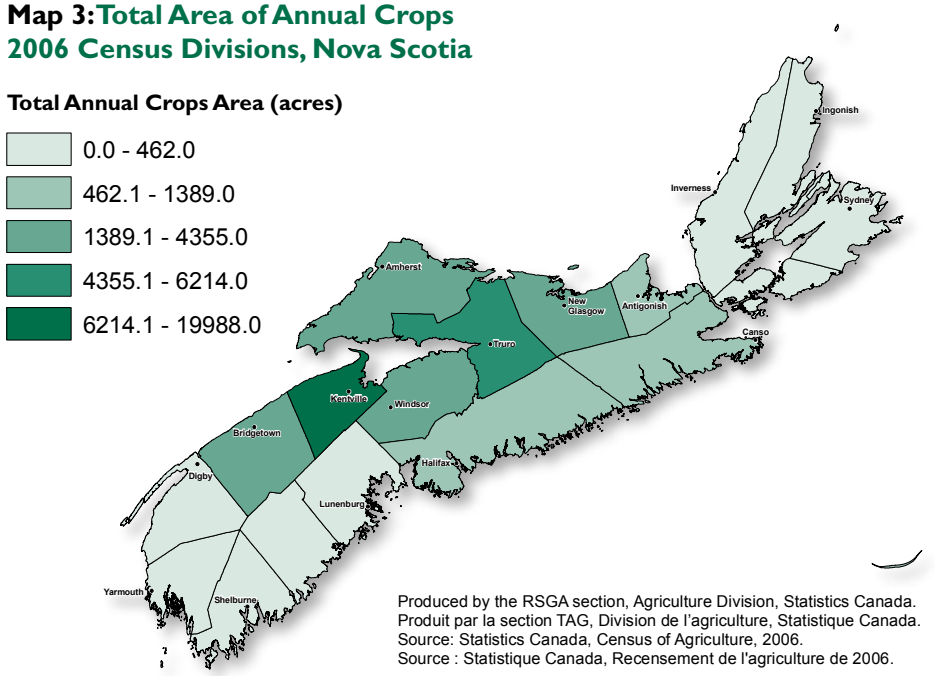
Kings County, which has the highest total animal units, has a sizeable land base on which to accommodate their animal sector and on average has sufficient cropland to spread manure. Hants, Colchester and Cumberland Counties have large numbers of animal units but also have substantial land bases with the potential to mitigate manure handling risk from livestock concentration.

Maps 3 and 4 provide information on concentration of annual crops and vegetables by county. Crops that are planted annually, as opposed to perennially,

disturb the soil cover creating opportunity for erosion from wind and water, as well as more damage to soil structure and increased GHG emissions. Their production management is more intense including regular use of fertilizers and sprays for pests and weeds.

Map 3 shows the concentration of annual crops. Annual cropping distribution tends to follow that for total animal units because much of the annual crops grown are directed to livestock feed (e.g.: corn, grain). Kings County has the greatest concentration of annual crops with Colchester second. Kings also has the greatest concentration of vegetable production (Map 4) and annual crops are used in rotation with vegetable crops.

Map 3: Total Area of Annual Crops
2006 Census Divisions, Nova Scotia



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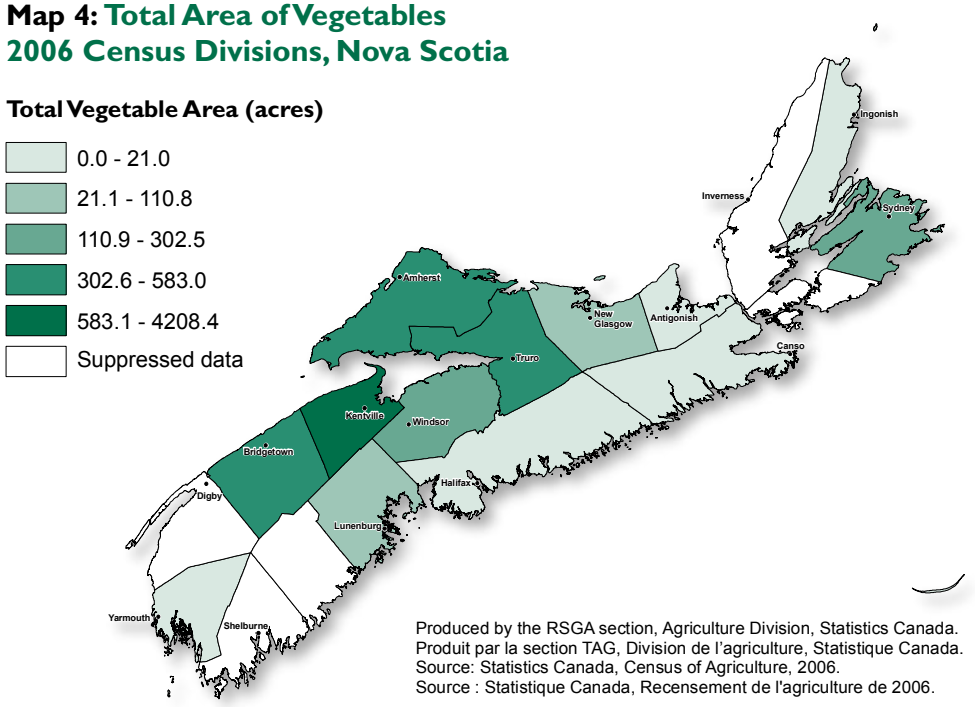
Produit par la section TAG, Division de l'agriculture, Statistique Canada.
Source: Statistics Canada, Census of Agriculture, 2006.
Source : Statistique Canada, Recensement de l'agriculture de 2006.

Map 4: Total Area of Vegetables
2006 Census Divisions, Nova Scotia

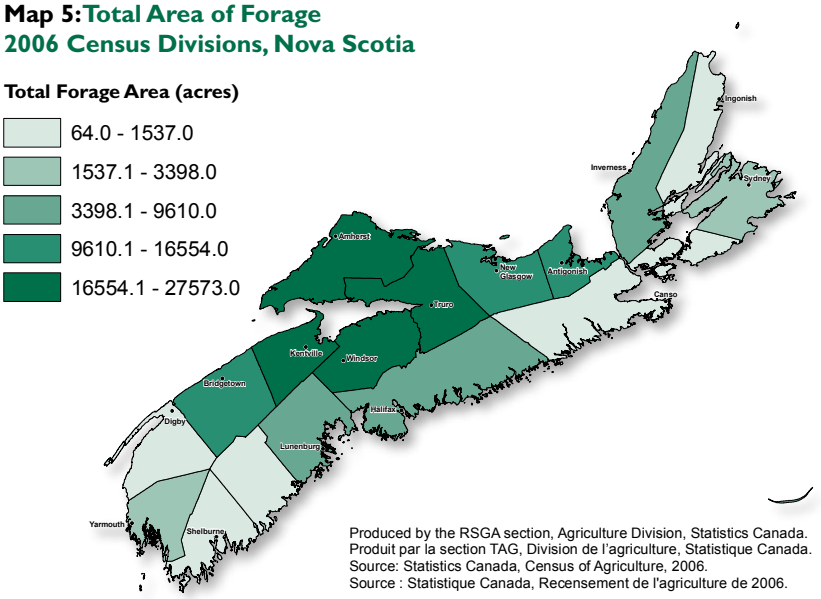


Produced by the RSGA section, Agriculture Division, Statistics Canada.
Produit par la section TAG, Division de l'agriculture, Statistique Canada.
Source: Statistics Canada, Census of Agriculture, 2006.
Source : Statistique Canada, Recensement de l'agriculture de 2006.

Map 4 indicates that along with Kings County, Annapolis, Colchester and Cumberland Counties have significant vegetable production, although small in relation to Kings.

Maps 5, 6 and 7 demonstrate concentration by county of acreage that is planted predominantly to perennial crops, some of which may make up portions of a rotation with annual crops such as grain, corn or soybeans. Perennial crops, such as forages, orchards and blueberries, require less frequent working of the soil than annual crops and soil cover is in place all year except when the land is worked as part of a rotation. Crop roots and soil cover reduce erosion and leaching of agricultural chemicals and manure into surface and ground water. They also improve soil condition and health by increasing organic matter, which helps to retain nutrients in the soil providing increased availability to plants and reduced leaching. Perennial crops also reduce GHG emissions relative to annual crops by maintaining soil cover. Perennials may also enhance biodiversity relative to annual crops depending on crop and harvest techniques.

