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Number 8

Report of the OECD/FAO Workshop on Integrated Pest Management  
and Pesticide Risk Reduction

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**Report of the  
OECD/FAO Workshop  
on  
Integrated Pest Management  
and Pesticide Risk Reduction**

**Neuchâtel, Switzerland  
28 June-2 July 1998**

**Environment Directorate  
Organisation for Economic Co-operation and Development  
Paris 1999**

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No. 3, *Data Requirements for Biological Pesticides* (1996)

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The Pesticide Programme was created in 1992 within the OECD's Environmental Health and Safety Division to help OECD countries:

- harmonize their pesticide review procedures,
- share the work of evaluating pesticides, and
- reduce risks associated with pesticide use.

The Pesticide Programme is directed by a body called the Pesticide Forum, composed primarily of delegates from OECD Member countries, but also including representatives from the European Commission and other international organisations (e.g. United Nations Food and Agriculture Organization, United Nations Environment Programme, World Health Organization, Council of Europe), and observers from the pesticide industry and public interest organisations (NGO's).

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**The Inter-Organization Programme for the Sound Management of Chemicals (IOMC) was established in 1995 by UNEP, ILO, FAO, WHO, UNIDO and the OECD (the Participating Organizations), following recommendations made by the 1992 UN Conference on Environment and Development to strengthen co-operation and increase international co-ordination in the field of chemical safety. UNITAR joined the IOMC in 1997 to become the seventh Participating Organization. The purpose of the IOMC is to promote co-ordination of the policies and activities pursued by the Participating Organizations, jointly or separately, to achieve the sound management of chemicals in relation to human health and the environment.**

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## **Part 1. Introduction and Overview**

This report presents the conclusions and recommendations made by the OECD/FAO Workshop on Integrated Pest Management and Pesticide Risk Reduction, held in Neuchâtel, Switzerland on 28 June-2 July 1998. The purpose of the workshop was to explore how “IPM” can help reduce risks associated with pesticide use in agriculture.

The workshop was organised in response to recommendations made by a previous OECD/FAO workshop on pesticide risk reduction held in Uppsala, Sweden in October 1995. One recommendation was for OECD and FAO to initiate activities to help countries share information about IPM and how it can reduce risks associated with pesticide use in agriculture. A second recommendation was to develop systems to measure progress in risk reduction in the IPM context.

The workshop was hosted by the Swiss Federal Office of Agriculture and Agency for Environment, Forests and Landscape, and was chaired by Dr. Alfred Riggenbach on behalf of the Federal Office of Agriculture. Approximately 100 people attended. Just over half were officials from national regulatory agencies or international organisations: these included representatives of 25 OECD and FAO countries, the European Commission, the United Nations Environment Programme, the European and Mediterranean Plant Protection Organisation, and the OECD and FAO Secretariats. The other participants were independent experts directly involved in developing and using IPM methods and tools: these included farmers, representatives of farmer and farm worker associations, agricultural researchers, extension agents, crop consultants, food retailers, manufacturers of both chemical and biological pesticides, and environmentalists. The list of workshop participants is attached in Annex 1.

### **What is IPM?**

The workshop was not asked to agree on a definition of IPM, but the participants were invited to provide the definition used by their government or organisation. The 24 definitions provided (attached in Annex 2) show a considerable amount of agreement about what IPM is, but also some differences.

Virtually all of the definitions describe IPM as an approach that combines a variety of methods to control pests rather than relying on chemical pesticides alone. The alternative methods most commonly cited are cultural (i.e. using good farming methods and pest-resistant crop varieties) and biological (i.e. using pests’ natural enemies, parasites or pathogens). Many of the definitions note that IPM seeks to balance environmental and economic concerns, taking into account crop yields, farm profits, health and environmental safety, and resource sustainability. Many definitions also emphasize that IPM is not just a set of techniques or an “off-the-shelf” package, but is an approach to pest control that is knowledge-intensive, farmer-based, and dependent upon local conditions and the crop being grown.

Some definitions go farther than others in emphasizing the importance of farming methods and the agro-ecological context. These stress that pest control starts with “prevention,” which means creating conditions needed to grow a healthy crop: the conditions include, for example, selecting locally-adapted and pest-resistant crop varieties, adapting planting times, maintaining a fertile soil and nutrient balance,

preserving biological diversity, and ensuring the presence of natural enemies. These definitions emphasize the importance of farmer expertise and knowledge about ecological and biological systems.

The definitions vary considerably in their attitude to pesticides, though all identify them as a valid IPM tool. Some definitions appear neutral about the use of chemical pesticides. Others say pesticide use should be reduced to a minimum, and some insist that pesticides should be used only as a last resort, after all other approaches have failed to control pests sufficiently. Some definitions take a middle road, stating that pesticides should be used judiciously and “safer” products preferred (e.g. biopesticides and growth regulators given preference over chemical pesticides, selective pesticides over broad spectrum pesticides, and quickly degradable pesticides over persistent ones).

Several definitions describe the social consequences of IPM, noting the positive effects of “farmer empowerment.” These definitions note that farmers who use IPM extensively become better farmers, more knowledgeable about the ecology of their farms, better at pest control and crop management, and more likely to be in contact with other farmers and with extension agents and IPM researchers. By surveying their fields regularly, collecting and analysing data, and making decisions, these farmers themselves become experts who develop technologies that work well on their own farms rather than being on the receiving end of technologies developed by others.

## Workshop Focus

The workshop addressed five questions concerning the role of IPM in pesticide risk reduction and what governments and other “stakeholders” could do to promote its use:

1. How can IPM contribute to pesticide risk reduction in agriculture?
2. What makes IPM projects successful?
3. What are the main barriers to and incentives for implementing IPM?
4. Is it important to measure progress in IPM implementation, and if so, how should this be done?
5. What can national governments, international organisations, and other IPM stakeholders do to increase IPM adoption?

## Workshop Organisation

### Plenary and Breakout Sessions

The workshop was organised in alternating plenary and breakout sessions.

The plenary sessions provided a variety of perspectives on the first four questions through panel presentations by farmers, food retailers, pest control experts, IPM researchers, manufacturers of biological and chemical pesticides, and environmentalists. The panel speakers are listed below. Summaries of their presentations are attached in Annex 3.

#### ***Panel 1. The role of IPM in pesticide risk reduction***

Speakers: Marcia Ishii-Eiteman, Pesticide Action Network-North America  
Jeff Waage, CABI Bioscience  
Ian Finlayson, Sainsbury Supermarkets

Bruno Pezatti, Swiss Fruit Tree Growers Association  
Bernhard Johnen, Global Crop Protection Federation

**Panel 2. *IPM Case Studies***

Speakers: Hasan Bolkan, Campbell Soup Company  
Erich Dickler, German Federal Biological Research Centre for Agriculture  
and Forestry  
Russell Dilts, FAO Programme for Community, IPM in Asia  
Tony Zatylny, Canola Council of Canada

**Panel 3. *Barriers and incentives for implementing IPM***

Speakers: Charles Mellinger, Glades Crop Care (United States)  
Bernward Geier, International Federation of Organic Agriculture Movements  
Erich Jörg, State Institute for Agronomy and Plant Protection (Germany)  
Leentje den Boer, Centre for Agriculture and Environment (Netherlands)  
Simon Zithole, Zimbabwe Ministry of Agriculture

**Panel 4. *How to measure progress***

Speakers: Sarah Lynch, World Wildlife Fund  
Caroline Drummond, Linking Environment and Farming (United Kingdom)  
Peter Dall, Peter Dall Consultancy (Republic of South Africa)  
Hermann Waibel, Institute of Economics in Horticulture (Germany)

The breakout sessions, in which the workshop participants split into six groups, allowed for more detailed discussion of the questions. Each group wrote a report summarising its discussions, and these reports are provided in Part 2 of this document. Conclusions and recommendations that were common to several groups and were highlighted in plenary sessions are summarised below, under Workshop Conclusions and Recommendations.

## **Field Day**

In addition to the plenary and breakout sessions, the workshop included a Field Day in the farming region surrounding the town of Neuchâtel and in the Bernese Lake Region. The workshop participants visited fruit, vegetable, wine, and grain farms that practice IPM or organic agriculture; the Bernese Agricultural Research Station at Ins, which advises local farmers on IPM methods; and a vegetable packing plant in Kerzers cooperating with the retailer MIGROS, which promotes produce grown using IPM and organic farming. The Field Day provided an opportunity for the workshop participants to talk to farmers, IPM researchers and retailers about their reasons for preferring IPM and the problems and successes they have encountered.

The Field Day was held on the second day of the workshop, so that the participants could include their observations in the remaining workshop discussions.

## Poster Display

The workshop included a display of approximately 50 posters provided by the participants to illustrate their work in IPM. A video on biological pest control produced by the Swiss government was shown in French and German (an English version is also now available).

## Background Papers

Two background papers were written for the workshop:

- What is Integrated Pest Management? A compilation of definitions submitted by workshop participants (attached in Annex 2);
- An overview of the IPM activities of international organisations participating in the OECD Pesticide Forum (attached in Annex 4).

## Conclusions and Recommendations

This section summarises the conclusions reached by the workshop's six breakout groups about: the role of IPM in pesticide risk reduction, what makes IPM projects successful, the main barriers to and incentives for implementing IPM, and whether and how progress in implementing IPM should be measured. The section also summarises the groups' top recommendations for actions that should be taken to promote IPM.

Readers should be aware of two things. First, the summary below highlights the conclusions and recommendations made most frequently by the breakout groups. However, *readers are also referred to the original group reports in Part 2 which contain many other valuable ideas that should not be overlooked*. Second, for simplicity's sake this report uses the single word "farmer" when referring to the people who work on farms and implement IPM. *The term "farmer" is intended to cover all those who work on farms*, including agricultural workers as well as farm owners.

### The Role of IPM in Pesticide Risk Reduction

The workshop agreed that IPM can contribute importantly to pesticide risk reduction by:

- reducing reliance on chemical pesticides and encouraging the use of alternatives,
- encouraging the use of reduced-risk pesticides when pesticide treatment is necessary,
- preventing pest problems to begin with through better crop management and maintenance of natural resources,
- increasing farmer knowledge about agricultural pests and ecosystems.

The workshop also agreed that IPM is an important part of integrated crop management and sustainable agriculture.

## What Makes IPM Projects Successful

The workshop identified the following key steps to successful implementation of IPM:

- Make IPM research and implementation “farmer-driven”
  - initiate research in consultation and co-operation with farmers who will use the results
  - design projects that are locally organised and adapted and that include diverse strategies and tools; avoid large, centralised, vertically integrated programmes that are not responsive to local ecologies
  - design projects in ways that allow farmers to increase their knowledge about agro-ecosystems and make better decisions
- Plan IPM projects thoroughly
  - identify needs
  - set clear criteria and achievable goals
  - develop an implementation strategy
  - develop a way to measure progress in meeting goals
- Create partnerships involving all IPM stakeholders to help plan, implement and supervise IPM projects
  - stakeholders can include farmers, government, research, extension, crop consultants, retailers, pesticide industry, environmentalists, consumers
- Help create market demand for IPM products
  - inform consumers about the nature and benefits of IPM
  - provide easy-to-understand IPM labels
- Create political will and support structures:
  - make support for IPM a feature of government pesticide policy
  - provide long-term government commitment and stable policies to support IPM
  - provide stable funding of IPM research, extension and information transfer to farmers
  - provide leadership for creation of IPM partnerships
- Give farmers concrete, practical support for IPM adoption, including:
  - training, education and information
  - practical, well-adapted and affordable technology
  - pilot projects and demonstration farms that illustrate the positive results of IPM
  - encouragement and recognition for using IPM
  - mechanisms for information exchange with other farmers and IPM stakeholders
  - instruments to measure progress in IPM implementation
  - financial assistance or other incentives during the period of transition to IPM
- Provide commercial incentives, registration priority or other support to maintain a viable, healthy biocontrol industry that can develop alternatives to chemical pesticides

## **Barriers to IPM Implementation**

The workshop identified the following as factors that often present barriers to IPM implementation:

### ***The focus and structure of IPM research***

- lack of field-focused, problem-solving, applied research to develop practical and affordable tools that farmers can really use; over-concentration on research/technology that is too far from the field
- lack of communication and discussion of research with stakeholders
- lack of long-term thinking about implementation of existing IPM tools and development of new ones
- lack of information generally on IPM approaches as compared with large amount of information available on chemical pesticides

### ***Problematic government policies***

- lack of continuity in policy and lack of political commitment to IPM; policy-makers can be short-sighted and inadequately informed about IPM
- lack of clearly defined IPM standards and tools to monitor and record progress (e.g. impacts on environment, health, farm economics); confusion about what IPM is
- insufficient funds for proper implementation of IPM programmes even when they have been shown to work
- pesticide registration not harmonized internationally and not well-adapted to promoting IPM; process too slow to approve new IPM tools
- current policies distort markets, provide conflicting incentives, offer subsidies for non-IPM farming, and contain inconsistent or illogical requirements (e.g. encouraging IPM but then requiring products to be dipped in insecticide or fungicide after harvest)
- policies are too rigid, demand too much standardization, stifle innovation

### ***Insufficient IPM tools and strategies***

- farmers need alternative or consecutive strategies with multiple options

### ***Farmers' reluctance to change***

- farmers are risk averse; wary of new, untried methods
- individualists; don't want to be told what to do
- high cost of shifting from chemical-based pest-control paradigms to IPM

### ***Weak markets for IPM products***

- consumers unaware, uninformed about IPM
- IPM labels confusing
- food quality requirements and grading place excessive emphasis on unblemished produce rather than rewarding IPM production

### ***Pesticide promotion***

- Influence of some pesticide producers, development/aid organisations and governments, who promote chemical pesticides to the detriment of other pest control tools

## **Incentives for IPM Adoption**

The workshop identified the following incentives that would help to increase IPM adoption. Not surprisingly, they are similar to the keys for successful IPM programmes.

### ***Strong, well-funded IPM research and extension, that***

produces practical, effective and affordable IPM tools  
uses well-trained IPM advisors  
involves farmers in projects

### ***Government policies that promote IPM by***

setting clear goals and maintaining long-term commitment  
structuring agricultural research and extension to promote IPM  
rewarding farmers who use IPM, not those who do not  
providing financial or other support during the transition to IPM  
using tax system to make IPM financially appealing  
facilitating registration of biological pesticides and other IPM tools  
communicating the meaning and value of IPM (to farmers, retailers, consumers, etc.)

### ***IPM partnerships and discussion fora that allow IPM stakeholders to***

share information  
oversee IPM projects  
generate support for IPM

### ***Positive results from IPM programmes that succeed in***

controlling pests  
producing higher yields  
avoiding development of pesticide resistance  
reducing agricultural production costs (fewer purchased inputs)

### ***Market demand stimulated by***

government purchase of IPM products  
food industry and consumer support  
uniform standards or definitions for IPM production  
clear labelling and/or certification of IPM products

### ***Practical measurement tools***

to enable farmers to monitor and record progress in implementing IPM

### ***Social rewards***

farmer desire to sustain natural resources, reduce risks to health and environment

## **Measuring IPM Implementation**

The workshop breakout groups were unanimous in agreeing that it was important to have systems to measure IPM implementation. They agreed that such systems should be a basic component of IPM projects and would be useful to farmers for tracking progress toward goals and making pest-control

decisions, as well as to governments, for evaluating the effectiveness of policies and programmes and communicating results to the public.

The workshop agreed that measurement systems should record both the *results of IPM*, e.g. impacts on the environment, farmer income and farmer “empowerment,” and *farmer activities*, i.e. whether farmers follow good IPM practices. The workshop agreed that this would require a series of indicators and could not be done by just one “overall” indicator.

The workshop identified the following main principles for developing IPM measurement systems:

- begin by developing guidelines or standards that clarify the meaning and objectives of IPM;
- specify the purpose of the measurements and who will be using them, e.g. farmers or government ministries;
- specify the measurement scale and focus;
- establish a baseline starting point by characterising current farming practices (by country or region) and their environmental, economic and social impacts;
- set clear targets and goals;
- involve the important IPM “stakeholders,” e.g. farmers and farmer associations, IPM researchers, extension agents, crop consultants, food retailers, government officials, manufacturers of biological and chemical pesticides, environmentalists, and representatives of consumer groups. This will increase everyone’s investment in the process and acceptance of the results.

The workshop also agreed that measurement systems should:

- track trends over time;
- be easy to use and produce readily understandable results;
- be sufficiently flexible to account for new technologies and IPM scenarios;
- be relevant to farmers and make use of farmer documentation of pesticide use and plant protection practice;
- use actual measurements rather than estimates to the extent possible.

Most of the breakout groups identified parameters they thought should be included in a measurement system, and several noted that the examples of existing systems presented in the plenary session on measurement provided good ideas (see Annex 3). These included:

- the “IPM continuum” developed by the World Wildlife Fund and Wisconsin Potato and Vegetable Growers Association and used by farmers to track progress toward “biointensive” IPM;
- the Linking Environment and Farming Programme (U.K.) self-assessment audit used by farmers to record, evaluate and improve their farming practices against approved standards; and
- the IPM and integrated production scoring systems used in South Africa’s Integrated Fruit Production Programme.

### Recommendations for Actions to Increase IPM Adoption

The workshop made the following list of priority recommendations:

Recommendation	Responsible Party
1. Develop a national policy framework that facilitates IPM implementation <ul style="list-style-type: none"> <li>• make IPM a central feature of pesticide policy</li> <li>• reform policies that promote or reward pesticide use in agricultural production</li> <li>• set clear goals and criteria for IPM implementation</li> <li>• develop a sustainable funding system for IPM</li> <li>• analyse and make transparent the costs and benefits of different pest control systems</li> </ul>	national government lead, with participation of all stakeholders
2. Increase applied agricultural research and extension, with focus on IPM <ul style="list-style-type: none"> <li>• encourage farmer participation in research</li> <li>• ensure that extension agents and crop consultants are well trained in IPM</li> <li>• ensure that extension services are well funded</li> <li>• improve delivery of information to farmers</li> </ul>	national government
3. Create or facilitate IPM partnerships and discussion fora	local and national government, OECD and FAO
4. Create financial incentives for using IPM. Remove conflicting incentive schemes.	national government
5. Improve education about IPM at all levels of society.	<ul style="list-style-type: none"> <li>• government</li> <li>• farmers and retailers working together on consumer education</li> </ul>
6. Develop IPM guidelines and standards in the overall context of sustainable agriculture. Include principles for measurement of IPM activities and results	OECD and FAO
7. Remove barriers and constraints to IPM.	national government
8. Improve and harmonize pesticide registration <ul style="list-style-type: none"> <li>• remove products posing unacceptable risks to human health or the environment</li> <li>• streamline pesticide approval and promote registration of IPM compatible products</li> </ul>	national government, OECD
9. Encourage developing countries to use IPM in intensifying agriculture	FAO
10. Strengthen OECD-FAO co-operation	OECD and FAO

## **Part 2. Breakout Group Reports**

### **Report of Group 1**

#### **Session 1. The Role of IPM in Pesticide Risk Reduction**

IPM is an important part in the framework of integrated crop management. IPM must be well balanced between the requirements of economy and ecology and reduces reliance on plant protection products; it encourages the use of alternatives and can reduce exposure to plant protection products and thus the risks resulting from such exposure.

IPM contributes to pesticide risk reduction especially through its preventive character. The backbone of IPM is a good authorisation of plant protection products, good plant protection equipment and a well educated grower. Furthermore a measurement system to quantify progress in risk reduction is a most important requirement for the successful implementation of IPM.

#### **What is the role of the stakeholders?**

Stakeholders can contribute enormously to the success of an IPM program by forming partnerships which provide comprehensive support for IPM implementation.

#### *Farmers*

Farmers have the education and specific knowledge about farming practices. They are the driving force for implementation of IPM-methods and innovation. Farmers must meet consumer preferences and maintain the sustainability of the agricultural production system.

#### *Food Industry*

One role of the food industry is to provide a link between consumers and farmers. Another is to define their quality standards relevant to IPM.

#### *Governments*

Governments may have an important role to play. They can provide besides the legal basis the framework for research, training, extension service, and information both for consumers and farmers. They can stimulate IPM research through partnerships and financial support. They are responsible for implementing good authorisation practices and along with other stakeholders for facilitating the availability of alternatives to the most toxic plant protection products. Under certain circumstances (e.g. for implementation of new methods) it may be helpful for governments to provide financial incentives.

## **Session 2. IPM Case Studies**

### **What makes IPM projects successful?**

To be successful, farmers must be the ones who choose to apply IPM and they must be the managers, i.e., IPM must be farmer driven. In order to be fully successful, however, all those involved along the value chain (from producer to the consumer) will have to benefit.

Incentives can support adoption of new IPM-methods. Incentives for farmers can include economic advantages, consumer preferences and quality standards from the food industry.

Farmers must have the technology to move from conventional farming to IPM. They may need support in the forms of education, information, funds, encouragement and recognition for implementation of new IPM-methods. The support may be higher during the transition phase.

### **What makes IPM unsuccessful?**

If the above conditions are not met IPM may not be successful. Other factors may also cause an IPM programme to fail. For example, IPM may not be sustained and benefits not realised if it relies on outside financial incentives particularly if temporary. If there is a lack of commitment to an IPM approach among those involved, the production system may fall back to a conventional system.

Too much bureaucracy can get in the way. If IPM involves too many administrative requirements for farmers levied by local, regional or national governments, it may be too burdensome to adopt or maintain.

IPM methods will not be accepted by growers if they do not differ much from conventional methods but cause more work, higher risks or less income.

### **What can governments do?**

Governments can provide the legal framework for implementation of IPM methods and strategies. They can act as a major provider of information; they may sponsor programmes to coordinate information on IPM technology, benefits and application. They may be in a position to disseminate or coordinate the availability of information on IPM and bio-intensive technology.

Without clear goals or strategies for the implementation of IPM, it may be very unclear as to how they should be applied. If a government sets goals for IPM, it must have in mind that IPM is a farm based, dynamic system which adapts very fast to new technical developments if they are practicable, feasible and effective.

For example, setting targets for the percent of national farming that should be under an IPM system may not be enough and in some cases not feasible. Governments together with all the other stakeholders may need to support such a goal with a specific, regional and crop-related strategy which could include support for research and application of IPM techniques.

Governments can provide financial support for IPM research and it is important for this support to be continuous. It lessens the effectiveness of a research programme if it is subject to frequent budget shifts which can affect long-term projects.

### **Session 3. Barriers and Incentives to Implementing IPM**

#### **Barriers**

- There appears to be a lack of consumer knowledge about the concepts of IPM and the benefits it entails for consumers, other stakeholders and the environment. However, insufficient information is available about consumer knowledge about IPM and what kind of information should be provided.
- Research targeted at improving IPM is insufficient in terms of focus, funds and relevance for its application in practice.
- Quality requirements for agricultural products are unnecessarily excessive (blemishes, grading systems, etc.).
- Methods and tools are lacking to measure progress towards the objectives of IPM.
- Political support on all levels is insufficient; even where IPM programs have progressed significantly, insufficient resources are made available for an appropriate implementation of the programs.
- There is a lack of long-term thinking required for implementation of IPM-methods and developing IPM-systems further in the form of a continuous process.

#### **Incentives**

- A “Code” or general principles for IPM would add to the transparency of IPM concepts, make them better understandable by the public, allow for comparison on all levels of implementation and facilitate recognition of IPM producers. Such “Code” MUST be adaptable to local conditions.
- Certification of IPM production processes may give participants in such programmes a competitive edge by differentiation, but may become a barrier if they are too bureaucratic.
- Policies and regulations need to be developed (further) to facilitate the adoption of IPM practices; they have to be transparent, bring into prominence the essence and the advantages of IPM, and must be understandable and acceptable for the stakeholders.
- Economic incentives are a driving force for changing over to and maintaining IPM processes. They may result from contracts between producers and food processors, be granted for specific ecological efforts and achievements, or made available through other schemes. They should be tailored to the specific political, economic and other characteristics for a given country and the local conditions.

