Report of the Director

J.R. Hillman

Preliminary indices in the Quarterly Bulletin of Statistics issued by the Food and Agriculture Organization of the United Nations reveal that total agricultural and food production on a world basis fell slightly in 1991. This can be attributed largely to political decisions in those countries responsible for agricultural exports. With the exception of certain areas of the world suffering from war and strife, the less-developed countries generally experienced reasonable harvests and demand for food aid was less pressing than in previous years. *Per capita* food production in both developed and less-developed countries fell to a level close to that of 1988, but food stocks were apparently adequate to compensate for the shortfalls and suppress price rises. The record grain stocks accumulated in 1990 have permitted global grain use to exceed output in 1991. Much of the decline in grain production occurred in the former Soviet Union. World output of oilseeds and their by-products increased again in 1991, with rises in the production of rapeseed, cottonseed, palm kernels and soybeans. Raw sugar production also rose in 1991. Green coffee production was similar to that of 1990 but cocoa bean production declined. The collapse of the Soviet bloc in 1989 was followed in 1991 by the abrupt dissolution and disintegration of the Soviet Union itself. In turn, agricultural production was adversely affected, reflecting the breakdown in the arrangements for marketing and distributing food stocks and agricultural inputs such as seeds and agrochemicals. Throughout the cold war, there had been limited dialogue between scientists in the west and behind the Iron Curtain. Now there are pleas from large numbers of scientific organisations and scientific colleagues in the former republics for assistance. Few substantial support programmes aimed at promoting collaborative research and development in the non-medical life sciences have been implemented, despite the fact that a great deal of time and effort have been invested by the agricultural research institutes in establishing formal links. Undoubtedly, though, these links will lead to formal contracts in the near future.

Although recession in 1991 affected food processing and marketing, health and safety aspects remain paramount for Western consumers. New legal regulations such as the Food Safety Act 1990 restructured food legislation in the UK, influencing marketing operations and leading to the widespread application of analytical technologies at all stages in

the food production and retailing chain. Natural food flavourings, colouring agents, food irradiation, packaging, and freedom from contamination and imperfection are rapidly becoming crucial areas of research and commerce. In the UK, the food and drink industry became the largest contributor to the trade deficit. Import substitution will surely receive greater attention than hitherto.

As in 1990, the year ended with the inability of the United States of America and the European Community to agree on agricultural reform at the multilateral trade negotiations, suspending completion of the Uruguay round which fortunately does not have an official deadline. A package submitted at the end of 1991 by Arthur Dunkel, Director-General of the General Agreement on Tariffs and Trade, specified the major issues to be resolved in world agricultural trade. The issues included export competition and subsidies, market access and the conversion of non-tariff import barriers, special safeguards to prevent swamping of the domestic market by imports, reductions in domestic support, and future reforms. Successful completion of the Uruguay round would have a profound effect on the direction and priorities of agricultural research and development.

Growing awareness of the environment is manifest in the attention paid to the preparations by countries for the United Nations Conference on Environment and Development, the 'Earth Summit', due to be held in Rio de Janeiro in 1992. Strategies designed to reduce the threat of climate change arising from the so-called 'greenhouse effect' and the depletion of the stratospheric ozone layer have been linked to a range of other topics tied to pollution. Nonetheless, deep divisions have grown between the industrialised and less-industrialised countries over the financing and timing of environmental reforms. Establishment of the Global Environment Facility, which came into operation in 1991 through the cooperation of the World Bank, the United Nations Environment Program and the United Nations Development Program, may provide practical assistance in environmental protection and preservation of areas of rich ecological diversity.

Throughout the world, scientific research is under severe pressure. Scientists in the USA, for example, face sharply reduced grant-aid, greatly increased bureaucratic impedance, phenomenal political and legal interference, internecine disharmony, and a public perception mauled by ferocious activists and well-publicised accounts of fraud and failure to meet expectations. Most worrying of trends common to most countries, but especially prevalent in the USA, is the disillusionment of young scientists seeking a career in research. In truth, science has an insatiable appetite to consume all resources made available to it and thus judgements on priorities will be inevitable. The mechanisms to establish priorities, monitor progress and achievements, and avoid whimsical interference are central to the maintenance of a proper science base.