Map 5: **Total Area of Forage**
2006 Census Divisions, Nova Scotia



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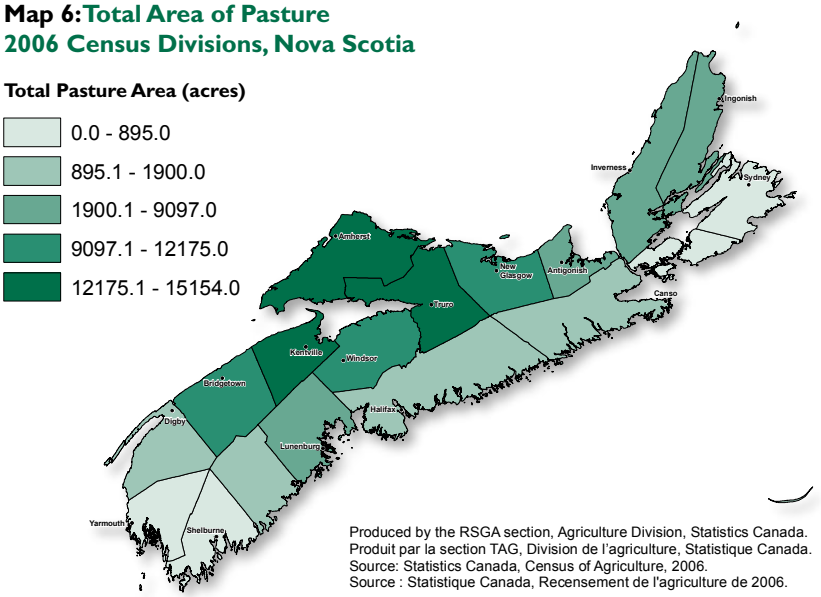
Source: Statistics Canada, Census of Agriculture, 2006.
Source : Statistique Canada, Recensement de l'agriculture de 2006.

Map 6: **Total Area of Pasture**
2006 Census Divisions, Nova Scotia



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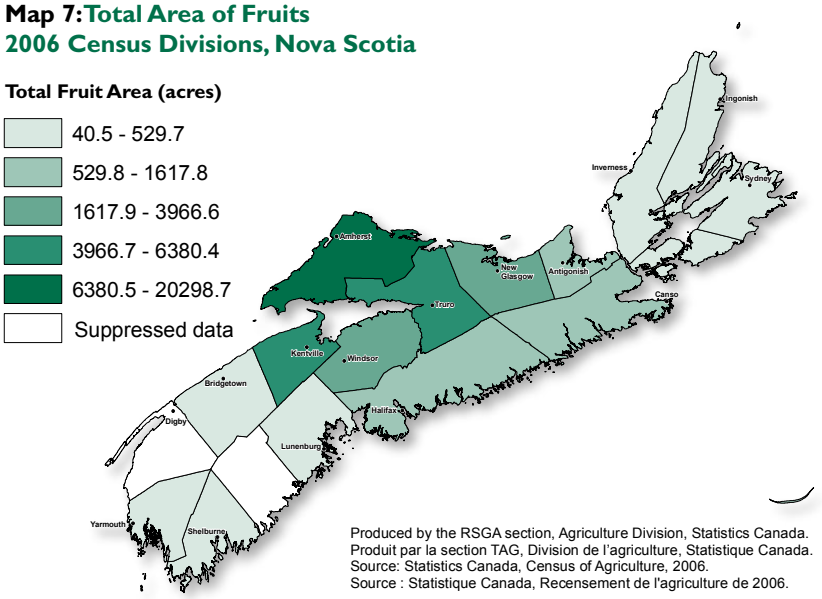
Source: Statistics Canada, Census of Agriculture, 2006.
Source : Statistique Canada, Recensement de l'agriculture de 2006.

Map 7: **Total Area of Fruits**
2006 Census Divisions, Nova Scotia



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Source: Statistics Canada, Census of Agriculture, 2006.
Source : Statistique Canada, Recensement de l'agriculture de 2006.

Map 5 provides information on forage crops that are grown mainly to be harvested for livestock feed (e.g.: alfalfa, grass crops) and provide continual soil cover except when replanted. These crops produce a sod that protects soil from erosion and traps greenhouse gases, reducing air pollution.

Map 6 shows concentration of pasture crops that are used for dairy, beef, sheep, horses and other companion animals. Pasture land is usually replanted infrequently. The maps indicate that counties with livestock concentration are also those with large acreage of forage and pasture.

Map 7 provides concentration of fruit crops. Orchards and low-bush blueberries made up 97% of Nova Scotia fruit acreage in 2006, with strawberries representing an additional 1.7%. Much of the province's orchard sector is concentrated in Kings County. Blueberries are most prevalent in Cumberland and Colchester Counties, although it is also an important crop in Hants, Pictou, Halifax and Antigonish Counties. Cumberland County has almost 8,000 hectares of blueberry production. Orchard crops and blueberries are perennial crops that have significant ground cover; however, fertilizers and pesticides are used in both production systems, creating the potential for runoff into rivers and streams. Orchards and blueberry fields often maintain biodiversity by providing habitats for animals and insects.

Environmental Farm Planning

A Paradigm Shift in Farm Management

The Environmental Farm Planning (EFP) process evolved out of a recognized need to support farmers in becoming better environmental stewards because of a myriad of issues that were changing the way they, as farmers, were going to have to work within the environment.

Now used in various forms across Canada, the Environmental Farm Plan (EFP) first became available to Nova Scotia farmers in 1999 as a voluntary program, but its completion eventually became linked to various funding opportunities.

The main objective of the EFP is to provide a guide, and objective professional advice, to farms so they can identify areas of on-farm environmental risk and opportunities to reduce or eliminate risks through everyday farm management practices.

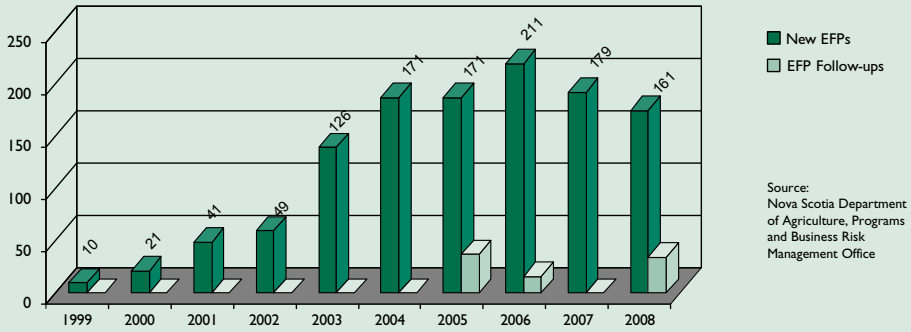
EFP evolution represents a significant cultural change in how farmers approach the management of their operations. Dr. Gordon, former Dean of Research at Nova Scotia Agricultural College and currently Dean of Ontario Agricultural College, said, "Most farmers now believe that you are not farming properly if you don't have an EFP." Dr. Gordon also noted that the EFP has reached beyond individual farm issues and has served a broader educational role by making farmers more aware of their environmental impact, not just on their farm but on the entire eco-system.

According to Laurie Cochrane, an Agricultural Engineer at Nova Scotia Department of Agriculture, the EFP process was instrumental in pushing development of Nutrient Management Planning because of the perceived need for better nutrient management. EFP coordinators now review the Nutrient Management Plan (NMP) as part of the overall EFP farm review.

Nova Scotia farmers were early adopters of the EFP in Canada. Now in its tenth year in this province, there have been over 1,100 EFPs completed, nearly 100 follow-ups of existing EFPs, and almost 100,000 hectares of farm land managed under an EFP. This is a remarkable milestone for the EFP program, especially considering this was a program farmers initially resisted.

The EFP works because it helps farmers identify and assess environmental risks on their properties and offers practical guidance that enables them to incorporate environmental considerations into their everyday business decisions. It is also linked to a variety of government support programs for on-farm improvements.