## **Session 4. How to Measure Progress**

One of the most critical elements of a measurement system is a common vision of what the potential users want to achieve at the national, regional and farm level and along the food production chain. The purpose of the measurement system must be clear to all who will use the information provided by it.

To set objectives, the users and applicators of this system would have to decide on an appropriate scale and criteria, in other words, should data be collected for a particular farm, on all farms using a particular IPM program or on an even broader level? The measurement for IPM will in general be part of a more comprehensive measurement system and function in the context of Integrated Crop Protection.

There are a number of prerequisites for an IPM measurement system to be successful:

1. The objective of an IPM measurement system is to show the state of implementation and to use this information for the improvement of the effectiveness of implementation. This requires a dynamic system which gives frequent feedback to those who develop and implement the system. The performance of IPM practices and eventual changes due to these practices should be registered and evaluated.
2. All relevant stakeholders need to participate in the review of standards and criteria.
3. The measurement system should be credible for all stakeholders. The system must be easily understood. It must be clear how the measurement data relate to the results of the system.
4. Measurement systems must be easy to use and must be based on robust methodology.
5. Farmers will not agree to record the same data several times. It should be possible to use one data set for several applications, for instance risk management, regulation and self-auditing by farmers.
6. Measurement systems need to have both a short- and long-term application. They need to make trends over time clearly visible, particularly in risk reduction.

### **Government needs**

In general governments nowadays do not have the information they need for measurement systems. They may have data but not always all that is required. The different data needed are, for instance, data on pesticide products and volume used, farm conditions, farm practices and product/method performance.

## **Session 5. Priority Recommendations**

- Define clear goals and criteria for IPM, focusing on risk reduction.  
Responsibility: all stakeholders with government lead.
- Facilitate partnerships and discussion fora from local to national level:  
Responsibility: local and national government, OECD, FAO.
- Increase applied research  
Responsibility: all stakeholders; work through partnerships.

- Make costs and benefits of control systems transparent.  
Responsibility: government and OECD, with involvement of stakeholders.
- Provide training and assistance to extension  
Responsibility: all stakeholders with lead from government and industry.
- Remove barriers and constraints that penalise IPM: harmonize pesticide registration procedures.  
Responsibility: government and OECD

## **Group 1 Participants**

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## Report of Group 2

### Session 1. The Role of IPM in Pesticide Risk Reduction

1) In what ways can IPM promote risk reduction ?

Some of the benefits of IPM include:

- improved management concepts
- better educated users and customers
- diverse production systems that protect users, consumers and the environment
- encourage use of reduced risk pesticides and systems

2) What can countries and others do to effectively promote IPM ?

Need:

Measurement to quantify progress in risk reduction

Knowledge and education of:

- (i) public in order to provide a better understanding of what IPM actually is and the benefits it can provide
- (ii) farmers i.e. the concept of integrated production from “farm to fork”

Role of stakeholders - essential to encourage the concept of partnership between all interested parties in adopting IPM

Farmers can: initiate innovation  
meet consumer preference  
maintain sustainability

Food Industry can: link consumers and farmers  
formulate clear quality criteria for produce

Governments can: provide a framework of training and extension information  
improve IPM research through partnerships  
implement “Good Authorisation Practices” of pesticides  
consider financial incentives (although probably not suitable for all countries e.g. large countries)

## Session 2. IPM Case Studies

The discussions mainly dealt with the question: what makes IPM programmes successful? Government activities in order to make IPM programmes successful were discussed only briefly (for more detailed information see Session 3).

### What makes IPM projects successful?

#### *Key stages to a successful IPM programme*

A careful and comprehensive planning phase must precede the introduction of an IPM programme. The following steps have to be part of a successful programme:

- i) Identification of the key needs
- ii) Identification of the stakeholders and their benefits (goals)
- iii) Development of a common IPM strategy
  - setting of priorities
  - definition of the tasks
- iv) Measurement of progress
  - economic
  - environmental
  - quality
- v) Demonstration of economic benefits to the public (direct and indirect)

#### *Partnership - the key to successful IPM programmes*

“Partnership” was identified as the single most important concept to ensure the success of IPM programmes. The prerequisites for and the participants in the partnerships are as follows:

- i) Prerequisites for a successful partnership include:
  - Independence of the partners
  - Openness of all parties
  - Mutual benefits
  - Commitment of all involved
- ii) Participants should include:
  - Government Organisations
  - Growers’ Associations
  - Research Institutions
  - Pesticide Industry
  - Extension Services (Government and private consultants)
  - Environmentalists
  - Consumers’ Organisations
  - Marketing Organisations

iii) Forum

National (and international) fora including all the stakeholders as equal partners should be installed to supervise the IPM programmes.

The main tasks of the forum are:

- to guarantee an appropriate membership for the individual stages of the programme (the team may vary during different stages of the programme)
- to keep a watch on the implementation of the programme (methods, aims etc.; see: key stages).

iv) Starting Points for IPM Programmes

Up to now almost all IPM programmes have been drawn up as a consequence of a “crisis” (e.g. pesticide resistance). It was discussed whether a “crisis” must be the prerequisite for the establishment of an IPM programme. However, it was agreed that instead of maintaining a “reactive approach” the stakeholders should adopt a “proactive approach”. Such an approach would remove time pressure from the programmes to be planned.

**What can governments do to make IPM programmes successful?**

Governments should take efforts in the following fields:

- i) IPM should be a central feature of government plant protection policy
- ii) Education and extension to ensure provision of information on IPM to all parties
- iii) Incentives - either direct financial support for IPM programmes or indirect via supportive measures (e.g. research and development)
- iv) Leadership in bringing together all stakeholders in the national fora (see above).

**Session 3. Barriers and Incentives for Implementing IPM**

The discussions concentrated on the role of government in removing barriers and providing incentives to the implementation of IPM. It was acknowledged that removal of barriers was also often complementary to offering incentives.

**Removal of barriers by governments**

1. Clear definitions of targets and roles for all stakeholders expressed in government policy.
2. Encourage the commitment of all stakeholders to adopt IPM and remove any artificial barriers, including setting a beneficial economic environment.
3. Subsidise the development and uptake of biological pesticides and preventive (non-chemical) IPM measures (i.e. remove the cost/risk factors).
4. Taxation linked to research and development of improved IPM techniques.
5. Promotion of extension services, both public and private, in promoting IPM with all stakeholders including the general public as consumers.

6. Auditing of progress after validation of the IPM schemes.
7. International harmonisation of pesticide regulation including the de-registration of high risk pesticides.
8. Eradication of poor practice by industry, development/aid organisations or governments in the promotion of pesticide use.
9. Consider a reward scheme for good IPM practice.

### **Governmental incentives**

1. Definition of clear political goals.
2. Encourage and facilitate partnerships (e.g. creation of national IPM fora).
3. Promotion of industry/government research initiatives.
4. Tax incentives for improved research, extension and agricultural/horticultural practice (inc. transition schemes to encourage adoption of IPM).
5. Reward for innovators in the promotion of IPM.
6. Improvement of education and training for the uptake of IPM (improving the links between academic research, extension services and growers).
7. Develop adequate tools to monitor and record progress.
8. Continued international harmonisation and standardisation of indicators.
9. Lead by example in the purchase of food and commodities.

### **Session 4. How to Measure Progress**

The data needed for the quantification of progress and the data availability to governments were the central points under discussion.

#### **Data needed for measuring progress**

##### *Definition of “progress”*

At first a recent status has to be characterised and goals have to be defined. Then parameters have to be identified to measure to what extent the goals have been reached.

##### *Key areas*

Data must be recorded from the following five areas:

- 1 - farm management
- 2 - human health
- 3 - environment
- 4 - consumer reaction
- 
- 5 - socio - economics

The complexity of the data increases from the micro-level (1) to the macro-level (5).

***Development of a database***

The data must contain all the relevant information needed. A representative sample system must be established especially on the macro-level (socio-economics). Actual measurements should be preferred to estimates. Care has to be taken with indices combining several parameters from different key areas, especially if weights are assigned to the single parameters.

1. Micro-level

- Pesticide usage data

Complete information on pesticide products should be available so that effects on human health and the environment can be estimated more accurately.

- Farmer documentation

The group agreed that there should be a simple farm-based database with information on farm practices. Farm records must be simple but reliable. All activities should be documented so that agrochemical input and the output can be measured.

2. Macro-level

Databases must be related to the goals and based on sound statistical samples. (e.g. biodiversity databases to measure environmental progress, surveys of consumer confidence and acceptance, socio-economic cost-benefit database).

**Data availability to governments**

database	availability	comment
pesticide usage	(+)1	variable*
plant protection practice	O1	limited
environmental parameters	(+)	variable
consumer acceptance	?	?

\*= active ingredients sufficient but coformulants often incomplete

1= some governments have extensive surveys of actual pesticide usage on farms but there appeared to be only limited knowledge of the scale of IPM in practice.

?= the group did not have any expertise in this subject and would look to others with experience of the retail industry to expand (note that representatives of Migros had talked about their approach to this topic during the field day)

Governments must create the links between the databases and fill the knowledge gaps to improve the policy instruments.

Governments should be encouraged to improve the knowledge database in all of the fields outlined in the table above (e.g. it is essential to link the pesticide usage data bank to the implementation of IPM in agricultural practice).

Good examples of initiatives discussed at the workshop included: the pesticide usage surveys in the United Kingdom; the Eurostat programme to develop an international pesticide usage database; the LEAF scheme in the UK encouraging farmers to keep own activity records to assess their individual performance against environmentally friendly practice; the South African farmer participation schemes.

## **Session 5. Conclusions and Recommendations**

### **1. IPM policy and partnerships**

Governments should establish a forum based on a partnership of all the stakeholders to develop a national IPM policy with clear definitions and goals. The forum should oversee all of the programmes to ensure a cohesive approach, although the membership of each individual programme should be appropriate to the desired goals.

### **2. Tools for IPM**

Governments should continue to facilitate research to ensure that farmers have the necessary tools for the implementation of IPM strategies on farms. It is essential that both existing and newly developing methods are simple to understand, practicable and sustainable in the farming environment. IPM methods must be applicable to individual crops and to the whole farm.

### **3. Education and Extension**

The benefits of IPM need to be understood all the way from the farm to the consumer. Information on the benefits of IPM for society should be included in the curricula of schools to promote its wider understanding and acceptance. For farmers' education, IPM should be made the core aim in lessons on plant protection and the benefits shall be practically demonstrated to the farmers. IPM can be introduced into agricultural practice most efficiently by independent extension services. Governments should ensure the provision of well-equipped extension services.

### **4. Measurement of progress**

Governments should implement a data collection, measurement and analysis system to measure progress in achieving the defined goals of the overall programme as well as the individual projects.

### **5. Harmonisation of pesticide registration**

Governments should continue all efforts in the harmonisation of pesticide registration, especially to encourage the introduction of biological pesticides, bio-control agents and low risk pesticides along with the deregistration of high risk pesticides.

## **Group 2 Participants**

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## Report of Group 3

### IPM Empowers Farmers

- Farmers are important. Successful projects should seek to empower farmers who will then hold public and private institutions inside and outside their communities accountable.
- Higher quality ecological science: IPM depends on this for success, and support for farmers in generating it is crucial.
- Farmer driven research will forge essential links between researchers and farmers to ensure that appropriate solutions are being developed.
- Technical - better science and information provisions will lead to better informed decision making by farmers.
- Better IPM services should be provided which do not focus only on products.

### IPM Means Reduced Reliance on Chemical Pesticides

- Reduced reliance on pesticides = reduced risk
- Producing opportunities for alternatives
- Demands policy reform
  - Government
  - Advocacy
  - Consumer education
- High risks should be targeted first
- There may be too much to address at once, therefore the most hazardous chemicals and high risk crops should be targeted for action first.

### Measurement

#### *Definition*

- The Principles of IPM need to be defined in terms measurable at the output rather than input side. The terms need to encompass economic, environmental and health benefits, production quality, and consumer acceptance.

#### *Farmers measuring implementation*

- National policy can be targeted to bring about better measurement of progress towards alternatives.
- Data should be improved: Currently there is a reliance on data from industry and academia. In support of farmer driven research, the acceptance of field data must be promoted.
- Measurements should include at least the dimensions of:
  - ecology (e.g. functional agrobiodiversity etc.)
  - economics (e.g. cost benefit analysis etc.)

- environment (e.g. biodiversity, reduced pollution, reduced erosion, societal willingness to pay for environmental protection, etc.)
- society (e.g. farmer welfare, rural development, changing structure of agriculture, etc.)
- farmer empowerment (e.g. understanding of agroecology, farmer-initiated scientific and technological innovations, farmer collection of field data on pest control approaches, pest population evolution, pesticide applications, etc.)
- Measurement should allow forward planning by farmers, communities, outside institutions. NGOs and industry can play an important role in measuring progress, especially in reduction of pesticide use.
- Measurement systems should be sensitive to local situations, not overly technical.

***Government – Civil Society partnerships***

- Government target setting, for example:
  - Pesticide use or risk reduction;
  - organic production.
- Governments can recommend, but not legislate for measurement.
- NGOs and civil society are key players in measurement and implementation (PIC).
- Differentiate between government interventions in i) OECD ii) developing countries.
- Involve national governments in developing countries especially for continuity beyond external support.

***Farmers measuring IPM for better decisions***

- Measurement must be relevant to farmers
- Importance of farmers' documentation
- Measurement should be robust in the face of new technologies and scenarios
- Positive reinforcement is more effective than negative reinforcement

**Forums**

- Role of Forums
- Discussion forums are seen as a crucial tool in generating support for IPM among all stakeholders. Governments (and others?) should take a leading role in creating these forums and encouraging debate.
- Local → consumer education
- National
- International
  - OECD
  - FAO
  - NGOs (PAN)

## **Roles of Government and Others**

### ***Policy reform by governments***

- Policies should set clear targets and facilitate implementation of concrete measures.
- Increase funds for IPM implementation.
- Influence prices preferentially to create a pull towards IPM.

### ***Risk assessment***

- Assuming risks from use of pesticides outside the farm will create a further incentive towards IPM. Risk can be assumed by corporate entities, consumers or through taxes.

### ***Research***

- Dynamic research support
- Regulation
  - Improving chemical management and supporting registration and use of better products, improved food safety standards
  - Regulating production systems instead of individual chemicals for example by introducing land management plans or land stewardship mechanisms.

### ***Forums***

- Governments (and others?) should take a leading role in creating discussion forums and encouraging debate.
- Consumer education

## **Driving Forces for IPM**

- Financial
  - Direct savings on production costs
  - Higher yields
  - Lower transactions costs, especially for information
- Health & Environment
  - Landscape quality
  - Health of applicators and handlers
- Social rewards
- Legislation
 

Chemical bans, food safety legislation and other government imposed controls can promote the cause of IPM
- Pest resistance
- Marketing incentives created by the
  - food industry
  - government buyers/consumers

will generate incentives for farmers to take up IPM.

- **Debate shifting to big food retailers**  
Major retail organisations are increasingly driving the shift in farming practices in developed countries towards IP or IPM. There is a danger that farmers will be disempowered from their role in feeding research, developing solutions and creating markets for products and services for IPM because the retailers are centralising and obliging farmers contractually to participate.
- **Market orientation**  
A market oriented towards IPM provides better incentives to farmers thereby reducing overall risk to health and environment from pesticides. Such a market would also provide more information to consumers about the relative benefits of IPM and to producers about the expectations and understanding of consumers.
- **Integrated production**
- **Reduced reliance on chemical pesticides in order to create space for applying ecological science**
- **Advocacy from civil society**
- **Privatisation**  
The production and provision of products and services for IPM is most successful on a small scale close to the point of delivery. The enterprises that provide these products and services cannot be expected to deliver the financial returns which major investors demand. Systems should therefore be established to support these enterprises.
- **Consumer education/farmers**  
Not necessarily a role for governments, but one for 'countries' in informing consumers and farmers better about IPM and about each others' expectations.

### **In Support of IPM**

- **Dynamic research support**
- **More location specific information**
- **Better IPM services, not products alone**
- **Better information processing and delivery**
- **Tools that are not yet available to farmers should be made available to them for experiments to support their local choices.**
- **Projects should enable farmers to increase their knowledge about agro-ecosystems, make better decisions, and reduce their reliance on pesticides.**
- **The highest quality ecological science should be available and applied locally.**
- **Re-allocate existing, but often shrinking, resources :**
  - Support the production, marketing, and distribution of alternatives to pesticides in IPM systems.
  - Farmer education.
  - Replace crop and inputs subsidies with IPM subsidies.
  - Preferentially purchase IPM produce for government agencies.

- Initiate policy reform:
  - Remove policies that assume pesticide use in agricultural production and pest management
  - Tax pesticides to fund IPM interventions.
  - Explore crop insurance schemes to replace plant protection packages.

### **What Makes IPM Projects Unsuccessful?**

- Potential risks in large, centralised, vertically integrated IPM; these systems are usually not as responsive to local ecologies and their associated production problems.
- IPM that does not seek to empower farmers in and among their communities.
- Market failures and distortions:
  - \* Induced by bad or outdated policies
  - \* Created by dominance of large suppliers that keeps smaller suppliers from offering their goods and services to farmers, who then have fewer tools for IPM.
- High costs incurred in shifting from chemical pest control paradigms to IPM.

### **What Makes IPM Projects Fragile or Vulnerable?**

- The loss of key tools
- Over-concentration on research and technology combined with insufficient attention to learning processes.
- No or low perceived value to farmers added by IPM; especially after a pilot or demonstration phase has ended.

### **Group 3 Participants**

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## Report of Group 4

### Session 1. The Role of IPM in Pesticide Risk Reduction

#### In what ways can IPM promote pesticide risk reduction?

IPM does promote risk reduction in the following ways:

- reduced pesticide use (most of the time)
- use of all available tools in an integrated way - cultural, biological, chemical, etc. (as required)
- promotes more monitoring, forecasting so that pesticides are used only when needed
- promotes use of reduced risk products
- promotes ecosystem awareness and understanding

**If countries agree that IPM can be a means to risk reduction, what should they do to effectively promote IPM? What actions should be taken by governments? What actions by other groups?**

#### *Government*

- registration systems - integrate IPM concepts in order to encourage registration of IPM compatible products
- support area wide innovative programs e.g. Sterile Insect Release Program
- provide economic incentives/safety nets re insurance
- provide grower and consumer education, information
- develop a national IPM policy
- involve NGOs in development of policies and programmes

#### *Research*

- provide good relevant and practical information on tools

#### *Industry*

- provide safer products
- develop other methods of pest management, e.g. pheromones
- ensure ethical practices e.g. no pesticide donations to developing countries because this makes moving to lower chemical inputs more difficult ; no aggressive advertising

#### *Retailers*

- buy agricultural products produced under IPM programmes
- work with growers to develop IPM programmes
- communicate to consumers so that IPM labelling is well understood
- provide financial incentives for IPM produced products

#### *Grower associations*

- educate themselves
- support research
- work with retailers/researchers to develop practical IPM programmes
- be aware of and incorporate international protocols that exist in the development of IPM programmes, particularly for export commodities

*Consumers*

- understand what IPM labelling means
- buy IPM products (produce cultivated under IPM conditions)

*International technical assistance*

- IPM must be a key component in international development projects

**Session 2. IPM Case Studies**

**What makes IPM projects successful?**

- having an IPM champion
- being grower driven and locally adapted
- having continuous grower education
- ensuring a partnership approach particularly between buyer and grower
- political will
- good technology transfer
- availability of trained crop consultants
- incentives to move towards IPM: resistance management; reduced inputs (financial); market access; better ability to manage crop.

**What makes them unsuccessful?**

- growers incurring financial loss that creates scepticism
- poorly trained extension and crop consultants
- lack of availability of registered alternative products and strategies (e.g. biopesticides )
- lack of problem-solving and IPM targeted research
- inconsistent policies; e.g. changing IPM targets too quickly

**What can governments do to help make IPM projects successful?**

- provide coordination role/framework for IPM
- develop IPM certification programmes
- provide research funding
- facilitate registration of biopesticides and invertebrates (exotic biocontrol agents)
- develop a national IPM policy
- ensure information delivery/technology transfer
- provide funding to improve extension services, including appropriate extension methodologies

**Session 3. Barriers and Incentives for Implementing IPM**

**What are the main barriers to implementing IPM?**

- lack of field focused /IPM problem solving research
- lack of communication/discussion of research with stakeholders
- lack of information exchange within/between countries

- lack of media attention on IPM
- lack of consumer knowledge and interest, and therefore no market for IPM produced commodities
- lack of clearly defined IPM standards
- vested pesticide industry influence, where use of chemical pesticides is encouraged to the detriment of other tools
- higher cost of IPM
- growers seeing IPM as high risk

#### **What are the main incentives for implementing IPM?**

- IPM programmes are positive for growers' images
- better farmers
- knowledge of successful IPM programmes
- having IPM champions
- provides an opportunity to sustain (natural) resources
- financial gains through reduced input costs

#### **Which of these barriers could governments remove and what incentives could government create?**

- facilitate communication to stakeholders
- remove non IPM subsidies
- ecotaxes - use to support IPM implementation
- fund applied IPM research
- effective pesticide management (registration) to promote IPM e.g. IPM compatible products
- reduce inappropriate government regulation
- support development/harmonization of IPM guidelines/standards

### **Session 4. How to Measure Progress**

#### **What are the lessons learned from the examples presented in the plenary?**

- complex, possible, diverse
- should be grower-driven, local or site, commodity specific
- all stakeholders need to be involved

#### **Is having a system to measure IPM adoption a critical part of a programme to promote IPM?**

- yes

#### **What are the important elements of such systems?**

- targets, goals
- baseline information
- site, commodity specific
- accreditation systems (international or harmonized if possible, but is likely to be difficult)
- pesticide endpoint data
- funding

- grower interest
- a measurement system is seen as different than a pesticide risk indicator

**Do governments have the information they need to put a viable measurement system into place?**

- no (this was interpreted to mean pesticide use data; California was considered to be an exception) but governments do have endpoint data (this should be made available)
- governments do not necessarily need this data to be supportive of the development of measurement systems, by developing a measurement framework

**Session 5. Five Main Recommendations for Governments, Countries, Organisations**

**1. Consumer information**

Recommendation:

- Growers associations and retail trade sector work together with consumers to facilitate understanding of IPM

**2. Farmer motivation**

Recommendation:

- OECD/FAO countries work together to develop a guidance document on general principles for IPM

**3. Measurement of progress**

Recommendation:

- OECD/FAO countries work together to develop a guidance document on general principles for measurement of progress in IPM

**4. Research / Extension**

Recommendation:

- Countries ensure that extension/crop service consultants are well trained and adequately resourced
- countries shift some existing resources to preferential funding for IPM
- countries ensure grower participation in research

**5. IPM friendly policies**

Recommendation:

- Countries develop policy frameworks that facilitate the implementation of IPM, recognising the contribution of IPM to risk reduction

## **Group 4 Participants**

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## Report of Group 5

### Session 1. The Role of IPM in Pesticide Risk Reduction

On the basis of the presentations given in the first plenary session the group addressed the three questions posed with the following outcome:

#### **In what ways can IPM promote pesticide risk reduction?**

- IPM *can* promote pesticide risk reduction (volume reduction, less harmful pesticides etc.).
- Well chosen IPM however balances in fact three risks involved: environment, human health (consumer and worker) and farm economics.
- Local circumstances will determine the strategy to balance the various risks, including looking at the alternatives
- Creation and transfer of knowledge to farmers combined with financial incentives are conditions for adequate decision making while balancing the risks.

#### ***Remarks***

Reduction in pesticide use does not necessarily equate to reduction in risk (especially if profitability is reduced).