Unlike most research bodies in the UK, SCRI has experienced a period of growth commensurate with the transformation of its science and the importance of its projects in the context of global agriculture and the life sciences. The Scottish Office Agriculture and Fisheries Department (SOAFD) properly adopts a rigorous, clinical approach to the disbursement of its funding, carefully scrutinising all projects it finances wholly or in part. The support we receive from SOAFD and the rapid growth in contract income directly reflects the confidence of those that fund us. Detailed analysis of this Annual Report and previous reports reveals the major scientific achievements of SCRI and the associated Scottish Agricultural Statistics Service (SASS). The SCRI Interim Visiting Group Report was especially well received by the AFRC Plants and Environment Research Committee, providing independent assessment of the Institute. In drawing together the multidisciplinary skills of plant geneticists, pathologists, physiologists and agriculturalists, with molecular biologists, mathematicians, statisticians, physicists, chemists, and environmentalists, it has been possible to combine traditional and modern approaches to the life sciences. Valuable conventional expertise in agronomy, pathology, soil science and breeding have been retained and exploited at SCRI, in contrast to the situation elsewhere.

SASS received its first Visiting Group during 24-26 June 1991. The Group was comprised of Sir David Cox FRS (Chairman), Professor R Cormack and Professor B Morgan, with Dr M Carpenter and Dr P Maplestone of the AFRC Secretariat, and Dr T W Hegarty and Dr K Moore of SOAFD. In summary, the Group found that an extremely good organisation had been built up in the few years since the formation of SASS and commended the Director of SASS, Mr R A Kempton, for his hard work, leadership and initiative. A series of constructive recommendations

to strengthen SASS were presented in the report of the Group, and discussed at an implementation meeting with SOAFD and AFRC on 9 December 1991. Other organisations now look to SASS as the model system for multi-organisational research, consultancy and training in biomathematics and statistics. SASS is unique for it links the five Scottish Agricultural Research Institutes, the Scottish Agricultural College and SOAFD Agricultural Scientific Services, East Craigs, Edinburgh, enhancing the quality and value-for-money of the work in the 'Scottish System'.

Perhaps one of the most important changes affecting routine operation of research at SCRI during 1991 was the full implementation of the ROAME (Rationale, Objective, Appraisal, Monitoring and Evaluation) procedures as developed by SOAFD from recommendations of the Cabinet Office. Budgetary control of projects was transferred to Research Objective leaders of UG7 grade and above. Even greater emphasis is now placed on project management to retain flexibility, adaptation and most prominently, innovation. Science departments adjusted quickly to the change, their role evolving to sustain scientific disciplines, to act as centres for generating new ideas and proposals, and to attend to general administrative matters.

As universities and polytechnics undergo the transition to accommodate annual staff reviews, visiting groups, health and safety regulations, ROAME-based project management and redundancies, the institutes of the AFRS must share their experience as well as their science. SCRI collaborates closely at all levels with the higher education institutions, and our affiliation with Dundee University is probably the strongest, most productive linkage between an institute of the AFRS and a university in the UK.

SCRI houses several working genebanks of wild species, land races, derived research material, crop pests and diseases. New policies on the role of such genebanks are under consideration by government departments. That over 90% of the world's population depend on just 15 plant and 7 animal species for food grown on an ever-diminishing area of cultivated land poses enormous questions about the potential impacts of climate change, loss of genetic diversity and population growth. Population pressures, hence the demands on and perception of agriculture, differ according to region. Over 85% of the growth in human population occurs in the less-developed countries where the numbers of malnourished people have increased by 30% since 1980. In the tropics, the area cultivated *per capita* has declined from 0.28 ha in 1971 to less than 0.20 ha in 1990, a figure masking urbanisation, fragmentation of farms, and expansion of cultivation into virgin lands unsuitable in the medium-to-long term for arable farming. Deforestation, soil erosion, desertification, and loss of natural habitats must point towards social instability, emigration pressures and disruption of trade afflicting primarily those nations least able to cope. Employed in concert, conventional plant breeding and modern biotechnology have the capacity for the foreseeable future to meet the basic demands of mankind. Genebanks constitute the primary sources of genetic material for agriculture; those at SCRI have become a pivotal feature in the UK's contribution to world agriculture and biotechnology.

Professor T Blundell FRS was appointed Secretary to the Agricultural and Food Research Council (AFRC) on 1 January 1991. He followed Professor W D P Stewart FRS, FRSE who became Scientific Advisor to the Cabinet Office. Professor Blundell is an eminent molecular biologist noted for his application of modern biochemical, crystallographic and modelling techniques to determine the structure of complex organic molecules. His determination to build on the work of Professor Stewart, promoting the international excellence of AFRC research, fostering greater links with the higher education institutions, and focusing on science crossing traditional discipline barriers, will secure a leading role for AFRC in the UK scientific scene. By its association with the AFRC through the Agricultural and Food Research Service, SCRI will continue to develop closely similar precepts addressing the major agricultural and environmental problems through innovative science.

