In this issue

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Diseases and pests of crop plants are the subjects of the first three papers of this issue of Food Security and two further disease problems in sorghum makes their appearance in the fourth. Why such emphasis on diseases and pests? Of course, the contents of any issue are bound to reflect the papers offered but there are at least two more fundamental reasons. First, diseases and pests cost agricultural productivity dear, one estimate being around 40% loss. Second, diseases and pests are not easy to combat. Part of the explanation for this is that, in a breeding context, one is seeking to introgress characteristics which allow the plant to be durably resistant. Unfortunately, much of the resistance bred into crops tends to be far from durable, and often distressingly ephemeral, as the pathogen or pest evolves ways of overcoming such resistance. Third, resistance is seldom a simple character. There is therefore an urgent need to address this running sore which destroys so much agricultural produce before it even leaves the field.

Maurizio Vurro and co-authors write about four infectious diseases of plants. They are a viral disease of cassava caused by Cassava Mosaic Virus, a parasitic weed of cereals, *Striga hermonthica*, a bacterial wilt of banana caused by a species of *Xanthomonas* and a newly evolved race of the rust fungus, *Puccinia graminis* f. sp. *tritici*, named Ug99. Remarkably, three of these diseases first came to the attention of plant pathologists in Uganda, the exception being *Striga*. The damage done by these four plant pathogens is staggering. A particularly virulent outbreak of Cassava Mosaic Disease occurred in the early

1990s, reducing cassava production in the northern part of Uganda by 80–90% and causing the suspension of cassava cultivation in many areas of East Africa. The virulence of the outbreak was attributed to a new strain of the virus and co-infection with a previously recognized strain. *Striga hermonthica* affects cereals over an area of at least 5 million hectares of sub-Saharan Africa and may cause losses that are total where the soil is heavily infested by seeds of the parasitic plant. Banana is a staple food, relied on for food security by about 70 million people. Losses caused by the wilt disease in Uganda in the early part of this century were put at 50%. Rust of wheat has long been a threat to wheat production and the evolution of the race Ug99 in Uganda is of particular concern as it is able to overcome the resistance of many of the genes that give protection to the crop in all wheat growing areas of the world. As the spores of the fungus are windborne the new race has already travelled to the horn of Africa, Yemen and Iran and is likely to spread to the heavily populated area of the Indo-Gangetic plain with serious consequences for food security in that region.

How to deal with insect pests that threaten food security is the subject of Toby Bruce's paper. He points out that, although synthetic pesticides have given good control in the past, their efficacy is likely to be eroded in the future by three factors: the evolution of biotypes of pests that are pesticide resistant, the low rate of discovery of new pesticides and increasingly stringent regulatory requirements. Resistant crops are the ideal answer but, as with plant diseases, the resistance may be short-lived owing to the evolution of the ability of the pest to overcome the resistance. Biocontrol with natural enemies of the pest is another option but it is difficult to keep the population of the biocontrol agent at sufficiently high levels to be effective. A very promising approach is to activate or prime

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the natural defence responses of plants with chemical compounds known as semiochemicals. Unlike pesticides, these compounds have the advantage of not being toxic. Furthermore, rather than use the semiochemicals directly, plants which produce the relevant compounds have been used successfully in the “push-pull” system of integrated pest management.

The many ramifications of climate change over the coming decades are difficult to predict. Although, clearly there will be some benefits in terms of increased yields of some crops in some areas, what about the diseases that affect them and the economic consequences? These are the questions tackled by Neal Evans and co-authors using oilseed rape and its two most important fungal diseases, canker caused by *Leptosphaeria maculans* and light leaf spot caused by *Pyrenopeziza brassicae* as models. Although the work pertains to the UK, the authors point out that *L. maculans* is important elsewhere in the world, including such places as China, India and parts of Africa where the crop provides an essential source of oil and protein for subsistence farmers. Should climate change promote the disease the consequences for food security in these areas would be serious.

Climate change also features in the paper by Sam Page and co-authors who sought the underlying causes of the 2009 sorghum failure in the Kongwa district of Tanzania. They draw attention to the increasing uncertainty of the *msimu* rains across inland Tanzania and attribute the poor yields to the early cessation of the rains and the late arrival of seed for planting. In addition, some of the seed was heavily infected with the fungus, *Sphacelotheca sorghi*, the causal agent of covered smut. Furthermore, there was a high incidence of the parasitic weed, *Striga asiatica*. As a result of all these constraints farmers were harvesting an

average of only 62 Kg of sorghum, enough to last a family consisting of three adults, two adolescents and two children for only 14 days.

Rattan Lal suggests that an opportunity was lost at the Cop-15 Conference in Copenhagen on climate change. He points out that there is an enormous potential for carbon sequestration in soils if farmers could be persuaded to adopt recommended management practices (RMPs). These include appropriate afforestation of degraded or desertified soils, conversion of degraded croplands to pastures and tree cover, conservation agriculture with no-till farming and crop residue mulching along with cover cropping, integrated nutrient management based on appropriate use of organic and inorganic sources of plant nutrients, use of compost or manure and biochar in conjunction with other soil amendments and complex crop rotations including agroforestry. The effect of these practices would be not only to reduce CO₂ concentrations in the atmosphere but increase the productivity of crops through the augmentation of soil organic carbon. As Professor Lal points out, this is a win-win situation. Moreover, he advocates payment to farmers who adopt RMPs and suggests that farmers would be satisfied with such payments at a rate equating to around one-quarter of the cost of carbon capture and storage technology.

The final paper by Philliph Musyoka and co-authors highlights the paucity of information on consumption patterns of the urban poor in Nairobi under changing economic conditions. They therefore estimated the responses of poor and non-poor households to income, price and demographic changes and identified dairy and wheat products as foods which should be subsidised in order to enhance the food security of urban poor households.