From the point of view of sustainability farm economics has definitely to be considered in decision making about IPM strategy. Also other aspects could be considered, in other words a holistic approach is needed.

Decision making asks for sufficient knowledge and understanding where also the risks of alternatives should be considered equally. In order to obtain sufficient economic perspective also financial incentives or rewards should be there.

Local farm circumstances are crucial which means a great deal of farmer involvement in IPM implementation. IPM projects should allow sufficient room for that.

#### **If countries agree that IPM can be a means to risk reduction, what should they do to effectively promote IPM and what actions should be taken by governments?**

- Putting up a policy framework, this is a matter of both governments and all other stakeholders involved.
- The policy framework consists of the following main elements:
  - a regulatory framework
  - education and extension activities
  - private initiatives
  - farm support

- Regulatory framework is responsibility of the government, present legislation should not frustrate IPM initiatives. Legislation can concern certification of farmers, restriction of use, authorisation standards giving a push to develop alternatives.
- Education and extension services (to convey general principles of IPM and assist with specific technology transfer) can be undertaken both by the private sector (industry, consultants) and by the public sector (government, NGO's).
- Education and training should be continuous processes.
- Farm support is a matter of the government and can be direct (direct payments, subsidies) and indirect (lower tax rate, privileges such as access to specific pesticides or technologies).
- Governments play an important role in facilitating the necessary cooperation between farmers, retailers and consumers.

### ***Remarks***

The division of activities between governments and others depends on the particular situation in each country. We notice quite some difference. In some countries the government is very much involved in e.g. training and education and has e.g. an extended programme for financial farm support where other governments have restricted themselves to regulatory and facilitating activities which fit in the general policies.

In case financial incentives are only temporary and IPM is not paid for on a structural basis, IPM systems will not give the desired and permanent result. In fact this also applies to education and knowledge. IPM is a permanent process of change.

## **Session 2. IPM Case Studies**

Four case studies concerning the implementation of IPM were presented in the second plenary session. Although these case studies varied with regard to relevance to risk reduction, they provided stimulating material for the breakout session and for making an attempt at answering the following questions:

### **What makes IPM projects successful?**

#### ***When farmers have clear incentives to use IPM***

- IPM programmes must be grower driven (=incorporate his/her values):
- Especially when policies do not allow to promote IPM through subsidies, other ways must be found to motivate farmers to use IPM, either through:
  - direct economic payoff (=higher profits),
  - awareness, ethical values, etc.

The direct economic payoff may be through reduced input costs (IPM is actually cheaper than conventional pesticide use) or higher market prices (consumers are willing to pay more for IPM-products).

- Money is a powerful incentive to adopt IPM, but will subsidies be sustainable?

E.g. Switzerland, where direct payments are 1500-2000 Swiss Francs/ha, farmer participation rate is high.

- Long planning horizons (=low discount rates): farmers are more likely to choose IPM in their long-term plans than short-term plans: hence governments need to make long term commitments to promote/support IPM, to assure certainty of existing policies, etc.
- Market demand
  - IPM-labelling scheme for consumers (simple, easy to understand, simple protocol)
  - pressure from the retailers and consumers
  - high visibility: IPM-products must be displayed well in shops in order to attract buyers: market oriented production
- Sound project planning:
  - well defined objectives of the project;
  - accurately identified problems;
  - projects are geared towards local level,
  - involvement of all stakeholders: government and industries should work together
  - clear prioritisation of alternatives
- Information:
  - Farmers are adequately informed
  - Pilot /demonstration farms: seeing is believing.
- Sometimes the starting point, e.g. current production method, is economically unsound and/or detrimental to environment so the project cannot fail.
- Community wide efforts/collective approach.
- Industry should be encouraged to find alternatives to conventional pesticides, thus commercial incentives are needed.
- Government backing is needed to support alternative pest control strategies.
- IPM works for fruit and vegetables, but what about (other) arable crops?
- Regulatory hurdles for pesticides are becoming so high (e.g. MRL's, FQPA) that a move away from chemical pesticides is occurring.
- Traceability (the consumer can trace where the product originates from), control and auditing create credibility for IPM.

**What makes IPM projects unsuccessful?**

- Lack of alternatives: biological and genetic tools are needed to provide true alternatives to conventional pesticide use.
- Administrative workload to farmers: they have to keep detailed records, are subject to controls, may feel auditing as pressure and the whole control process as unpleasant/humiliating.
- Individualism among farmers: they themselves know what is the best use of their land, thus do not want to be told what to do. It may also be difficult to have a community wide effort.
- IPM-labels or descriptions on food are not simple: consumers are confused between IPM/organic/bio/eco and thus there may be low demand for IPM-products.
- Unbalanced information: information on chemical pesticides may be abundant, but information on IPM scarce thus resulting in misinformation among farmers: need to get the message across to the growers.
- Regulatory system does not know how to deal with biologicals: organisations, such as the OECD should take the initiative to develop harmonized guidelines.
- Certain pesticides or new technology may not be available.
- Lack of adequate control through independent bodies and/or extension service.
- Risk of harvest loss: farmers are risk averse and in the absence of insurance against IPM induced harvest losses unwilling to adopt IPM.
- Single pest mentality contributes to failure: whole system approach should be promoted.
- Unharmonized IPM approaches.
- Growers experience of success with conventional methods.
- Economic constraints conflicting with the application of cultural and preventive measures; high cost of monitoring and use of thresholds.

**What can governments do to help make IPM projects more successful?**

- Harmonize rules and regulations in order to remove distortions and conflicting incentive schemes.
- Provide safety nets to farmers to compensate for the loss of harvest caused by the application of IPM
- Adopt a transparent regulatory process
- Promote community wide approaches
- Facilitate the interaction between stakeholders, e.g. by creating a forum
- Promote independent advisory services.
- Promote research for alternative pest control tools

- Move the debate on GMO's (should GMO's be part of IPM? which ones are better for consumers: pesticide-free GMOs, IPM- or conventional products?) to some sort of conclusion (growers need clarity).
- If a pesticide risk reduction scheme exists in a country, it should be backed financially: "empty" schemes are no good.
- Add resources to framework on IPM.

### **Session 3. Barriers and Incentives for Implementing IPM**

The group considered that its deliberations concerning the questions posed for session 2 had already provided some answers to the questions to be addressed in this session. Nevertheless, some new points arose in the discussion, with the group combining questions 3b and 3c.

#### **What are the main barriers to and incentives for implementing IPM?**

- Since IPM is a long term project and not a 'single day solution,' a lack of continuity in policy and political commitment and policy makers' insufficient knowledge and understanding about IPM are very serious barriers to IPM implementation.
- Financial farm support during a long period causes a lack of creativity and can be therefore a danger for sustainability. On the other hand, a temporary support can be an incentive for implementing IPM during the transition period.
- Lack of clear consumer wishes, confusion about labels and their credibility weaken the driving force of the market in relation to IPM. An uniform, internationally accepted system of basic standards and a clear definition for IPM produce and production will help.
- The regulatory system for pesticide registration and authorisation can be sometimes a barrier since it does not always meet with specific IPM needs. Improvement and speeding up of national and international procedures necessary for IPM implementation are of great importance.
- A well planned programme for further restriction or even phasing out of certain pesticides can be an incentive for farmers to implement IPM. Speeding up review of registration procedures would assist this process and drive the introduction of new safer products, either chemical or biological.
- Lack of instruments to measure the actual impact of IPM on environment, health and farm economics is a barrier.
- The absence of an insurance such as alternative or consecutive strategies with more options is a barrier for IPM implementation.
- Present structures in extension, education and research institutions can form a barrier; in that case restructuring and re-allocation of finances can enable IPM implementation.
- A lack of sufficient decision making tools (e.g. practical thresholds) or the absence/lack of alternatives is a barrier for IPM implementation.

**Which of these barriers could governments remove and what incentives could governments create?**

- Governments can re-allocate financial resources for extension/research in favour of IPM implementation. In that way the basic decision making tools can be provided.
- Governments can communicate in general terms about IPM and increase the awareness throughout the whole chain, from farmer up to consumer. They can facilitate the mutual understanding between growers, retailers and consumers.
- Governments can also put “socially acceptable food production” etc. on each school curriculum.
- Governments can remove barriers concerning pesticide legislation and improve the transparency of legislation in order to facilitate IPM implementation.
- Governments can give financial support to farms implementing IPM and meeting environmental requirements (cross compliance)
- Governments should develop general standards to measure progress in IPM.
- Governments should promote the development and understanding of uniform guideline/standards for IPM labelling.

#### **Session 4. How to Measure Progress**

The group considered this issue to be of critical importance. Whilst all four questions were addressed, the group felt that question 4c (concerning the important elements of measuring system) needed far more time and consideration than was available. In particular, the scheme shown in outline below merited further elaboration.

##### **What are the lessons learned from the examples presented in the plenary?**

- All measurement systems/indicators/tools presented were action oriented (i.e. whether action was taken or not).
- The indicator presented by WWF combined a number of different impacts, such as mammalian toxicity and ecotoxicological effects; only ecotoxicological effects need to be included as everything else is covered by the registration process.
- Necessary to distinguish between actual effects and predictions. E.g. biodiversity (number of species before IPM and after). Action oriented approach is a good start though.
- Problems with predictive indicators: it is common to first decide which pesticides are to be phased out, then develop the indicator (and choose weights), so that the indicator will show/confirm the anticipated (and desired) result.
- Risk parameters need to be looked at first, then develop the policy (based on the risk parameters), and not proceed in the other direction. Independent measurement needed.
- Necessary to look at hazard rather than risk. This requires clear understanding of difference between hazard and risk. More information needed to assess risk.
- None of the measurement tools were comprehensive enough nor addressed the ultimate goal.
- The presentations described the cases, but as more precise measurement tools are needed, they offered no clear solutions (and politicians need simple answers).
- The measurement tools were developed for different purposes (e.g. the starting point for one tool was what needs to be done to meet the maximum residue levels in western Europe (=Germany). Thus some tools were not designed to assess IPM in the first place.
- Danish and Swedish indicators: were developed to give a quick view to politicians about what has happened.
- Developing risk indicators is not easy, e.g. lot of the input data is missing for aquatic risk indicators.
- Measuring progress is the most difficult aspect, thus one should not be too negative in assessing current efforts, all presentations were on schemes that make farmers think about how to carry out their business. The two related projects in the UK show that some areas can be identified, e.g. pesticides in water and operator incidents. It is worth noting that a lot of damage is caused by misuse (=wrong application) of pesticides, which is an aspect that is difficult to measure.
- Output related indicators needed.

- Data availability is a problem: this means reliability and comparability of data need to be improved, methodological differences solved, and data collection organised.
- Even if we identify a general set of parameters, priority must be given to parameters at the local level.
- It is not possible to come up with a single measurement tool compressed to one number and the critical values/thresholds for parameters must be defined.
- Distinction must be made about what is to be measured: IPM adoption, risk reduction, or environmental performance of policies: thus a whole set of indicators is needed.
- Clear distinction need to be made between indicators that measure environmental benefits and those that measure farming practices. Concerted action in the EU assesses 9 existing risk indicators.
- The whole complex system need not be defined immediately, it is possible to begin with a partial approach.
- At what level do we want to (and need to) measure the progress? How to decide the weights?
- One possible approach: analyse relative trends.
  - E.g. positive impacts of food and fibre production would consider the relative trends in sustainability, grower profitability, salinity, structure, OM, output/area, health factors (including pesticide risk), environmental impacts (water, non-target species, dosage), set-aside, removal from production.
  - First establish a baseline for the current situation, then analyse the direction of change (plus/minus).
  - Intriguing from the conceptual point of view.
  - Relative measure of progress.
  - Decision-making tool to assess whether the IPM measures taken are actually working (=reducing the risk) or not.

**Is having a system to measure IPM adoption a critical part of a programme to promote IPM?**

- Yes! (As long as the system measures the effects (preferably benefits!) of IPM and does not just count the number of farmers using IPM.

**What are the important elements of such systems?**

*General remarks*

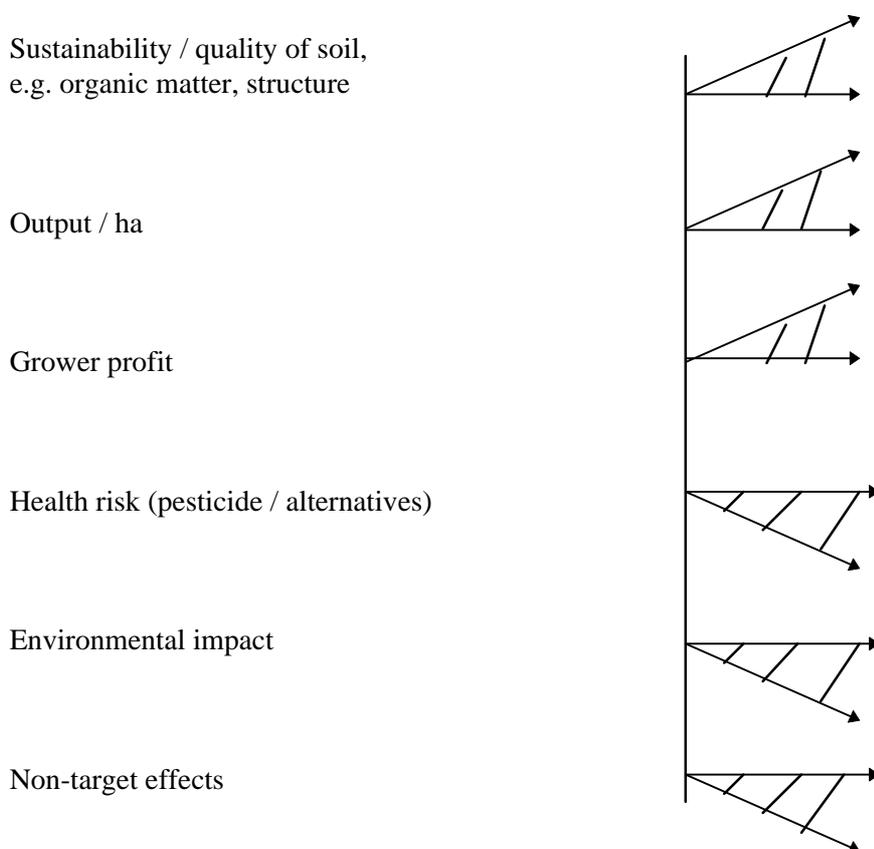
- Policy tools for policy makers.
- Important to distinguish between causes and consequences (=between input and output data).
- It is easier to measure inputs than outputs
- Importance of benchmarks, representative numbers.
- Reference levels must be established.

- The starting point must be known. Baseline = conventional production method.
- Consistent methodologies and standardised measurement.
- Ability to distinguish between IPM and market effects (prices, set asides, etc.).

*Brainstorm on elements of a measurement system*

- kg a.i. (total and per crop)
- number of applications
- rate of crop rotation (input data)
- measure the occurrence of pests and diseases (output data)
- percentage of ecological set-aside areas
- risk related parameters (exposure and hazard)
- parameters on ground- and surface water quality
- parameters on soil quality
- ratio: benefits/pests (ecological composition / diversity)
- use of pest resistant varieties (input parameter)
- number of hours/ha (not necessarily an indicator of efficiency)
- energy consumption (fossil fuels) (more mechanical weeding can increase energy consumption).

### Example of a Scheme for Measuring Positive Impact of IPM in Food / Fibre Production.



The importance in a scheme for measuring positive impact is the combination of parameters that show “reduction” (e.g. health risk) and “increase” (e.g. soil quality, output etc.)

#### Do governments have the information they need to put a viable measurement system into place?

- There is already a substantial amount of information/data at the farm level (on farms practising IPM), this information should be collected systematically to start constructing a database.
- Lack of data on regional or national level at present.
- A set of indicators is needed, thus there is no one universal indicator.

#### Session 5. Priority Areas for Action

1. Develop/establish IPM guidelines/standards (including a measurement system!) in the overall context of sustainable agriculture. (OECD possibly).
2. Education at all levels of society (consumers, farmers, policy makers) on the concept, acceptance and implementation.

3. Encourage the development of alternative tools and technologies, including GMOs, bio-pesticides, resistant crops, etc. and move the GMO debate to a clear solution.
4. Strengthen efforts on the development of transparent, harmonised, relevant regulatory system. Enhance the re-registration process in order to enable risk reduction from most hazardous chemical pesticides (OECD).
5. Development of sustainable funding system at national level (recommendation): governments could consider financial support.

**What might be done to implement the actions and who should be involved? What partnerships are needed?**

- Implementation of actions by most appropriate stakeholder(s)
- OECD Forum to consider 'special group' to progress and monitor actions agreed.

**Any specific role for OECD?**

- Establish/develop IPM guidelines/standards
- Should look at the option of setting up a group specifically to develop measurement systems
- Strengthen involvement of all stakeholders (this workshop was good first step)
- Disseminate to a wider range of stakeholders the existence of the OECD risk reduction information exchange.

**FAO?**

- Should encourage developing countries to use IPM in intensifying agriculture, an intensification which is needed for feeding their growing population.

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## **Report of Group 6**

### **Session 1. The Role of IPM in Pesticide Risk Reduction**

Group 6 considered the role of IPM in pesticide risk reduction and generally considered that IPM can contribute to risk reduction. However, there was some concern that the term risk reduction suggests that all pesticides are risky, including biopesticides, and that real risk should be clearly sorted out from perceived risk.

With regard to actions that could be taken to promote IPM, the group identified several broad categories:

1. Promotion of all manner of partnerships (e.g., researcher-extension service agents, specific commodity growers (such as grape growers) within a region). Governments at all levels could play an important role in facilitating partnerships.
2. Promising safer, more careful or diligent use of pesticides so that "right choices" are made, government can again play an effective role here.
3. Provision of education and information in an interactive fashion to all stakeholders involved (e.g., farmers need to know what is most hazardous; how to introduce biocontrols; governments need to understand what farmer realities are), governments play a key role here.
4. Setting of goals/broad national policies or principles (this is a governmental function, but there was much discussion of the need for flexible and practical implementation of such goals).
5. Development of both positive and negative incentives (e.g., creating a positive "environment", financial incentives, grower challenges).
6. Generation of demand for IPM (pulling as well as pushing).

### **Session 2. IPM Case Studies**

Group 6 considered factors that make IPM projects successful and unsuccessful. Factors for success may include:

1. Having funds for research, projects, delivery of technology.
2. Having a strong sponsor where there is an economic advantage to both sponsor and grower.
3. Setting practical, achievable goals.
4. Having variety and flexibility in control measures (choice of available tools, different strategies, diversity of tools, knowledge of pest biology...).
5. Having educated farmers as well as retailers, consumers and other stakeholders.
6. Involving every part of the value chain from farmers to consumers.
7. Having market demand (but many questions whether this is a right or reliable factor for achieving sustainable IPM).
8. Having ownership of the project by all stakeholders.

Factors for failure may include:

1. Lacking funding (problems with both consistency and continuity).
2. Changing policy.
3. Lacking common understanding of IPM concept.
4. Fearing the new unless there are no other alternatives (risk aversion).
5. Failing to form necessary partnerships because of issues of competition.

Governments can help to make IPM projects successful by:

1. Setting standards/articulating principles.
2. Facilitating parties getting together.
3. Addressing differing standards between importing and exporting countries (e.g., post harvest treatments).
4. Funding/supporting implementation of the use of biopesticides and other alternatives.
5. Maintaining critical infrastructure (e.g., critical scientific expertise).
6. Streamlining product approval processes (faster and easier may have a positive impact on pricing of new products developed by small companies).
7. Aligning government infrastructure to support IPM (e.g., aligning differing/conflicting agendas, providing education for school children).

### **Session 3. Barriers and Incentives for Implementing IPM**

Group 6 considered barriers and incentives for implementing IPM. Barriers may include:

1. Lack of delivery/availability of advisory services to farmers:
  - \*need for recognised standards/training - certification of advisors
  - \*need for integrated, collaborative delivery of expertise from multiple sources/disciplines
  - \*both government and private delivery sources can work
  - \*farmers may need to provide funding for service
  - \*governments need to be flexible in their provision of service.
2. Reluctance to change:
  - \*risk aversion
  - \*need to see real impact/benefit of change
  - \*moving from fixing problems to predicting and preventing
  - \*motivation of stakeholders.
3. IPM is not a clear concept to many (confusion created by use of symbols).
4. Lack of commitment amongst all stakeholders.
5. Too much top down government control and standardization.
6. Government policies may result in unintended stifling of new technologies.
7. Lack of funding.
8. IPM is information intensive.
9. Requirements for post harvest treatments, which can appear unreasonable to farmers who produce products using IPM and are then required to dip them in insecticide or fungicide.
10. The relatively small market for new, "softer" fungicides consistent with the IPM philosophy, which are needed as pathogens develop resistance to the few remaining registered fungicides. Plant pathologists are finding it difficult to convince commercial partners to invest in these products because of the small market.

Incentives may fall in at least three broad areas: economic, public recognition, technical assistance. Specific examples include:

1. Education about value of IPM and how to implement IPM.
2. Concern over sustainable resource management.
3. Public recognition through such things as direct marketing.
4. Concern for reducing risks.
5. Concern for global food abundance, sustainable agriculture and environment.

#### **Session 4. How to Measure Progress**

Group 6 considered whether and how to measure progress in the adoption of IPM. There was considerable interest in the audit developed by LEAF as a management tool for farmers to assess their own farming practices. Particular features of interest included the fact that it is a self assessment and not imposed by external parties and that it allows a farmer to compare performance over time and with others.

The group generally agreed that having systems to measure adoption of IPM and to measure the impact of adoption of IPM was of high value as an element of a program to promote IPM. However, it was also generally agreed that actually implementing IPM further should not be delayed by the need to develop measurement systems.

The group made the following additional observations about important elements of measurement systems and issues associated with their use:

1. No one system of measurement is satisfactory by itself, multiple measures or indices can provide a more useful assessment.
2. It is important to know who will use the measurement system (e.g., farmers, food processors, the government) and what the goals are.
3. Knowing the assumptions and baseline data on which the system is based is important for assessing its reliability.
4. Measurement systems should to the extent possible make use of real world reliable data.
5. Measurement systems should be tailored to fit circumstances.
6. There is a need to be careful in interpreting the significance of the measurements.
7. The use of these measurements may have consequences that are challenging to deal with (e.g., may point up conflicting social, economic values and goals that are hard to resolve).
8. Because IPM is complex, flexible and changes over time, it is important to measure trends, not just snapshots.
9. Measurement systems are valuable as farmer management tools and as a way for governments, researchers and others to show results and accountability which can increase consumer confidence.
10. Ideally, measurement systems would show whether "right choices" are being made that have positive economic, environmental and human health impacts.

#### **Session 5. Priority Areas**

1. Setting goals/framework/measure: start with baseline, where is agricultural production today.
2. Partnership - discovery of players.
3. Education
  - farmers
  - farm workers
  - schools/public
4. Knowledge generation and dissemination
  - research/development
  - delivery.
5. Government infrastructure: streamline the pesticide approval process.
6. FAO-OECD collaboration on IPM.

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## **Annex 2**

# **What is Integrated Pest Management? A Compilation of Definitions Submitted by Workshop Participants**

This paper compiles the official definitions of integrated pest management used by various governments and organisations represented at the workshop. They were provided in response to the invitation made to all workshop participants to submit their employer's official IPM definition.

The definitions are listed from shortest to longest and are supplemented by any comments provided by the people who sent them. Most focus specifically on IPM, but definitions of organic agriculture, integrated production, and crop management were also submitted and have been included. Two workshop participants provided published articles on the subject, and these are attached at the end.

## What is Integrated Pest Management?

1. “IPM is a management system to reduce dependence on costly and polluting fertilizer and pesticide inputs.”

Used by the IPM Programme in the Republic of Korea  
*Submitted by Bong Hoon Lee, UNDP IPM Programme, Rural Development Administration.*

2. “IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.”

