

FOOD SECURITY - ACHIEVING LONG TERM SOLUTIONS

The Royal Institute of International Affairs (www.chathamhouse.org.uk), tackled the politics and science surrounding global food security in London on 2 and 3 November. The conference brought together food policy experts from international agencies, governments and industry as Bruce Knight reported (Crop Protection Monthly, November).

The politics of food security

Much of the emphasis on the first day was addressing how to make an impact on rural poverty particularly in Africa. Dr Kanayo Nwanze, president of the UN's Rural Poverty Agency, gave the keynote speech. He stated that to meet the challenge of feeding nine billion by 2050 will require the continent of Africa to double food production. There are now lessons to be learned from what has happened in China where the Government has recognised that the first step to growing the economy is to invest in the rural economy and to minimise the risk of rural poverty. For international aid agencies there has to be a programme designed to support the whole food chain. Dr Nwanze's view is that the challenge can be met but aid has to be conditional on sound corrupt free governance, transparency and sustainability. In a separate press briefing, Dr Nwanze was asked by *Crop Protection Monthly* how the other pressures on African countries, climate change and water deficiencies, energy needs and maintaining biodiversity were being addressed alongside the food security issue. He responded by referring to local case studies but made no reference to overarching UN directives.

Mark Cackler, agriculture sector manager at the World Bank, also stressed that growth in agricultural GDP will benefit the poor most effectively. From analysis in 43 developing countries growth in agricultural GDP has been shown to increase the income for the poor by a factor of two to four, compared with that from enhanced GDP of non-agricultural activities.

The politics of R&D

A more specific example of the task facing some of the African States was presented by Elvis Musiba, chairman Corporate Advisory Services, Tanzania. He described the 'Kilimo Kwanza' initiative which is a president led national initiative involving public and private sector collaboration designed to accelerate agricultural transformation. Some 80% of Tanzanians depend on agriculture for their livelihood. In order to halve the targeted reduction of the number of people suffering poverty by 2015 an annual increase of 10% in agricultural productivity is called for, and the current rate is just 3.3%. Average yields of maize are little more than 1.2 tonnes per hectare compared with 9.5 tonnes/ha in the US, 3.8 tonnes/ha in Brazil and 5.15 tonnes/ha in China. Under 'Kilimo Kwanza' a well reasoned case for aid funding in support of all input needs is being made. Fertiliser consumption is only 9 kg/ha compared with over 200 kg/ha for industrialised countries. Agrochemical demand already exceeds supply by a factor of two to four. Most significant is the fact that only 23% of potential arable land in Tanzania is actually cultivated.

Dr Lawrence Haddad, director, Institute of Development Studies, University of Sussex, UK set out some theories on the politics behind Agricultural R & D for the developing world, and what makes investment in R & D successful. Reporting on an evaluation from published articles he observed that most successes come from input enhancing technologies, followed by policy enhancing initiatives with improved farmer knowledge and output enhancing systems lower down the scale.

His overall conclusion was that good governance is critical. Using a scoring system to measure the success of anti hunger policies the top five are Brazil followed by China, Ghana, Vietnam and Malawi.

Climate change and food security

The link between food security and climate change was made by Professor Bob Watson, chief scientific advisor to Defra. Professor Watson had chaired the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD). He described agriculture's role in terms of adapting to climate change through breeding drought and salt tolerant crop varieties, managing water and in some cases changing crops and planting times. Mitigation actions will need to include reducing GHG (greenhouse gas) emissions by optimising nitrogen and manure use, better livestock production efficiency and anaerobic digestion of slurries. Professor Watson had been critical

of the role of GM technology in the past (*CPM August 2008*). However on this occasion he conceded that advanced biotechnology may be needed to increase productivity under climate change and the emergence of new plant and animal pests. He did, however, suggest that current hunger problems could be solved with small farmers gaining access to existing technologies such as minimal tillage, IPM and reduced post harvest losses.

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PESTICIDE MEETING DISCUSSES FOOD SECURITY

Food Security was also the theme at the UK's 10th Annual Open Meeting of the UK Advisory Council for Pesticides, held in York on 9 November. Discussions focused on achieving food security at a time of unprecedented forecasts regarding increasing global food demand. About 100 delegates from all sections of the industry attended; four papers were presented followed by break-out sessions to discuss specific issues. Robin Jenkins, Associate Consultant, Innovation Management, reports (Crop Protection Monthly, December).