Two senior colleagues retired from the Virology Department during 1991. Professor B D Harrison CBE, FRS, FRSE was appointed to a Personal Chair in Plant Virology in the Department of Biological Sciences, University of Dundee, in mid-June following his retirement from the SCRI after 25 years as Head of the Virology Department. He first joined the then Scottish Horticultural Research Institute (SHRI) in 1954, leaving in 1957 to take up a post in the Plant Pathology Department at Rothamsted, where he stayed until 1966. In 1966 he returned to SHRI as head of the Virology Department and subsequently held the post of Deputy Director from 1979 to 1981 until he gained individual merit

promotion to Deputy Chief Scientific Officer (UG5). He was appointed an honorary professor in the University of St Andrews in 1987 and an honorary visiting professor in the University of Dundee in 1988. He was elected a Fellow of the Royal Society of Edinburgh in 1979 and a Fellow of the Royal Society in 1987. In 1990, he was awarded a CBE and in 1991 received an Honorary Doctorate of Agriculture and Forestry from the University of Helsinki. As an Honorary Research Professor at SCRI, Professor Harrison maintains close links with the Institute as supervisor of PhD students and of externally funded research projects. His personal research has the general aim of discovering the mechanisms underlying the biological properties of plant viruses. He is internationally acclaimed for his wide-ranging discoveries concerning viruses that are spread by soil-inhabiting organisms, virus resistance in plants, and virus diseases of potato, cassava and other tropical crops.

Mr W P Mowat, UG7 in the Virology Department retired in September 1991 after 32 years' service. Initially appointed in 1959 as a mycologist, he transferred in 1961 to the Virology Department to investigate fungal virus vectors. Thereafter he turned his attention to tobacco necrosis virus which is transferred by a fungus, and which affects tulips. This led to a long-term interest in bulbs. For the past ten years he pioneered the development of Scottish virus-tested narcissus bulbs, a notable achievement in raising phytosanitary standards and widely respected in international circles.

Staff at SCRI were deeply saddened by the untimely death in post of two highly dedicated colleagues. Mr M R Cormack, SSO in the Soft Fruit Genetics Department died in February 1991 after a long illness. He was appointed in 1962 to the then SHRI as Scientific Assistant in the Pomology Department to work on top fruit under the supervision of Dr (later Professor) C A Wood. Following a reorganisation and the reduction of research effort on top fruit he was given responsibility for a programme on techniques of establishing raspberry plantations and adaptation of various growing methods for mechanically harvesting raspberries. He was the prime mover in the formation of the UK Blueberry Growers' Group, and at the time of his death he was developing initiatives on woody plants and the introduction of horticultural crops into the Western Highlands. A talented sportsman, Mr Cormack played an influential role in social activities within and outwith the Institute. In December 1991, Mr G Pollock, P&TO in the workshop and garage, died suddenly. Soon after joining the Institute in 1963, he transferred to the vehicle workshop, eventually taking charge in 1983. There, he occupied a key position in the day-to-day organisation of a large and complex transport operation. In addition, he served in many capacities the local community of Longforgan. We extend our condolences to the families of both former colleagues.

Four staff deserve special mention. Professor N L Innes (Deputy Director) was elected Chairman of the Board of Trustees for the Centro Internacional de la Papa based in Lima, Peru, highlighting the growing interface between SCRI and the Centres (Institutes) supported by the Consultative Group on International Agricultural Research. Dr W Powell (Head of the Cell and Molecular Genetics Department) was awarded the Broekhuizen Prize by the European Cereal Atlas Foundation in recognition of an outstanding contribution by a scientist under the age of 40 to research in cereals. The prize was awarded at a ceremony in Wageningen, The Netherlands and cites Dr Powell's work on the regeneration of plants from microspores, and the integration of cellular and molecular methods of crop improvement with conventional approaches. Dr Powell and Dr A T Jones (Virology Department) were promoted to UG6 grade on individual merit. Mr D R Simpson, EWI in the Estate Department, received the Scottish Society for Crop Research Field and Glasshouse Staff Prize, coinciding with his retirement from the Institute after 37 years' service. This was the first occasion on which the prize had been awarded and was in recognition of the considerable contribution Mr Simpson has made to field experiments.

