Introduction

Peter J. Gregory

Although food prices in the shops and cereal prices on the world commodity markets have fallen from their highs in mid 2008, the wake up call to governments around the world has continued to foster interest in the issue of food security and associated concerns around water and energy supplies and use. During the year, we have been actively engaged in numerous workshops and discussions organised by the UK and Scottish governments, the UK research councils and internationally in meetings in Australia, Austria and India, and as part of the Copenhagen climate change talks on the subject of food security. The renewed importance of the topic is evident in the new strategy of the Biotechnology and Biological Sciences Research Council (BBSRC) in which it is one of three major themes along with bioenergy and healthy food. More locally, the Scottish Government, too, is engaged with interested parties in determining the research required to give substance to its Food and Drink Policy published in mid-2009 which aims to promote sustainable economic growth through work with Scotland's food and drink industry to address quality, health, wellbeing, environmental sustainability and the need for access and affordability. All of this debate highlights the importance of the research undertaken by us, and it has been very pleasing to see this recognised in both the various surveys of UK national capability in agricultural research and the reopening of BBSRC funding to us facilitated by the Scottish Government. These small individual steps will allow us to play a significant role in the emerging UK research programmes on issues related to food security.

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In this context, the 'in principle' decision of our Governing Board and that of the Macaulay Land Use Research Institute (MLURI) to merge the two institutes from April 2011 is of considerable significance. The merger will bring together about 200 senior research scientists plus their support staff into a single institution capable of undertaking research across multiple disciplines and scales. The New Institute (the name has yet to be decided) will have a vision that encompasses 'excellence with delivery', a remit that has global reach, and a research focus on the environment/plant/land continuum and the uses that society makes of it. It will combine scientific and research excellence with delivery of knowledge, products and services to international, national and local customers. As with both SCRI and MLURI, the New Institute will be mission oriented and its research will feed directly into long term societal concerns relating to sustainable economic development, food/energy/water securities, environmental change, biodiversity, waste reduction and community development and wellbeing. Both institutions believe that by coming together at this time we can create a world leading institution that will be able to address these challenging issues in a way that, individually, would be impossible. As the economic recession starts to be felt in the public sector, we think that this timely initiative will place the New Institute in a position to attract scientists of the highest international quality and to broker access to the best minds and research in other organisations by providing global leadership in a broad range of land based disciplines.

SCRI Director Professor Peter Gregory interviewed by Radio Tay as plans for the 'New Institute' are announced.

Obviously substantial work remains to be done to make the New Institute a reality, and much of 2010 will be focused to this end. Already, though, agents have been appointed to recruit a Chairman and Chief Executive for the new company and we have held a joint meeting of the science programme leaders to familiarise ourselves with each other's research interests and to explore potential areas of synergy. Richard Aspinall (the Chief Executive of MLURI) and I have been working together on the science vision and on the business plan with the Scottish Government and consultants from Arthur D Little who assisted the Boards in making their decisions. We anticipate that the New Institute will play a leading role in the food security and multifunctional land use debates currently exercising governments and policy bodies.

The 2009 SCRI Director's summer soirée.

2009 marked the 20th birthday of Mylnefield Research Services Ltd (MRS Ltd) which was celebrated as part of the Director's summer soirée in July. MRS Ltd has continued to develop profitable business despite the recession, and we were very pleased to be able to appoint two new field geneticists who will undertake research in modern molecular genetics while receiving hands-on training in breeding of potatoes and barley. We hope that these 'trainees' will form the next generation of breeders, and so keep alive a skill that is in danger of disappearing from public sector research institutions. An allied activity has been the launch in October by our colleagues in the Division of Plant Sciences, University of Dundee of a Master of Research (MRes) course in Crops for the Future. Staff from the Institute are contributing to the course modules, but we hope that the project element of the course will also contribute to our research

activities and to our breeding programmes. MRS Ltd has successfully renegotiated the raspberry breeding contract with a consortium of growers, the Horticultural Development Company and the Scottish Government and we look forward to new varieties flowing from that work.

