

# Introduction

**Peter J. Gregory**

Our focus for the first half of 2008 took over from where 2007 had left off, with widespread newspaper comment on rising food prices and a realisation that the food system and cheap food could, perhaps, no longer be taken for granted. *The Economist* magazine of 19-25 April suggested a “tsunami” affecting world food security, and there were riots resulting from increased prices and shortage of supplies in several cities worldwide. A variety of reasons, many operating on different timescales, were given for these increased

food prices including speculation, the falling value of the US dollar, increased demand for grains, export bans on selected foodstuffs, inadequate grain stocks, higher oil prices, poor harvests and the use of crop lands for the production of biofuels. Whatever the reasons, food policy and food security are now back on the UK agenda in a big way. We contributed material to the launch of a Food Policy by the Scottish Government in June 2008, and there is growing interest in improving the diet and health of the Scottish population. There is



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increasing evidence that eating a wide variety of plants plays a vital role in human health and our research on Plant Products and Food Quality is increasingly being sought and used for policy and by commercial customers. Throughout the year I attended a range of meetings in London seeking to support policy development in the area of UK food security and research priorities are starting to emerge in which SCRI's research will play an important part.



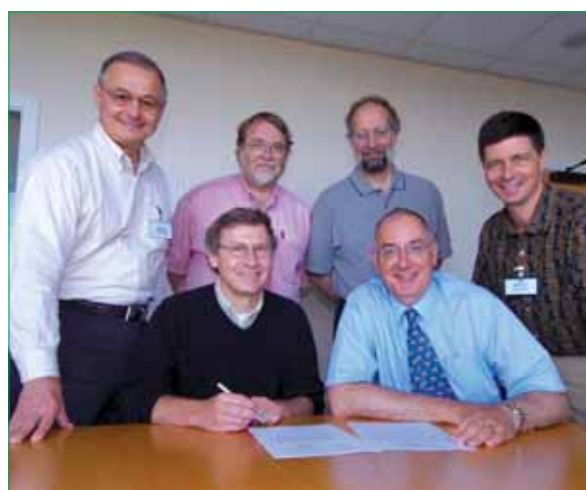
Left to right: Madam Ma Shuping, Chinese Ministry of Agriculture, Pete Wishart MP and Dr Pamela Anderson, Director-General CIP, Peru,

2008 was the UN International Year of the Potato and we celebrated this in August with a conference in Dundee on Improving International Potato Production. It was a great success with visitors from China, India, Peru, the Netherlands and UK businesses all sharing their insights. Potato is now the world's third most important crop in terms of production after rice and wheat and it was gratifying to see the SCRI Group's research and breeding contribution placed in an international context. Potato is increasingly being seen as a means to improve livelihoods in rural communities close to growing towns and cities in Africa because there is demand for the crop and the produce can be sold for cash. Production is increasing rapidly in some regions but there are major problems with diseases. Coincidentally, the year ended with our long-term partner Greenvale AP winning the Tesco Fresh Produce Variety of the Year award for the potato variety Vales Sovereign bred at SCRI. They, and we, have a winner which is starting to establish itself as a major variety in the UK.



The Tesco Fresh Produce Variety of the Year bred at SCRI.

SCRI has for many years benefited from numerous links to the international scientific community but we have placed even more emphasis on this recently. To mark this there is a new section of this report on SCRI Worldwide, and during 2008 we entered into some new agreements with institutions overseas. We now have a formal link with Michigan State University with whom we share interests in potato and soft fruit breeding as well as plant-soil interactions. MRS became a partner in Danasia in China, a company that will use our varieties of raspberry and blackcurrant in a venture to increase production and consumption initially in the Beijing area. Closer to home we shall cooperate with ILVO in Belgium, especially in areas of plant pathology and food quality. We were very pleased to receive the Governing



Signing a Memorandum of Understanding with Michigan State University.



The MoU being signed between SCRI and ILVO

Board of Bioforsk, Norway, with whom we are working ever more closely in topics related to sustainable production research.

Outward-looking research scientists collaborating with the best internationally and shaping the research agenda are essential components of research excellence. Our research quality and outputs were reviewed by external panels during the year in two exercises. Firstly, the major Scottish Government programmes of research in which SCRI participates (Profitable and Sustainable Agriculture - Plants) with SAC (Scottish Agricultural College) and The Macaulay Institute were reviewed by sizeable external panels to ensure that they are on target to deliver the outcomes commissioned by 2011. The preliminary feedback was very complimentary about the quality and quantity of what had been achieved, and there were few concerns about the direction and outcomes. Internally, the Governing Board has instituted a rolling programme of reviews of the science programmes and in 2008 it was the turn of Genetics to be scrutinised by an international panel of experts in the field. Their report was highly complimentary about the international excellence of the science being undertaken and the demonstrable leadership exhibited by staff in the programme in their various fields of study.