Detailed in this Annual Report are accounts of core-funded projects, new initiatives, and the numerous awards and grants made to staff throughout the year. Patents, new cultivars, reports, publications, participation in meetings and learned societies, and supervision of research students also indicate the buoyancy of the scientific effort which often involves coordination with several organisations. Such achievements are only possible by the unstinting effort and commitment of talented staff in every department and section of the Institute. By way of illustration, a major grant to Dr B A Goodman (Director's Group) for research on food irradiation has allowed SCRI to explore the use of electron paramagnetic resonance spectroscopy to examine the role of free radicals in

senescence processes. Another substantial grant involves the Departments of Cellular and Environmental Physiology and Cell and Molecular Genetics. Coordinated by Dr H V Davies, this grant by the European Community and the European Crisp and Snack Association Research Limited extends the research on genetic modification of carbohydrate metabolism in the potato. New projects include studies of plant ecology, physiology and biochemistry using stable isotope techniques at the natural abundance level.

The staff of SCRI gratefully acknowledge the contributions by the Governing Body to the increasing professionalism of the Institute and its scientific stature. We also thank the staff of SOAFD for their major investment in SCRI and the constructively high standards to which they operate. Grants, contracts and donations from the Scottish Society for Crop Research, governmental agencies, grower levy boards, local authorities, commercial companies, farmers and other individuals are also warmly appreciated. In its first year of trading, Mylnefield Research Services Limited was an outstanding success as the commercial arm of the Institute. After a remarkable year of change and growth, we look forward to the future with justified optimism.

Opening of the Crop Genetics Building

The Crop Genetics Building was formally opened on 31 May 1991 by Lord Strathclyde, Minister for Agriculture at the Scottish Office. Almost 100 distinguished guests attended the opening and subsequently toured the new building and potato glasshouses.

The Director, Professor J R Hillman, welcomed the guests in his opening speech and said that this was an important day for SCRI because it marked the final stage of the establishment of the Institute at Invergowrie.

"Following the decision to amalgamate the SHRI and the SPBS in the early 1980's, staff were transferred from Pentlandfield to Mylnefield. Any move will cause disruption, but in this instance it did not hinder the research programme and there has been a

The ceremonial opening of the Strathclyde Building. Left to right: Mr G.R. Mackay, Head of Crop Genetics Department; Mr. J.L. Millar, Chairman, SCRI Governing Body; Lord Strathclyde, Minister for Agriculture and Fisheries at the Scottish Office; Professor J.R. Hillman, Director SCRI.

Lord Strathclyde examines cooked potatoes with l. Dr M.F.B. Dale and r. Mr. J.L. Millar.

sustained increase in scientific productivity throughout the transfer period."

"The Scottish Office has made a major investment on this site and SCRI is of great importance to the economy of Tayside. Our Institute is unique in the United Kingdom because of the range of scientific disciplines covered and the number of crop species investigated which extend from potatoes and cereals through to cocoa, coffee and cassava. Furthermore, the Institute now has an international reputation for the excellence of its research in several areas."

Lord Strathclyde is shown the glasshouse facilities by G.E.L. Swan

"This new building and the related glasshouse complex will allow us to integrate modern biotechnology, chemistry and mathematics with conventional plant genetics. Our interface with our commercial partners will ensure that the technology is transferred to the market place."

The Director then paid tribute to the Scottish Office Agriculture and Fisheries Department. "They deserve a special commendation for they have been mindful of the value of scientific research and have supported the long term investment required at this site. I also thank my fellow Institute directors and the Principal of the Scottish Agricultural College for their co-operation and our industry and levy board partners for their confidence."

Lord Strathclyde then replied.

"Chairman, Professor Hillman, ladies and gentlemen; it is a great pleasure to be here today. Unlike many of you this is the first time I have had the opportunity to come and visit the Institute and already I have been greatly impressed by the dedication, professionalism and academic excellence of the work that you produce here."

"I am particularly gratified by the fact that there is such a great feeling of partnership between the work that the Institute does and the requirements that are laid down by government. In many fields of agriculture these may not always seem as being entirely compatible but I am delighted to say that here we have a tremendous centre of excellence and one which relies on providing the kind of quality in terms of research and development that not just this country needs but the whole world. I know that the main focus of today's event is to open this building. I am particularly glad to say that the main emphasis of the work on this building will be on potatoes although I gather that it will also include barley, beans, raspberries, blackcurrants and strawberries. It has cost nearly £3m and I hope that you recognise that is a measure of the commitment the government has towards the furtherance of these programmes and the commitment that it has in particular to this Institute."

"I congratulate you for all the work that you have done over the years and in advance for all the work you will be doing in this new building. Therefore, it is my great pleasure to declare this building, the 'Strathclyde Building', officially open."