Number of EFPs Completed Annual, 1999 to 2008



Source:
Nova Scotia Department of Agriculture, Programs and Business Risk Management Office

Environmental Indicators

Environment Canada defines environmental indicators as "... selected key statistics which represent or summarize a significant aspect of the state of the environment, natural resource sustainability and related human activities."[iv] Indicators focus on trends and how environmental changes impact the environment. Environmental indicators are tools to present information in a concise form to support decision makers in policy development. Decision makers at all levels need concise, accurate information on the agricultural industry's current and expected interface with the environment to fashion effective policies, programs and regulations. Indicators not only provide measurable data for policy formulation, but also can be benchmarked and used as an effective means of monitoring changes in agricultural ecosystems. A 2008 report for Agriculture and Agri-Food Canada[v] identified ten potential indicators that would provide information that could be used to assess Nova Scotia agriculture's performance.

Usually indicators can be defined as discrete measurable environmental parameters and categorized based on their effect or presence in a specific receiving environment. As an example, the level of nitrates is often used as an indicator of groundwater quality; or, suspended sediments in streams and rivers may be an indicator of surface water quality. Often however, empirical data on specific environmental parameters may not be available for use as an indicator, in which case a surrogate indicator may be used. For instance, the extent to which riparian buffer strips are employed may be used as an indicator of effective protection of surface water resources.

During the course of this study a number of potential indicators were examined in terms of their appropriateness and their usefulness in assessing the environmental performance of the agricultural sector in Nova Scotia. This study identifies relevant indicators, based on the available data, to create benchmarks against which the agricultural industry's environmental performance can be measured over time. The study made use of provincial and federal government data sources derived from census data and environmental program records (e.g.: Environmental Farm Plan administration). Four indicators are presented and discussed in the following Sections of this report.

Indicator 1: Completion of Environmental Farm Plans

Definition of an EFP

The Environmental Farm Plan is a voluntary program offered to farms by the Nova Scotia Federation of Agriculture and is jointly funded by the provincial and federal governments. The aim of the program is to "help farmers identify and assess environmental risk on their property. It helps incorporate environmental considerations into their everyday business decisions." [vi]

The Nova Scotia approach to the EFP process is a comprehensive assessment by professionals that includes completion of a questionnaire and two farm visits – one to evaluate environmental issues on the farm and a second to review the EFP report and recommended actions.

An EFP is an environmental risk-management plan that helps farmers identify and remove environmental risks and recognize potential problems that can be avoided. The document helps the farmer carry on agricultural activities so environmental risks are minimized. As such, it not only safeguards the environment but also provides some legal protection to the farmer if EFP recommendations have been adopted and an environmental problem develops..

iv) http://www.ec.gc.ca/soer-ree/English/Indicators/what/default.cfm#what

v) Framework for the Nova Scotia Report Card on Sustainable Agriculture, LJM Environmental Consulting for Agriculture and Agri-Food Canada, March 2008.

vi) Environmental Farm Plan Brochure http://www.nsfa-fane.ca/files/images/file/EFP2009%20brochure.pdf

Significance and Importance as an Indicator

EFPs are an environmental audit tool that provides farmers with information and recommendations on implementing sustainable environmental practices and managing their environmental risks. The topics covered in the EFPs include management and protection of soil, water and air resources, as well as water and energy conservation measures, among others. EFP coordinators identify the educational component of the process as a significant tool to protect the environment. EFP recommendations also help farm businesses incorporate environmental issues into their management and investment decisions. Therefore, risks to the environment should decrease as more farmers complete the EFP process. Subscription to the program can be viewed as a surrogate indicator which can enhance environmental protection by identifying risky practices and providing recommendations of alternative management strategies.

Historical and Current Data

Table 1 provides cumulative percentages of farm plans completed and total farm acreage covered. The percentage of farm plans completed is based on provincially registered farms for each year. The percent of acreage reflects agricultural land excluding woodland, wetlands and other land not directly tilled.

Data presented in Table 1 shows a steady increase in participation during the first 10 years of the EFP farm program, such that 45% of all registered farms have adopted EFPs, covering close to half of the agricultural land base in Nova Scotia.

Farmers were advised in 2003 that EFPs, or being on the waiting list to have one completed, would be required to access government funding (cross compliance) by the government's 2008-09 fiscal year.

Table 1 EFP Summary 1999-2008

Year	EFP Completed	Farm Land (ha)
1999	0.4%	n/a
2000	1.3%	1.0%
2001	2.8%	1.6%
2002	4.7%	4.9%
2003	9.2%	11.9%
2004	15.3%	21.3%
2005	21.7%	27.9%
2006	29.7%	37.7%
2007	38.1%	44.5%
2008	45.3%	47.7%

Source: Nova Scotia Department of Agriculture, Programs and Business Risk Management Office

In 2008, the Nova Scotia Department of Agriculture (NSDA) tied completion of an EFP to financial assistance from the Farm Investment Fund (FIF). The EFP coordinators have identified the poultry sector as the slowest adopter of the EFP process and, while having a relatively high adoption rate, the mink sector has been slow to implement EFP recommendations.

Future Goals and Objectives

Follow-up EFPs began in 2005 for farmers whose plans were more than five years old. The follow-up plans, coupled with a new database being developed by the EFP office, will provide information on adoption of recommendations from the original plans and changes in identified environmental risks since the initial assessment. This database will be invaluable by providing data that can be used to identify the farm community's success in reducing environmental risks.

The goal that should be identified by the industry is to have all farms in the province complete an EFP and adopt the report's recommendations by 2020, in line with the Environmental Goals and Sustainable Prosperity Act (EGSPA) goals. To ensure an efficient process of regular EFP updates, NSFA and NSDA should undertake a risk assessment process that identifies those farms that require a full EFP and those that may only need outreach and education to address lesser environmental risk.

An NMP is prepared by a trained Planner who completes a comprehensive evaluation of the nutrient status of a farm using a number of soil tests in fields on a farm. The extent of soil testing reflects the variety of soil types and farm topography. These data are used in combination with the farmer's planting intentions over the next three years to develop an efficient rotation and fertility plan for each crop.

An NMP not only reduces the impact of nutrient applications on the environment but it also helps the farm business maximize yields and revenue, at the lowest nutrient cost, thus increasing farm profit.

Strengths and Weaknesses of this Indicator

The EFP process provides farmers with the services of professionals who are trained and experienced in identifying and assessing risks and making recommendations on how to mitigate risk. However, the act of completing an EFP does not ensure that recommended risk-abatement activities are actually undertaken.

The EFP program is voluntary and farms that completed EFPs may not be those that create the greatest risk to the environment. Those who have completed EFPs may have

been more aware of environmental issues and possibly produced relatively less risk than those who have not completed an EFP.

Also, the indicator reflects the percent of registered farms that have completed EFPs. The number of census farms, measured every five years, is approximately 50% greater than the number of registered farms, thus the indicator overstates actual program uptake by Nova Scotia farmers.

Information provided by the NSDA Programs and Business Risk Management office, which administers provincial and federal government funding programs, indicates that farm businesses made almost $17-million of cost-shared capital investments in environmental areas. Farm businesses covered over $8-million of the total capital asset costs from their own resources.

Recommendations for Additional Data

Follow-up EFPs will provide additional data on actions taken by farmers to mitigate risks and implement sustainable practices on their farms. The indicator results would be more meaningful if more detailed information by geography and type of farm (e.g.: main commodity, farm size) was available on EFPs completed so specific gaps can be identified. The new database that the EFP office is establishing will allow them to address some of these gaps.

vii) *Farm Investment Fund Guidelines 2009-10*, Nova Scotia Department of Agriculture, Programs and Business Risk Management Office, page 19.

Indicator 2: Completion of Nutrient Management Plans

Definition of an NMP

Nutrient Management Plans are designed to ensure the efficient use of crop nutrients. Certified Nutrient Management Planners develop a comprehensive farm plan that uses farm-generated nutrients including manure, chemical fertilizers, lime and other soil amendments to provide optimum crop nutrition.

