O.04 - Southern perspective: Integrated pest management research and practice within the Consultative Group on International Agricultural Research (CGIAR)

Hoeschle-Zeledon, I.[1], Sikora, R.[2], James, B.[3], Bramel, P.[4]

[1] CGIAR Systemwide Program on Integrated Pest Management, c/o IITA, Oyo Road, PMB 5320, Ibadan, Nigeria, i.zeledon@cgiar.org
[2] CGIAR Systemwide Program on Integrated Pest Management, University of Bonn, INRES-Phytomedicine, Nussallee 9, 53115 Bonn, Germany, rsikora@uni-bonn.de
[3] CGIAR Systemwide Program on Integrated Pest Management, IITA – Benin, BP 08-0932, Cotonou, Benin, b.james@cgiar.org
[4] IITA, DDG Research, Oyo Road, PMB 5320, Ibadan, Nigeria, p.bramel@cgiar.org

Abstract

The increasing demand for affordable food is putting growing pressure on agricultural production. More food has to be produced on a shrinking area of arable land. Crop and post-harvest protection in all its facets is extremely important in food production. In view of the current and future food and nutrition challenges it will no longer be acceptable to lose significant amounts of the agricultural production due to pests, diseases and weeds in the fields and stores. At the same time food has to be produced in such a way that threats to human health and the environment are kept at a minimum. The Consultative Group on International Agricultural Research (CGIAR) System-wide Programme on integrated pest management (SP-IPM) is a collaborative effort of several CGIAR Centres and their partners to champion forward-looking research and outreach programmes to provide farmers in the South with ecologically durable options for managing pests, diseases and weeds. The paper describes SP-IPM's recently agreed upon strategic research direction with the three pillars: adaptation of IPM to climate variability and climate change, management of contaminates in food, feed and the environment, and improvement of agro-ecosystem resilience for soil, root and plant health. This strategy aims at providing new technologies for improved IPM that will contribute to more productive and healthy agro-ecosystems, needed to enhance food production. In addition, a rotational advanced studies programme across the pillars is planned, which moves from region to region to train National Agricultural Research System (NARS) scientists in new IPM technologies. In order to achieve its objectives, SP-IPM is seeking partnerships with centres of excellence in the South and the North, vital to develop and deliver advanced IPM knowledge and technologies suitable for different agricultural production systems. The paper therefore also intends to provide food for thought about areas of potential cooperation between SP-IPM and the members of the ENDURE network.

Introduction

CGIAR's System-wide Programme on Integrated Pest Management (SP-IPM) is a collaborative effort to champion forward-looking research and outreach programmes to provide farmers in the South with ecologically durable options for managing pests, diseases and weeds. Members are CIMMYT, CIP, CIAT, ICRISAT, IRRI, ICARDA, WARDA, Bioversity International, IITA as the host Centre, and the associated Centres ICIPE and AVRDC. Established in 1996 as a response to the Agenda 21 of the UN Earth Summit, it gained increased importance over the years. The Millennium Development Goals of the United Nations (UN, 2000) and the CGIAR System Priorities (CGIAR, 2005) call on improved pest management to address new challenges related to food security and safety. As a consequence, SP-IPM recently revised its strategy.

Current food security and safety situation requires innovative crop protection solutions

In 2007 alone, the number of hungry people has increased by 95 million resulting in 923 million persons being undernourished. This is an increase of 81 million since 1990-1992 (FAO, 2008a). FAO estimates that food demand will double by 2050. To meet this demand, cereal yields in developing countries will have to increase by 40% and an additional 100-200 million hectares of land may be needed (FAO, 2008a). According to Rosegrant et al. (2008), cereal demand worldwide will rise by 56% until 2050 when

the population will have increased to over 8 billion. The higher demand is stimulated by economic growth in countries with an emerging economy. The purchasing power in these countries will increase and this will translate into greater consumption, particularly of high value products (RSC/IChemE, 2009). The provision of additional agricultural land will be limited by water scarcity (Rosegrant et al., 2008) and would happen at the expense of forests and natural habitats of wildlife, crops' wild relatives, and the natural enemies of crop pests. Increasing productivity on existing land is by far better and provides significant opportunities through the application of available knowledge and technologies.