Increasing global demand

Professor John Beddington, UK Government's chief scientist, gave an authoritative keynote presentation on the global issues relating to achieving food security. By using projections to 2030 he brought the size of the challenge facing the entire agro-industrial sector into sharp focus. Professor Beddington stated that four global issues needed to be considered. There can be no food security without sustainability, the global population is increasing by six million every month, increasing urbanisation means that two thirds of that population will live in cities by 2030, and alleviating poverty for the "bottom one billion" must remain a goal.

Professor Beddington said at the same time energy demand is predicted to increase by 50% by 2030 (International Energy Agency), fresh water demand by at least 30% (International Food Policy Research Institute) - that is assuming some increases in usage efficiency - and food demand by 50% (Food and Agriculture Organisation of the United Nations). This is all against a background of accelerating climate change. The nature of the food demand will also change as the middle classes increase from the current 350 million to a predicted 2.1 billion by 2030: as incomes rise increased demand for meat and dairy products leads to a rapid increase in demand for livestock feed.

By 2030 the world population will be 8.7 billion but the available farm land will remain static at best. Professor Beddington noted that the available farm land per person has already halved between 1950 and 2000. Water supply will become a key concern because of increases in demand and the changes in rainfall patterns resulting from climate change. Today 70% of water supplies are consumed by agriculture (52% in the high income countries, 70% in low income countries) but increasing demand from the world's growing cities is likely to price water out of subsistence farming. On top of that climate change is likely to increase water scarcity and stress in some key agricultural areas such as California and the southern US, southern Europe and parts of China, although increased rainfall may provide opportunities in other areas such as the northern US, Canada and northern Russia. In the UK there is a 50% probability of a 3 to 5°C temperature increase in southern England by 2040, bringing increased rain and crop disease in the north and drought in the south.

The increased energy requirement is driven largely by sharp increases in demand from the non-OECD countries, particularly China and India, where coal is at present the main energy source. Carbon capture and storage, nuclear and renewable energy technologies must all be implemented within 20 years to decarbonise electricity generation.

Crop protection technologies will become increasingly important given that even with the current level of crop protection global crop losses from field to plate are 40%. Technologies for more efficient and safer use of pesticides must be developed whilst also dealing with the impact of pesticide reduction strategies on food security. The hazard assessment of pesticides that forms part of the new European regulation on pesticides is in Professor Beddington's own words, "just plain silly", and must be replaced by risk assessment.

In summary Professor Beddington said we are facing a 'perfect storm' of food shortages, scarce water and insufficient energy resources that threaten to unleash public unrest, cross-border conflicts and

mass migration as people flee from the worst-affected regions. By 2030 the world will need to produce 50% more food, 50% more energy, 30% more fresh water whilst at the same time mitigating and adapting to climate change. Techniques and technologies must be developed to meet this sharply increased food demand from the same amount of farm land. We will therefore need 'sustainable intensification' using every available technology. To this end the UK Government has appointed a Food Security Taskforce within the Cabinet Office which through the Food Technology Strategy Board will invest £90 million (\$144 million) over the next five years in developing food security strategies and technologies.

Achieving self-sufficiency

Focusing specifically on the UK, Debbie Winstanley, agronomist and member of the Pesticides Residue Committee, looked at the progress made over the last 20 years in achieving self-sufficiency in two crops – carrots and lettuce. Through a combination of improved growing techniques, improved disease resistance, disease forecasting and improved varieties the UK now provides carrots for 50 weeks of the year and lettuces for 25 weeks of the year. At the same time harvesting, packing and transport has been radically improved to ensure continuity of supply to the supermarkets, necessitating major investments by suppliers and packers. Disease and insect infestation forecasting is used to optimise the timing and amount of pesticide applications and maximum use is made of application by seed dressings. A major challenge for carrot producers is the loss of some key pesticides, the result of tighter pesticide controls. Weed control will require more inputs but a greater threat is the potential loss of key fungicides and insecticides such as the pyrethroids.

Self-sufficiency or trade?

Professor Gareth Jones of Bangor University considered the costs and benefits relating to UK food security. Does the UK continue to import or should we now aim for total self-sufficiency? Currently the UK produces 60% overall but to be self-sufficient it would need to produce much more fruit and vegetables (currently only 20%) plus more sugar and bread wheat. Apart from the disruption to the current UK cropping pattern this would cause, Professor Jones also considered in some detail the costs of importing, particularly in relation to carbon emissions. He concluded that whilst we should accept trade when it makes sense economically and environmentally to produce crops where they can be most efficiently grown, we should also help our trading partners to produce and transport responsibly. We also need to invest in post-harvest technology to enable the UK to store more of the products that can be produced economically here and to enable our trading partners to switch the shipment of produce from planes to ships to minimise carbon emissions.