Significance and Importance as an Indicator

NMPs are designed to maximize the efficiency of nutrient use in crop production and, as a consequence, to reduce air, water and soil pollution and minimize social issues such as odour nuisance.[vii] As such, the extent to which NMPs have been implemented across the province is an important indicator of environmental performance of the agricultural sector. Healthy soils are important for productive agriculture, supporting biodiversity in our ecosystems, reducing greenhouse gases through carbon storage and maintaining environmental stability. NMPs are an important tool in ensuring healthy soils.

Historical and Current Data

Table 2 provides the percentage of provincially registered farms that have completed NMPs since they were first offered in 2005. The plans are funded under the NSDA Farm Investment Fund. Renewal plan funding is available every three years. The first renewal plans were completed in 2007. To date, 430 first time and 131 renewal plans have been completed. As of the end of 2008, just over 17% of Nova Scotia farmers had completed an NMP. Thirty percent of farms that completed an NMP in 2006 had a renewal completed in 2008.

Table 2 Completion of Nutrient Management Plans

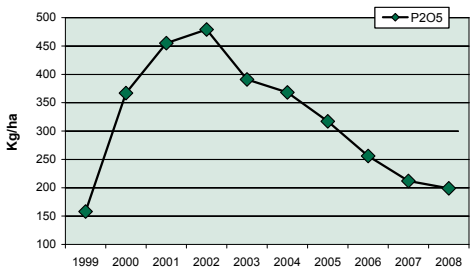
Year	Initial NMP Completed
2005	4.8%
2006	10.5%
2007	13.7%
2008	17.1%

Source: Nova Scotia Department of Agriculture, Programs and Business Risk Management Office

Macronutrients are important nutrients for plant growth and facilitate the efficient growth of crops. The main macronutrients measured in Nova Scotia soil tests are Phosphorus (P) and Potassium (K). However, too much P and K can have negative environmental effects on surface and ground water through overland runoff and leaching.

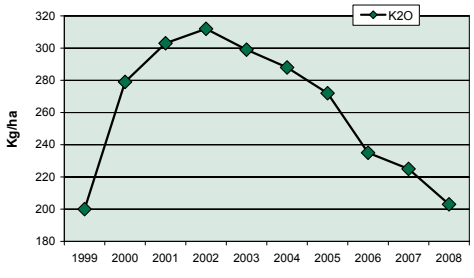
Figures 2 and 3 provide median levels of P and K for the last decade from soil tests conducted at the NSDA Soils Laboratory. Each crop group has different optimum levels of P and K for production, which

Figure 2
Nova Scotia Median Phosphorus (P_2O_5) Levels



Source: LP Consulting Ltd.

Figure 3
Nova Scotia Median Potassium (K_2O) Levels



Source: LP Consulting Ltd.

case study 3

Integrated Pest Management
(Blomidon Farms Limited)

The Hennigar family operates Blomidon Farms Limited (www.blomidonfarmsltd.com) in Dempsey's Corner, near the village of Aylesford, Nova Scotia. In operation since 1962, Blomidon's tree fruit crops are now under the management of Geoff Hennigar who took over operations from his father 15 years ago.

Today, the 280-acre farm employs eight people for the season, and up to twenty-five during harvest. It is the largest peach farm in Eastern Canada. Along with peaches, the farm grows apples, plums, nectarines, apricots, pears and some vegetables.

The Hennigars know the importance of pest management and the delicate balance between pesticide use and good quality produce that is attractive to consumers. The farm has always followed Integrated Pest Management guidelines – a farm-wide approach to economical and environmentally-sound suppression of pests, and Integrated Fruit Production, defined as 'economical production of high-quality fruit, giving priority to ecologically safer methods, minimizing the undesirable side effects and use of agrochemicals, to enhance the safeguards to the environment and human health'.

Geoff's objectives for his farm are to grow the best crops possible and be profitable. He also has a personal goal to minimize his farm's impact on the environment. "Spraying is my biggest dislike in farming and our goal is to use the least amount possible and to have no blanket spraying." The Hennigars have always followed safe practices, using recommended thresholds for spraying and minimum pesticide rates.

Integrated Pest Management, or IPM, works by pitting pests against their enemies, or trapping them with false promises of sex. Pesticides are used only as a last resort, when conditions warrant.

"In Canada it (IPM) began in Nova Scotia in their apple industry at the end of World War II when they were more or less pushed into developing a cheaper way of growing fruit, and they developed what they called a reduced pesticide program and they developed a system of taking advantage of beneficial insects, mites, what have you, and at the same time reducing pesticide use in their orchards." David Pree, www.science.gc.ca (June 28, 2007)

This means the operation is now using more expensive, but better directed, pesticides – alternatives to lower-cost blanket pesticides. The Hennigars use products that may accelerate the life cycle of a pest – "making it moult sooner rather than killing it outright." The products the Hennigars use are considered to be much "softer" pesticides, and include pheromone traps – devices used to lure and trap male insects and slow the rate of reproduction. Seaweed products are also used in the orchards as a deterrent to pests.

Geoff says that the methods he follows on the farm are more expensive relative to traditional methods, but their approach to pest management is much more targeted. "These (products) are more focused on the pest and offer minimal hazard to the beneficial insects in the orchard." This is important because many of the predator insects in the orchards, if permitted to thrive, can do some of the work of the pesticide.

The average consumer will not recognize the difference between product from the Hennigar's farm and product that follows more traditional approaches to herbicide and pesticide management practices. This means that the Hennigars are not able to offset their higher operating costs with premium pricing. Geoff, however, is helping to educate consumers one customer at a time through their retail outlet, Peach Pit Farm Market. Now in its fifth season, the retail outlet provides direct-to-consumer revenues that help offset higher production costs and Geoff has the opportunity to speak to customers about the "low-load" method of farming practices used by the Hennigars.

Geoff likes to "debunk the myths" about farming by speaking to people about their approach to agriculture. Geoff believes that what they are doing means something to the environment. "By using these products we have minimized the usage of pesticide products in our fields. We use less product and product that is more defined for the pests being targeted." Through their approach to pest management, the Hennigars are cutting back on the amount of pesticides that are entering the environment and the food supply. "The least amount of pesticide product is used to get the highest quality product."

Unfortunately, until there is no better return on investment for being sensitive to the environment, Geoff feels that others will continue to follow cheaper and less environmentally sustainable forms of farming. The bottom line – Geoff is "spending more money to get the same return, but for personal peace of mind, I feel better about it."

Table 3 Counties with High Phosphorous Levels

County	No. samples	% over 500 kg/ha	% over 1,000 kg/ha
Antigonish	3,288	31.8%	15.0%
Colchester	18,877	34.0%	15.5%
Cumberland	6,626	33.0%	14.3%
Hants	6,114	30.9%	13.0%
Kings	20,230	39.6%	18.9%
Pictou	3,004	33.0%	14.5%

Source: LP Consulting Limited

may not be optimum for the environment. Forage and grain levels have the lowest (329 kg/ha for phosphorus and 411 kg/ha for potassium) and vegetables highest (914 kg/ha for phosphorus and 562 kg/ha for potassium). However, the large variation in recommended levels by crop creates a significant challenge for farmers managing effective crop rotations while ensuring that excess P and K do not build up in soils. Phosphorus has a detrimental impact on surface water, particularly runoff from fields with high soil-content levels.

The soil test levels of P and K increased until 2001, followed by a steady decrease to below optimum levels on a provincial basis. However, these values are provincial averages and Table 3 indicates that there are variations among counties and farms within those counties.

Table 3 provides information for counties in which there were a significant number of samples with what can be considered high or very high phosphorus levels. All of the counties identified had more than 30% of samples with over 500 kg/ha of phosphorus and almost 40% of samples for Kings County. Percentages of samples in excess of 1,000 kg/ha were approximately 15% with Kings County again the highest. Kings County has significant poultry production and poultry manure is high in phosphorus; however the other counties identified have predominantly livestock-based animal sectors that generally have lower phosphorus content in the manure. Some high levels of phosphorus may be the result of overuse of chemical fertilizer.

Future Goals and Objectives

Discussion with EFP coordinators indicates that they use the NMPs as part of their review for both initial and follow-up plans. Coordinators recommend that farmers complete NMPs as part of their overall farm environmental management program. Their goal is that any farmer who completes an EFP and grows crops will also complete an NMP. Industry's goal should be that any farm operation that uses or produces nutrients (i.e.: manure) should complete NMPs on a regular basis.