Used by the IPM programme at the U.S. Department of Agriculture, Cooperative State Research, Education, and Extension Service  
*Submitted by Michael Fitzner, USDA/CSREES, who says he is not sure this definition is “official,” but it’s the one the programme uses.*

3. “IPM is the farmers and plant growers best mix of control tactics, based on criteria of crop yield, quality, profit and safety for the public health and the environment: IPM is a part of Total Quality Agricultural Management.”

Used by AGROMETRIX BICM  
*Submitted by Bernard Blum, International Biocontrol Manufacturers Association (IBMA).*

4. “IPM can be defined as the rational use of all available control methods in order to keep pests, diseases and weeds in a crop below damaging levels, taking in consideration the necessary care of public health and environment protection.”

Used by the International Biocontrol Manufacturers Association (IBMA)  
*Submitted by Bernard Blum, IBMA.*

5. “IPM is a pest population management system that anticipates and prevents pests from reaching damaging levels by using all suitable tactics, such as natural enemies, pest resistant crop plants, cultural manipulations and the safe and judicious use of pesticides.”

Used by the Texas Pest Management Association  
*Submitted by Rick Kocurak, who notes that this definition was written by the (U.S.) National Coalition on IPM and is used by many in the U.S. including the National Foundation for IPM Education.*

6. “IPM is a pest management system that, in the context of the associated environment and the population dynamics of the pest species, utilises all suitable techniques and methods in as compatible a manner as possible and maintains the pest population at levels below those causing economic injury.”

FAO definition (written by the FAO/UNEP Panel of Experts on IPM at its first session in 1967)

*Submitted by Gerard Schulten, FAO; Trond Hofsvang, Norwegian Crop Research Institute; Geza Ripka, Budapest Plant Health and Soil Conservation Station; and Bernhard Johnen, Global Crop Protection Federation.*

Gerard Schulten added that while this definition is still considered valid, variations can be found that are made more understandable for the different target groups. For operational purposes, many IPM field projects make use of basic principles of IPM that are more action oriented and less confusing than definitions. The Global IPM Facility and the programmes in the FAO Inter-Country Programme for South and Southeast Asia use the following principles of IPM: (1) Grow a healthy crop, (2) Conserve natural enemies, (3) Observe the crop regularly (e.g. soil, water, plant, pests, natural enemies, weather, etc.), (4) Farmers as IPM experts. These principles include the classical integration of cultural, biological, chemical, and mechanical methods, imply the use of informed decision making, include important crop production and protection interactions, and put the farmer at the centre of doing IPM (IPM is not *for* farmers, it is *by* farmers).

Gerza Ripka added that IPM, by considering significantly the aspects of environmental protection, has been expressed as the only viable alternative to the intensive use of chemicals. IPM recommends application of the well-determined volume of chemical formulation only when and only where it is needed in an environmentally friendly way and which is indispensable for the profitable production.

Bernhard Johnen noted the phrase “economic injury” was replaced by “economically unacceptable damage or loss” when the definition was incorporated into the FAO Code of Conduct.

7. “IPM includes all aspects of production, not only pest management but also soil, plant propagation material, nutrition and irrigation. IPM includes precise instructions for plant protection, biological methods, mechanical methods and a list of allowed chemical plant protection products with instructions for use.”

Used by the Republic of Slovenia, Ministry of Agriculture, Forestry and Food (Plant Protection Department)

*Submitted by Milena B. Koprivnikar, Republic of Slovenia, MAFF, who says the Republic of Slovenia does not have a short official definition of IPM but that IPM is well developed in fruit production and runs under the Slovenian association for fruit production called SIPS (Slovenian Integrated Production of Fruit, trade mark titmouse) who issued a brochure on IPM with financial support from MAFF.*

8. “IPM is the application of a variety of agricultural practices that substitute techniques, technology and information for agricultural chemicals whenever possible consistent with maintaining a sustainable agricultural system into the future. We do this to reduce pesticide use and reduce or eliminate pesticide residue exposure for infants.”

Used by Gerber Products  
*Submitted by Nick Hether, Gerber Products.*

9. “Integrated control is the rational application of a combination of biological, biotechnological, chemical, cultural or plant-breeding measures whereby the use of chemical plant protection products is limited to the strict minimum necessary to maintain the pest population at levels below those causing economically unacceptable damage or loss.”

This is the European definition for “integrated control” as set forth in Directive 91/414/EWG concerning the placing of plant protection products on the market  
*Submitted by Wolfgang Zornbach, German Federal Ministry of Food, Agriculture and Forestry, who noted that the German Plant Protection Act has included a similar definition since 1987.*

10. “In the context of a sustainable agriculture, IPM is intended to contribute to the equilibrium of the agro-ecosystem, using all economically, ecologically and toxicologically defensible methods to keep damaging pests below economic thresholds. IPM is intended to reduce the application of chemical pesticides to the necessary minimum and puts priority in natural control.”

Used by Portugal’s General Direction of Crop Protection, Ministry of Agriculture  
*Submitted by Miriam Cavaco, Ministry of Agriculture.*

11. “IPM is a knowledge-intensive and farmer-based management approach that encourages natural control of pest populations by anticipating pest problems and preventing pests from reaching economically damaging levels. Appropriate techniques are used, such as enhancing natural enemies, planting pest-resistant crops, adapting cultural management, and, as a last resort, using pesticides judiciously.”

From the World Bank  
*Submitted by the OECD Secretariat, from the World Bank report, Integrated Pest Management: Strategies and Policies for Effective Implementation (1997).*

12. “Integrated fruit production means that all elements of the technology are used in a safe way for the environment taking the natural conditions and properties into consideration. Selection of the growing area, determination of variety, pruning, culturing operations, tillage and, first of all, pest management are performed and integrated in such a way that the least possible chemicals are used in a sustainable manner.”

Hungarian definition set forth in the Guidelines for Integrated Fruit Production in Hungary (1982)

*Submitted by János Lantos, Plant Health and Soil Conservation Station of Szabolcs-Szatmar-Bereg County, Nyiregyháza.*

13. “In the frame of the IOBC definition for integrated production, integrated fruit production (IFP) is defined as the economical production of high quality fruit, giving priority to ecologically safer methods, minimizing the undesirable side effects and use of agrochemicals, to enhance the safeguards to the environment and human health.

IFP is the further development of IPM and the Guidelines worked out by over 40 experts from over 14 European countries.”

Definition of integrated production of pome fruits used by the German Federal Biological Research Centre for Agriculture and Forestry (BBA) and the Belgium Ministry of Agriculture

*Submitted by Erich Dickler, BBA, who notes that this definition is given in the Guidelines for Integrated Production of Pome Fruits in Europe, Technical Guidelines III, published by IOBC/WPRS Working Group on Integrated Plant Protection in Orchards and ISHS Working Group on Integrated Fruit Production. Also submitted by Christian Papeians, Belgium Ministry of Agriculture, who notes that the definition was adopted by Belgium in a ministerial order of 26 March 1997 concerning integrated production of pome fruit.*

14. “IPM is an approach to pest management which emphasizes the development of the right mix of control measures which are cost effective to the farmer and sustainable. The emphasis for the farmer is on profit, safety and stability. While IPM can include chemical control, it usually seeks to minimize chemical inputs, because of their cost and the dangers they pose regarding the treadmill, residues on produce, environment and health. Primary emphasis is put on encouraging natural control processes, particularly the action of natural enemies, and other local, inexpensive approaches. Plant resistance, trap crops to lure pests away, modified planting dates, intercropping, attractant traps and other methods all contribute to effective IPM in different systems.

The key point is that IPM is not an off-the-shelf technological package for pest control. Rather, it is a locally developed approach in which the farmer is involved and makes the decisions based on his or her understanding of what is occurring in the crop.”

Used by the Global IPM Facility

*Submitted by Peter Kenmore, Global IPM Facility.*

15. “IPM is a decision-making process that uses all necessary techniques to suppress pests effectively, economically and in an environmentally sound manner.

The elements of IPM include:

- identifying potential pest organisms
- monitoring pest and beneficial organism populations, pest damage, and environmental conditions
- managing ecosystems to prevent organisms from becoming pests
- using injury thresholds in making control decisions
- reducing pest populations to acceptable levels using strategies that may combine biological, cultural, mechanical, behavioural, and, when necessary, chemical controls
- evaluating the effects and efficacy of pest management strategies.”

Used by the Canadian government  
*Submitted by Wendy Sexsmith, Canada Pest Management Regulatory Agency*

16. “Biologically based IPM is a systems approach to pest management that is based on an understanding of pest ecology. This approach is knowledge-intensive and multiple sources of data are used to accurately diagnose the nature and source of pest problems. In an effort to keep pest populations below action thresholds a range of preventive tactics and biological controls are used. Reduced risk pesticides are used if other tactics have not been adequately effective, as a last resort and with care to minimize risks.

In addition, IPM systems exist along a continuum ranging from those dominated by treatment oriented practices largely dependent on chemicals, to those mostly reliant on prevention-oriented biological processes.”

<b>No IPM</b>	<b>← Transitional IPM Systems →</b>		<b>High or Biointensive IPM</b>
	<b>Low</b>	<b>Medium</b>	
→ → → Shifting Reliance From Treatment to Prevention → → →			
→→ Chemically Based	→ → →		Biologically Based→→

Used by WWF (known as World Wildlife Fund in the U.S. and Canada, and as World Wide Fund for Nature in other countries)  
*Submitted by Sarah Lynch, WWF-US, who notes that the definition was adapted from C. Benbrook, Pest Management at the Crossroads, 1996.*

**17. “Integrated Production**

The following requirements must particularly be adhered to:

- a. the balance of nutrient cycles is maintained;
- b. the physical, chemical and biological properties of a healthy and sustainably fertile soil are not affected;
- c. biological diversity is favored;
- d. the rotation and mix of cultures are determined in such a manner as to avoid, to the extent possible, problems linked to rotation as well as soil erosion and leaching;
- e. the intensity of the use of grazing lands is adapted to the site and its botanical composition;

- f. preference is given to natural measures of control in the cultivation of vegetable crops;
- g. holding, care and feeding of livestock are favorable to their well-being;
- h. energy is used economically;
- i. the number of animals is adapted to the site;
- k. extensive buffer zones are constructed along lakes, rivers, streams, hedges and forest edges.

### **Organic Cultivation**

The following requirements must be adhered to:

- a. the grower renounces all use of synthetic chemical products intended for plant treatment, of easily soluble mineral fertilizers, and of synthetic nitrogen fertilizers;
- b. the requirements for integrated production [as given above] are adhered to.”

Taken from the Swiss Ordinance instituting subsidies for specific ecological contributions in agriculture (Chapter 3 Article 13, requirements for integrated production, and Chapter 4 Article 17, requirements for organic cultivation), 26 April 1993 (translated by the OECD Secretariat)  
*Submitted by Alfred Riggenbach, Swiss Federal Office of Agriculture.*

18. “Definitions of IPM abound. Rather than creating yet another definition, the Pesticide Action Network North America refers to and draws on selected definitions which capture our principle concerns. Among these are definitions provided by the Food and Agriculture Organization,<sup>1</sup> the Indonesian National IPM Programme<sup>2</sup> and the Philippine National IPM Programme<sup>3</sup>. A fuller discussion of IPM definitions is provided by PANNA Program Director, Monica Moore, in "Redefining IPM - farmer empowerment in the context of sustainable agriculture"<sup>4</sup> (attached). However formulated, an acceptable definition of agricultural IPM should be based upon the following essential concepts summarized below.

IPM refers to an ecologically and culturally appropriate combination of management decisions, practices and policies that reduces use of and reliance on pesticides, emphasizes farmers' central role in decision-making and is based upon understanding of ecological principles and support for local experimentation and adaptation. The use of non-chemical measures is preferred over the use of pesticides which are used only as a last resort. If and when pesticides are used, they should be least toxic, least ecologically disruptive and chosen with careful attention to effects on human health, agricultural sustainability, the environment and the economy. Critical elements of successful IPM programs have included: development of ecological solutions to pest problems based upon ongoing analysis of human and natural interactions with local agroecosystems; the active participation of farmers not only in the technical aspects of pest management but also in the revitalization of relevant community-based processes, mechanisms and organizations; and strong government and institutional support in establishment of an enabling policy environment.

IPM is a continually evolving, field-based and farmer-driven process, which must be grounded in specific activities and supported by a coherent policy framework. Thus IPM as an element of an overall policy favoring sustainable agriculture and rural development is articulated not only in response to specific pest control and crop protection needs, but as a means to address a wide range of economic, social and environmental imperatives. IPM can simultaneously increase farmers' skills in ecological crop management; reduce farmers' dependence on expensive off-farm inputs; strengthen community self-reliance; protect agro-biodiversity; help meet local agricultural pollution prevention targets; and protect the health of farmers, farmworkers and the public. At its most successful, IPM has the potential to

become a social movement, led by its owners and implementors - i.e. farmers and other pest managers - and embraced as a major vehicle for local empowerment and the development of safe and sustainable food production systems.”

<sup>1</sup> FAO Field Program Circular No. 8/92, December 1992.

<sup>2</sup> Indonesian Ministry of Agriculture Decree No. 390/Kpts/TP/600/5, 1994.

<sup>3</sup> The Philippine National IPM Program, Kasakalikahan, 1993.

<sup>4</sup> Pp. 79-86 in Dinham, Barbara, editor. *Growing Food Security: Challenging the Link Between Pesticides and Access to Food*. The Pesticides Trust, London, UK, 1996.

Definitions supported by the Pesticide Action Network North America  
Regional Center

*Submitted by Marcia Ishii-Eiteman, PANNA.*

19. “IPM can be described as the farmer’s best mix of control tactics, taking into account yields, profits, safety and sustainability. IPM is an approach to pest control and not just a set of techniques one learns and applies. Its basis is an understanding of the ecology and interaction of the crop and pest concerned. On the basis of this understanding, techniques are selected and applied to keep the impact of the pest below economically damaging levels. Techniques used in IPM include:

- Cultural control (crop rotation, inter-cropping, field sanitation, strip harvesting, altering planting or harvest dates, water management) to make the environment less hospitable to pests and/or more hospitable to natural enemies of the pest.
- Biological control (introduction or re-introduction of the pest’s natural enemies, parasites or pathogens).
- Use of pest resistant crop varieties.
- Judicious and selective use of pesticides when other economically viable alternatives do not exist, when damage or loss levels are exceeding economic thresholds and other control methods have failed. In general, bio-pesticides and growth regulators are preferred over chemical pesticides, highly selective pesticides over broad spectrum pesticides and quickly degradable pesticides over persistent pesticides.

In both industrialised and developing countries, IPM programmes have demonstrated that it is possible to sustain or increase agricultural production levels, while reducing the use of pesticides, in particular insecticides. IPM makes agricultural production less dependent on external inputs and more cost-effective. Biodiversity is conserved and environmental contamination by pesticides is reduced to a minimum. Health hazards are reduced and farmers are empowered to make more decisions over their crops. Development becomes more sustainable with IPM.

IPM does not necessarily require intensive preparatory research and complicated decision making. As an approach, IPM can be introduced at any level of agricultural development. It can be included in small-scale farmer’s projects, schemes for the production of industrial crops, and in the design of large scale agricultural intensification programmes. At field level, a simple IPM strategy can usually be drawn up on the basis of existing information about the crop and its pests. At a later stage such strategies can be developed and refined when experience is gained and additional research has been conducted. Starting with a simple strategy helps in identifying research requirements for the enhancement of IPM strategies tailor-made to the local situation.”

From the OECD Development Assistance Committee (*in Guidelines for Aid Agencies on Pest and Pesticide Management, 1995*)

*Submitted by the OECD Secretariat.*

## 20. “Organically Grown Agricultural Product Guidelines

### Organic agricultural product

*Agricultural products that are harvested from fields in which only organic composts (fertilizer) are used for periods of over three years, without using chemical synthetic pesticides, fertilizer and chemical soil amendments.*

### Semi-Organic (*in-transition period*) agricultural product

*Those products harvested from fields in which organic composts were used for over three years without using chemical synthetic pesticides, fertilizer and chemical soil amendment.*

### Specially cultivated agricultural product guideline

*Specially cultivated agricultural products are products harvested from fields without the use of pesticides and chemical fertilizer, or those with using a limited amount of chemical agents. This was defined for evaluating efforts of growers who aim at cultivating organic agricultural products.*

#### i chemical pesticide free cultivated agricultural products

*Products harvested from fields in which no chemical pesticide is applied during the cultivation periods. (The cultivation period is a period after the harvest of previous crops to the harvest of the said crops.)*

#### ii chemical fertilizer free cultivated agricultural products

*Products harvested from fields in which no chemical fertilizer is applied during the cultivation periods.*

#### iii limited-use chemical pesticides cultivated agricultural products

*Products harvested from fields in which number of application of chemical pesticides is reduced to 50% of that of the conventional cultivation during the cultivation periods.*

#### iv limited-use chemical fertilizer cultivated agricultural products

*Products harvested from fields in which the amount of chemical fertilizer used is reduced to 50% of those of the conventional cultivation during the cultivation periods.”*

Table 1. Usage of chemical pesticide and fertilizer in the various agricultural products in the guideline

	pesticide		chemical fertilizer
	chemical	natural	
Organic agricultural product (over 3 years)	none		none
Semi-organic agricultural product (less than 3 years to over 6 months)	none		none
Chemical pesticide free cultivated agricultural product (cultivation period)	none	none	
Chemical fertilizer free cultivated agricultural product (cultivation period)			none
Limited-use chemical pesticides cultivated agricultural products (cultivation period)	less than 50%		
Limited-use chemical fertilizer cultivated agricultural products(cultivation period)			less than 50%

From the Japanese Ministry of Agriculture, Forestry, and Fisheries Guidelines for organically grown food, enacted on 1 October 1992. No definition of IPM *per se* has been made officially so far.

*Translated and submitted by Kazuo Hirai, Japanese National Agriculture Research Center, Tsukuba, who notes that examples of organic agricultural products cultivated by growers, mostly organized by agriculture associations throughout Japan, include rice, soybeans, cabbage, cucumber, tomato, eggplants, Japanese apricot, orange, and other vegetables.*

## 21. “The Principle Aims of Organic Agriculture and Processing

Organic agriculture and processing is based on a number of principles and ideas. They are all equally important:

- To produce food of high nutritional quality in sufficient quantity.
- To interact in a constructive and life-enhancing way with natural systems and cycles.
- To encourage and enhance biological cycles within the farming system, involving micro organisms, soil flora and fauna, plants and animals.
- To maintain and increase long-term fertility of soils.
- To promote the healthy use and proper care of water, water resources and all life therein.
- To help in the conservation of soil and water
- To use, as far as possible, renewable resources in locally organised agricultural systems.
- To work, as far as possible, within a closed system with regard to organic matter and nutrient elements.
- To work, as far as possible, with materials and substances which can be reused or recycled, either on the farm or elsewhere.
- To give all livestock conditions of life which allow them to perform the basic aspects of their innate behaviour.

- To minimise all forms of pollution that may result from agricultural practise.
- To maintain the genetic diversity of the agricultural system and its surroundings, including the protection of plant and wildlife habitats.
- To allow everyone involved in organic production and processing a quality of life conforming to the UN Human Rights Charter, to cover their basic needs and obtain an adequate return and satisfaction from their work, including a safe working environment.
- To consider the wider social and ecological impact of the farming system.
- To produce non-food products out of renewable resources, which are fully biodegradable.
- To encourage organic farming associations to function along democratic lines and the principle of division of powers.
- To progress towards an entire organic production chain, which is both socially just and ecologically responsible.

Note:

Genetic engineering focuses on the genetic makeup without taking into account the complete organism or system in which the organism functions. It is thus a contradiction to the above mentioned principle aims of organic agriculture.

### **The Principle Requirements of Organic Agriculture and Processing**

In order to achieve its principle aims, the organic agricultural movement has adopted certain techniques that respect natural ecological balances. These make it possible to avoid such products and methods which are contrary to the principle aims

The basis for crop production in gardening, farming and forestry is the consideration for the structure and fertility of the soil and surrounding ecosystem, as well providing a diversity of species. This is achieved by a combination of:

- a versatile crop rotation
- the recycling of organic material, and includes
- a wide range of methods for the control of pests, diseases and weeds which avoid the use of synthetic fertilisers, pesticides and herbicides

The basis for animal husbandry is the respect for the physiological and ethiological needs of the animals. This is achieved by a combination of:

- providing sufficient amounts of good quality organic fodder
- providing husbandry systems appropriate to behavioural needs
- proper veterinary treatment

Animals are an important part of an organic farming system because:

- they contribute to closing the nutrient cycles,
- animals convert organic matter and are thus major contributors to soil fertility
- some animal species can utilise agricultural areas which cannot otherwise be used
- growing forage crops improves the crop rotation, the diversification and balance of the farming system
- they may be for draught purposes
- they can utilise by-products from agricultural production
- they contribute to higher yields

The basis for natural ecological balances in livestock production is a harmonious relationship between the crop production and animal husbandry. This is achieved by a combination of:

- establishing as much self-sufficiency of manure and animal feed on the farm unit as possible
- through specifying maximum stocking rates.

Converting plant protein and energy into animal protein and energy brings about losses during the metabolic process. For this reason crop production for human nutrition and that for animal nutrition should generally be balanced.

The basis of processing organic products is that its vital qualities are maintained throughout each step of the process. This is achieved by a combination of:

- Choosing and developing methods which are adequate to the specifics of the ingredients.
- Developing standards which emphasize careful processing methods, limited refining, energy saving technologies, minimal use of additives and processing aids etc.

The production and handling of organic products should seek to minimise the environmental degradation. This is achieved by:

Developing standards which encompass waste management, packaging systems and energy saving systems in processing and transport.

Products produced and processed in a traditional way by indigenous and/or traditional groups can be certified as organic, provided that the sites are subject to a normal annual inspection and production and/or processing are in accordance with the principles in the Basic Standards.”

Taken from the International Federation of Organic Agriculture Movements (IFOAM) Basic Standards for Organic Agriculture and Processing

*Submitted by Bernward Geier, IFOAM*

## 22. “Definition and Objectives of Integrated Production (Integrated Farming)

Integrated production is a farming system which

- Integrates natural resources and regulation mechanisms into farming activities to achieve maximum replacement of off-farm inputs.

*These objectives address the basic intentions of a sustainable agriculture. An intelligent management and careful utilisation of natural resources can help to substitute for farm inputs such as fertilisers, pesticides and fuel. Total or partial replacement of these materials not only reduces pollution but also production costs and improves farm economics.*

- Secures sustainable production of high quality food and other products through ecologically preferred technologies.

*IP aims at high quality production but mainly through ecologically sound techniques. Quality evaluation of the product considers not only its specific internal and external characteristics but above all the means of production as significant criteria.*

- Sustains farm income.
- Eliminates or reduces sources of present environmental pollution generated by agriculture.

*Existing pollutants of agricultural origin have to be eliminated whenever and wherever this is feasible.*

- Sustains the multiple functions of agriculture

*Agriculture has to meet the needs of the entire society including those requirements that are not directly connected with the production of food and fibre. Diversified landscapes, wildlife conservation, decentralised colonisation and cultivation of remote areas as well as maintenance of local cultural traditions are some of the non-agricultural environmental and recreational values provided by operational farms.*

## **The Principles**

- (i) IP is applied only holistically.

*IP is not a mere combination of Integrated Pest Management with additional elements such as fertilisers and agronomic measures to enhance their effectiveness. On the contrary, it relies on ecosystem regulation, on the importance of animal welfare and on the preservation of natural resources.*

- (ii) External (societal) costs and undesirable impacts are minimised.

*Detrimental side-effects of agricultural activities such as nitrate or pesticide contamination of drinking water or erosion sediments in waterways impose enormous costs to society. These external costs are normally not reflected in budgets for agricultural expenditure and must be reduced.*

- (iii) The entire farm is the unit of IP implementation.

