Report of the Director

J.R. Hillman

Agricultural production on a world basis was generally satisfactory during 1990. Forecasts by the Foreign Agricultural Service of the United States Department of Agriculture indicate that world grain reserves of wheat and rice increased for the first time in four years, although the reserves of coarse grains were expected to decline. In most economically developed countries, the production of dairy products, sugar, wine and wool exceeded demand; output and consumption of oilseeds and their by-products appeared to be in balance. The Quarterly Bulletin of Statistics issued by the Food and Agriculture Organization of the United Nations reveals that the preliminary indices of total agricultural and food production rose for the second year in succession, but *per capita* food production remained the same as in 1989. War and civil strife exacerbated drought conditions or weak economies in parts of Africa, and emergency assistance was required to avert widespread famine. Bolivia, Haiti, Nicaragua and Peru also needed assistance.

The collapse in December of the multilateral trade negotiations led to urgent moves to rescue the Uruguay round. Political and economic pressures continue to be applied by the United States of America, the Cairns group of agricultural exporting nations and less-developed countries to the European Community to alter the operation of the Common Agricultural Policy with its associated import restrictions and export subsidy arrangements. Changes to international trade practices in agricultural commodities may have an immediate effect on the priorities and funding of agricultural research and

development programmes in both the public and private sectors.

In the food processing and marketing areas, there was increased emphasis on the health and safety aspects of food, food packaging and new products. Consumers favour innovation, freedom from residues and contaminants, pleasing appearance, detailed labelling, easy preparation and value for money. These expectations are transmitted directly to the grower, who is largely dependent on food-related products and unable to capitalise on added-value processes. Legitimate concerns about food irradiation, laboratory-based genetic engineering, and chemical methods to control weeds, pests and diseases can only be addressed by research, education and openness. The alternative is likely to be a ban on processes that could be crucial to meeting the complex requirements of various societies.

Throughout the year and relevant to two SCRI research projects, the predominant environmental issue continued to be the threat of climate change arising from the so-called 'greenhouse effect' and depletion of the stratospheric ozone layer. In many respects, international cooperation is good, with political commitments to fund research projects and introduce measures for environmental protection. Remarkably, an environmental agenda has emerged worldwide. This involves the creation, protection and management of wilderness areas, national parks and special ecosystems, in addition to greater care over waste disposal and xenobiotics, integration of control measures and the synthesis of national and international policies setting quality standards. Conflicts arise, however, between the needs of a rapidly expanding world population and the environment. Anthropocentric policies imperilling the existence of other species and sub-species horrify biologists and those sensitive to the natural world.

1990 was associated with tremendous concern over forestry activities. Bans, export taxes and adverse commentary on the environmental impact of harvesting hardwood and softwood timber in natural forests have in turn affected the supplies of wood and wood-products to the industrialised nations. In the arid and semi-arid areas of the third world, a shortage of wood for fuel adds to stressed lifestyles. There is an increasing role for agroforestry to create and maintain sustainable and environmentally sensitive agricultural systems. Research on woody plants - their genetics, breeding, pathology, physiology, propagation, cultivation, ecology and use - must become a priority in the life sciences. To this end, SCRI is already building on its investments and achievements in fruit crops and fibre biochemistry and biophysics.

One feature of the western world is a growing divide between stable or expanding urban and declining rural populations. In the UK, 91.5% of the population is urban, with relatively low mobility, a birth rate per 1000 population of half the world average, and a population doubling time in excess of 100 years. The overall population density is high (235 persons /km^2) revealing the extent of crowding in the urban areas. Perceptions of agriculture and horticulture by the urban population are complex: subsidies, "food mountains", high-technology methods, animal welfare issues, real and imaginary scares on food safety, and purported privileges for sections of rural communities contrast with appreciation of the countryside, poor financial returns, long hours of physical effort, dependence on the vagaries of the climate, lack of modern social facilities, and transport difficulties. Rational analysis of world population trends and all that implies, and realisation of the potential impact of climate change and the adaptability of pests and diseases, firmly point to a pivotal role for advanced agriculture to sustain urban mankind and continued development of social structures. Again, those concerned with rural affairs must publicise their meritorious activities and demonstrate their importance.