Strengths and Weaknesses of this Indicator

Completion of an NMP is tied to funding under some government programs but there is no mechanism to ensure that NMP recommendations are followed. Periodic updating of farm NMPs has the potential to monitor changes and trends in soil fertility levels, as well as adoption of recommendations. However, issues related to data ownership, privacy and database management are currently unresolved.

The plans detail farms by size, crop, slope of land and fertility recommendations. These data can eventually be used to build an information base that could provide input to a variety of research over the long term. Renewal plans are important in determining the extent to which farmers follow NMP recommendations. Factors such as fertilizer price and weather conditions will impact the farm's ability to use NMP recommendations in crop production in some years, but long-term trends should remove these impacts. Selection of soil health indicators tied to a data system to track changes in soil health needs to be established to provide trend data.

This indicator has the potential to help identify crop lands that have high risk of leaching nutrients into ground and surface water, as well as those fields that require additional fertility for optimal growth and nutrient uptake. However, the soil test data used are consolidated on a county or provincial basis that masks variation among farms and small geographic areas. NMPs, coupled with more detailed soil test data, will provide targeted information on environmental risk.

Soil-nitrogen tests are not completed by the NSDA soil laboratory. Soil nitrogen can contribute to GHG emissions and lower water quality; therefore, information on soil concentrations across the province would help Nutrient Management Planners and researchers assess potential environmental issues. However, there is

presently no soil nitrogen test that has been validated for our region; therefore, such a test will have to be developed to ensure meaningful data are available.

Recommendations for Additional Data

NMP reports contain significant details on soil fertility that could be used to assess the state of soils and nutrient management by specific location, crop and tillage practice. These data need to be centralized into a database that will allow detailed analysis. That analysis, along with the information on NMP completion as in Table 2, will provide trend data on Nova Scotia farmers' efforts to improve soil health over the long term.

Many farmers conduct soil tests during crop-years in which they are not having an NMP completed. Annual soil-test data should provide details on crops that are grown in fields tested, number of farms tested since many farms conduct multiple tests, and the percentage of test results that are above acceptable levels by geographic area and smaller than a county, so problem areas can be identified more specifically. Soil test data and Nutrient Management Plans should be coordinated to ensure comprehensive information is available for future report cards.

Important information on potential environmental risks is unavailable because of the lack of soil-nitrogen data under Nova Scotia's existing soil testing system. Steps must be taken to collect that data through annual soil tests.

Indicator 3: Implementation of Soil Conservation Practices

Definition of Soil Conservation Practices

Soil conservation practices aim to maintain soil quality by reducing erosion and soil compaction, and increasing soil organic matter. In Nova Scotia these practices include crop rotations that preserve soil organic matter, winter cover crops and plough-down crops, and contoured tillage practices, amongst others.

Table 4 Percentage of Farms Implementing Soil Conservation Practice

Cropping Practice	2006	2001
Crop rotation	35.5%	30.8%
Winter cover crops	8.7%	6.4%
Plowing down green crops*	12.0%	
Rotational grazing*	30.1%	
Windbreaks or shelterbelts*	23.6%	
No-till buffer zones around water bodies*	24.5%	

** New for 2006 or question changed*

Source: Statistics Canada, 2006 Census of Agriculture, Selected Historical Data, catalogue no. 95-632-XWE

Significance and Importance as an Indicator

The use of soil-conserving practices is an important indicator of efforts to improve soil quality in Nova Scotia. For instance, from data on the extent to which winter cover crops have increased over time we can infer that improvements in soil quality have been achieved.

Historical and Current Data

Table 4 provides census information on soil conservation practices conducted by Nova Scotia farmers who grow annual crops. These data indicate that a larger proportion of farms were using soil crop rotations and winter cover crops in 2006 than in 2001.

Future Goals and Objectives

Future census data will provide long-term trends for cropping practices, including information on the percentage of cropped acres represented by the farms that reported in the census. This will provide data on the impact on productive farmland of changes in cropping practices. Industry's goal should be to increase the percentage of farms and farmland on which soil conservation practices are applied.

Strengths and Weaknesses of this Indicator

Census data collected every five years is perhaps not often enough to provide information for on-going policy monitoring and decisions. Moreover, the accuracy of the information received reflects only what is provided by farmers, and is based on their understanding of the definition of the cropping practice. These data may also reflect weather conditions during the census year that may have influenced cropping activities by changing the farm's ability to plant cover crops or follow a desired rotation so that less environmentally beneficial practices have to be used.

Recommendations for Additional Data

This indicator would be more meaningful if these data were available on an annual basis and with more detail on the farms,

Table 5 Percentage of Farms Implementing Tillage Practices for Seeded Acreage

Tillage Practice	2006	2001
Incorporating most of the crop residue into the soil	65.9%	71.3%
Retaining most of the crop residue on the surface	20.3%	20.4%
No-till or zero-till seeding	13.7%	8.3%

Source: Statistics Canada, 2006 Census of Agriculture, Farm Data and Farm Operator Data, catalogue no. 95-629-XWE

such as main crop, location and farm size. Information on total acres and percent of cropped land on which the conservation activities are applied will increase the usefulness of this indicator.

Indicator 4: Implementation of Conservation Tillage Practices

Definition of Conservation Tillage Practices

Conventional tillage practices incorporate crop residue into the soil, leaving the soil more susceptible to erosion, particularly in climates such as Nova Scotia's that have significant amounts of rainfall relative to other areas of Canada. Conservation tillage practices leave all or some residues on the soil surface.

Significance and Importance as an Indicator

Practices that retain crop residue on the surface reduce the potential for erosion, while no-till or zero-till practices disturb soil cover the least and minimize erosion that can damage waterways and remove valuable topsoil that is important to crop production and soil health. Crop residues left on the surface or reduced tillage methods also decreases vapourization of gases that contribute to GHG emissions, maintaining air quality.

Historical and Current Data

Table 5 provides census data on the type of tillage practices used in Nova Scotia. While the majority of Nova Scotia acreage is still seeded using conventional tillage methods, the trend is toward more conservation tillage practices.

Future Goals and Objectives

A future goal would be to gather crop-specific data on the percentage of acres represented by the farms that reported on the census (i.e.: type of annual crop). This would provide data on changes in cropping practices and the impact on productive farmland. Industry's goal should be to increase the percentage of farms and farmland on which conservation tillage practices are applied.

Strengths and Weaknesses of this Indicator

The indicator data come from census data collected every five years. These data may also be influenced by weather conditions during the census year that changed the farm's ability to apply a specific tillage practice. More frequent monitoring of tillage practices would provide data and allow industry and government to respond to trends more effectively. These data reflect farmers' understanding of various tillage practices which impacts the accuracy of the information they provide.

Recommendations for Additional Data

This indicator would be more meaningful if these data were available on an annual basis and with more detail on the farms, such as main crop, location and farm size. Information on total acres and percent of cropped land on which the specific tillage practice is applied will increase the usefulness of this indicator.

The Organic Approach
(Knoydart Farm Limited)

Knoydart Farm Limited. is a family-run business producing dairy, beef, sheep, and, more recently, cheese. Operated by Frazer, Angela and Adam Hunter of Pictou, NS, the farm is in its nineteenth year of operation (eleventh year of operation under present ownership) and for the past two years has been run as a certified organic farm.

Why switch to organic production? Frazer says it was because "1) I want to do it; 2) there are market opportunities; 3) the consumer is demanding it and the consumer is the marketplace."

"...it was more of an economic decision than an environment decision, but the environmental benefits were obvious."

As Frazer reflected on the future of his farm and passing the operation to family, his choices were to diversify the production mix, buy more dairy quota, or do more value-added production. Based on what Frazer saw in Ontario where organic dairy production was yielding a 20 percent price premium over traditional milk production, he decided to convert to organic production and value-add his milk. As Frazer says, "This was not our attempt to 'save the world' – it was more of an economic decision than an environment decision, but the environmental benefits were obvious."