*IP is a systems approach focusing on the entire farm as the basic unit. IP practised on isolated individual areas of the farm is not compatible with a holistic approach postulated under item 1. Important strategies such as balanced nutrient cycles and optimum allocation of farm machinery only become meaningful if considered on the entire surface of the farm.*

- (iv) The farmers' knowledge of IP should be regularly updated.

*The farmer is a key component in IP-systems. His insight, motivation and professional capability to fulfill the requirements of modern sustainable agriculture are intimately linked to his professional abilities acquired and updated by regular training.*

- (v) Stable agroecosystems are to be maintained as key components of IP.

*Agro-ecosystems are the basis for planning and realisation of all farm activities, particularly those with potential ecological impact. They are the visible expressions of the holistic concepts and provide both natural resources and regulation components. Stabilisation means the least possible disturbance of these resources by farm activities.*

- (vi) Nutrient cycles are to be balanced and losses minimised.

*"Balanced" in this context means targeting maximum reduction of nutrient losses, a cautious replacement of those amounts leaving the farmed area through sales of commodities, and recycling of farm materials is a component of balanced nutrient cycles.*

- (vii) Intrinsic soil fertility is to be preserved and improved.

*The intrinsic fertility of soil is the production capability of the soil without external interventions under given site conditions. Accordingly, fertility is a function of balanced physical soil characteristics, chemical performance and balanced biological activity. The soil fauna is therefore an important indicator of soil fertility.*

- (viii) IPM is the basis for decision making in crop protection.

*Integrated Pest Management (IPM) applies to noxious species of phytophagous animals, pathogens and weeds. Noxious species are those causing more losses than benefits. "Control" means elimination of the damaging portion of the pest population (pest control). Decisions about the necessity of control measures must rely on the most advanced tools such as prognostic methods and scientifically verified threshold aspects.*

- (ix) Biological diversity is to be supported.

*Biological diversity includes diversity at the genetic, species and ecosystem level. It is the backbone of ecosystem stability, natural regulation factors and landscape quality. Replacement of pesticides by natural regulation factors cannot adequately be achieved without adequate biological diversity.*

- (x) Product quality must be evaluated by ecological parameters of the production system as well as by the usual external and internal quality parameters.

*Commodities produced under strict IP regulation do not only exhibit measurable external and intrinsic quality parameters but also meet the requirements of the ecological evaluation of the production processes. Hence a certification testifying the achievements of the producer is the prerequisite for the IP-label that defines additional requirements during storage, processing and handling of the products.*

(xi) Animal husbandry.

- a) Specific requirements for the welfare of each species of farm animals.

*Holding conditions of the farm animals have to respect basic behavioural needs of the species.*

- b) Animal density should be maintained at levels consistent with other IP principles.

*Animal density has a major impact on the nutrient balance of the farm. Purchased animal feed and animal manure have important effects on nutrient cycles, edaphon diversity and environment. ”*

The definition, objectives and principles (approved by a special *ad hoc* expert panel of IOBC/WPRS on 6 May 1992, put into effect by IOBC/WPRS Executive Committee on 16 May 1992, and an integral part of IOBC Guidelines I, II & III) are used by the German State Institute for Agronomy and Plant Protection along with the attached article, “Integrated plant protection in the context of a sustainable agriculture.”  
*Submitted by Erich Jörg, German State Institute for Agronomy and Plant Protection.*

## **Integrated plant protection in the context of a sustainable agriculture\***

E. F. Boller, J. Avilla, J.P. Gendrier, E. Jörg, C. Malavolta

### **Introduction**

Integrated Plant Protection looks back to a longer history. In Europe IOBC played a major role in its development and implementation. A closer examination of the relevant literature does, however, reveal that the concept was not always straightforward and open to a considerable array of interpretations.

What is Integrated Plant Protection? How is it defined? These questions are frequently asked by politicians and farmers that are directly affected by the Common Agriculture Policy of the European Union, for example by the directive no. 2078/92 providing financial support for farmers participating in a program for sustainable agriculture. It is not surprising that the pioneering work of IOBC published already in 1977 has almost been forgotten. However, it merits to be re-examined to-day as it might help to clarify a certain confusion that can often be observed in political and professional circles that have not participated in the international collaboration provided by IOBC over many decades.

The basic IOBC document on “Integrated Production - Principles and Technical Guidelines” published in 1993 addresses the aspect of crop protection as part of the technical guideline I that outlines the general technical approach without giving the background information on the rationale of the modern strategy that puts high priority on indirect preventive measures followed by direct control measures. This contribution tries to close this important gap and describes the development from early definitions of Integrated Plant Protection to the present situation.

### **Integrated Plant Protection: The road is not the final destination**

The starting point of our review is table 1 on the evolution of plant protection methods that has been established in 1977 but still retains its basic validity....

Some 20 years ago scientists have described 4 steps in the development of plant protection with the conclusion that integrated plant protection is the most advanced step that can be reached. They separated step 4 from step 5 (Integrated Production) by a solid line indicating a sort of final destination. However, a major improvement has been made in recent years as there is common agreement that plant protection has to be removed from this isolation and put into the context of all farm operations (Boller *et al.* 1988, 1995; IOBC 1993). Therefore, we have replaced the solid line in the table by a broken one to emphasize that Integrated Plant Protection is and has to become an integral part of Integrated Production.

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\* Reprinted with permission from IOBC Bulletin 21(1), 1998.

*Tab.1.  
The Evolution of Plant Protection Methods (IOBC 1977, modified)*

<p><b>1. Blind chemical control</b> (Lutte chimique aveugle)</p>	<p>General, schematic and routine applications of the most potent pesticides; Advice from industry</p>
<p><b>2. Chemical control based on advice</b> (Lutte chimique conseillée)</p>	<p>Application of usually broad spectrum pesticides after consultation with an official advisory service</p>
<p><b>3. Specific control</b> (Lutte dirigée)  <i>Transitory phase</i></p>	<p>Introduction of the concept of the "economic threshold levels"; Application of pesticides with no negative side-effects; Protection of beneficial organisms</p>
<p><b>4. Integrated plant protection*</b> (Protection intégrée)  <i>Dynamic phase</i></p>	<p>Like specific control, in addition  Integration of biological and biotechnical methods and methods of good agricultural practice; Chemical control strongly regulated</p>
<p><b>5. Integrated agricultural production*</b> (Production agricole intégrée)  <i>Open dynamic phase, further development possible in the whole world</i></p>	<p>Like integrated plant protection, in addition  Observance, integration and exploitation of all positive factors in the agro-ecosystem according to ecological principles</p>

\*) In the original table step 4 was separated clearly from step 5 by a solid line. We have replaced it by a broken line to indicate that in the modern concept integrated plant protection is removed from its isolation and put into the context of all farm operations.

Having reviewed this evolution of methods we now can proceed to the point of our interest, namely Integrated Plant Protection in the context of Integrated Production. In this target area we can observe a high degree of vagueness and a multitude of opinions that have their roots in the definition of FAO (1967) and its later adaptation by IOBC that reads as follows:

**Definition of Integrated Plant Protection**  
(FAO definition modified by IOBC 1977)

*All economically, ecologically and toxicologically defensible methods will be applied to keep damaging organisms below economic damage levels whilst conscious exploitation of natural control factors is emphasized.*

This definition leaves open space for a broad spectrum of interpretations. Many illustrations in textbooks show Integrated Plant Protection as a large range of plant protection measures arranged around the crop (e.g. Franz & Krieg, 1976). This suggests that we can make any given combination (= integration) of control methods according to our personal taste and declare it an integrated protection program. An extreme case found in the literature declares that "the principle (of integrated plant protection) consists of a combination of biological *and* chemical control methods" (Börner, 1981). Obviously, this view does no longer reflect a modern concept of plant protection in the context of a sustainable agriculture.

The modern concept that evolved in the 1980s puts emphasis on the agro-ecosystem as one of the key elements of Integrated and Organic Farming.

### **A clear hierarchy of priorities replaces the free combination of control methods**

It cannot be the main task of plant protection to repair damages caused by inadequate farming practices. Based on these considerations IOBC has adopted a clear concept of priorities for plant protection in the context of a sustainable agriculture (IOBC 1993). The basic elements of this priority list are presented schematically in table 2.

The holistic systems approach gives highest priority to *preventive measures* that can be summarised as *indirect plant protection*. This first element includes (1) the optimal use of natural resources already in the planning stage of a new crop, (2) the elimination of all farm operations with negative impact on the agro-ecosystem (i.e. causing or enhancing plant protection problems), and (3) the protection and augmentation of natural antagonists.

*Monitoring and forecasting systems* as important second element provide the necessary instruments for the decision if and when the third element, namely

*direct plant protection* (= control measures) has to be applied. Hence the use of pesticides is not *per se* an integral part of integrated plant protection but the last option when prevention alone does not produce acceptable results.

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Tab. 2  
Plant protection in the context of a sustainable agriculture (integrated & organic farming)

<p><b>Indirect Plant Protection</b> (= Prevention)</p>	<p><b>1. Optimal use of natural resources</b></p> <p><i>e.g. crop adapted to local conditions; appropriate yield expectations; resistant varieties and clones; weed management with adequate intensity of competition to crop; mixtures of varieties and crops; optimal timing of sowing; optimal training systems; ecological compensation areas</i> (= system parameters)</p> <p><b>2. Farming practices without negative impact on the agro-ecosystems</b></p> <p><i>e.g. no surplus input of nutrients (especially N); optimal density of crop and foliage (ventilation); low intensity of tillage/cultivation and production methods protecting soil fertility; weed management (erosion control); habitat-management (green cover) to enhance biodiversity.</i></p> <p><b>3. Protection and augmentation of antagonists</b> (beneficial arthropods, fungi, plants)</p> <p><i>e.g. Assessing importance of individual antagonist species; inoculative releases; suppressive soils; habitat-management</i></p>
<p>Decision to apply direct control measures:</p> <p><b>Monitoring &amp; Forecasting Systems</b></p> <p><i>Epidemiology &amp; prognostic models (time of occurrence &amp; risk)</i> <i>Economic thresholds and tolerance levels</i></p>	
<p><b>Direct Plant Protection</b> (= Control)</p>	<p><b>4. Use of control measures acting exclusively upon target organisms</b> (pests, diseases, weeds)</p> <p><i>e.g. <u>Biological and biotechnical</u>: Sterile-Insect Technique; repetitive release of selective parasitoids, predators, entomopathogens (e.g. viruses) and fungal antagonists induced resistances; competitive plants, mycoherbicides and selective herbivores in weed control; <u>Selective chemicals</u>: Pheromones (e.g. mating disruption, oviposition deterrents)</i></p> <p><b>5. Application of less selective measures</b>, where previous steps do not prevent economically unacceptable damage:</p> <p><i><u>Semi-selective pesticides</u>: e.g. <i>Bacillus thuringiensis</i>, insect growth regulators (IGR), sterol synthesis inhibiting fungicides;</i></p> <p><i><u>Unselective pesticides</u>: short persistence</i></p>

## **Redefining Integrated Pest Management - Farmer empowerment and pesticide use reduction in the context of sustainable agriculture \***

by Monica Moore

In 1993, the Clinton Administration announced its commitment to reduce the use of pesticides and promote sustainable agriculture in the US.<sup>1</sup> In 1994, The Environmental Protection Agency, US Department of Agriculture and Federal Food and Drug Administration announced that integrated pest management (IPM) would provide the foundation of the Administration's pesticide use and risk reduction programme.<sup>2</sup> This paper discusses the potential for IPM strategies to contribute a comprehensive national pesticide use reduction policy in the context of a commitment to sustainable agriculture and rural development. It considers conditions that would maximise such contributions; recommends a supporting policy context; and suggests areas of further work to help speed and guide development and implementation of IPM and pesticide use reduction (PUR) in the context of sustainable agriculture.

### **Origins and evolution of IPM**

The formal origins of the IPM concept date from the late 1950s, when it was developed by University of California entomologists in response to serious pesticide-induced pest outbreaks in Southern California. In its first decades, Integrated Control (as it was first called) and IPM (a term first used in 1967) emphasized that pest control takes place within an ecological framework, and identified biological and other natural controls as the foundations of successful pest management.<sup>3</sup> By the late 1970s, IPM was promoted as the new technology of pest control, in which broad spectrum chemical insecticides were replaced with alternative control methods, and which might in some cases include more selective (i.e. narrow spectrum) synthetic chemicals and biopesticides.<sup>4</sup>

Definitions of IPM proliferated as its theory and practice evolved, and the term gradually came to mean different things to different people. Over time, a focus on optimal use of multiple tactics in a compatible manner overshadowed the earlier concentration on the ecological foundation of IPM. There was also increasing emphasis on more efficient pesticide applications based on economic thresholds and pesticide resistance management strategies.<sup>5</sup> The devolution of IPM into a mix of tactics and improved methods for timing of pesticide applications continued, to the extent that by the early 1980s, IPM was so closely associated with pesticide use that the term was interpreted by many to mean integrated pesticide management. In fact, during the period 1968-1992, which coincided with the period of mainstream adoption of IPM in the US, pounds per acre application of pesticide active ingredients to US cropland increased by 125%.<sup>6</sup>

Both the ecological and chemical traditions of IPM continue into the present. This duality presents both advantages and disadvantages for adoption of pesticide use reduction policies based on IPM.<sup>7</sup> On the one hand, IPM is an extremely flexible and familiar concept, universally endorsed in theory by agricultural industries and government, and practised at least partially by many producers.<sup>8</sup> Because pesticides are so

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\* Printed by permission of Dinham, B., editor, *Growing Food Security: challenging the link between pesticides and access to food*, The Pesticides Trust, U.K., 1996, pp. 79-86.

widely overused, even partial adoption of IPM techniques by agricultural producers in many states demonstrates that loosely defined and largely chemical IPM approaches can improve pest control, provide acceptable yields and reduce pesticide use.<sup>9</sup>

However, the total absence of standards or even a common general understanding of what constitutes legitimate IPM also presents serious problems. First, it means that a *de facto* standard of anything goes prevails by default. This makes comparisons of results and quality assessments between and among IPM systems very difficult, and confounds the already formidable tasks of replicating and scaling up successful experiences. More fundamentally, in the best of circumstances, IPM has the potential to serve as an entry point to a broader conversion to more sustainable farming systems.<sup>10</sup> The fact that so many IPM approaches remain pesticide-based not only severely constrains their potential, but can actually pervert IPM into a vehicle for continuing dependence on pesticides *in spite* of proven alternatives.<sup>11</sup> This has prompted some sustainable agriculture advocates to distance themselves from the term.<sup>12</sup>

### **Moving to farmer-centred, participatory IPM**

In contrast, IPM as an element of an overall policy favouring sustainable agriculture and rural development (SARD) is articulated not only in response to pest control and crop protection needs, but as a means to address a wide range of economic, social and environmental imperatives. For example, IPM can simultaneously increase farmers' skills in ecological crop management, reduce farmers' reliance on expensive off-farm inputs, protect agro-biodiversity and help meet agricultural pollution prevention targets.

The SARD approach to IPM is firmly grounded in many seasons of experience in farmers fields around the world, and a steadily growing list of crops and production systems. It is informed by field-based learning methodologies that are enabling the formation of new partnerships between farmers, researchers, consumers, NGOs, government representatives and some private sector interests. Such methodologies can greatly increase the adoption rates and quality of IPM practices. They also demonstrate that while many important IPM achievements are associated with overcoming pesticide misuse and overuse, IPM's most spectacular and enduring successes are a result of farmer empowerment and participation in ecologically-based pest management approaches that serve their interests, and which farmers control. This recognition has ushered in a dynamic new era of farmer-centred participatory IPM, vs. conventional science research-driven IPM technology packages that are transferred from experts to farmers.<sup>13</sup>

Broad international acceptance of the concept of sustainable agriculture and rural development dates from publication of the Brundtland Commission Report in 1987, which called for sustainable development in all sectors and human activities.<sup>14</sup> In 1988, the United Nations Food and Agriculture Organization (FAO) formally defined sustainable agriculture and rural development as:

*...management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agriculture, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable.*<sup>15</sup>

A more detailed definition of SARD was elaborated at an Experts Meeting on Sustainable Agriculture and Rural Development co-sponsored in 1991 by FAO and the Netherlands government. This meeting, which involved SARD practitioners and experts from governments, NGOs, donor organisations and technical

and research institutions, actually produced a declaration and action agenda for replacing chemical-intensive agriculture with more sustainable and holistic agricultural production to fulfil global food and fibre needs that stressed the importance of people's participation, and especially farmers' and rural communities' participation, to SARD.<sup>16</sup> This emphasis on participation was later echoed in Chapter 14 of Agenda 21 (on Sustainable Agriculture and Rural Development), the action plan endorsed by UN member governments during the UN Conference on Environment and Development in Brazil in 1992.

In the US as in most countries, SARD approaches have been pioneered and/or described by farmers, rural communities and sustainable agriculture and other NGOs long before they were recognised by government institutions. The US government widely acknowledged the validity and promise of SARD as a framework for needed changes in US agriculture first in 1989, with the publication of the National Research Council's study *Alternative Agriculture*.<sup>17</sup> This point is important not only to credit accurately the work and innovations upon which current SARD policies are based, but to underscore the crucial role of these innovators in ongoing development of SARD and IPM/pesticide use reduction (PUR) policy and practice.

#### *Enabling conditions*

Against this background, it is useful to consider the conditions under which farmer-centred, bio-intensive IPM can flourish in the US, and how to maximise the contributions of IPM to the broader national goals of sustainable agriculture and rural development, including significantly reducing pesticide use. High on the list of these enabling conditions are:

- Adoption of a clear operating definition of IPM in the context of SARD;
- Adoption of supportive national policies to finance and facilitate IPM policies, and especially farmer-centred IPM training and implementation;
- Adoption of ambitious national policy and programme commitments to reduce use of, reliance on and damage associated with pesticides.

#### **IPM definition**

Seemingly endless definitions of IPM have been developed in its relatively brief history.<sup>18</sup> Yet by declaring IPM to be the foundation of its pesticide use and risk reduction programme, the Clinton Administration begs the question regarding the nature of that foundation. And by placing its commitment to PUR in the context of both IPM and sustainable agriculture, the Administration rendered obsolete earlier seat-of-the-pants definitions of IPM commonly used in government publications (e.g. use of at least two IPM-associated tactics, scouting of pest levels and use of economic threshold techniques in some form).<sup>19</sup>

The marriage of IPM and PUR, which has already occurred at the policy level (on paper at least), must be reflected in the definition of IPM, despite attempts by conventional agricultural interest groups to keep them separate.<sup>20</sup> A SARD-compatible national IPM/PUR definition is essential not only to offer direction to practitioners, guide policy, and suggest certain basic evaluation criteria but also to prevent definition shopping to justify counter productive practices.<sup>21</sup>

Fortunately, a growing body of experience from national IPM programmes in countries that link IPM directly with sustainable agriculture and use reduction is available to draw on in developing a US IPM/PUR framework. For example, the National IPM Programme of Indonesia is widely considered one of the world's most successful IPM initiatives to date.<sup>22</sup> Government documents describe the programme

as “A planned and coordinated effort to institutionalise the principles of IPM by farmers within the farming community itself, and to spread the understanding of IPM within the general public as part of a broad promotion of sustainable, environmentally sound agricultural development.” The programme’s goals include “maintaining food self-sufficiency, fostering the creativity, dynamism and leadership of farmers, and strongly supporting the efforts of farmers in implementing and disseminating IPM such that sustainable, environmentally sound agriculture can be achieved.”<sup>23</sup> The programme’s working definition of IPM clearly indicates its approach:

*IPM is an ecological approach where agriculture is viewed as a complex, living system in which humans interact with land, water, plants and other organisms in an attempt to optimise human, natural and man-made resources. IPM is also a human resource development program. Farmers learn to work with nature and gain the capacities necessary for productive, sustainable agriculture. Farmers become experts, and the central focus of the agricultural system. Farmers also become more active, independent, competent actors within agricultural development.*

*IPM training helps farmers to learn to collect and analyse data, make their own decisions, and create a strong working network with other farmers and with extension workers and researchers. IPM farmers promote sustainability by applying ecological principles in the cultivation of their fields and learning how to optimise resources use by managing the ecosystem. Farmers are the main owners, implementors and developers of IPM. They determine their own needs and create solutions and practices appropriate to their specific local conditions.*<sup>24</sup>

Another example of an IPM definition that offers guidance and direction is offered by the Philippine National IPM Programme:

*IPM is an ecological approach with biological control as its foundation. It focuses on growing a healthy crop, conserving natural enemies and observing fields regularly. IPM is also a program of human resource development that focuses on farmers as experts. Farmers’ empowerment through improved decision making skills alongside the revitalisation of farmers organisations spur the process of fully assimilating IPM into existing community farming practices. IPM facilitates knowledge processes, continuous observation and feedback from the local environment, and enhances decision making capacity and capability. IPM is carried out by farmers, not for farmers.*<sup>25</sup>

Both programmes emphasize the role of expert farmers and their ability to learn and adapt IPM technologies to their particular locations and conditions, discriminate among products and approaches heavily promoted by agrochemical sales people and agricultural research systems, and ensure appropriate application, alterations and continuing improvement of IPM/PUR strategies in the field.

A third example is the FAO operational definition of IPM set out in its 1992 Field Programme Circular, which conveys a clear preference for non-chemical control options:

*The presence of pests does not automatically require control measures, as damage may be insignificant. When plant protection measures are deemed necessary, a system of non-chemical pest methodologies should be considered before a decision is taken to use pesticides. Suitable pest control methods should be used in an integrated manner and pesticides should be used on an as-needed basis only, and only as a last resort component of an IPM strategy. In such a strategy, the effects of pesticides on human health, the environment, sustainability of the agricultural system and the economy should be carefully considered.*<sup>26</sup>

Each of these example stresses attributes of IPM conspicuously missing in the prevailing best possible mix of tactics definition: IPM’s ecological foundation, recognition of IPM as an ongoing human process

with practitioners at the centre, and avoiding use of pesticides in IPM. The absence of any one of these allows IPM to be used merely as a technique to counter resistance to pesticides or time pesticide applications (for example), rather than as a necessarily holistic, ecologically based and practitioner-controlled process.

US efforts to promote adoption of IPM must be guided by a definition that acknowledges IPM as both an ecological process and a process of human development. This definition should also indicate the central role of farmers/practitioners, use of pesticides only as a last resort, and allowing only least-toxic, least-ecologically disruptive compounds under any circumstances. Unfortunately, according to these criteria, IPM definitions put forward in response to the Administration's goal of 75% of US cropland under IPM systems in 2000 are noticeably lacking. Both the USDA definition

*IPM is defined as the judicious use and integration of various pest control tactics in the context of the associated environment of the pests in ways that complement and facilitate the biological and other natural controls of pests to meet economic public health and environmental goals.*<sup>27</sup>

and that espoused by the National Coalition on Integrated Pest Management

*IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimises economic, health and environmental risks.*<sup>28</sup>

fail to present farmers and practitioners as central actors, nor is the pesticide use reduction imperative acknowledged. Of the two, the USDA version is more ecologically oriented, and the Integrated Pest Management Initiative launched by USDA in December 1994 does involve IPM teams of producers, land grant universities, crop advisors and consultants, and private industry which are to operate at state and regional levels.<sup>29</sup> However, the guiding definition for the programme still signals the outmoded best mix approach.

### **Supportive policy frameworks**

Adoption of a national IPM policy is a crucial first step toward harnessing the benefits of IPM and PUR. However, merely declaring a policy is insufficient to accomplish much, especially if the policy remains undeveloped. Supportive national policy frameworks and programmes are needed to provide a comprehensive, coherent framework for action, and to ensure that appropriate resources are available to implement the policy.

