

food production is limited. Only about 5% of Canada's total land area, or about 49 million hectares (120 million acres), is improved farmland and it is estimated that no more than 16 million hectares (40 million acres) of land, most of it marginal, remains to be brought into use. This has given added impetus to land-use research.

The economics branch is expanding its activities in production economics, new technologies and management systems for farm use, appraisal of agricultural research resources and studies of energy use in agriculture. The production-marketing branch helps producer and industry groups, universities and provincial agencies on development and adaptation of new crops and varieties for commercial production. The animal health branch is intensifying research on diagnostic procedures for animal diseases, development of wildlife rabies vaccine and studies of disease prevention in high density cow-calf operations.

Agricultural research is conducted through a network of federal, provincial, university and industrial organizations. About 50% of the work is performed in federal laboratories. The agriculture department, as the focus of this federal involvement, has played an active role in developing the research infrastructure and in establishing co-operative research programs. Through its research agreement program, the department awards about \$1.3 million a year to scientists at Canadian universities. It contributes to the provinces for expansion of veterinary science teaching facilities at the universities of Guelph, Montreal and Saskatchewan.

#### 9.2.5 Atomic Energy of Canada Limited

Atomic Energy of Canada Limited (AECL), with intramural R&D expenditure of about \$63 million in 1977-78, is a Crown corporation responsible for nuclear research and utilization. The main R&D centres are Chalk River Nuclear Laboratories, Chalk River, Ont. and Whiteshell Nuclear Research Establishment at Pinawa, Man. These laboratories carry out a full range of activities: underlying research in physics, chemistry, materials science and radiation biology; research and development on advanced nuclear reactors and other nuclear power systems; and research and development to improve current models of nuclear power plants. Three other groups, covering power projects, heavy water projects and commercial products, are responsible for utilization. They also carry out development work related to commercial objectives.

The corporation's prime responsibility is to develop nuclear energy technology to meet Canadian requirements. Its objective is to make available by the year 2000 about 80 000 MW of nuclear capacity (one and one-half times Canada's present total electric capacity). It also produces radioisotopes and develops associated products such as radiation processing equipment and radiotherapy instruments for use in medicine and industry.

Applied research and development activities, mainly performed at Chalk River, Ont., and Pinawa, Man., are carried out on power reactor systems, nuclear fuel, environmental protection and radioactive waste management, heavy water production, radiation equipment and radioactive isotopes. Applied work is supported by basic research in physics, chemistry and materials science. There is close collaboration with utilities and industry since this program provides the technological base for the largest industrial program ever initiated, developed and put into industrial practice by Canadians. About 30,000 people are employed in the Canadian nuclear industry.

R&D ranges from work at the laboratory bench to experiments using multi-million dollar research reactors and associated facilities. Much of the nuclear power activity involves the CANDU (CANada-Deuterium-Uranium) pressurized heavy water system; as well, work is conducted in support of heavy water plants. Particular attention is paid to developing reliability through sound design and good maintenance so that high capacity factors already achieved (87% for the Pickering, Ont., generating station in 1976) will continue. A slowly increasing percentage of the work is devoted to the development of new fuel cycles to ensure nuclear fuel supplies adequate for centuries. To protect people and the natural environment from effects of radiation, about 10% of the research effort is devoted to radioactive waste management, health physics, environmental research and biology research.