National Agri-Environmental Health Analysis and Reporting Program (NAHARP)

Environmentally Sustainable Agriculture

Achieving environmental-sustainability in agriculture –to ensure production and processing of agricultural products in a manner that protects the natural resource base, prevents degradation of soil, water, and air quality, and protects wildlife habitat and genetic resources– has become a more pressing and more complex challenge than ever. In some sectors, environmental concerns now pose a direct constraint to growth, and they are expected to increasingly affect agriculture's ability to retain international markets and compete for new ones. To be managed effectively, pressures and opportunities must be understood. Decision makers at all levels need reliable information on the impacts, economic implications, and expected future evolution of environmental performance in the agricultural sector. In other words, if we genuinely want to practice environmentally sustainable agriculture, we must have some idea of whether the path we are on is headed towards or away from this goal.

The National Agri-Environmental Health Analysis and Reporting Program (NAHARP)

In 1993, in response to the need for agri-environmental information and to assess the impacts of agricultural policies on the environment, AAFC began work on the development of a set of agri-environmental indicators (AEIs) to determine how environmental conditions within agriculture were changing over time, and how such changes could be explained. Results were published in February 2000 in the report, *Environmental Sustainability of Canadian Agriculture: Report of the Agri-Environmental Indicator Project.* Building on this initial work, and in light of current and future needs for this kind of information, it was decided to strengthen the departmental capacity in the development and continuous improvement of AEIs and of tools that use these indicators in policy development and integrate the environment and the economy. This capacity will be established through the National Agri-Environmental Health Analysis and Reporting Program (NAHARP), using the following three complementary approaches:

1) Agri-environmental indicators (AEIs)

Environmental indicators are the result of efforts into developing new ways of measuring and valuing environmental assets and services, and understanding the links between the environment and the economy. Agri-environmental indicators are science-based measures of key environmental conditions, risks, and changes resulting from agriculture, and of management practices used by producers. They are designed to inform agricultural and other decision makers about environmental performance in agriculture; demonstrate progress in adoption of stewardship principles and use of environmentally sound practices; support development of strategies and actions targeted at areas and resources that remain at environmental risk; and facilitate the environmental analysis of policies and programs in agriculture and the monitoring of their performance.

As a federal department, AAFC's goal is to provide national coverage of agri-environmental sustainability in a manner that is sensitive to the regional variations in agriculture and consistent across Canada. Therefore, in the context of NAHARP, AEIs are primarily intended to provide information at a national, provincial and regional scale. This means that these indicators will be subject to some level of uncertainty. To make national assessments it is necessary to work at broad temporal and spatial scales. However, broad scale analysis is not precise, tending to average out extreme conditions. Similarly, the ecological units (ecoregions, ecozones) are not homogeneous in terms of either farm management practices or biophysical conditions, and broad scale analyses tend to make them seem so. This makes the approach more suited to non-point source than point source environmental problems, and will usually not give an accurate picture of the farming or environmental conditions at specific locations. Because of the broad scale of this assessment, these indicators will rarely be applicable at the farm level, and this work is not intended as a guide to on-farm best management practices.

Under NAHARP, it is proposed to continue the work initiated under the 1993-2000 AEI Project, essentially updating the existing set of AEIs, enhancing methodology and underlying data when appropriate and possible, and developing new indicators to address key gaps in environmental information. To provide a comprehensive portrait of the situation, three types of indicators will be developed:

(1) state indicators, to provide information on the main impact (state) or potential impact (risk) from farm activities (e.g. risk of soil degradation, risk of water contamination, agricultural atmospheric emissions, state of agricultural biodiversity);

(2) pressure indicators, to provide information on major environmental stresses to agroecosystems (e.g. risks from invasive alien species, desertification, wildlife damage); and

(3) response indicators, to provide information on the use by producer of various key management options which may influence the environmental performance of the sector (e.g. use of integrated pest management, production eco-efficiency).

It is also proposed to initiate the development of eco-efficiency indicators for the food-processing sector.

The indicators developed under NAHARP will typically focus on risk (estimate of potential environmental impact) rather than state (monitoring of the presence and degree of an impact) because they are more readily calculated at broader spatial scales and can isolate the potential contribution from agriculture on the environment. Also, detailed field monitoring data are generally not available on a national scale for most environmental issues. AEIs are therefore based on integrating existing information on soil, climate, and landscape with data from the Census of Agriculture and/or custom data sets, using existing mathematical models or formulas (e.g. Century model, RUSLEFAC), or new ones developed specifically for these applications. These calculations can be repeated over time to estimate changes and trends in the indicators. Many existing indicators have been calculated using the Soil Landscape of Canada polygons as the basic spatial unit. This level of detail allows data about soils and landforms to be integrated with farm management data derived from Census of Agriculture enumeration area summaries. Results can then be summarized and portrayed on an appropriate ecological basis, such as the national ecological classification system for Canada (ecozones, ecoregions, ecodistricts) or by watershed level, as well as by province, region and country.

2) Integrated economic/environmental modeling and forecasting

While the AEIs provide an historical perspective of the environmental performance of the agriculture sector, analytical systems are also required to provide a predictive capacity for assessing agricultural policies and programs. This involves integrating economic models with AEI models to try to understand how changes to agricultural polices and programs will impact future economic and environmental outcomes of the sector in a manner that is consistent with government goals and objectives. The integrated modelling system uses a policy model to estimate changes in farm resource allocations (crops and livestock) relative to a baseline, and feeds this information into AEI models to assess a suite of environmental impacts. Some AEI models have already been linked to economic models (e.g. the Canadian Regional Agricultural Model, CRAM) and have been used in the past to assess the environmental implications of income support programs, analyse measures and strategies for reducing greenhouse gas emissions, and to help establish environmental targets for the Agricultural Policy Framework. Under NAHARP, it is proposed to further expand the departmental capacity in this area, and improve the quality and reliability of these tools.

3) Agri-Environmental Valuation

Through NAHARP, it is proposed to develop the capacity to quantify the economic costs and benefits of environmental impacts (positive and negative) from agriculture, to both farmers and society. There are no markets for many impacts of agriculture on the environment, such as water quality, wildlife habitat and atmospheric emissions, and assigning them an economic valuation will allow quantitative trade-off analysis of the environmental versus the economic impacts. Various approaches to non-market valuation of natural resources exist, and in establishing this capacity, particular attention will be payed to the work at Statistics Canada and Environment Canada on environmental accounts to ensure consistency.

Further information, please contact:
NAHARP
Agriculture and Agri-Food Canada
Central Experimental Farm
960 Carling Ave., Building 97
Ottawa, Ontario, K1A 0C6

or via e-mail: prouxs@agr.gc.ca