CAPSA
Centre for Alleviation of Poverty through Sustainable Agriculture

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Integrated Pest Management in the Asia-Pacific Region

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Introduction

Agriculture in the Asia-Pacific region has a pivotal role in promoting food security, livelihoods and sustainable development, especially for the rural poor. However, it is increasingly affected by issues such as degradation of natural resources, increased frequency of extreme weather events and change in rainfall patterns that are linked to climate change. The region's population, estimated at over 4.2 billion, is also growing fast, affecting the demand for food and other agricultural products.

Due to these factors and given the limited availability of agricultural land, the burden on the farming sector has increased manifold. A negative consequence of this has been the over-exploitation of water resources, soil erosion and salinization, and desertification, compromising the sustainability of production systems. Another consequence has been the excessive application of synthetic inputs on farms. According to estimates by the Food and Agriculture Organization of the United Nations (FAO), East Asia (including China) and South Asia together account for more than half of pesticide use in developing countries in the world. Moreover, farmers often apply large quantities of highly toxic pesticide or even use banned or spurious ones, instead of less toxic alternatives. Integrated Pest Management (IPM) offers an alternative that is safer for human and environmental health.

What is IPM?

According to FAO[1], IPM is an ecosystem approach to crop protection and production that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides. IPM is not a single pest control method but encompasses a series of pest management evaluations, decisions and control methods. It is based on the concept that it is not necessary to eliminate all pests but to reduce pest populations to levels where pests cannot cause significant loss. An IPM strategy includes the use of pest-resistant crop varieties, modification of agronomic practices to reduce pest incidence, biological control, other innovative pest suppression approaches and need-based, judicious use of chemical pesticides.

IPM can make a key contribution to not only addressing the challenge of food insecurity but also meeting the growing consumer demand in the Asia-Pacific region for safe food.

Principles of IPM

- Agricultural ecosystems are managed to prevent organisms from becoming pests that cause economic damage. An ecological approach that uses appropriate preventive measures, with consideration to maintaining native species diversity, is applied.
- Safeguarding human health, the environment and non-target organisms are primary considerations when developing pest management strategies, action levels and injury thresholds.
- A formal system is used to monitor populations of pests and beneficial organisms, pest damage and environmental conditions. Monitoring denotes the regular surveying of sites and/or features to understand and identify the location and extent of potential pest management problems.

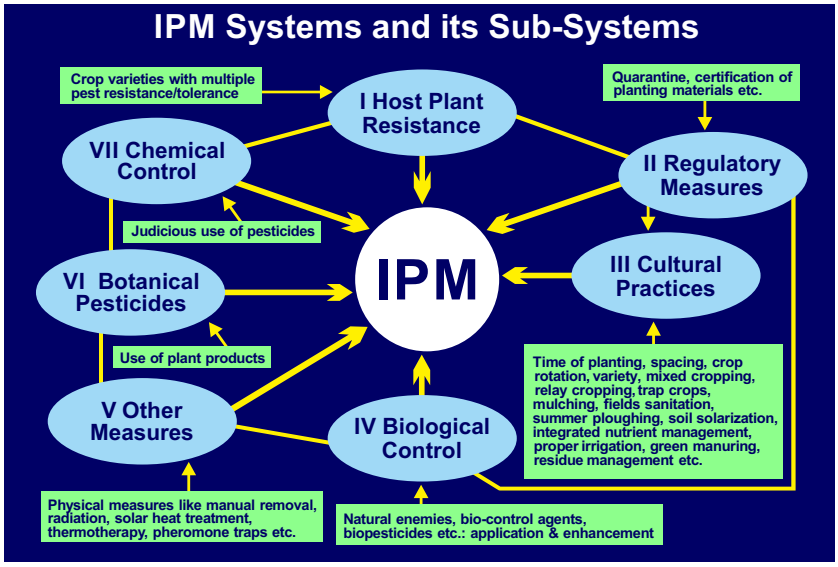
Components of IPM

IPM includes a variety of components under different frameworks and emphasizes the intelligent selection and use of the optimum pest management strategy. The selected pest management option should be effective, practical, economical and environmentally sound. Selecting a suitable strategy requires understanding of the pest life cycle and behaviour, deciding whether the infestation has

[1] http://www.fao.org/agriculture/crops/thematic-sitemap/theme/spi/scpi-home/managing-ecosystems/integrated-pest-management/en/

economic consequence or not, comparing different pest management options and then implementing the suitable IPM option.

Figure 1. Different components of IPM arranged in order of priority of use



Advantages and limitations of IPM

The following are among the key advantages of IPM:

- Decreased chemical application reduces health risks for farm workers, farmers and consumers.
- Decreased chemical application reduces risk of deterioration and disfigurement of holdings.
- Decreased chemical application may result in financial savings.
- Environmental improvements in the facility to implement IPM can enhance long-term stability of the holding over and above protection against pests.
- IPM may be the only solution to some long-term pest problems where chemical application is not effective.
- IPM ultimately allows producers to have greater control over and knowledge of pest activity.
- IPM is the pest management technique of choice for major institutions.

The main limitations of IPM include:

- Requires more staff/farmer time than traditional pest management, even if implementation is contracted to a pest management company.
- Requires coordinated effort across farms.
- May initially be more expensive.