Our research continues to produce new knowledge and insights into the workings of plants, their pests and pathogens and interactions with the environment. In our Genetics programme a highlight of the year has been the public release of a draft genome sequence for potato together with international colleagues from around the world. In barley, a gene controlling fertility of the lateral florets in barley spikes has been identified, and with colleagues from the Division of Plant Sciences we have shown that the flowering regulator, FPA, functions in messenger RNA 3' end formation and that the nucleolus has a novel role in recognition and turnover of aberrant mRNAs. Software (Flapjack and Tablet) for visualising dense molecular genotype information and second generation sequence data respectively, has been developed by our informatics team and has been widely adopted by the international genetics community. Meanwhile staff in Plant Products and Food Quality have used a combined metabolomic, transcriptomic and sensory analytical approach to identify the key volatile components driving desirable potato aroma and texture, and the genes underpinning biosynthesis of the associated components. Collaborative research with partners in the UK and Europe has shown that berries such as strawberries and raspberries can inhibit pancreatic lipase. This enzyme controls fat digestion and associated calorie intake in humans and opens avenues for the dietary management of obesity and related degenerative diseases.

In Environment Plant Interactions, there has been a particular push to develop novel methods for studying root system development in natural substrates using x-ray tomography (with the University of Abertay, Dundee), rhizotron image capture and structured mesocosm techniques, combined with image tracking approaches. Results from these techniques are being used to inform mathematical models predicting how root architecture affects the acquisition of water and mineral elements from the soil, and how this might be manipulated for improved resource capture and ecosystem sustainability. As ever, our Plant Pathology programme has been very active and we were part of an international consortium that published the full genome sequence of *Phytophthora infestans*, the causal agent of the damaging late blight disease of potato. Availability of the genome sequence has had immediate effect in enabling a large number of pathogen effector molecules (pathogen encoded factors important in the disease process) such as transcription factors and proteins involved in secretory, signalling and ubiquitination pathways to be identified. These factors are being used to develop 'smart screens' to identify durable resistance in potato germplasm. In related work, we have used molecular markers to analyse isolates of *P. infestans* from >1000 late blight outbreaks in the UK and Europe. In the UK, data from >5000 isolates analysed in recent years show that populations of *P. infestans* are currently dominated by one genotype (designated 13_A2). This aggressive genotype is causing concern as it has overcome the resistance of some previously resistant commercial cultivars such as our own variety Lady Balfour. Work is ongoing to understand the biological and genetic properties that make isolates of genotype 13_A2 so successful.

January saw the launch of the BBSRC Sustainable Bioenergy Centre in which the Division of Plant Sciences of the University of Dundee, along with SCRI, plays a major part. The Dundee work will concentrate on altering lignin production in barley to make it easier to produce bioenergy from straw without reducing the quality of the grain crop. This research is an essential step in the development of second generation biofuels.

The high quality of our research has continued to be attested to by the external reviews undertaken by our Governing Board. In May it was the turn of BioSS to be reviewed. The team concluded that "BioSS is a first-rate organisation which is delivering international level research in fundamental science as well as statistics and bioinformatics methodology." This ringing endorsement of their work was much appreciated. The turn of Environment Plant Interactions came in November and again the programme received praise for its quality and

Dr Keith Dawson (left) receives a farewell gift from SCRI Chairman Peter Berry as he retires from the Governing Board.

the enthusiasm of the staff. Changes on the Governing Board this year were limited to the departure of Keith Dawson after eight years of substantial service during which he worked tirelessly for the promotion of the Institute, especially alongside the crop based skills of SAC (Scottish Agricultural College). Andrew Wilson joined the Board; his interests in communication and knowledge of politics and commerce in Scotland will be valuable to us.

We were very pleased at the award of the Jones-Bateman Cup of the Royal Horticultural Society to Julie Graham for her work on the genetics of soft fruit; this is vital underpinning research for our commercial breeding of new raspberry cultivars. The Director's Award for 2009 was made to Ian Pitkethly for his very substantial contributions to our publications, scientific posters and general communications. He will always go the extra distance to deliver high quality products against very tight deadlines, and this is much appreciated by a wide range of staff.

Dr Julie Graham of the Genetics programme is presented with the prestigious Jones-Bateman Cup by Giles Coode-Adams, President of the Royal Horticultural Society (RHS). Julie was honoured for her work on raspberry breeding.

I hope that you will enjoy reading about the rest of our activities in 2009 and learn something of the exciting research that we are engaged in to underpin food security.