

\$108.4 million in 1976-77. Research, conducted at the Central Experimental Farm in Ottawa and at regional laboratories across Canada, involves all elements of the food chain, soils, crops, animals, plant and animal products and diseases, in addition to problems of food processing and storage. Other programs engaged in scientific activities include the Administration Program (scientific information services), the Canadian Grain Commission (grain research at the Winnipeg laboratory), the Health of Animals Program (animal and poultry diseases) and the Production and Marketing Program.

The agriculture industry accounts for some 3.4% of Canada's gross domestic product. Moreover, agriculture is a major export industry; wheat accounted for over 6% of Canada's merchandise exports in 1975, and in 1976 food, feeds, beverages and tobacco contributed a surplus of \$1.3 billion to the international balance of payments.

Rising labour and energy costs have made agriculture increasingly dependent on technology. This, combined with Canada's size, wide range of climatic and soil conditions and correspondingly wide range of agricultural crops and animals, makes it essential to coordinate research effectively.

The Research Branch performs most of the department's research studies and supports a number of expanded research programs. One is aimed at the economical conversion of cellulose and carbohydrate waste materials to feed-stock for ruminants and other animal species; others are concerned with the extraction and processing of proteins derived from plants, models for predicting crop production on the basis of soil and weather information and remotely sensed light reflectance from crop canopies, and a combined cultural and chemical control system for wild oats.

The branch is pursuing a central core of food-related research programs intended to improve the genetic characteristics of crops and livestock. One by-product of such studies is that branch scientists have developed techniques for sexing and for the successful transfer of cattle embryos. These techniques will increase the international exchange of superior gene pools. Continued research into the causes of early pregnancy failure, the mechanisms of transmission of diseases which reduce reproductive efficiency, and the artificial control of the female estrus cycle may lead to further improvements in the productivity of the Canadian breeding stock.

A modest increase is planned in the resources devoted to research programs that tackle energy and environmental problems. The emphasis of energy research will be on the energy efficiency of agricultural production systems and the conversion of animal wastes to usable energy forms. The environmental program will continue to emphasize research into the use of biotic agents for controlling agricultural pests and studies of the nature and effect of toxicants arising from infestations, additives, chemical control agents or inadvertent contamination.

The federal government, in cooperation with the various provincial governments, supports an active soil survey program. Surveys have shown that the land available for agriculture and food production is limited. Only about 5% of Canada's total land area, or about 120 million acres (49 million ha) is improved farm land and it is estimated that no more than 40 million acres (16 million ha) of land, most of it marginal, remains to be brought into use. This has given added impetus to land use research. It is expected that the Research Branch will give priority to improved evaluation methods and criteria concerning land productivity, and to the collection, collation, and manipulation of field data relating to crop yield, soil properties, economic inputs, climatic factors and other aspects.

The Economic Branch is expanding its activities in production economics, new technologies and management systems for farm use, appraisal of agricultural research resources, and energy modelling and monitoring of the agricultural system. The Production and Marketing Branch contributes to producer and industry groups, universities and provincial agencies for the development and adaptation of new agricultural crops and varieties for commercial production. The Health of Animals Branch is intensifying its research efforts on diagnostic