The logical step is to reduce current yield losses from pests, pathogens and weeds in the field and during storage to better deploy the yield potential of the major food crops. Mechanical, biological and chemical control measures reduce losses worldwide in rice from 77 to 37%, in wheat from 50 to 28%, in potatoes from 75 to 40%. Some pests are difficult to control with available technologies and large differences exist in the efficacy of pest control. In Northwest Europe, during 2001-2003, efficacy was as high as 71%, in South Asia 42%, in West Africa 43% and in East Africa 32% (Oerke, 2006).

Mycotoxins in food and feed pose risks to human and animal health. Because mycotoxins occur more frequently under hot and humid conditions, and diets are more heavily loaded with susceptible crops, these chronic health risks are particularly common in developing countries. They also cause severe economic losses when produce for export does not comply with international food safety standards (Bhat and Vasanthi, 2003). Pesticide residues are also a more frequent issue in developing countries due to higher pest pressure and subsequent overuse of pesticides, often of doubtful quality. Disposal of contaminated yields adds to further decrease in crop productivity. Climate change is likely to increase pest pressure and the incidence of mycotoxins (FAO, 2008b).

In the regions with the highest need for additional food there is still room for increasing productivity by simply reducing the current yield losses through improved crop and post harvest protection. Future attempts to intensify agricultural production are likely to increase crop losses to biotic stresses. Solutions are often seen in the development of varieties with improved resistance. However, the scientific community doubts that breeding can solve all pest and disease problems because there is insufficient or no durable resistance available in known germplasm.

Re-oriented SP-IPM focus

SP-IPM re-oriented its research to target the challenges. The Program endeavours to develop knowledge and technologies for innovative crop protection to increase and secure the production of safe food in an environmentally and economically sound way in the developing world. Collaborative research is carried out to provide valuable economies of scale, avoid duplication of efforts, and to achieve synergistic effects in relevant of research outcomes and impact. SP-IPM's new strategy focuses on three main areas (AIM) which will be further strengthened by expanding knowledge on IPM technologies through capacity building at the NARS level in cooperating countries.

1) Adapting IPM to climate change

In particular, SP-IPM will:

- identify regions and cropping systems most affected by increased pest incidence,
- provide tools for pest risk assessment and adaptation planning,
- broaden pest management option to deal with emerging pests,
- train national scientists in risk assessment and adaptive pest management strategies,
- support the adaptation of national pest management and quarantine programs.

On-going CGIAR work on models and mapping tools for pests and natural enemies, and species distribution and adaptation studies provides a solid foundation to build upon.

2) Improving the resilience of agro-ecosystems

SP-IPM focuses on broadening the understanding of the ecological relationships in agricultural production systems to improve soil, root and plant health in key cropping systems.

Emphasis is placed on:

- development and promotion of crop production practices that retain and stimulate the biological diversity needed to mitigate damage to soil and plant health,
- strategies for adapting host-plant resistance to pests under different climatic conditions.

The Centres' current work on soil biota, soil and agro-ecosystem health indicators and world-class biodiversity reference collections, and conservation research using GIS tools for biodiversity mapping and landscape projects is the base for SP-IPM activities.

3) Managing contaminants in food, feed and the environment

SP-IPM addresses trade losses and the threat to human and animal health due to contaminants in food and feed by:

- developing tools to identify germplasm of crops with resistance to insect damage and subsequent fungal colonization, reduced toxin production and swifter toxin degradation,
- adapting aflatoxin biocontrol methods to local situations by releasing non-toxin producing local strains of *Aspergillus flavus* to replace their toxin-producing relatives in the environment,
- providing cost-effective mycotoxin detection tools to exporters and food monitoring agencies to increase the market opportunities for agricultural produce and allow for the reduction of health risks from local food supplies,
- developing and adapting storage technologies for agricultural produce at risk of insect and mycotoxin infestation,
- developing and promoting bio-control options and bio-pesticides,
- influencing policy makers to adopt national food safety enhancing policies.

Several Centres have done major research in this area from which SP-IPM can start off.

Extending partnerships for higher impact

Work in the prioritized areas needs to be strengthened by cooperation with scientists with expertise currently scarcely or not available within SP-IPM. We are therefore extending our invitation to ENDURE members to enter into mutually beneficial partnerships. Possible entry points would be the ENDURE Staff Mobility Program to overcome barriers of fragmented and localized capacities, the Higher Education Program and specific research projects of common interest, e.g. mycotoxin management in countries which export to the European Community.

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