Critical issues in plant health

50 years of research in African agriculture

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This book essentially provides a summary of the work of the International Institute of Tropical Agriculture, Ibadan, Nigeria, established in 1967. In its early days, to enter IITA, it seemed that you entered an American research station as the layout looked vastly different to its surroundings of the small-scale farms it aimed to help. Over the years it has expanded so that there are now over 200 scientists at 22 locations in several African countries to cover different crops and extend results to farming communities. Other similar research institutes set up at much the same time and are now collectively the Consultative Group on International Agricultural Research (CGIAR).

The Group has concentrated on plant breeding and biological control of pests of crops grown by small-scale farms in the tropics. The research soon made progress with improved varieties of key crops which coincided with the availability of pesticides which led to the "Green Revolution" with much higher yields possible. Although pesticides were used by CGIAR scientists, the research needed to provide information independent of the chemical companies which was not a key part of their crop protection strategy, even though integrated pest management (IPM) had been formulated as a way of minimising pesticide use. Without guidance in tropical countries many highly hazardous chemicals have been used without adequate knowledge about how and when to optimise their use.

The book begins with contributions from senior scientists who worked at IITA in its early days or at collaborating organisations. They emphasise the importance of plant health rather than crop protection, a term which they felt did not describe what the IITA aimed to achieve adequately. Chapter 2 introduces the importance of controlling insect pests and diseases, including viruses as well as some of the early history at IITA, when effective disease control was achieved using resistant varieties alongside the development of improved methods of detecting and diagnosing pests and diseases. Part 1 of the book – *Managing threats to plant health* continues with chapters 3, 4 and 5 that cover disease surveillance, diagnostics and germplasm in crop protection, conserving and exploiting biodiversity in crop protection and viruses affecting African crops and their vectors.

Part 2 deals with plant health in practice: managing threats to key African crops, with seven multi-author chapters. The food crops are cassava, maize, yams with taro and cocoyam, banana and plantains, legumes including cowpea and soybeans, vegetables and fruit and other tree crops, that include mango, papaya, coconut and cashew crops. Most of these chapters cover both diseases and insect pests. Problems in pesticide use are specially mentioned in relation to vegetable crops, as farmers in urban and peri-urban areas failed to receive proper advice and were spraying cabbage, tomato and eggplants with harmful pesticide regimes involving an excessive number of treatments - a problem echoed in many other tropical areas as growers were spraying large volumes of water-based sprays downwards on to hydrophobic leaf surfaces, so very little of the insecticide ever reached the pests with most going into the soil. As expected, pesticide residues were detected in harvested crops. The alternative approach from IITA was to deploy biological alternatives, such as the entomopathogenic fungi *Beauvaria bassiana* and *Metarhizium anisopliae*, as well as predatory and parasitoid insects.

Part 3 has 3 chapters. These are entitled *Commercial products promoting plant health in African agriculture*, *Weeds affecting field crops and water bodies in Africa* and lastly *Making integrated pest management (IPM) work in sub-Saharan Africa*. The commercial products include Green Muscle, based on *Metarhizium acridum*, originally developed under an internationally funded project managed by CABI, UK, for locust control following the ban on using dieldrin. This chapter refers to the difficulty in producing it commercially partly due to mergers in the agrochemical industry but also persuading users to adopt a product that was somewhat slower acting than chemical pesticides, despite being much better in terms of environmental protection. A new product, NOVACRID, manufactured by a smaller company Eléphant Vert is now being tested. Aflasafe contains four atoxigenic strains of *Aspergillus flavus* that decrease the aflatoxin content in maize and groundnuts during crop growth.

The chapter on weeds relates to speargrass (*Imperata cylindrica*), *Striga hermonthica* and *Chromolaena odorata*, but also has sections on weed control in plantains, cassava and in aquatic environments. Interestingly the control of Striga by sowing seed of a herbicide tolerant maize, coated with an imidazolinone herbicide is mentioned, but the technology has not yet resulted in improvements in maize production due to a number of other factors, associated with registration and marketing seeds treated with a herbicide.

The IPM chapter has sections on using healthy planting material, the role of pesticides, gender access to IPM, improved exchange and collaboration with farmers and lastly future trends. Of interest is the graph showing a decline in tonnage of pesticide used in different parts of Africa between 2005 and 2014, possibly due →

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to increasing use of more active chemicals, such as the pyrethroids. The authors do note an increase in application of herbicides as low-cost supplies are less expensive than hiring labour for weeding.

In Part 4, the final chapter assesses the impact of IITA research projects on; biological control, resistant varieties and cultural and environmental control, biorationals and chemical control, in Africa, and the challenges ahead, suggesting that "IPM is primarily a science-guided decision-making support platform that can reach low-literacy farmers with a customized gender-targeted message in their own language, empowering them to take the right decision about pest management at the right time by using modern and affordable techniques". While that may be important, the messages to farmers need to be based on detailed research which includes cultural controls such as rotation of crops and maintaining closed seasons to reduce survival of pests during the dry season and much better advice on how to use pesticides as a last resort or in some cases as a rapid response to control larvae such as the fall armyworm (*Spodoptera frugiperda*) in the earliest stages of infestation. As the authors acknowledge, the success of any IPM endeavour will rely on quality training, yet few countries in Africa have maintained adequate extension services to support their farming industry.

Presently with concerns about climate change, loss of biodiversity and the need to feed an ever growing human population, the book does provide a valuable reference to the need to develop IPM giving greater emphasis to the environment. This is necessary with the future of farming changing with new technology, including precision agriculture, digitalisation, robotics and new genetic engineering technology.

There is an index and a number of maps, colour photographs and graphs are arranged in the text. All chapters have an extensive list of references. ■

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