Constraints in implementation of IPM

According to Koul *et al.* (2004), an in-depth study has categorized constraints to the implementation of IPM in developing countries into the following five main groups:

1. *Institutional constraints:* IPM requires an interdisciplinary, multifunctional approach. Traditional top-down research, in many cases does not address the real needs of farmers who are the end users and, either adopt or reject the technology based on its appropriateness. Institutional barriers to on-farm research by national research scientists in developing countries need to be addressed.
2. *Information constraints:* The lack of IPM information that can be used by farmers and extension workers is a major constraint as is the lack of training material, curricula and experienced IPM teachers. In many cases, field-level extension workers are not sufficiently trained in IPM to instil confidence in farmers.
3. *Sociological constraints:* Often, farmers and farm-level extension workers become conditioned to advocate the use of chemicals as being simple and highly effective. This is a major constraint in IPM implementation. Private industry and public sector extension agencies need to complement each other's efforts to overcome this constraint.

4. *Economic constraints:* Funding for research, extension and farmer training in IPM is often inadequate, limiting IPM adoption.
5. *Political constraints:* In some cases, government subsidies for pesticides and their linkage with government-provided credit for crop production, are an important constraint to farmer acceptance of IPM.

Strategy for promoting validated IPM technologies

Validation of IPM refers to the combination of various scientific technologies knitted together as an IPM module for testing in a real field situation. As IPM is a multidisciplinary, multi-organizational and multilocational participatory approach, the involvement of all stakeholders, including farmers and field technicians, should be ensured in the validation process. Once validated, it is necessary to have a dissemination strategy for the horizontal spread of IPM technologies to larger areas with crop/pest problems similar to the location where the technology was validated. A dissemination strategy has the following essential components:

- *Availability of IPM inputs:* The timely supply of critical inputs like seeds and good quality biocontrol agents as well as different biopesticides is crucial. Both public and private agencies should work in partnership and ensure the timely availability of critical IPM inputs to farmers.
- *Training and education:* As IPM is knowledge-intensive, the development of human resources is important. This includes training to make master trainers, extension personnel, field technicians and farmers fully aware of IPM, prevention methodologies, pest monitoring and management, and decision-making tools. Dealers/retailers of chemical pesticides/biopesticides also need appropriate training. For participating farmers, regular training through the Farmer Field School (FFS) is essential (please see below).
- *Community participation:* Success depends on the active participation of farmers and village institutions. The motivation and participation of women facilitates adoption. An area-wide approach is necessary to produce visible impact.

Farmer Field School approach

The Farmer Field School (FFS) approach plays an important role in the validation as well as dissemination of IPM technologies. The FFS consists of people with a common interest who come together on a regular basis to study the 'how and why' of a particular topic. It is a learner-centred, discovery-based and non-formal education (adult learning) approach, using decentralized responsibility, which engages farmers in the selection of training content, self-learning and evaluation of their own learning.

Figure 2. Farmer Field School on IPM

The IPM-FFS has become the model approach for farmer education in Asia and many other parts of the world. The approach has been used with a range of crops including rice, cotton, tea, coffee, cacao, pepper, vegetables, small grains and legumes. Farmers across the region have responded with enthusiasm to IPM FFS. While some are motivated by the reduced costs and risks through the application of ecological principles to crop management, others are intellectually stimulated and excited by the experience of designing and carrying out their own experiments. Yet others are mainly attracted by the group interaction, discussion and debate that are an important part of FFS. The most notable evidence of this enthusiasm has been the spontaneous emergence of the farmer-to-farmer FFS where FFS graduates organize a season-long FFS for other farmers. FFS thus merits due attention in the design of IPM promotion strategies.

Considerations in formulating national IPM policies

National IPM policies represent a deliberate effort, complementing other national agricultural development policies, to emphasize and encourage research, development, education, training, adoption and application of IPM throughout the agricultural sector. While developing a functional national IPM policy involves addressing a host of contextual factors, processes and stakeholder perspectives, the following important elements should be considered for inclusion:

- **Regulating use of highly toxic pesticides** and promoting use of less toxic, eco-friendly, yet effective inputs and practices for pest management to maintain the ecological balance between pests and beneficial insects, and ensure the overall well-being of the ecosystem.

- Facilitating an **interdisciplinary approach**, considering not only the management of insect pests, weeds, diseases and nematodes, but also the economic and social impact of control programmes on the environment as well as the health and economic status of farmers.
- **Enhancing awareness** on Good Agricultural Practices and on the impact of pesticides and pesticide residues on health and environment through public information initiatives and mass media.
- Strengthening **institutional and scientific capacities** for IPM research, extension and innovation with emphasis on national and regional priority crops, and prioritizing closer research-extension linkages (e.g. through extension and outreach in research projects and encouraging involvement of researchers in farmers' fields).
- Addressing **subnational contexts** including through institutionalized and participatory design, implementation and feedback mechanisms involving the farming community.
- Promoting **public-private partnerships** and ensuring engagement of various institutional stakeholders for adoption of IPM. While the public sector has a central role in this regard in many countries of the region, government policy initiatives can be leveraged to promote a market-aligning and appropriate technology-providing role for the private sector, a community mobilization role for NGOs, and a cost-sharing and change-facilitating role for development agencies.

Conclusion

In today's world, it is necessary to adopt a systems approach to pest management, taking into account natural resources, biodiversity, landscape and the importance of environmental conservation. Farming practices also need to be made fully compatible with ecological systems by avoiding crops, cultivars and agronomic practices that can transform an insect species into a pest. These factors make it increasingly vital to upscale the adoption of IPM across the Asia-Pacific region. Achieving this goal requires a holistic approach, encompassing not only the technical and ecological but also the broader socioeconomic aspects. It also requires due recognition of the fact that IPM application goes beyond individual ownership or boundaries and needs collective action by diverse stakeholders.

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