UK Food security research programme

Brian Harris, head of the Agriculture Food and Energy Research Group, BBSRC, returned to the 'perfect storm' scenario described by Professor Beddington and stated that the UK must invest now in the new technology needed to meet the challenge. To achieve this the BBSRC is leading the development of a new cross-Research Council and cross-Government Department multi-disciplinary programme. A consultation process to consider research targets and barriers to delivery has led to a food research food map and the new programme. This programme will be supervised by the new Food Security Programme Development Board which will provide clear leadership and improved co-ordination of the main funding bodies. Mr Harris did not detail specific targets for the programme but did emphasise that an extension process needed to be developed as the Research Councils do not have the remit to take new technology all the way through to farm production. Commerce, he said, will need to step in to translate the new research into practice.

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BCPC CONGRESS - GLASGOW

The BCPC Congress was born again in 2009 on 9-11 November at the Scottish Exhibition and Conference Centre in Glasgow. Following its cancellation in 2008, due to financial difficulties, it was organised this year by United Business Media (UBM) with advice from the British Crop Production Council (BCPC). A session on crop productivity was reported by Bruce Knight (Crop Protection Monthly, November)

Farmers and crop production

Factors affecting crop production from the farmer's viewpoint commenced with a paper by Darren Coppock, CEO, US National Association of Wheat Growers. He explained that price volatility of commodities and inputs was driving American wheat growers to more consolidation at home. Domestic wheat prices had dropped from \$6.67 per bushel (\$245 per tonne) in 2008 to \$4.79 now. The crop is under severe pressure in some regions having to compete with more profitable crops such as corn. As 50% of US wheat is exported the Association has recognised the importance of striking up new international trade alliances.

The complexity of farming in volatile markets was also the main issue raised by Tom Hind, head of Economics and International Affairs, UK National Farmers' Union (NFU). Financial pressures were brought about by the new limitations on the availability of credit, although farm borrowing in the UK had increased over the last year. Exchange rate volatility was another factor particularly relevant to the UK. Commercial challenges were created by volatility in commodity prices but also the concentration of power within the supermarkets.

In practice farmers and operators need to respond even to rapidly changing technologies. Behind these challenges are those brought about by political pressures: more regulations, uncertainty about how much investment will be made into agriculturally focused R&D, and the question about the future of the CAP and whether more control of agricultural policy will come back to the UK Government.

Keith Norman, research director of Velcourt, a major UK farming company, presented an overview of the range of technologies that farmers can, or soon will be able to, call on. Putting the challenge of increasing crop productivity into perspective he pointed out that the global area of arable land is 1.5 billion hectares. Were we to abandon modern systems such as crop protection chemicals it would require 4.0 billion hectares of land to feed the current population of over six billion. By 2025 with a population of eight billion the need would be 5.9 billion hectares and this is simply not available.

Keith Norman outlined developments under several broad headings. Plant breeding has brought about considerable success already. Velcourt's wheat yields in the UK in 1989 were 7 tonnes/hectare over a four year average. Today they are 10-11 tonnes/hectare over five years. They have achieved 14 tonnes/ha in some situations and there is good evidence that the theoretical yield of wheat is as high as 17 tonnes/ha. The way forward will depend on marker assisted breeding methods which can result in a six year timeframe for new varieties rather than 15 years through conventional breeding. Traits being targeted are stress tolerance, drought, salinity, temperature extremes, nutrient uptake efficiency, nitrogen as well as P and K, disease resistance and quality traits. The potential for new uses of crops will also set challenges for plant breeders. High starch content grain for biofuel markets and low phytase wheat for feed are good examples.

In terms of agronomy Keith Norman sees the potential withdrawal of key cereal fungicides as a major threat. This will bring about a greater threat from agrochemical resistance and shifts in sensitivity of fungal pathogens. In general terms the trends in agrochemical use will be greater dependence on seed treatments, better growth regulators, and improved formulations such as controlled release systems.

Remote sensing with near infra red images can be used to predict crop performance and disease incidence. It could gain importance particularly if there is a link with the EU wide defined cross compliance requirements for environmental crop production. Remote sensing through radar is under investigation by Velcourt.

In the UK public sector expenditure on agricultural science is divided between the Department of Environment, Food and Rural Affairs (Defra) with £300 million per year and the **Biotechnology and Biological Sciences Research Council (BBSRC)** with £400 million, the latter being primarily fundamental science. The need is to get the right balance between basic and applied science and to be able to translate research into commercial practice through partnerships.

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