The Hunters knew the transition from traditional to organic farming would be challenging. The farm land had to be weaned off chemical fertilizers, herbicides, and other traditional methods. As Frazer says, "Your soil is changing from an instant fix to trying to do things over a longer period – in non-organic you can slap on nitrogen and get a quick response." With organic production, things have to be planned more carefully and with a view to the total agronomy of the farm. In organic farming there are "no quick fixes". If you want the effect of nitrogen, plant clover the previous year; if you have pests, diseases and weeds, you need to think of "total agronomy from the point of view of farm planning."

The process of becoming certified organic took the Hunters four years – three years to convert the land and one year to convert the animals. Over that time, yields deteriorated and more land was farmed to offset the drop in production. They were fortunate that additional land was readily available for rent in their area.

Frazer said the first two to three years were the most difficult, but the results have been positive. Changes to livestock husbandry meant no more instant control mechanisms; while yields initially fell, production is back up, vet bills are down, animals are physically healthier, and cows are living longer. When the cost of commercial fertilizer doubled recently, Knoydart Farm Ltd. was unaffected.

If the currencies for the twenty-first century are education and innovation, Frazer adds that innovation must be "sustainable, market-driven, and with a margin – organic works on the agronomy side, so it is sustainable." It works on the market side, because consumers demand it, and it is innovative, because, as Frazer says, they had to learn and adopt organic approaches to manage the total agronomy of the farm.

Being an organic operation is an ongoing process, and there will always be lots to do. Frazer says that in livestock production, "all you are doing is converting something from the soil to crops to animals – so looking after the soil, when it comes to organics, is critical to success."

Stakeholder Interviews

A variety of stakeholders were interviewed to gain additional input on the agricultural industry's relationship with the environment. This section summarizes the opinions of those interviewed. Although supporting data are not readily available, the opinions provide anecdotal information and may help identify new areas for data collection.

Those selected for interviews have been associated with environmental initiatives related to research, program delivery and industry representation. Others supply inputs to the industry, such as equipment and services, which have changed over the years, partially in response to environmental issues.

In general, stakeholders believe that farmers are doing well in the face of industry change and difficult financial challenges but this is a long-term process and issues will take years to address. Interview responses can be combined into several categories.

Cultural Shift

The most significant change has been a dramatic shift in the culture as it pertains to agriculture and the attitudes and reaction of farmers to environmental issues. Farmers have a vested interest in being environmental stewards. Their livelihood depends on protecting their land and their natural resources. For example, washing manure and fertilizer spreaders by backing them into the stream is no longer part of farming. Nova Scotia's environmental acts and regulations support these changes by encouraging compliance rather than using the coercive powers of government as an enforcement tool. This has helped establish a culture of self regulation that minimizes the need for a harsh regulatory approach.

Interviewees believe farmers have generally done a good job of mitigating their environmental impact, but a bad job of documenting the results and communicating them to the public. Interviewees believe that farmers have come a long way, but also said "don't pat yourself on the back yet – there is still a long way to go." Farmers need to communicate how proud they are of what they are doing and be more open to the public. Public outreach also needs much more emphasis on educating future decision-makers. Communication to the public has to become a major part of the farm response to environmental issues, providing accurate information to all Nova Scotians.

Manure Management

One industry researcher stated that Nova Scotian farms do not produce sufficient manure to meet crop requirements based on recommended manure application amounts. Regional consolidation of farms has led to some areas having excess manure for their land base leaving others with manure deficits. Transportation costs of manure are prohibitive and land application of excess manure has created concerns about high phosphorus levels in some areas, particularly in the Annapolis Valley where much of the province's poultry sector is based.

Larger farms and increased scale of production enhances challenges to efficient manure handling. EFP coordinators indicated that farmers have increased storage capacity and many have moved to liquid manure systems, an opinion that is supported by the $17-million investment since 2005 supported by the Farm Investment Fund. However, manure management in areas of livestock concentration has to be improved.

A regional approach is needed so excess manure is moved elsewhere or alternative uses developed. Programs and systems could be developed to support these efforts. Transporting liquid manure is particularly expensive as it requires specialized equipment and has relatively low fertility levels per tonne because of the amount of water mixed with the manure.

Some farmers and farm groups are investigating alternative uses for excess manure, such as producing energy from biogas using anaerobic digestion. This approach may be particularly useful for areas of the province with high livestock density and little crop land, such as Digby and Yarmouth Counties, although the wastewater has to be treated to protect the environment.

Farm Management and Investment

Interviewees who work closely with farmers believe they have become very aware of risk management in relation to the environment. Farmers have invested in manure, fuel and pesticide storage to reduce the incidence of spills that will

damage the environment. Farmers are more careful in their use of pesticide sprays, partly as a cost savings technique; using targeted sprays, spraying based on need rather than a general preventative step; and moving to biological controls such as insect predators. Tree fruit orchards and blueberry operations have adopted many of these practices.

Both those who work closely with farmers and information from the Farm Investment Fund indicate that livestock farmers are fencing animals away from watercourses and installing alternative water sources for pastured livestock. This reduces the negative impact on waterways and improves livestock rate of gain by up to one-half pound per day through improved water quality.

Farmers are using more cover crops to combat erosion. Bare soil is rarely seen in Nova Scotia in winter. Most farmers realize the need to save soil to retain fertility and yields. Nutrient management plans are helping farmers target manure and fertilizer applications to maximize yield, which has the side effect of reducing the potential for run-off into waterways. Energy efficiency is an area that requires more focus, benefits the environment and helps farmers reduce costs, similar to the impact of NMPs.

Government's Role

Programs to help farmers make environmental investments coupled with EFP recommendations have effectively supported changes in agriculture's interface with the environment. Continued investments to improve agriculture's role as environmental stewards will require on-going support, including industry education on environmental issues.

One area identified by interviewees is the lack of specific extension resources dedicated to environmental issues, including educational programs and specialists to provide whole-farm advice that incorporates farm production issues. For example, drainage on some farms is poor and extension resources are not available to help design effective drainage systems. Several sectors have experienced growth from new entrants who do not have the level of access to extension support as previous generations. New farmers frequently try new things that may increase environmental risk and need the support of specialized, dedicated extension and research staff from government, universities and the private sector.

One of the areas farmers will have to focus on in future is water – both quality and quantity.

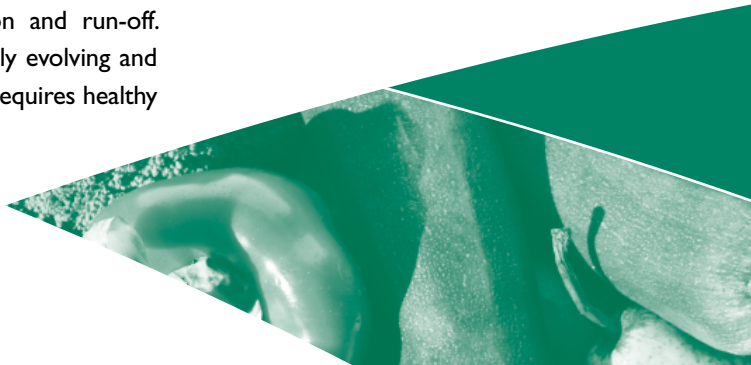
Industry Challenges

Farmers need to focus on the EFP recommendations which frequently emphasize management changes rather than costly investments. While EFP industry penetration is impressive, there are many farms that have not completed EFPs and may be unknowingly creating risk to the environment. A concerted effort has to be made to ensure that all Nova Scotia farms complete and implement EFPs to protect both the environment and industry reputation.

One of the areas farmers will have to focus on in future is water – both quality and quantity. This is both an environmental and economic concern (e.g.: irrigation, livestock drinking water). The initial impetus for the agricultural industry's focus on the environment was water quality issues as they related to erosion and run-off. Water issues are continually evolving and expanding and agriculture requires healthy water to survive, so it has to be involved in developments. Many large dairy farms now plant corn and row crops for feed, moving away from forage-based systems and raising issues around erosion management because soil is exposed from row-crop tillage systems. Concentrations of farms in specific areas and the resultant increase in phosphorus concentration have the potential to negatively impact groundwater. Changes to farm industry structure have to be done in such a way that water is protected.