Links between SCRI and the Centres (Institutes) supported by the Consultative Group on International Agricultural Research (CGIAR) are critical to the development of the SCRI remit, aims and objectives. Established in 1971, CGIAR is an informal association of 40 public and private sector donors that in 1990 pledged $240 million to support an international network of 13 (now 16) Centres designated to investigate agricultural and food problems afflicting the world's disadvantaged peoples. The CGIAR system is one of the most successful international development initiatives in the postwar era, contributing to improved cultivars of wheat, rice, maize, sorghum, pearl millet, beans, cassava and potato, as well as introducing pest control systems, coordinated gene banks and germplasm collections, and assisting national programmes of developing countries on agricultural policies and research. In meeting the interwoven challenges arising from deteriorating environments, poverty and population growth, the Centres are beginning to focus on

sustainability, biotechnology, and technology transfer at the regional level. SCRI has a growing involvement in several of the Centres, notably Centro Internacional de la Papa, International Board for Plant Genetic Resources, Centro Internacional de Agricultura Tropical, Centro Internacional de Mejoramiento de Maiz y Trigo, International Center for Agricultural Research in the Dry Areas, International Crops Research Institute for the Semi-Arid Tropics and International Institute of Tropical Agriculture.

Domestically, the Institute thrives. Five techniques are permeating our research programmes *viz.* predictive modelling, mass spectrometry, nuclear magentic resonance, electron paramagnetic resonance and the polymerase chain reaction (PCR). Pioneering studies by Khorana, Mullis and colleagues that gave rise to PCR answered the needs of molecular biologists to study DNA, permitting specific DNA fragments to be copied repeatedly, resulting in enormous amplification of the starting material. Elaborations such as anchored, inverse and rapid PCR systems, especially in combination with Southern and Northern blotting and restriction fragment length polymorphism, are revolutionising research on heterogeneous and small DNA samples, detection and diagnosis of diseases, speciation, gene cloning, gene mapping and sequencing. Problems with false-positive signals from contamination, the accuracy of the type of DNA polymerase and statistics of the process are recognised and are being investigated.

Early in the New Year, Mr J. A. Inverarity OBE was appointed Chairman of the newly formed Scottish Agricultural College and stepped down as Chairman of the SCRI Governing Body. He retains membership of the Governing Body where his special expertise is invaluable. Mr James L. Millar CBE, Chairman and Chief Executive of Wm. Low & Company plc, replaced Mr Inverarity as the SCRI Chairman, emphasising the importance of matters financial and administrative in modern scientific organisations.

Senior staff appointments during the year reflected the scientific transformations taking place at Mylnefield. Dr H.V. Davies was appointed to UG6 Head of the Cellular & Environmental Physiology Department, Dr J.M. Duncan to UG6 Head of the Mycology & Bacteriology Department and Dr D.A. Perry to UG7 Head of the revamped Scientific Liaison & Information Services Department. Dr J.W.S. Brown, formerly Lecturer in Biological Sciences, Dundee University, was appointed UG7 Molecular Biologist in the Cell & Molecular Genetics Department, placing SCRI at the forefront of studies of plant gene splicing. Several junior appointments were also made of outstanding staff members, enhancing the scientific stature of the Institute. Supervision of research students is seen to be an integral part of the activities of a major research institute, and healthy growth in the numbers of students and participation in university activities was a feature of 1990.

Implementation of the Control of Substances Hazardous to Health (COSHH) regulations and related legislation of health and safety in the workplace received particular attention during the year. In the Agricultural and Food Research Service, all Institutes followed the guidelines, adapting laboratory and field practice to conform to the rules and investing heavily in facilities and equipment. Cost and inconvenience are seen as the necessary price for a safe working environment.

Reorganisation of the Administration Department was essential to absorb changes in the research commissioning arrangements and to deal with the commercial interface. Mr S. L. Howie, Chartered Accountant, was appointed to manage the accounts. Implementation of the administrative computing system installed in Scottish Agricultural Research Institutes and the Scottish Agricultural College proceeded slowly as a result of modifications to the software supplied by McKeown's; this will prove to be a limiting factor in upgrading financial management in the Scottish system.

Through the generosity of Professor and Mrs R.B. Massalski, a Prize Fund was established in memory of their son, Dr Peter R. Massalski, who was a member of the Virology Department at the time of his death. The Fund which is administered by the Scottish Society for Crop Research provides the Peter Massalski Prize awarded biennially to the person under 36 years old who is considered to have done the most meritorious research while working at SCRI. Dr K.J. Oparka of the Cellular & Environmental Physiology Department was the first recipient of the Prize presented by Professor Massalski at a ceremony held on 19 June 1990.

Contributions to numerous scientific societies and journals by the staff are testimony to the rapidly expanding influence of the Institute in diverse areas of

the life sciences. These roles must be seen alongside the greatly enhanced output of published papers and patents as well as unprecedented levels of external grants and contracts. Such achievements are only possible by the commitment of highly competent staff in every department. We gratefully acknowledge the Scottish Office Agriculture and Fisheries Department and its core funding. Grants, contracts and donations from the Scottish Society for Crop Research, governmental agencies, grower levy boards, local authorities, commercial companies, farmers and individuals are also warmly appreciated.

Mylnefield and Gourdie Farm from the south.