Given the weak nature of the US commitment to IPM, representatives from all points along the IPM continuum are organising to provide input into a national IPM policy. Some of these efforts actively solicit cross-sectoral participation of farmers, NGOs and alternative pest management practitioners, as well as from more regularly consulted regulatory, industry and private sector representatives.<sup>30</sup> The urgency of such efforts is underscored by a parallel search for alternatives to the many uses of methyl bromide, a fumigant pesticide that is the fifth highest use pesticide in the US by volume. In a development that shocked the US agricultural establishment, methyl bromide was identified as a powerful ozone-depleting compound in 1992 and is scheduled for a full production, sales and export ban in the US under the Clean Air Act in 2001.<sup>31</sup>

As with IPM definitions, a steadily expanding body of experiences in developing and implementing SARD-oriented IPM and PUR policies is available from countries around the world,<sup>32</sup> including from

nations that began shaping their policies as early as 15 years ago. For example, the Indonesian National IPM policy is based on data gathered in thousands of plots throughout the country between 1980-1986 by FAO.<sup>33</sup> It incorporates clear restrictions on the role of pesticides within IPM, and “pesticides which might cause pest resurgence, resistance or other damaging side-effects are herefore illegal and forbidden” by Presidential decree.<sup>34</sup> Numerous pesticides have been severely restricted or removed from the market as a result of these criteria, beginning with 57 widely broad spectrum insecticides whose use in that crop was cancelled in 1986.<sup>35</sup> In 1985, the Swedish government declared its first national PUR policy, committing itself to a 50% reduction by volume by 1990, a target that was met and replaced with an additional 50% reduction goal in seven years.<sup>36</sup> The Swedish PUR programme has identified criteria that differentiate unacceptable pesticides from those with clearly unwanted properties based on health and on environmental hazards. It then established cut off criteria (i.e. criteria for banning) for unacceptable compounds and guidelines for case-by-case determination of whether or not to allow registration of pesticides with clearly unwanted properties.<sup>37</sup> Pesticides in Sweden must now be re-registered every five years according to these criteria, and meet additional standards as developed. In the first round of re-registration, 20 formerly registered pesticides were removed from the market, and seven more were severely restricted.<sup>38</sup>

A particularly striking account of international IPM experience is offered in the summary account of a 1993 Global IPM Workshop organised by the FAO in conjunction with the National IPM Programmes of Bangladesh, Indonesia, Philippines, Thailand and Vietnam.<sup>39</sup> The Workshop began with participants spending a week with IPM trainer/facilitators and farmers in the rice fields of one of the co-sponsoring countries. Afterwards, participants (mostly government crop protection workers from more than 35 countries, a number of donor and technical agency representatives and a few NGOs) convened in Bangkok to discuss and recommend policies and actions to accelerate IPM implementation and support IPM farmer-trainer processes and management activities. The meeting also identified specific constraints to IPM and challenged governments, scientists and donors to implement the IPM Manifesto:

- Recognise and train farmers as experts in IPM.
- Make research and training participatory.
- Adopt IPM as national policy.
- Eliminate pesticide subsidies.
- Conduct true costing of pesticide use.
- Eliminate WHO categories Ia, Ib<sup>40</sup> and chlorinated hydrocarbon pesticides.
- Promote environmentally-friendly, non-chemical methods of pest management.

In August 1995 the Director of the FAO Intercountry Programme for IPM in Asia presented to World Bank staff an initial framework for assessment overtime of nine national IPM programmes in the region. Although crude and not directly transferable to other regions, the framework is instructive for its emphasis on pesticide policy, involvement of local governments and collaboration with NGOs as indicators of progress:

*Generalised stages of development of national IPM programmes in Southeast Asia*<sup>41</sup>

- 1 Awareness of problem, expression of interest
- 2 Field studies validating IPM technology
- 3 Testing of IPM training process (pilot farmer field schools)
- 4 National policy constituencies identified and meet
- 5 National IPM policy declaration

- 6 Pesticide policy reforms bans, restrictions, tariffs
- 7 Pesticide policy reform removal of subsidies
- 8 National government commitment
- 9 Implementation of national IPM programme with donor support
- 10 Local government commitments: political and administrative
- 11 Local government commitments: financial
- 12 Government-NGO collaboration in village level training
- 13 Policy advocacy from NGOs
- 14 National Programme mostly supported from government revenues

Both the IPM Manifesto and the above framework place IPM and PUR policy explicitly in a macroeconomic context, as do many analysts and studies in and outside the US.<sup>42</sup> This is, of course, an appropriate and necessary function for national policy. As German agricultural economist Herman Waibel explains:

*Economic assessment of pesticide use has to be treated within a framework that covers the farmer's point of view as well as the society's viewpoint. The criterion for the farmer is to maximise expected net returns. The criterion for the society as a whole on deciding how much pesticides to apply is to maximise net social benefit. This differs from the private optimum, because pesticides cause external effects, e.g. through the contamination of groundwater or food, which are not taken into account by the farmer. If governments do not interfere in the pesticide market, adequate information on crop loss will not be provided and externalities will not be internalised. As a consequence, the level of pesticide use is likely to be above the social optimum. The resulting overuse of pesticide causes additional costs, because potential and actual damage caused by pesticides leads to an increased need for government activities which aim at monitoring the implementation of rules and regulations as well as reducing the environmental and health damage caused by pesticides. Examples [include] establishment of pesticide residue monitoring programs and training programs on the safe use of pesticides. There is no doubt that such activities, which mostly require public funds, are necessary. However, the extent of these activities must be decided simultaneously with the level of [allowable] pesticide use, or over investment is likely to occur.<sup>43</sup>*

Nonetheless, the skewed economics of US national pesticide policy have yet to be addressed. In spite of progress in other areas important to IPM, including apparent USDA acceptance of ecological-based IPM and the need to reduce pesticides, the topic of how pesticides are favoured economically as a pest control strategy, directly and indirectly, remains off limits. Alternatives Assessment,<sup>44</sup> Benefits Assessment<sup>45</sup> and a variety of taxes and fees<sup>46</sup> have all been suggested as partial remedies. As an example of the range of options available in the latter category, since adopting its PUR policy, the Swedish government has significantly increased registration fees, instituted an annual fee based on volume of sales, adopted a weight-based environmental tax, imposed a price regulation levy by hectare and spray operation, and is currently developing a pesticide hazard tax.<sup>47</sup>

In the meantime lack of an adequate economic context for evaluating the role of pesticides in IPM systems and in crop protection strategies more generally, continues to slow adoption and innovation of alternative pest management approaches in the US. This unfortunate situation supports those who advocate a purely voluntary approach to IPM ("Encourage, don't mandate: IPM must be compelling, not required"<sup>48</sup>), using loosely defined best mix approaches, maintaining broad spectrum compounds for use in emergencies only. Without pesticide use reporting there is no means of checking the voluntary approach.

## **Recommendations for future work**

To build on the above, additional work in three areas is needed to guide the process of redefining IPM, and to speed implementation of IPM/PUR in the context of SARD:

- Articulation of more and less acceptable IPM practices and processes in light of SARD and PUR parameters,
- Development of indicators of SARD-compatible IPM,
- Identification and removal of technical, political, market and other obstacles to adoption and dissemination of IPM.

### *More and less acceptable IPM*

The long reign of IPM as best mix of tactics has left a legacy of loose standards in developing and implementing IPM systems. A clear definition and policy framework are essential to correct this, and progress is being made in re-establishing ecological dynamics as the foundation of IPM. Guidelines and standards to further delineate less from more desirable and acceptable IPM activities can accelerate progress toward this end. The agricultural pollution prevention spectrum developed by World Wildlife Fund's Great Lakes Basin Pesticide Use Reduction programme represents one useful approach, as does the Community Alliance with Family Farmers BIOS programme in California.<sup>49</sup> The need for standards and guidelines in the social, political and management aspects of IPM is particularly acute. Topic areas needing attention most urgently include IPM policy development processes; farmer-centred, participatory and field-oriented IPM training methodologies; and means of limiting pesticide dependence, use, toxicity and applications in IPM systems.

### *Indicators of SARD-compatible IPM*

Indicators are important tools for all participants in IPM/PUR processes. Well designed indicators can convey complex quantitative and qualitative information in a manner that is easily understood and related to a bigger picture regarding how well IPM/PUR goals, definitions and guidelines are being implemented, whether they are adequate, and where further work or changes are needed. Indicators can be used at many levels and for many purposes. At the policy level, they can guide priority setting within and focus policy attention on establishing effective IPM/PUR programmes. Indicators also provide a framework for information collecting, measuring progress (or lack of it) toward stated goals, and for public reporting of IPM/PUR information. At the regional level, indicators are useful in assessing the quality of IPM training, for example, the degree to which different producers (male/female, family farmers/corporate farm managers, growers of different crops etc.) are served by training efforts, and relationship of different IPM practices to overall reduction goals. At the field level, indicators help IPM practitioners in designing, monitoring, correcting and assessing actual IPM projects (the concept of economic threshold is a widely used indicator in IPM, and the debate over what they mean is an indicator of changing IPM theory and practice).<sup>50</sup>

Indicators also can and should be used to generate public and social support for IPM farmers and sustainable agriculture. Successful IPM/PUR requires mobilisation of significant resources and technical support for farm research into non-chemical methods; pilot projects and other settings where the benefits of IPM can be effectively demonstrated; and IPM training methodologies that involve farmers, extension personnel, researchers, community organisations, etc. It is likely that many of these resources will need to be re-allocated from current uses. Developing indicators that IPM practitioners, policy makers and the general public can quickly relate to broader social goals of PUR and SARD can communicate the specific benefits of IPM including environmental, economic, biodiversity, worker safety and public health benefits to society, helping to make the case for reallocation of resources to SARD-compatible IPM.

*Identification and removal of obstacles*

Mechanisms are needed to help practitioners and others systematically identify obstacles to IPM. Additional mechanisms, for a and resources may be required to address, remove or otherwise resolve these obstacles; to evaluate the resulting improvements in IPM processes; and to consider further measures if problems persist. Examples of such obstacles include direct and indirect pesticide subsidies, excessive or inappropriate pesticide advertisements and availability, lack of transparency of government or private sector activities, gross imbalances in information available on non-chemical vs. chemical pest control methods, insufficient and/or poor quality IPM training, etc. Specificity in determining what and how the identified obstacle(s) undermine the viability of IPM programmes is important both to resolving the situation at hand, and to ongoing evolution of IPM practices. Recommendations for appropriate action should build on existing mechanisms where possible, and develop and support new mechanisms where necessary.

A related issue requiring closer examination is the role of genetic engineering in IPM. For example, incorporation of *Bacillusthuringiensis* (*Bt*) toxin into plant tissue will accelerate pest resistance, in this case to a biopesticide compatible with both IPM and organic production.<sup>51</sup> Extensive investment in and commercialisation of herbicide resistant plants can be expected to increase use of individual herbicide products, while maintaining or increasing farmers' reliance on herbicides in their production systems, contrary to SARD and PUR principles.<sup>52</sup> Legal and economic issues are raised by patenting of entire species, which also proscribes farmers rights to save seeds, restricts farmers abilities to innovate, and fails to recognise the role of farmers' contributions to genetic conservation and plant breeding.<sup>53</sup>

Pest resistance is another topic that demands scrutiny. Strategies to prolong the use and profitable life span of pesticides, i.e. resistance management, have been and will continue to be undertaken by industry for commercial reasons. This is not to say that resistance management has no relation to IPM, as indicated by the earlier point about genetically engineered *Bt* plants. But the interests and responsibilities of IPM practitioners, public sector institutions and the broader society lie with agroecologically-based pest management, which addresses the health, environmental and economic problems of pesticide use by developing and promoting non-chemical alternatives. Given increasing scarcity of public funds, it is important to clarify corporate interests vis-a-vis these longer term social interests and actual agricultural necessity in decisions to commit public funds to resistance management activities.

**IPM: What's in a name?**

The task of redefining IPM at this particular point in history is far more than a semantic exercise. A systems change is underway within US agriculture as SARD principles and practice move from the margins toward the centre of mainstream agriculture. Identification of IPM as the centrepiece of the Administration's Pesticide Use Reduction initiative - an explicit response to one of the more obvious crises of unsustainable agriculture - is part of this change, and offers exciting possibilities to accelerate and help shape it.

These changes in US agriculture are occurring simultaneously with a paradigm shift in IPM itself. From the old best mix of tactics and economic thresholds approach, integrated pest management is evolving toward a series of related activities carried out of by practitioners who implement and further develop IPM, and by other actors who, in a wide variety of public, private and non-profit sector capacities, support practitioners in increasing their expertise and reducing their, and society's collective reliance on pesticides.

IPM in this perspective is a rapidly evolving, field-based and practitioner-driven process grounded in specific activities and supported by a coherent policy framework. Recognition of who are the owners and

implementors of IPM - i.e., farmers and other pest managers-is central to the emerging IPM paradigm. Clarifying pest managers' responsibilities to reduce and wherever possible to eliminate pesticide use is equally central. Significant reductions in reliance on pesticide, increasing diversity within and sustainability of US agriculture, and decreasing pesticide related health and environmental impacts are among the benchmarks by which we can recognise its spread. At its most successful, IPM has the potential to become a social movement, recognised and embraced as major vehicle for social and agricultural development. The observations and recommendations offered in this paper are intended to help narrow the gap between IPM at its most successful and the existing situation of IPM in US agriculture today.

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**Annex 3**

**Panel Presentations**

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**Session 1 – The Role of IPM in Pesticide Risk Reduction**



## **Integrated Pest Management: A Variable Track Record in Pesticide Risk Reduction**

Marcia Ishii-Eiteman  
Pesticide Action Network North America Regional Center  
San Francisco

IPM definitions and approaches abound; some contribute significantly to pesticide risk reduction, while others have little or no effect. IPM that results in reduced risks consists of culturally and ecologically appropriate combinations of management decisions and practices that decrease use of and reliance on pesticides; emphasize farmers' central role in decision-making; and are based upon ecological principles, local experimentation and adaptation. If used at all, pesticides - whether synthetic or natural - are least toxic, used sparingly and only as a last resort.

By this definition, the contribution of IPM to risk reduction is obvious. Farmers who adopt this type of IPM necessarily reduce their use of (and therefore exposure to) pesticides and minimize the hazards of those few chemicals which they may use. Results are evaluated not only at the field level, but also at community, institutional and policy levels. An enabling policy environment is an essential component of successful IPM, ensuring lasting results in risk reduction.

Other forms of pest control described as "IPM" have limited capacity to reduce risks and may in some cases even exacerbate them. Programs which emphasize the "safe and effective use" of chemical pesticides typically pay only nominal attention to non-chemical alternatives and risks can increase. While the frequency of application or even volume of pesticides used may decrease, many IPM programs fail to reduce farmers' dependence on pesticides. If the focus when selecting pest control practices is limited to mitigating the acute effects of pesticides, opportunities to create sound sustainable solutions are missed. Examples of successful and problematic IPM approaches will be discussed.

Farmer-driven ecologically-based IPM has the potential to go far beyond reducing risk. It addresses larger societal goals such as the production of and access to safe food, good health, a clean environment, education and local empowerment. In this context, pesticide risk reduction strategies provide an important first step that can be carried much further by the broader objectives of participatory, ecological IPM.

## **How Can We Reduce Dependence on Chemical Pesticides?**

Jeff Waage

Biological Pest Management, CABI Bioscience  
International Organization of Biological Control and Integrated Pest Control

The potential to reduce pesticide use through IPM involves three factors: (1) the current level of unnecessary, or replaceable use of pesticides, (2) the capacity to establish sustainable IPM in those systems, and (3) the existence of alternative interventions, if and where these may be necessary. For all of these factors, most attention has been paid to insecticides, which are also the products of greatest regulatory and ecological concern at present. Hence, the following argument will concentrate on insecticide use, and its extension to other pesticides will be considered at the end.

The precise relationship between current pesticide use and necessary pesticide use can be determined using well established research methods in any particular case. It is my impression that, when this is done, insecticide use is often found to be excessive, and that this is associated with the ecological phenomenon of pesticide-induced pest resurgence. This occurs when insecticides eliminate important natural enemies of pests, leading to greater dependence on insecticides and consequent greater loss of local, “free” natural control. In addition, secondary pests arise through elimination of their natural enemies, and new efforts to control them with pesticides can make their impact more severe.

In extreme circumstances this leads to serious and persistent pest outbreaks. Pest resurgence has been the principle catalyst of the landmark IPM programmes of recent decades, e.g. against slug and nettle caterpillars on cocoa, bollworm on cotton, brown planthopper on rice, diamondback moth on vegetables, and many other pests. However, in many more systems it is likely that chemical pesticides are simply replacing natural control, generating unnecessary input costs and risks of secondary pest problems.

It is also important to note that development of pest control products for the next decade is often directed at these very same, pesticide-induced problems, because they are difficult to control and markets are large. Hence, a substantial proportion of R&D in pest management is almost certainly wasted on essentially non-pest problems, when it could be directed at IPM.

How easy is it to implement IPM in systems of unnecessary insecticide use? The experience of the past few decades has shown that traditional extension systems, based on messages about pest thresholds and scouting, are often ineffective at implementing IPM where there does not exist “on farm” an IPM specialist to make decisions based on changing local conditions. In a developing country, smallholder context, where extension systems are poorly resourced and dominated by pesticide sales representatives, this need has been addressed by the empowerment of farmers as IPM experts through farmer-participatory training programmes such as the “farmer field school”. In this “learning by doing” context, farmers learn about the biology and phenology of pests and natural enemies, and the effects of crop protection practices on these. Because this involves a commitment to growing a healthy crop and regular observation of fields, FFS generates not only savings in reduced insecticide inputs and increased natural pest control, but it frequently leads to increased yields due to better agronomic practices.

In traditional estate crop systems, similar results are obtained where an IPM-aware pest control officer manages particular areas of a plantation on a daily basis, and in developed countries, crop protection consultants are coming to play a similar role, on behalf of farmers or farming contractors. For all of these approaches to farming, the underlying key to sustainable IPM and pesticide reduction is local decision

making by an expert who regularly observes the crop and understands the ecology of pests and natural enemies, and the effects of interventions on the agroecosystem.

To what extent can pesticides be replaced by alternative, biologically-based technologies (BBTs)? This frequently-asked question incorporates a fundamental misunderstanding of intervention in IPM. The principle of IPM is to minimise, not replace, inputs. BBTs, which include e.g. predators, parasitoids, pathogens and pheromones, protect natural control, meaning that their contribution is measured in their direct effect and this indirect, protective effect. Concepts of product efficacy and use, based on chemical models, have yet to adapt to this changing perspective. For instance, biological products such as *Bacillus thuringiensis* (Bt), have been widely introduced as replacements to pesticides, and their regular use as prophylactic treatments in this context has led quickly to resistance development, wasting their potential as IPM technologies. A similar fate probably awaits transgenic crops incorporating the Bt toxin, which have also not been thought through in an IPM context. To make BBTs work as IPM technologies, they need to be used only when required to augment natural control.

When BBTs are introduced into chemical-intensive systems, as many will be as IPM systems are developed, it may be best to view them as environmental remediation products rather than as pesticides, because much of their use may be transient, decreasing as natural control recovers to a level of limited use on an as-need basis.

Unfortunately, for some decades now, scientists, governments and the international community have looked to the agrochemical industry to be the champions of a new generation of BBTs to replace broad-spectrum pesticides. More recently, microbial technology companies have arisen with similar goals, supported by large amounts of venture capital which illustrate the expectations of these stakeholders. In the past few years, it has become clear that, despite some considerable effort on their part, neither the agrochemical industry nor these venture capital companies will deliver substantial BBTs to underpin future IPM needs. For the industry, this reflects simply the poor prospects of return on investment in a business that is only really viable on a smaller scale, and for venture capital companies, the lesson has been that investment committed products to achieving much larger market than was realistic at this point.

Thus there exists now a crisis in the delivery of IPM technologies to the IPM systems which will need them. The constraint is not at the research end: Many exciting and promising methods exist, although many are locked away as proprietary technologies on shelves in companies who cannot develop them profitably. The problem is more one of developing a new paradigm for BBTs which makes them much more flexible and responsive to the needs of local IPM experts. Models for this new approach exist in small- or medium-scale, highly cost effective biological control companies associated with particular commodities and areas, such as glasshouse systems in Europe, citrus systems in California or sugarcane systems in India. The challenge will be to develop these innovative local and regional businesses, through appropriate regulatory and financial incentives.

Finally, how much of this argument is easily translated to herbicides, fungicides and rodenticides? Certainly, pesticide resistance is a characteristic of all these systems, as it is with insecticides, but pesticide-induced resurgence is not as yet, with the possible exception of some fungicidal systems (e.g. in coffee) where intensive fungicide use may be associated with increasing pathogen levels and decreasing levels of natural antagonistic micro-organisms. Curricula have now been established for farmer field schools in disease management for a range of crops, and it has been possible to dramatically reduce fungicide use through FFS training. Also, plant disease management has been a particularly exciting area of BBT development, where in both developed and developing countries, commercial systems exist for augmenting the natural microflora in soils to prevent damage from plant disease. I believe weed and rodent management will prove similarly accessible to IPM and pesticide reduction.

## **Does IPM Benefit the Consumer?**

Ian Finlayson  
Sainsbury's Supermarket

In my presentation this morning, I would like to propose several questions to prompt our discussions later. The title of my talk is 'Does IPM benefit the consumer?'. My question raises the issue of who is IPM designed to help - is it focused on the end consumer and their needs, is it principally for growers? Or the employment of scientists studying IPM?

Within supermarkets we are becoming more and more customer focused, with extensive market research, category management and something called ECR - which stands for efficient consumer response. We have seen the introduction of reward cards and data warehouses - all in our effort to understand our customers better than the competition.

### **Sainsbury's credentials**

Perhaps I could start by providing some insight into the supermarket business. Sainsbury's has 397 stores throughout the UK, which sell 3,000 tonnes of produce every day. We have focused on development of Integrated Crop Management which includes IPM, but also interactions that arise from growing the crop e.g. biodiversity. In 1992 our Integrated Crop Management policy was issued to all 350 of our fresh produce suppliers - both in the UK and overseas, and translated into 4 languages. This formed the framework for strategy that has continued to evolve and develop up to the current time and will continue to do so. The aim of ICM is to conserve and enhance the environment for wildlife and people whilst producing quality crops of economic yield.

To reduce duplication of retailer's standards in the UK, the Assured Produce scheme was created in conjunction with growers and the National Farmers Union. This scheme has produced protocols of best practice for ICM in the UK. I can describe more about this in the workshop sessions.

Overseas the EUREP (a group of European retailers) was created for the specific purpose to set standards for Good Agricultural Practice (which also encompasses ICM). For the first time we now have common standards for world wide supply to European retailers.

### **Risk to consumer confidence**

About 40% of our sales are own-label products, so we have a significant 'brand' name to protect. The greatest risk to us is the loss of customer confidence in our products. This may arise from legitimate or theoretical concerns or misinformation. Customers must have confidence that the products they buy at Sainsbury's are first and foremost safe. The role of my department is to ensure that the fresh produce and flowers we sell are both safe, of the right quality, and grown in a way that minimises the impact on the environment.

These concerns relate to potential health effects of pesticides both for those applying the pesticides (e.g. flowers in Colombia) and for consumers (e.g. variability of organophosphate residues in carrots). As a supermarket we are particularly aware of the concern about pesticide residues in produce. However this in itself is not enough. Increasingly, customers expect us to be responsible down the supply chain for the way food is produced as well. Our new social responsibility policy tackles some of these ethical issues.

During our visits to growers overseas, worker welfare and correct application of pesticides constitute a major part of our agenda.