The mink and poultry sectors are concentrated in relatively small areas, which increase environmental risks. The mink sector, in particular, is primarily located in an area with a small cropland base, reducing alternatives to effectively manage mink manure and other wastes close to mink farms. Transporting excess manure to areas with manure deficits is very expensive and the manure often has to have water removed to reduce its volume for trucking. This expense limits opportunities to manage excess manure based on transporting it to other areas.

Issues of biodiversity in Nova Scotia are different from many other provinces because of the nature of our agriculture and geography. Farming areas in other parts of the country that are dependent on row crops have more challenges maintaining biodiversity than Nova Scotia, but farmers still need to address this issue, particularly as farms grow and consolidate.



Emerging Issues

Several emerging issues in agriculture have been identified that will influence agriculture's interface with the environment. Industry, government and researchers should identify indicators and collect data to measure environmental effects related to the issues. Issues include:

Energy

Energy issues encompass both more efficient use of fossil-fuel based energy and adoption of alternative energy sources. The close relationship between fossil fuel use and climate change adds importance to this emerging issue. Reduction in use of fossil fuels through conservation and replacement with alternative energy sources will also improve air quality.

Energy efficiency is the most immediate opportunity to reduce fossil-fuel use. Nova Scotia Agricultural College has established an Energy Chair and Energy Committee. The College also developed an energy audit program that has been tested on 15 farms. The program reviews energy usage and recommends change and investments that will conserve energy. The energy audit program has the potential to generate long-term data similar to that from the EFP and NMP regarding farm adoption and impact of energy initiatives.

Farmers and farm groups are investigating alternative, renewable energy sources such as wind, solar, biogas, biodiesel and biomass. Some of these initiatives have the potential to address issues of excess manure. Both the fur and poultry sectors are investigating biogas production using manure and industry waste materials.

Industry, government and researchers need to begin identifying and collecting data for use in the next agro-environmental report card. That information should focus on both energy conservation and adoption of renewable energy alternatives.

Biodiversity

Agriculture provides significant biodiversity and ecological habitat through the forests and wetlands farmers own as well as their cropping practices and patterns (e.g.: pastures, hay land, shelterbelts, perennial forest crops, setbacks from waterways). Biodiversity measures require a whole-farm approach because many aspects of agriculture influence the ecological system that includes plants, animals, insects, soil microbes and so on. Systems for whole-farm biodiversity management need to be adopted before indicators can be identified to track changes. The Nova Scotia Department of Natural Resources has developed a program to conduct Agricultural Biodiversity Conservation (ABC) Plans for farmers. ABC Plans have the potential to become an important indicator similar to EFP and NMP.

Alternative Soil Amendments

Reducing use of fossil-fuel based soil amendments depends on identifying alternatives. Several alternative products have been studied and adopted, such as wood and seaweed products and others are of public interest (e.g.: bio-solids).

Relevant indicators should be defined and measurement data identified so this emerging issue can be included in the next report card. Data needed include neutralizing efficiency of off-farm nutrients as they affect pH, specific content of both beneficial and hazardous material and potential economic benefit to farmers.

The following recommendations are designed to fill information gaps and improve the quality of the indicator data, as well as address environmental issues identified in the indicator analysis. Recommendations are directed toward the Agricultural Industry, Researchers and Government.

Better Energy Management
(White Birch Poultry Farm Inc.)

David and Patti Young operate White Birch Poultry Farm in Bridgewater, Nova Scotia, where they barn-raise more than 750,000 kg of chicken and up to 130,000 kg of turkey annually. Like other poultry farms in Nova Scotia, White Birch Poultry Farm faces a challenging set of circumstances when it comes to rising energy costs.

Raising chickens takes a lot of heating oil, and a lot of electricity for lighting and air circulation. After labour and feed, energy is the highest cost item needed to raise poultry. It is also one factor of production where farmers can do little to control prices.

Even so, David knew he had to do something when the price of oil shot past $140 per barrel in 2008. David explains, "This is not something you think about every day," but the motivation for change was pretty strong last year when he was dealing with big increases in energy costs.

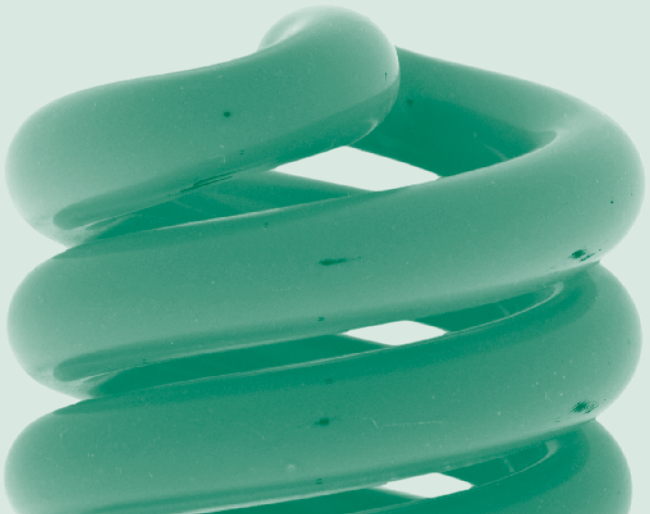
With the help of an energy audit made available through a pilot project of the Nova Scotia Scotia Agricultural College, David was able to access expertise and identify areas where they could be more efficient. The energy audit identified wasteful energy uses and offered simple, low-cost recommendations for improvements to heating and cooling management.

The energy audit showed White Birch Poultry Farm's normal practice of heating to target temperatures meant that heat remaining in the system after the furnace cut out would continue to heat the barns past the ideal temperature. This remaining heat was just enough to push the barn temperature up to trigger the exhaust fans to expel air David had just paid to heat.

Through the energy audit, David learned the off-mode for his barns needed to be about one-half of one degree lower than it was. This simple change meant the exhaust mode would be triggered less often and the result was a 10 percent to 15 percent reduction in heating oil consumption.

Another significant change in energy use at White Birch Poultry Farm occurred after a visit from their electrician. David had been aware that Compact Fluorescent Lighting (CFL) was a potential source for savings, but he did not know how significant this was until his electrician connected an amp meter to a string of CFL in one part of his barn. A surprise to both David and the electrician – ten lights were drawing less than one amp – about one-tenth the electricity of incandescent bulbs. Two hundred bulbs later, the chicken barn was running on CFL – with the net saving offsetting rising electrical prices occurring at the time.

David says there was no real investment needed for the steps they have taken. Every step benefited the environment and the farm. "They were jobs we had to do anyway, and at the end of the day they saved us money." Electricity and oil savings were important to cost control and any investment needed to make these adjustments was quickly paid back. Simple changes at White Birch Poultry Farm have resulted in reductions in the cost of production – small changes that are important for the environment and good for the operating budget.



Recommendations

Recommendation 1: Data Identification and Collection

The indicators used in this study reflect data that are currently available. The indicator discussion identifies weaknesses for each and steps that will improve the information they provide. Additional data for a range of environmental indicators identified in the AAFC report is currently lacking for Nova Scotia, as well as data on the impact of specific agricultural activities and resource status (e.g.: water quality, soil health). These are required to facilitate a more complete assessment of the impact of agriculture on the environment and will add to the number of indicators available.

Industry, government and researchers need to start gathering a broader base of information on all environmental categories – air, water, soil and biodiversity. The information needs to be related to specific activities and linked to programs designed to mitigate environmental risks and promote environmental sustainability. Much of this information is available nationally, but within Nova Scotia we need to develop a better understanding of the effect of environmental farm management practices in specific receiving environments, based on science and statistics.

These data are not currently available, although some information may be collected by other government levels or departments and universities. Efforts have to be made to determine data that are available, coordinate its consolidation and determine gaps that need to be filled.

Recommendation 2: Manure Inventory

Industry and government need to conduct an inventory of manure based on geographic location. Potential risks and new opportunities will be better identified with current, accurate data. The inventory will help industry stakeholders develop programs to manage manure as both a nutrient and potential energy source.

Recommendation 3: Soil Test Improvements

The NSDA should take steps to modify the information management system of the soil testing lab such that data can be analysed by crop and geography on an on-going basis. The feasibility of introducing a nitrogen soil test should be re-examined.

More detailed data will support the effectiveness of nutrient management planning and provide better data for industry and government decision makers. Accurate evaluation of soil health depends on being able to tie data to the specific situation (e.g.: location, crop).

