Increased importance of Integrated Pest Management

FAO, 2013: International Code of Conduct on Pesticide Management – Guidance on Pest and Pesticide Management Policy Development (Annex 1, 34-36)
Pictures: Ecoport, J.Breithaupt (www.ecoport.org); IPM: Approach, definition, principles, reference links, history, etc.: http://ecoport.org/ep?searchType=glossaryShow&glossaryId=58389&viewType=F
IPM References including case studies:
http://ecoport.org/ep?SearchType=reference&Keyword=IPM&To=2013&MaxList=0

Currently, there is renewed attention to Integrated Pest Management (IPM) in response to steadily increasing pesticide use that results in pest control crises due to development of resistant pests and outbreaks of secondary pests. Another important factor that contributed to the development of IPM was increasing evidence and awareness of the cost to human health and the environment of intensive use of pesticides. It should immediately be noted that the introduction of IPM does not necessarily involve sophisticated information gathering and decision-making on any level of the stakeholder hierarchy.

As a problem-solving approach to pest control, IPM can be introduced at any level of agricultural development. For example, improvement of basic crop management practices, such as planting time and crop spacing, can often be effective in reducing pest attack. A useful beginning can be made with relatively limited specialized information or management input. Later, additional information, technologies, and mechanisms can be developed to enhance its effectiveness.

IPM is a dynamic process that makes use of an ecological systems approach and encourages the user or producer to consider and use the full range of best pest control options available given economic, environment and social considerations.

The following main steps can be considered as typical for an IPM approach.

(1) Prevention and/or suppression of harmful organisms. This should be achieved or supported among other options especially by:

- crop rotation; inter-cropping (see Fig 1 below);
- use of adequate cultivation techniques (e.g., stale seedbed technique, sowing dates and densities, under-sowing, conservation tillage, pruning and direct sowing);
- where appropriate, use of pest resistant/tolerant cultivars and standard/certified seed and planting material;
- balanced soil fertility and water management;
- prevent spreading of harmful organisms by field sanitation and hygiene measures (e.g., by removal of affected plants or plant parts, regular cleansing of machinery and equipment);
- protection and enhancement of important beneficial organisms, e.g. by the utilization of ecological infrastructures inside and outside production sites.

Figure 1: Intercropping maize with legumes to suppress harmful organisms.

(2) Harmful organisms must be monitored with adequate methods and tools, where available.
Such adequate tools should include observations in the field and where feasible warning, forecasting and early diagnosis systems (e.g. traps).

(3) Based on the results of the monitoring it is decided whether and when to use what pest management inputs. Sustainable biological, physical and other non-chemical methods must be given priority over chemical methods if they provide satisfactory pest control.

(4) Pesticides should only be applied when threshold values indicate that pesticide use is justified.

(5) The pesticides applied shall be as specific as possible for the target and shall have the least side effects on human health, non-target organisms and the environment, while their use should be kept at minimum levels, e.g. by partial applications.

(6) Monitor the success of the applied pest management measures.

Examples of available techniques in the IPM toolbox

There is a wide variety of techniques that can be applied under IPM approaches. Applicability of individual techniques depends on various factors, including: the crop, the cropping system, the pest complex, the climate, the agro-ecological conditions, etc. Generally, IPM involves a combination of techniques. Some examples of such techniques are:

Population monitoring
- Trapping (pheromone trapping, sticky traps, water traps, etc.)
- Counts of eggs, larva/nymphal instars, pupae, adults (sweep nets) etc.

Cultural practices that can help prevent buildup of pests or decrease their pest status
- Use of pest-resistant or highly competitive crop varieties
- Field sanitation, use of quality seeds and seed bed sanitation
- Crop rotation
- Inter-cropping
- Managing sowing, planting or harvesting dates
- Water/irrigation management
- Soil and nutrient management (including mulching, zero/low tillage, fertilizer management)
- Practices to enhance the buildup of naturally existing populations of natural enemies (See Fig 2 below)
- Hand-picking of pests or hand-weeding
- Use of traps or trap crops
- Mechanical/physical controls (including barriers, crushing devices and use of heat)
- Post-harvest loss prevention

Figure 2: Use of naturally occurring predators; A predatory bug of the Reduviidae family with successful prey. This is most likely the common assassin bug *Pristhesancus plagipennis*

Biological inputs that can help manage pest populations

- Biological control (biocontrol) through release of predators, parasites or pathogens (see Fig 3 below)
- Biological control through fish, ducks, geese, goats, etc.
- Release of sterile male insects (sterile insect technology; SIT)
- Bio-Pesticides
- Biological preparations (e.g. natural plant extracts, e.g. Neem, *Azadirachta indica*)

Figure 3: Corn borer larva killed by a Nuclear Polyhedrosis Virus (NPV), and showing the typical symptom of the dead larva hanging by its prologs

Chemical inputs

- Chemicals that disrupt insect behavior (e.g.: pheromones)
- Induced resistance activating compounds
- Growth-regulators
- Conventional pesticides

Further technical information about IPM can be found at:

- http://www.epa.gov/pesticides/factsheets/ipm.htm
- http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html
- http://www.oisat.org/
- http://ipmworld.umn.edu/
- http://nysipm.cornell.edu/
- http://www.aglearn.net
- http://www.vegetableipmasia.org
- http://www.ipm-neareast.com