Environmental concerns relate principally to the effect of pesticides on biodiversity. Last October we launched at the Sainsbury's/ FWAG conference, the Farm Biodiversity Action Plan. In a pilot scheme seven suppliers, the Farming and Wildlife Advisory Group and Sainsbury's developed a simple methodology to conserve and to enhance biodiversity on farm. This involved a survey a biodiversity on the farm and identification of 5 or 6 key species on the UK Biodiversity Action Plan whose numbers could be increased by changes to management practice.

### **Limitations to IPM**

The principal limitations to IPM are the unknown factors that expose the farmers and growers to risk of crop loss. These are largely overcome by better understanding the pest and disease interactions with crop and weather. Expert systems could overcome some of these limitations by providing science based solutions using modelling techniques.

Other limitations include:

- ◆ There is a lack of information on the non-target effects of pesticides. This data would allow farmers to make better decisions on the choice of chemicals to use.
- ◆ More accurate weather forecasting would help us all I'm sure, but especially farmers when they need to decide if pesticides need to be applied or not, and the timing of those applications.
- ◆ The cost of biological control is currently too high for wide spread use in field production. If the costs are reduced many potential organisms could be used to control pests and diseases.
- ◆ The customer acceptance of blemished produce.
- ◆ In the future the development of newer pesticides for minor crops (which includes most of fresh produce) will be restricted. This is due to the cost of registration and generation of residue data to set an MRL. These newer compounds are often better suited to IPM and safer to the consumer.

### **Alternative risks**

IPM does also have some risks. As we start to rely more on the use of crop monitoring threshold levels, and use less protective and more curative sprays - these all lead to greater risks being taken. As narrower spectrum pesticides are used new pests are seen to develop - Will we have the armoury to control them?

The strict phytosanitary requirement for import of produce into certain countries (notably the USA) restricts the use of IPM. If whole consignments are rejected on the basis of one or two insects, how can threshold levels be used? We have come up against this problem in some countries where we are encouraging the use of IPM, but other countries to which the grower exports have strict tolerances.

I believe the greatest risk of all is debate for the sake of debate, science for the sake of science, and nothing changing in practice. My plea for this meeting is that we will see positive steps taken to progress IPM in practice.

## **Integrated Fruit Production in Switzerland**

Bruno Pezzatti  
Swiss Fruit Association

When interest in integrated fruit production (IP) started in the 70s, Switzerland was participating in developing this new agricultural production method as from the start. GALTU from the Swiss area of Lake Geneva together with COVAPI from France, two regional organisations of fruit producers, were the first agricultural groups for integrated production. Switzerland was the first country to have a national working group propagating the method of integrated production in fruit cultivation throughout the entire country. Accordingly, the first national IP guidelines in Europe, the guidelines of the SAIO (Swiss Working Group for Integrated Fruit Production) came from Switzerland.

In 1985, the Swiss Federal Government initiated a scheme for supporting environmentally beneficial and animal-beneficial forms of agriculture with direct payments. This policy rewards voluntary ecological performance by farmers above the statutory requirements. In concrete cases, federal payments were made for ecological compensation areas as well as for integrated production and biological land cultivation.

In integrated fruit production, full-quality fruit of a high intrinsic and extrinsic quality is to be produced using ecologically adapted methods and economically justifiable methods. For the producers and the authorities, it is most important to reduce the use of auxiliary production products such as pesticides and fertilisers. The aim is to reduce pesticide risks for the user, the consumer and the environment alike and to lower the amounts of nitrate and phosphate polluting ground water and water courses. Residues of active agents of pesticide in agricultural produces and in the environment are to be minimised as far as possible.

At the moment, two labels are widely used in Switzerland for the identification of products from integrated fruit production. One is the company-neutral IP label of the Swiss Fruit Association (SOV) and the other label is the M-Sano brand name of Migros, which is the largest wholesale organisation in Switzerland. Both labels, which can be found on sales packages, assure to the consumer, together with the bio-labels, that such products are originated from controlled, integrated production or from controlled biological cultivation, as the case may be. The above mentioned labels call for stricter minimum agricultural production requirements than those under comparable conditions for payments by the government. The minimum requirements for cultivation technique for the two IP labels will be harmonised as from 1999 onwards. The IP guidelines of the SAIO are not static, but are permanently adapted to the latest knowledge.

To close, a word about the controls and the propagation: each farm that has voluntarily indicated to adhere to the respective IP requirements is inspected at least once a year. In addition, analyses of residue are made within the framework of the IP labels. The correct use of the IP labels by the trade and distribution companies is also checked several times a year by neutral inspectors of the quality assurance service of the SOV. Environmentally beneficial methods of cultivation are already widespread in Switzerland. The rules of the IP label are followed in 83 per cent, the directives of Bio-Suisse in 3 per cent of the apple cultivation area.

## **The Role of IPM in Pesticide Risk Reduction - An Industry View**

Bernhard G. Johnen  
on behalf of the Global Crop Protection Federation

The crop protection industry represented by GCPF fully supports a Sustainable Agriculture which, - as with “Sustainable Development” in general, - must meet the triple bottom line of economic viability, environmental soundness and social acceptability. Within this concept of sustainable agriculture GCPF is fully committed to the principles of Integrated Crop Management (ICM). Integrated Pest Management (IPM) constitutes an integral part of ICM and GCPF has adopted a formal policy in this respect, which is reproduced in the GCPF contribution to the workshop background papers and more fully elaborated in the GCPF monograph “IPM - The Way Forward for the Crop Protection Industry” (available at the workshop).

The crop protection industry supports the practice of IPM as defined by the FAO in the “Code of Conduct on the Distribution and Use of Pesticide” : ‘Integrated Pest Management means a pest management system that, in the context of the associated environment and the population dynamics of the pest species, utilises all suitable techniques and methods in as compatible a manner as possible and maintains the pest populations at levels below those causing economically unacceptable damage or loss’.

This clearly means that crop protection products (CPPs) are an integral part of IPM and at least as important a tool of crop protection within IPM than any other techniques, and not “a last resort” to be used when everything else fails as some people advocate.

Looked at in this context, can IPM contribute to pesticide risk reduction and, if so, how? First and foremost it needs to be borne in mind that the registration process for CPPs is designed to keep the risk from using these products small and acceptable. The regulatory authorities are after all publicly accountable bodies. Secondly, the uptake of IPM (differing systems or degrees of adoption of IPM) is only acceptable, if it is not used as a means of encouraging the farmer to loose or risk his crop. For the farmer the economic risk may be greater than the often only perceived ‘residual’ risk to human health and the environment, which may emanate from CPP use. Any contribution of IPM can therefore only be in reducing this residual risk. There is evidence that the farmers are getting the balance of CPP use right. There is considerable uptake of ICM/IPM by farmers and their advisers (behavioural change) and at the same time a high level of grower confidence in CPPs and a strong underlying demand for them.

Farmers appear to have a rank order of criteria for taking up IPM. American research shows these criteria to be (in rank order): profitability, yield stability, production compatibility, input cost containment, risk reduction, and environmental quality. In other words, if IPM fits these criteria under real life situations, it will be adopted. But, risk reduction is not the prime motivator.

An initial answer to the question posed above will have to be “it depends”. If IPM replaces a farming system, which solely relies on CPPs for crop protection - a system that is becoming increasingly rare - then the very fact that less chemicals are used could be seen as a contribution to risk reduction. On the other hand, the integrated use of CPPs could lead to more products being used. For example, a single broad spectrum product may be replaced by several more specifically acting ones. It is entirely feasible that this could lead to an increase in risk.

The reduction in use of CPPs is often proclaimed to be a major element of reducing risk to human health and the environment as a result of IPM. This claim does not necessarily stand up to scrutiny. The injudicious reduction in CPP use may lead to a loss of quality (in the widest sense of the term) of farm produce and food with adverse consequences to consumer health as a result of fungal toxins, allergic reactions etc. Perceived environmental benefits could turn into major environmental problems. For example, biodiversity could be negatively affected, if more land needs to be farmed to feed an increasing and hungry world as a result of high yielding agriculture being threatened by certain inadvisable low input and low yielding IPM systems. If IPM is to make a contribution to pesticide risk reduction, we must avoid such pitfalls and not take any knee-jerk reaction as a result of listening to the siren songs of well meaning but nevertheless ill informed consumer or environment organisation initiatives. We must also resist the unrealistic claims of certain farming movements which could lead to starvation, if adopted widely. Campaigns against CPPs and Biotechnology resulting in Chemo - and Biotechnology - phobia are also not conducive to realising risk reduction benefits from appropriate IPM systems.

One aspect that is more often than not neglected in the discussion on pesticide risk reduction, is the risk of the alternatives. Such risks may apply to the crop, the land and the farmer. For example, replacing herbicide use with hoeing leads to crop damage and, potentially yield loss; loss of the benefit of controlling soil erosion; and health effects to farm workers such as musculo-skeletal damage.

If the answer to the question “can IPM contribute to pesticide risk reduction?” is to be positive, then the implementation of appropriate IPM systems needs to be accompanied by education and training efforts for farmers and growers which result in:

- understanding and applying the principles of IPM resulting in growing crops successfully and with no economic risk;
- safe and effective use of CPPs

GCPF’s policy on IPM is designed to achieve this in co-operation with other organisations, bodies or individuals, who share this aim

**Session 2 - IPM Case Studies**



## **Integrated Pest Management of Processing Tomatoes Grown in Mexico: A Food Processor Success Story**

Hasan Bolkan  
Campbell Research and Development  
Davis, California

Public perception that residues of synthetic pesticides create food safety concerns and mounting pressure from special interest groups, retailers, and others to reduce the use of agricultural pesticides created a serious dilemma for the food processing industry. The critical issue currently facing the industry is how to control pests and diseases with fewer pesticides without affecting the wholesomeness of the food supply.

In early 1989, Campbell Soup Company recognized Integrated Pest Management (IPM) as an important tool in reducing both the amount and the frequency of pesticide use, and significantly reducing the grower's dependence on synthetic pesticides. The company promotes and helps its growers implement IPM strategies which include: risk assessment, disease forecasting and monitoring, use of resistant varieties, use of bioinsecticides, insect mating confusion, release of natural enemies, cultural practices, and judicious use of synthetic pesticides.

Adoption of the IPM Programs at its Sinaloa, Mexico operations has increased income for growers, reduced synthetic pesticide use, and improved quality without affecting yield. In 1996-97 growing season, synthetic insecticides and fungicide use was 99.96% and 54.4% less compared to pre-IPM growing season, respectively. Much of the reductions resulted from improved timing of the pesticide use. Synthetic pesticides were applied only when necessary and repeat applications were eliminated. The company's involvement and encouragement on the use of IPM has aided in the acceptance and enhancement of the adoption of IPM practices among its growers. In Sinaloa, Mexico Campbell's IPM Programs enjoy 100% grower acceptance. Results for the last seven years clearly show that IPM in processing tomatoes cuts costs, preserves the environment, protects the food supply, and increases crop yields while maintaining high quality.

## **The Development and Current Status of Integrated Fruit Production/IPM in Germany**

Erich Dickler  
Federal Biological Research Centre for Agriculture and Forestry  
Institute for Plant Protection in Fruit Crops  
Dossenheim, Germany

Integrated Fruit Production (IFP) is a further development of Integrated Pest Control (IPM). The development of Integrated Production is most mature in apples. For the last 5 years, more than 70 % of German apple production complied with IFP guidelines.

During the early development of IPM, which can be traced back to the late 1950s, analytic investigations of the apple ecosystem, studies on the population dynamics of apple pests and diseases, their antagonists and the side-effects of pesticides on beneficial arthropods aimed to reduce chemical pesticide treatments and pesticide risk to a minimum. Fundamental work was done by Hans Steiner in Baden-Württemberg in Southern Germany.

In the early 70s, advisory booklets titled “Visual control in apple orchards,” “Beneficials in apple orchards” and “The beating method” were published and became an indispensable aid for IFP-fruit farmers. During this period, offices for IFP-officers were set up in Southern Germany to educate and advise apple farmers about IFP. Training courses were offered and IFP systems were successfully compared with orchards managed conventionally on pilot farms. But from the mid- 70s to the late 80s, the practical implementation of IFP was very low not exceeding 2000 ha in Germany.

In the 1980s the Federal German Ministry of Agriculture (BML) initiated and funded several programs with the aim of implementation of IFP more widely. The practicability and benefits of IFP was demonstrated on several pilot farms. Numbers of pesticide applications and costs were significantly lower in IFP compared to the conventional. Forecasting systems for orchard pests were constructed and phenological models for major pests (codling moth, leafrollers, apple scab, fireblight etc.) developed.

In the following years, posts for IFP advisors were set up all over Germany, IFP-farmer organisations were founded, the national German guidelines and local guidelines for IFP published and, in 1994, 14 local fruit farmer organisations were following IFP and marketing their apples under IFP regulations.

The greatest successes achieved by this strong expansion of IFP are well trained fruit growers, an increase in beneficials and the exploitation of their regulatory potential, reduction in use of chemical pesticides, a preference for selective products less harmful to the environment, control of fruit farms, farm books and sprayers and the availability of regional, national and EC grants.

Upcoming problems within IFP-systems such as secondary pests, resistance to selective compounds, increasing costs in IFP-systems and other incentives will be discussed.

## **The Indonesian Rice IPM Program**

Russell Dilts  
Food and Agriculture Organization of the United Nations  
Jakarta, Indonesia

### **Statement of the Problem:**

Indonesia, after years of being the world's largest importer of rice, surged to self-sufficiency in 1984. This astonishing transformation was brought about by the broad introduction of plentiful fertilizers and responsive high-yield varieties, improved irrigation, credit, and appropriate supporting policies.

This achievement, however, had an Achilles Heel. Broad spectrum insecticides were always bundled together with other inputs despite little research foundation in tropical rice. This regime triggered massive outbreaks of the rice brown planthopper, which overcame the resistance of Indonesian developed high quality, high yield varieties. By late 1985, nearly 70% of Java's rice production was threatened by this pest.

### **What was achieved:**

For more than 10 years the Indonesian government has promulgated a combination of policy reform and aggressive grass-roots farmer training into one of the largest IPM programs in the world. On the policy side, a subsidy of over \$100 million per annum was erased without a loss in production, hence effectively de-coupling insecticides from rice production inputs. Further IPM supportive policies included the selective banning of 57 broad spectrum insecticides for use on rice, and their eventual total banning. Subsequent policy evolution declared a broad, ecological and farmer-based strategy for the spread of IPM throughout rice producing villages.

In terms of actual operations, the National IPM Program established developed the now widespread 'IPM Farmer Field School' approach to educating farmers in the complex ecological principles of sustainable crop management. In 1998, the one-millionth farmer will graduate from a season long IPM Farmer Field School. Subsequently the program has moved on to the development of community based approaches featuring large scale farmer-to-farmer education, farmer-based research initiatives, and local organizing for sustainable implementation.

### **What were the implications for hazard reduction:**

The program illustrates both the effectiveness, and the difficulties, of moving both IPM Policy and IPM farm-level implementation forward in tandem. The program works on both the 'supply' and the 'demand' side of the pesticide issue. Supporting components in ecological research, IPM in other crops, health impacts, economic impacts, etc. has supported the further expansion of the program. For example in the area of health, an in-depth study found that under 'normal use' conditions in the tropics, over 20% of pesticide spray operations result in poisoning as defined by the presence of three or more neurobehavioral signs and symptoms. Programs and policies based upon the 'Indonesian Model' which stress ecological foundations and farmer-based approaches have spread across the Asia region in recent years and have resulted in much reduced risk to millions of farmers. Further, the breadth of the program allows it to contribute to a much wider range of issues than merely 'pesticide risk reduction; and in fact actors within the program feel that this breadth of scope and vision is indeed necessary to effectively rectify a generation of mis-practice.

## **Integrated Pest Management in Canola**

Tony Zatylny  
Canola Council of Canada, Winnipeg

### **Overview of North American Canola Production**

- 720,000 hectares in 1977;
- more than 6 million hectares in 1998;
- average yield has remained relatively constant at approximately 1250 kilograms per hectare over the past 20 years; and
- major advances in crop protection options including, chemical pesticides, resistant varieties, understanding about individual pests.

### **Challenge in Pest Management**

- shifts in pest populations - as effective tools are developed to control one pest, more difficult pest problems emerge;
- increasing costs of pest management products;
- lack of chemical tools to control emerging and difficult to control pest problems; and
- emerging populations of resistant pests.

### **Current Status of Integrated Pest Management**

- most of the nearly 75,000 canola growers in North America implement IPM strategies intuitively employing practical approaches such as:
  - crop rotation;
  - pest monitoring;
  - resistant varieties; and,
  - judicious use of pesticides.

### **Development of and Integrated Pest Management Strategy**

1. Stakeholder Working Group (Canada & United States)
  - canola growers;
  - research scientists from government, university and private industry;
  - crop protection industry;
  - consumer and environmental groups;
  - federal and provincial governments;
  - regulatory bodies; and,
  - others
2. Selection of Multi discipline Steering Committee

3. Development of a work plan:

- define objectives;
- develop a comprehensive matrix of all tools available for pest management;
- identify knowledge gaps

4. Future Activities:

- bench mark IPM implementation;
- track adoption of IPM strategies;
- coordinated research effort to expand understanding pests and canola interactions including:
  - developing better forecasting tools
  - establish pest threshold levels and economic loss models
  - develop pest avoidance strategies
  - develop pest management strategies that minimize economic, health and environmental risks



**Session 3 – Barriers and Incentives  
to Implementing IPM**



## **Barriers and Incentives for Implementing IPM: by an Independent Crop Consultant**

H. Charles Mellinger, Ph.D.  
Glades Crop Care, Inc., Jupiter, Florida

Farmers' IPM use varies widely. IPM use can be viewed as a continuum with conventional pest control to the left and biologically based IPM to the right. The number or diversity of preventative practices to reduce and manage pests, diseases, etc., directly impacts the need for pesticide interventions. The farmer's choice of pesticides, conventional or reduced-risk type, the frequency of application, rate, and preventative practices determine the farmer's position on the continuum. Each farmer's position illustrates a limited or expanded IPM.

Significantly, barriers and incentives exist that influence advancing along the continuum toward biologically based IPM.

### **Barriers**

1. There is a lack of research results and strategies which enable farmers to implement IPM.
2. Academic institutions promote and advance individuals based on research published in peer reviewed, refereed journals. Most IPM research does not fit this paradigm, and thus the major incentive for academia to contribute is absent.
3. Institutions are not training adequate numbers of IPM technicians and professionals.
4. Governments have underfunded and are underfunding IPM research.
5. There is a lack of measuring tools to demonstrate to a farmer "how much" or "how little" IPM is being used.
6. Continuing education is inadequate within the private sector for IPM delivery and implementation.

### **Incentives**

1. Cost/benefit decisions regarding: 1) reduced pesticide usage through implementing specific pest and disease preventative practices; 2) sound, science-based strategies of resistance management and beneficial insect conservation and augmentation; and, 3) reduced-risk pesticides to promote worker safety, environmental benignity, and food safety.
2. Maintaining profitable food/fiber production as conventional pesticides are deleted from the marketplace.
3. Marketing benefits of labeled IPM grown produce sold as both fresh or processed.
4. United States government's commitment to have 75% of U.S. crop production using IPM by year 2000 has improved IPM research focus.

## **Barriers and Incentives to Implementing Organic Agriculture**

Bernward Geier

International Federation of Organic Agriculture Movements (IFOAM)

This presentation will describe the differences between Organic Agriculture and Integrated Pest Management (IPM) strategies. It will highlight the underestimated contributions of organic farming to improve the environmental performance of agriculture. It will point out that organic agriculture is successfully practised on million of hectares all over the world. Organic agriculture is “sustainability put into practice” and is a fast-growing reality for 100 % pesticide risk reduction.

A short overview about the rapid development of organic farming world-wide will be given highlighting the fact that Austria, Switzerland and a number of Scandinavian countries have reached or are close to a 10 % share for organic farming, with some regions or federal states coming up to 50 % organic.

Among the identified **barriers** for an even faster development are:

- the (increasingly diminishing) ignorance of the political and public sector
- the financial and media power as well as the influence on farm associations by the chemical industry
- the fundamental challenge of organic agriculture methodologies (requiring a real paradigm shift) for the “establishment” of science and practical farmers alike
- the lack of internalisation of environmental and social costs, which creates an economically unfair “environment” for organic agriculture.

**Incentives** for organic farming are manifold and include among others:

- a profound environmental risk reduction
- “organic” consumer preference and premium prices and thus increasing farm income (“happier farmers and consumers”)
- economic benefits and image gain for agriculture/food industry
- in contrast to the wishy-washy “sustainable” rhetoric, organic agriculture has been given a detailed and clear definition in standards and national laws, and certification and accreditation programmes are well established
- increasing support from politicians and the public sector.

The presentation will conclude with a reflection on the competition between IPM and organic farming, arguing why IPM approaches are only “halfway” strategies not leading to the needed results to improve our environment in a real and sustainable way.

## **Barriers and Incentives to Implementing IPM: View From an Extension Officer**

Erich Jörg  
State Institute for Agronomy and Plant Protection  
Mainz, Germany

**There are three main barriers** to the implementation of IPM: insufficient tools (IPM methods), reduction in extension work and farmers' reluctance.

**Tools:** For many pests and diseases no integrated control strategy is available due to the lack of biological or biotechnical control methods, resistant cultivars, decision support systems (thresholds, forecasting models etc.) and finally selective compounds. This especially holds for minor crops. Many decision support systems elaborated several years ago still are not validated sufficiently or have not been adapted to the changing agronomical/economical situation. Some sampling and diagnostic methods required for pest and disease monitoring are hardly feasible for farmers. Sometimes IPM methods are more expensive than the use of broad-spectrum pesticides.

**Extension:** IPM extension work requires teaching farmers complex strategies. This is best achieved by training courses in small groups. Unfortunately during the last decade the staff of extension services has been reduced dramatically. Governmental budgets for applied research in agriculture have also been cut back, reducing the quality and quantity of new IPM systems developed.

**Farmer reluctance:** Farmers as a safety-oriented class of people often do not have confidence in IPM. The main reason is lack of knowledge, but market demands and the need for rationalization also force farmers to specialize in a few crops/cultivars and renounce diversity.

**Incentives** to promote IPM in agricultural practice must at least compensate for the higher costs of the methods. This can be done through government programmes that link payments directly to the use of biological/biotechnical methods or Integrated Farming or through higher prices for their products. A juridical definition to distinguish it from conventional agricultural practice would be helpful. Intensive efforts have to be taken to train farmers, to demonstrate IPM and to develop new IPM methods that farmers really can use. Computer-aided decision support systems can help to introduce complex IPM strategies into practice.

## Labelling and IPM

Leentje den Boer  
Center for Agriculture and Environment  
The Netherlands

Labelling of foodstuffs is a means to show consumers that the food has special qualities. Labels as a 'marketing means' have a limited potential, their impact on consumers behaviour should not be overestimated.

figure of the pyramid

Both Organic and Green label production use certified labels with well defined and controlled standards. Organic production can be considered as the ultimate type of IPM. Green labels, like the Dutch Milieukeur-label, guarantee minimal environmental impact without considerable production loss compared to conventional production. In Western Europe 'within chain' labelling initiatives of growers and retailers (e.g. Migros, Albert Heijn, Sainsbury) are flourishing. The reduction of the use of pesticides based on IPM-like practices is an important topic. These initiatives do not use specific labels but act more as a 'brand' quality guaranty.

Conventional production is situated at the bottom of the pyramid: focused on maximum production without considering the environmental impact of inputs beyond legal standards.

The market for organic produce is rapidly growing. However a market share of 10% within the next decade seems an illusion. This leaves an interesting market and a clear market position for 'Green label' production with solid environmental standards. Risk reduction by pesticides is an important item in guaranteeing product quality and biological control attracts modern consumers. This strong appeal of biological control will contribute to the marketing success of serious IPM-based labels.