Recommendation 4: Industry Participation

The agricultural sector has come a long way in developing and adopting management techniques and programs to protect the environment. The EFP and NMP programs have become valuable management tools and cropping practices have been adopted by many farmers that minimize their impact on the environment. Participation in environmental programs is still low relative to the number of Nova Scotia farms, with only about one-third of total census farms involved.

Both industry and government must focus their efforts on increasing farm participation in environmental assessment and risk mitigation programs. Efforts should focus on adoption of best management practices and technology that has beneficial environmental impact, such as renewable energy.

Working Within the Watershed
(Burgess Farm)

When Jim Burgess retired from his work in forestry, he and his family decided to develop what had been a hobby farm started by Jim's father in Middle Musquodoboit in 1951. Jim runs the farm with his wife and two full-time employees. During the harvest, Jim and his wife are joined by their three sons who spend their vacations working at the farm. Blueberries are the farm's main crop, along with Christmas trees and, more recently, organic maple syrup.

"...These are simple things and there are programs out there to help other farmers and they should be taking advantage of them."

The philosophy at the Burgess farm is one of quality. As Jim says, "We want to provide a good product and quality is first." That means careful attention to details and working with nature to ensure that farming methods are appropriate for the environment. Jim uses mulch to reduce erosion and runoff, and plants buffer zones along streams to improve habitat and protect waterways. "These are simple things and there are programs out there to help other farmers and they should be taking advantage of them," Jim says.

Jim was the Chair of the St. Andrews Watershed Committee, charged with the development of regulations designed to protect the water supply for the Town of Stewiacke. As such, he is well aware of the actions that can be taken to improve and protect water supplies. "Being on the Stewiacke watershed committee made me really aware of these issues." He also knows that helpful on-farm innovations are sometimes unplanned. The Burgesses noticed that a neighbouring farmer had been putting mulch from a local sawmill on the side of the hill where he was experiencing erosion. "After a year, we saw good results so we now do the same, particularly on the developing (blueberry) fields."

Jim explains that the mulch helps prevent rains from washing the soil away, keeps moisture in the soil, prevents weeds, and, because of this, blueberry plant rhizomes are better able to spread through the soil more easily than without mulching. This technique for preventing soil erosion is easy to manage – no equipment is needed, one person can spread a truckload in about an hour, it can be done in the off-season when there is downtime, and it does not need to be done all at once.

The Burgesses' EFP provided focused guidance on management of on-farm ditches and ponds. Ponds are used for fire protection, farm water supply, and a source of water for herbicides and pesticide spray on blueberries fields. The farm now has a filling tank located in the barn so tractor-mounted spray tanks are kept far away from the water supply in ponds. In the past, Jim explains, filling the spray tank meant they had to come as close as 30 feet

"...An accident is an accident, but if you know that risks can be mitigated, do so. And if you know these risks and do not avoid them, then someone will pay the price."

from the supply ponds – a concern that Jim recognized then and is glad to have behind him. With the filling station and the new filling system, the sprayer is 200 feet away from any ponds. This new method saves time, is less risky, and is much less stressful than before. Jim reminds other farmers, "There was funding programming to help support this."

Buffers are also used around ditches and ponds to prevent runoff entering waterways and improve wildlife habitat. Vegetation is permitted to grow in these areas so runoff and erosion from rain is reduced. By planting the buffer areas with wild roses and honeysuckles, the Burgesses are further reducing runoff and soil erosion potential while improving the local habitat, particularly for the native pollinators that are critical for the blueberry crop.

Jim says, "We could get a bigger crop if we reduced the buffers, but it is not worth the risk." In fact, Jim got into Christmas tree production as a result of experimenting with buffers. Around the edges of the blueberry fields the shadow effect from taller trees reduced yields. A section of this buffer was clear-cut and "Lo and behold we had a full crop." They decided to cut back shade trees where they could and use the land to grow Christmas trees which cast a smaller shadow into the fields. While the buffers were effectively maintained, the change increased blueberry yields and helped keep employees full-time throughout the year with the addition of the Christmas tree crop.

The Burgess farm is all about safe practices too. They have all the required pesticide training and licenses, a fuel shed, and pesticide storage shed - all items identified in their EFP. Jim believes it is better for famers to take the initiative and adopt safer practices because the consequences can be severe. He says, "Let's play on the safe side now. It concerns me that not everyone is aware of the risk. An accident is an accident, but if you know that risks can be mitigated, do so. And if you know these risks and do not avoid them, then someone will pay the price."

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ORGANIZATIONS THAT FREELY PROVIDED INFORMATION

Agriculture & Agri-Foods Canada

NS Department of Agriculture

NS Department of Environment

NS Department of Finance

NS Department of Natural Resources

Statistics Canada

PAID PROFESSIONALS

Printing	Bounty Print
Research and Writing	Kelco Consulting
Graphic Design	QB Marketing

EDITORIAL COMMITTEE

Shelley Manning	Agriculture and Agri-Food Canada
Stephen Hawboldt	Clean Annapolis River Project
Jim Burrows	Clover Crest Farm Ltd. & Scotsburn Cooperative Services Ltd.
Scott Milsom	Coastal Communities Network
Wendy Robichaud	Coastal Communities Network
Deborah Buszard	Dalhousie University
Gerry MacDonnell	Dalhousie University's Eco-Efficiency Centre
Michelle Adams	Eco-innovations & Dalhousie University's Eco-efficiency Centre
Tom van Oirschot	Environmental Farm Plan Team
Gordon Michael	Farmers' Market Investment Cooperative
Cameron Taylor	Mill Acre Farms
John Woodford	Municipality of East Hants
Crystal Fuller	Municipality of Kings County
David Burton	Nova Scotia Agricultural College
Gordon Price	Nova Scotia Agricultural College
Ralph Martin	Nova Scotia Agricultural College
Richard Donald	Nova Scotia Agricultural College/ Jacques Whitford
Gerry Post	NS Department of Agriculture
Marah Haywood	NS Department of Environment
Mike Langman	NS Department of Environment
Reg Newell	NS Department of Natural Resources
Brian Watson	NS Department of Economic & Rural Development
Brad MacCallum	NS Federation of Agriculture
Richard Melvin	NS Federation of Agriculture
Henry Vissers	NS Federation of Agriculture
Barbara McLaughlin	Statistics Canada
Debbie Nielsen	Union of Nova Scotia Municipalities
Ellen Simpson	Women's Institutes of Nova Scotia

ORGANIZATIONS & INDIVIDUALS CONSULTED

Jennifer Scott	
Geoff Hennigar	Blomidon Farms Limited
Jim Burgess	Burgess Farm
Jim & Leslie Burrows	Clover Crest Farm Ltd.
Bev Connell	Grant Thornton
Frazer Hunter	Knoydart Farm Limited
Lisa Mitchell	LJM Consulting
Laurie Cochrane	NS Department of Agriculture
Arthur Pick	NS Department of Agriculture
Judy White	NS Department of Economic & Rural Development
Kathryn Bremner	NS Environmental Farm Plan Team
Trevor Davison	NS Environmental Farm Plan Team
Ray Cote	NS Roundtable on the Environment
Rob Gordon	Ontario Agriculture College, University of Guelph
Laurence Nason	Pembrook Farms
Donald & Patti Young	White Birch Poultry Farm Inc.

STAFF

Phyllis Collier	nova**knowledge**
Tim Outhit	nova**knowledge**
Wanda Hamilton	NS Federation of Agriculture
Donna Langille	NS Federation of Agriculture
Henry Vissers	NS Federation of Agriculture
Krista Vroegh	NS Federation of Agriculture

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a report card · September 2009

Nova Scotia Federation of Agriculture
332 Willow Street
Truro, NS B2N 5A5
(902) 893-2293
www.nsfa-fane.ca

novaknowledge
Behind forward thinking.
1660 Hollis Street, Suite 201
Halifax, NS B3J 1V7
(902) 494-1510
www.novaknowledge.ns.ca

Agri-Futures
Nova Scotia's ACAAF Council
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Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada
Canada
332 Willow Street
Truro, NS B2N 5A5
(902) 895-4454
www.agri-futures.ns.ca