As ever, the year produced new and exciting results from our research programmes. Green fluorescent protein isolated from jellyfish has been widely used by plant and soil scientists to study the movement of proteins in living plant and microbial cells. However, these fluorescent protein markers are quite large hence

they cannot be introduced easily into all cell types. In particular, they have limited use with viruses because movement within a plant is restricted. Our Plant Pathology programme has worked with scientists at Glasgow and Edinburgh universities to develop a much smaller fluorescent protein based on the light, oxygen or voltage-sensing domain of the blue-light receptor in plants, phototropin. Use of this new protein means that infection processes involving viruses can now be studied more readily because cell to cell movement is not artificially constrained by the size of the accompanying fluorescent protein. So, we now have a new tool available to study cellular processes especially in systems where genome size or protein shape was previously limiting. This research involved the “shuffling” of DNA, but more conventional work with DNA to ‘fingerprint’ microbes in seawater, and freshwater has reached a point where it will form the basis of a new spinout company from SCRI. EnPrint will offer a service for the microbiological analysis of seawater, facilitating compliance with recently approved EU legislation on water quality.

In our Environment Plant Interactions programme, techniques have been developed in collaboration with the University of Nottingham, the Nottingham Arabidopsis Stock Centre and Warwick HRI for genome-wide analysis of transcription in several plant species using commercially available nucleotide microarrays. The results suggest that many of the differences in gene expression between plant species, ecotypes and even between specific cell-types, have no adaptive significance and reflect ancestral plasticity and founder effects. In short, changes in the transcriptome cannot be assumed to be adaptive.

Determining the genetic sequence of plants and pathogens is increasingly providing novel insights into the behaviour of crop plants and is at the heart of much of our biology. In our Genetics programme, work has started with partners in Ireland, Imperial College and the University of Dundee to sequence chromosome 4 as a contribution to the International Potato Genome Sequencing Consortium. This complements existing work to sequence chromosome 4 of the tomato and the wide-ranging genotyping of barley. For example,



Professor Bernard King (right) hands on the Chairmanship of the SCRI Governing Board to Peter Berry (left).

each line in the Bowman collection of barley mutants developed by Jerry Franckowiak of the University of North Dakota has been genetically characterised. The results allow the location of the mutated genes to be defined, assessment of the distribution of genes in relation to a marker map, and the success of subsequent rounds of backcrossing in eliminating donor genes.

On the European scene, colleagues in Plant Products and Food Quality have played a key coordination role in the EU Integrated Project 'Promoting Food Safety through a New Integrated Risk Analysis Approach for Foods' (SAFE FOODS). This project has been at the forefront of assessing the potential value of advanced, broad scale analytical 'omics' technologies within a risk assessment framework to determine the safety of foods. Using potato and maize as model crop species, the project has shown that variation in gene protein and metabolite expression is large with respect to genotype, growing site and season, and even crop management practices. Any differences between GM and non-GM crops tested were dwarfed by comparison. These approaches could therefore be used to benchmark any measured differences in a particular crop against the extent of acceptable variation within a framework of 'safe' use.



Farm Manager Euan Caldwell receives the Director's Award 2008.

We said farewell to longstanding Member and Chair of the Governing Board, Bernard King, during 2008 and welcomed Peter Berry as his replacement. The Board have supported me in my work to make real the First Minister's announcement in January that SCRI and The Macaulay Institute would be encouraged to come together in a single body. The Director of The Macaulay Institute, Richard Aspinall, and I have drawn up a draft science remit for the new institute and work continues with the Scottish Government to devise a plan that will be acceptable to the Boards of both institutes. As we look forward, this potential new structure for our research will clearly influence the scope of our scientific endeavours.

The Director's Award for 2008 was made to our Farm Manager Euan Caldwell for his outstanding contribution to the life of the Institute, and particularly for his rapid improvisation of arrangements to ensure that Potatoes in Practice did not become Potatoes in Mudbath during a dreadfully wet August.

I hope that you will enjoy reading about the excellence of our research and its communication to numerous audiences.

P J Gregory

10 January 2009