By definition labelling requires a universal set of criteria and independent certification. For labelling IPM is a rather vague concept. Standards for IPM depend on accepted economic risk/damage not on environmental quality. Very different crop protection strategies, varying from very intensive spraying to almost 100% biological control are summarised under the heading IPM. This situation is clearly a contradiction to the condition that a label should guarantee quality.

The Pesticide Yardstick used in the Dutch Green label allows one to judge the environmental impact of pesticide use. Green Label production in the Netherlands results in 90% reduction of environmental impact compared to conventional production.

The actual experiences with Green label in the Netherlands and 'within chain' labelling initiatives do not allow high expectations of a price premium for farmers. However government organisations can stimulate IPM labelling initiatives by using financial instruments like green tax rates and green loans.

The challenge of labelling as an incentive for IPM is to develop standards which guarantee environmental benefit and added value for the consumer and at the same time limit production risks and offer a price premium for farmers. A strong and combined effort of all parties in the food chain can make such a (IPM-based) label successful.

(more information can be found at the Center for Agriculture and Environment's website, [www.clm.nl](http://www.clm.nl))

## **Barriers and Incentives to Implementing IPM: View of a Developing Country**

Simon Sithole  
Plant Protection Research Institute  
Harare, Zimbabwe

Population growth, hunger and environmental degradation constitute the main challenges of unprecedented magnitude to mankind in developing countries today. Human populations continue to increase while crop production per unit area of land shows little or no growth. Hunger and environmental degradation revolve around agricultural activities. Advancement in technologies during "Green Revolution" culminated in farmers' dependence on inorganic fertilizers and pesticides in a drive to increase crop yields and attain national food security. Although fertilizers and pesticides were considered effective interventions in the past, recent studies have shown that long-term and indiscriminate use of pesticides have negative effects on the environment. Potentially high use of pesticides leads to pest outbreaks and therefore farmers are demanding agricultural methodologies that are environmentally-friendly, increase land productivity and ensure long-term and sustainable use of land, water, and human resources.

During the past 50 years, a systems approach to crop protection problems under the theme "Integrated Pest Management" was developed. Although viable, the approach is still in its infancy and therefore subject to modifications. Recently, Zimbabwe's crop protectionists decided to follow a holistic approach to crop production and protection and termed it "Integrated Production and Pest Management" (IPPM). In this term the whole crop cycle is considered including land preparation, soil and water conservation techniques and compatible pest management strategies such as cultural, biological, natural through conservation on beneficial in the agroecosystem, chemical and use of resistant/tolerant varieties. This approach offers long-term solutions to low crop yields and pest management problems, especially for resource-poor farmers because it provides new options that reduce farmers' dependence on pesticide use while ensuring reasonably high land productivity.

There are several barriers and incentives to the development and implementation of IPM/IPPM in developing countries. Adoption has been slow and often culminates in periodic reproduction in food security world-wide with the concomitant spiral of poverty and malnutrition. It is therefore prudent to consider factors serving as barriers to IPM/IPPM and possible interventions to overcome (Table 1).

BARRIERS	INTERVENTIONS
<b>A: Price Factors</b>	
⇒ Government selling or providing pesticides free to farmers	Government not selling or providing free pesticides except in emergency times
⇒ Donors provide pesticides at low costs or free	Donors provide pesticides only when requested by government
⇒ Government refunds pesticide costs to agrochemical companies	Removal of pesticides subsidies and credit facilities
⇒ Preferential rates for tax and exchange involving pesticides	Removal of preferential tax rates for pesticides
⇒ Provision of outbreak to crop protection service	Vigorous monitoring of pesticide use and marketing by crop protection service
⇒ Existence of pesticide production externalities	Pesticide production monitored through legislation
<b>B: Non Price Factors</b>	
⇒ Lack of national policy on IPM/IPPM and non-existence of pesticide legislation and registration	Clear cut national policy on IPM/IPPM and institutionalisation like farming systems research
⇒ Lack /insufficient funding from government to support research on environmental impact of pesticide use (R & D).	Increase government financial support into research on non-chemical pest management strategies
⇒ Lack of adequate pest identification and definition of pest and crop loss.	Invest and increase manpower to training in biosystematics, crop loss and impact assessment
⇒ Poor linkages among policy makers, donors researchers, extension personnel and farmers	Improve linkage structures involving all clients and stakeholders
⇒ Poor information flow and exchange	Improvement in information flow and exchange via: brainstorming, group meetings (Farmer Field Groups), use of e-mail for inquiries and problem solving; data and paper publishing without costly publishing charges and web-mining

**Session 4 – How to Measure Progress**



## Measuring Progress in the Transition to Biologically-Based IPM

Sarah Lynch  
World Wildlife Fund, U.S.

Reducing public health and environmental risks associated with pesticide use is of growing concern to governments and citizens in developed and developing countries alike. This concern has motivated the call for the adoption of biologically based Integrated Pest Management (IPM) systems, an essential step in reducing risks from use of highly toxic pesticides. The adoption of IPM systems can achieve real pesticide risk reduction, but only when reliance on chemically based treatments is reduced and biologically based prevention interventions are maximized. IPM systems exist along a continuum ranging from those dominated by treatment oriented practices largely dependent on chemicals, to those mostly reliant on prevention-oriented biological processes.

An essential step in measuring and monitoring over time the risk reduction impacts of IPM is establishing a baseline of IPM adoption along the continuum. This requires collecting field level data on preventive practices, as well as pesticide use data. A measurement system<sup>1</sup> methodology has been developed to draw upon these data in empirically arraying fields or farms growing a particular crop along a continuum of IPM systems. Once farms or fields are divided into these four zones, average per acre pesticide use and risk levels within each zone can be estimated and compared.

*Incremental progress along the IPM continuum is critical in reducing reliance and use of high-risk pesticides.*

<b>No IPM</b>	← <b>Transitional IPM Systems</b> →		<b>High or Biointensive IPM</b>
	<b>Low</b>	<b>Medium</b>	
→ → → Shifting Reliance From Treatment to Prevention → → →			
→ → Chemically Based	→ → →		Biologically Based → →

Over the last year and a half WWF US has worked in a precedent setting collaboration with the Wisconsin Potato and Vegetable Growers Association (WPVGA), an agricultural commodity association made up of 250 growers, to achieve industry-wide reductions in pesticide risk and reliance through the adoption of biologically-based IPM. WWF and WPVGA agreed to ambitious five-year targets for steeply reducing the use of highly toxic chemicals and longer-term targets for the adoption of biologically based IPM. In order to ensure public accountability WPVGA and WWF worked together to implement a measurement system that will track potato growers' progress in meeting pesticide reduction and IPM adoption targets.

We will present results based on data collected in 1995 and 1997 on pesticide use in Wisconsin potato production. The collaboration's first-year use reduction goals are applicable to crop season 1997, with 1995 use levels serving as the baseline. Four critical analytical tasks are nearing completion and will be discussed in the presentation:

<sup>1</sup> See *Pest Management at the Crossroads*, Benbrook, C. et al., Consumers Union 1996.

- 1) **Setting quantifiable risk reduction targets and timetables.** WPVGA has committed to achieving one, three and five year targets for steeply reducing use of specific acutely and chronically toxic pesticides. In addition, five and ten year goals were established for moving growers from No and Low levels to Medium and High levels of IPM adoption.
- 2) **Defining the IPM continuum.** Working with WPVGA growers, crop consultants and IPM research and extension specialists we identified the IPM continuum for potato production in Wisconsin. The continuum captures the importance of specific IPM practices in contributing to the transition away from treatment and toward prevention oriented pest management systems in potato production.
- 3) **Establishing a baseline.** In order to measure changes in pesticide use, risk and reliance over time we established an industry-wide chemical use baseline using 1995 data. Practice data collected in 1997 and 1998 will generate the baseline of IPM adoption.
- 4) **Capturing changes in pesticide risk and reliance resulting from IPM adoption.** In order to track changes in pesticide risk and reliance, we convert data on pounds of pesticide active ingredient to toxicity adjusted units. The multiattribute toxicity index includes four component indices, each reflecting a broad area of potential risk: acute mammalian, chronic mammalian, ecological, and impacts on beneficial organisms and IPM systems.

For further information contact: Sarah Lynch, World Wildlife Fund, 1.202.778.9781, sarah.lynch@wwfus.org

## Measuring Performance with Integrated Farming for Better Management

Caroline Drummond  
Linking Environment And Farming (LEAF)  
United Kingdom

### Introduction

LEAF (Linking Environment And Farming) was set up as part of a pan-European group (the European Initiative for Integrated Farming) to encourage the uptake of Integrated Farm Management (IFM) - an approach to farming that is both economically viable and environmentally responsible. In the UK it became apparent from an early time that besides a network of Demonstration Farmers selected by LEAF there were other farmers who wanted to demonstrate their farming performance and others who wanted to improve their standards and adopt a similar approach. It was then that LEAF developed the LEAF Audit - a self assessment approach for farmers to ask themselves about their practices in a focused and disciplined way.

Although the LEAF Audit has been focused on the whole farm and the adoption of IFM, Integrated Pest Management (IPM) is a fundamental part of the approach. While IPM focuses on pest management, IFM balances IPM with the need to look at crop nutrition, energy use, pollution control, organisation and planning and wildlife and landscape management. Discussion will however be focused on minimising risk through an informed management approach with particular reference to IPM.

### The LEAF Audit

The LEAF Audit was developed five years ago as a management tool for farmers to use and encourage better attention to detail. With the experience that LEAF has built up over the years we have now computerised the LEAF Audit Software Package. This is a new and unique development offering a complete management package to help farmers record, evaluate and improve their farming practices against the standards of IFM. Originally the LEAF Audit gave a qualitative assessment of farm practices but we now have developed a rulebase for all sections of the audit - an eco-rating to assess performance against IFM - and this now also provides a quantitative assessment.

Features include, the LEAF Audit self-assessment forms covering the whole farm, on-screen access to advisory publications, detailed advisory information on key IFM topics, and, on return of their completed disk to LEAF, a personalised LEAF Performance Monitor offering detailed information on targets for action and a useful benchmark to assess environmental performance and adherence to IFM in all farming practices.

 **The LEAF Audit** - divided into the following self-assessment sections:

- Organisation and Planning
- Soil Management and Crop Nutrition
- Crop Protection
- Pollution Control and Waste Management
- Energy Efficiency
- Landscape and Wildlife Features
- Animal Husbandry

 **Advisory Information**

providing additional background information on key areas within the Audit, sources of further information and helpful hints on what action you can take to make improvements and on-screen access to the Ministry of Agriculture's Codes of Practice and LEAF's advisory publications.

 **The LEAF Performance Monitor**

When the disk is returned to LEAF for analysis, farmers will receive a LEAF Performance Monitor - this is a comprehensive report on the farmers quantifiable performance in all sections of the Audit, setting out suggestions for improvement and targets for action. As part of the report, farmers will be provided with their own Performance Profile giving an instant visual overview of overall performance and adherence to IFM.

The LEAF Audit Software Package is a progressive and practical management tool to help prioritise decisions and make meaningful changes to farming practices. It is also an excellent way to demonstrate environmental responsibility. LEAF also collates statistics from the returned audits to assess where farmers are getting it right and where there are concern areas that need to be addressed to improve performance both economically and environmentally.

## Measurement of IPM in South African Deciduous Fruit Orchards

Peter Dall  
Peter Dall Consultancy  
Republic of South Africa

Since the early 1990's South Africa has been pursuing an Integrated Fruit Production Programme which asks the producer to continuously apply the latest technology in his cultivation practices in order to:

- farm profitably in the short and long term.
- protect, conserve and improve the soil and the ecology.
- place health and welfare above all else.

In order to be credited as an IFP producer the following is required of the producer:

1. Attendance at an IFP and IPM course is compulsory for the representative of each participating farm.
2. Participating producers must compile a comprehensive survey plan for their farm.
3. Practice integrated pest management (IPM). Emphasis is placed on decreasing dependence on synthetic agro chemicals and promoting the safety of the farm worker and consumer in a healthy environment.
4. The grower must have a sound knowledge of the pest and diseases in his orchard as well as the level of pest and disease infection in each orchard. The grower must make use of well trained orchard monitors who regularly attend refresher courses.
5. The use of the tree row volume concept for the calibration of mist blowers is a prerequisite for effective application of pest control products.
6. Pyrethroids may only be used once during the flowering season if no alternatives are available.
7. Statutory regulations on the handling of chemicals must be adhered to.
8. The prescribed withholding period of all sprays must be adhered to and samples are drawn randomly for analysis to determine the residue value which must fall within the prescribed maximum residue level.

To participate in the IFP programme one is scored according to the attached scoring table and if one has higher than 30 points one is disqualified from the IFP programme.

For the IPM part of this questionnaire:

Five points If available monitoring methods are not applied.

Three points If orchard hygiene or other physical control measures were applicable and were not applied.

Two points If biological control agents were not promoted.

The IPM evaluation of the spray programme is also part of the scoring.

The implementation of the IPM programme is scored according to the attached table with the following example.

All spray programmes issued by the industry will state how many penalty points each product has at the stage of the fruits development.

There is no set number of maximum points in the industry at present although some of the packing sheds monitor their growers regularly and will disqualify them if more than 300 index points are recorded.

The aim must be to get a score of below 200 index points.

The implementation of this programme has been successful and we have seen a steady decline in the number of points in the spray programmes. The implementation of mating disruption, introduction of predators into the orchards and other programmes have assisted greatly in reducing the index score.

## POINTS SCALE FOR IFP

## ANNEX 1

ITEM	Disquali- fication	PENALTY						Points deducted
		5	4	3	2	1	0	
1. Producer								
2. Farm and orchard environment								
3. New plantings								
– Soil and terrain								
– Replant disease, etc.								
4. Cultivars								
5. Rootstocks								
6. Orchard floor management								
7. Nutrition								
8. Irrigation								
9. Pruning and training								
10. Thinning		See Annex 4						
11. Growth regulation/russeting		See Annex 4						
– Tree growth		See Annex 4						
– Russeting		See Annex 4						
– Delayed foliation		See Annex 4						
– Preharvest fruit-drop		See Annex 4						
12. Integrated pest management								
– Monitoring								
– Orchard hygiene								
– Biological control								
13. Post-harvest handling								
– Post-harvest practices								
14. Handling of chemicals*								
– Safe-keeping								
– Hygiene and orderliness of chemical store								
– Protective clothing								
– Training and medical								
– Disposal								
15. Records								
<b>TOTAL</b>								
[Disqualified if higher than 30]								

\* Can lead to disqualification

ANNEX 2

**IPM EVALUATION OF SPRAY PROGRAMME**

PRODUCT	STAGE(S)			IPM CODING (C)							TOTAL
	Before green-tip to full bloom  (X1)	Full Bloom to end Dec  (X2)	End Dec to harvest  (X6)	Within recommendations			Outside Recommendations				IPM
				Permitted  (X1)	Permitted with Restrictions  (X4)	NP with exceptions  (X6)	Permitted  (X6)	Not Permitted  (X24)	Permitted with Restrictions  (X8)	NP with exceptions  (X12)	INDEX  (S)x(C)
THIO FLO		X2			X4						8
TOTAL											

S = stage  
 C = coding  
 NP = not permitted

## **Introducing a Policy Perspective in the Evaluation of IPM Adoption**

Hermann Waibel  
University of Hannover

This paper deals with the methodology of IPM impact assessment as part of the adoption process of IPM in a country, region or cropping system. It is argued that adoption of IPM has to be measured at different levels that includes the farmer as well as policy change. Adoption of IPM is being seen a process in which the way of thinking is changed at the level of policy makers, extension agents, farmers and their organisation, consumers, private industries and other relevant groups of the society.

The introduction of IPM, first of all needs a clear vision of what is expected if the measurement of adoption shall have any meaning. The success of IPM projects must be measured relative to their objectives whose definition depend on the situation of crop protection in the country. There are basically two distinct situations:

- 1) A country, a region or a cropping system is already dependent on pesticides with indicators of their over-and misuse. The goal of IPM clearly must be to reduce pesticide use to a socially optimal level and to take the system out of this dependency.
- 2) In a situation of extensive agriculture with zero or low levels of pesticide use, the aim of an IPM project consequently will be to avoid the system to be driven into pesticide dependency (or any other dependency like that form transgenic plants) as a pre-condition for sustainable intensification.

Adoption of IPM must be demonstrated in its economic and non-economic benefits, which accrue to farmers and society. On the farm household level, economic benefits may include factors like reduction in pesticide costs, stabilised income and improved health status of farmers and farm labourers. Non-economic benefits may include factors like farmers increased understanding of the agro-ecosystem and more ownership in technology. For the society benefits can include savings in foreign exchange and improved environmental quality.

For the measurement of IPM, a cost benefit concept to be extended into a multi-criteria framework is proposed. A successful IPM initiative will induce a process that leads to better crop management decision making, stimulates a discovery process among farmers, strengthens the build-up of new institutional capacities and intensifies policy interaction among different interest groups of the society. The changes induced by an IPM initiative must be consistent with the basic tenets of welfare theory. This must be shown in a gradual reduction in economic distortions and the recasting of inappropriate procedures. IPM evaluation is proposed to start with a country study on crop protection policy which would lead to the formulation of an optimal mix of policy instruments subject to a defined objective.

The paper concludes that without a national IPM policy in place that goes beyond the so far dominant command and control philosophy IPM adoption is not likely to lead to pesticide risk reduction. More emphasis need to be given to economic instruments and crop protection policy more effectively integrated into agricultural and environmental policy.



## **Annex 4**

### **An overview of the IPM activities of international organisations participating in the OECD Pesticide Forum**

◆ OECD:

The Pesticide Programme

The Joint Working Party for the Committee on Agriculture and the Environment Policy  
Committee

◆ FAO

◆ Global IPM Facility

◆ European and Mediterranean Plant Protection Organisation

◆ World Wildlife Fund

◆ Global Crop Protection Federation



## **OECD**

The Organisation for Economic Co-operation and Development (OECD) is an intergovernmental organisation which works to improve and harmonize policies that affect economic growth, trade and social welfare in and among OECD countries. Founded in 1960, the OECD now has 29 member countries (Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Republic of Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States). The OECD's main function is not to create international laws but rather to provide a forum for its member governments to exchange their different points of view, analyse issues of concern, and work together to improve government policies.

In the area of agriculture and pesticides, the OECD is currently carrying out projects related to integrated pest management and pesticide risk reduction in both the Pesticide Programme, which is located in OECD's Environment Directorate, and the Joint Working Party for the Committee on Agriculture and the Environment Policy Committee (JWP), which is administered jointly by the Agriculture and Environment Directorates.

### **The Pesticide Programme**

Established in 1992, the OECD Pesticide Programme works to help OECD governments improve and harmonize pesticide testing and assessment methods, share the work of pesticide registration and re-registration, and reduce the risks associated with pesticide use. To date, the Pesticide Programme's activities on risk reduction have focused mainly on helping governments to share information about their different policies and programmes. This has become especially important in the last few years as many OECD governments have adopted goals to reduce pesticide risks or increase the use of integrated pest management in agriculture. Some of the Pesticide Programme's risk reduction activities have been undertaken jointly with the United Nations Food and Agriculture Organisation (FAO), so that member countries of both organisations could benefit from the exchange of information.

The Programme's pesticide risk reduction activities have included:

- a survey of OECD and non-OECD FAO member countries' activities to reduce the risks associated with pesticide use in agriculture (report published in 1996);
- a workshop to discuss the results of the survey and recommend further actions that could be undertaken by international organisations, national governments, and others to reduce risks associated with pesticide use (Uppsala, Sweden, October 1995);
- a workshop to recommend approaches to developing pesticide risk indicators that could measure risk trends over time (Copenhagen, April 1997), followed by initiation of a project to develop indicator models for both human health and the environment;
- a survey of OECD member countries' approaches to the collection and use of agricultural pesticide sales data (to be published in 1998);
- participation in a European Commission (EC) project (led by the EC's statistical office, Eurostat) to develop guidelines for collecting data on pesticide use in agriculture (guidelines expected to be published in 1998);
- the forthcoming workshop on integrated pest management and pesticide risk reduction (Neuchâtel, June-July 1998).

Two recommendations made by the workshop in Uppsala have provided the framework for the Neuchâtel workshop. The first was that the Pesticide Programme should initiate activities to help countries share information about integrated pest management and how it can reduce risks associated with pesticide use in agriculture. The second was to develop systems to measure progress in risk reduction in the IPM context.

### **The Joint Working Party for the Committee on Agriculture and the Environment Policy Committee**

The Joint Working Party for the Committee on Agriculture and the Environment Policy Committee (JWP), created in 1993, is composed of agriculture and environment representatives from OECD governments. It provides a forum for the exchange of information and points of view on agriculture-environment relationships with a view to promoting economically sound agricultural and environmental policies. Issues addressed by the JWP include:

- the consequences of agricultural policies and policy reform on the environment
- the development of agri-environmental indicators for use in tracking trends and analysing policies;
- the effectiveness of specific government policies and of market, voluntary/co-operative, and farm level approaches to achieve goals for environmentally sustainable farming and forestry;
- the development of an integrated approach to the design and implementation of agricultural and environmental policies;
- the relationship between agricultural, environmental and trade policies (including post Uruguay Round developments); and
- the impact on agriculture of environmental and climate change, non-agricultural sources of pollution, and environmental policies.

The JWP's work related to pesticides has focused in two areas: analysing pesticide policies and developing agri-environmental indicators.

### **Analysis of Pesticide Policies**

In 1995-1996 the JWP carried out a series of country case studies to assess the impacts of agricultural and pesticide policies on pesticide use. The case studies were done in Australia, France, Italy, Japan, Sweden, the United Kingdom and the United States. The results were published in 1997 in two reports: *Agriculture, Pesticides and the Environment: Policy Options* (an overview and analysis of the findings), and *Agriculture, Pesticides and the Environment: Policy Options – Annexes* (containing the original case studies). Both reports are available from the OECD Secretariat.

The reports identify policies that reduce risk from pesticide use and promote safer, more effective, and less environmentally damaging handling and application of pesticides. The main conclusions were that:

- environmentally beneficial agricultural support should focus directly on measures targeted to environmental outcomes, and attention should be paid to the design and implementation criteria of agricultural policies;
- streamlining the regulatory system and establishing private markets can help to improve pesticide application and to reduce environmental impacts of pesticide use;
- the generation of information, such as individual farmers' pesticide use data or other indicators on pesticide use, can contribute to a successful mix of policies.

## **Development of Agri-Environmental Indicators**

The JWP has identified 13 areas for development of agri-environmental indicators whose purpose would be to:

- provide information to policy makers and the public about the state of the environment in agriculture;
- help policy makers understand the impacts of agriculture and agricultural policy on the environment, and help guide their responses; and
- contribute to monitoring and evaluation of the effectiveness of policies in promoting sustainable agriculture.

The 13 areas targeted for work are:

- |                             |                            |
|-----------------------------|----------------------------|
| • nutrient use              | • biodiversity             |
| • pesticide use             | • wildlife habitats        |
| • water use                 | • landscape                |
| • land use and conservation | • farm management          |
| • soil quality              | • farm financial resources |
| • water quality             | • socio-cultural issues    |
| • greenhouse gases          |                            |

Work currently underway on the indicators of pesticide use and farm management include:

- collection of data on total pesticide use and use per crop/hectare in OECD countries (data sources include FAO and the OECD report Environmental Data [I will have to check the title], published every two years)
- development of a paper on farm management indicators for an OECD workshop on agri-environmental indicators to be held in September 1998 in York, United Kingdom. The paper will identify areas in which farm management indicators are needed and will review selected OECD member country experiences in developing indicators of nutrient management, soil management, pest management (e.g. IPM), irrigation, and whole farm management.

## **FAO**

### **IPM Activities Conducted by the Plant Protection Service**

The United Nations Food and Agriculture Organization (FAO) Plant Protection Service conducts a large number of activities relevant to IPM with core and extra-budgetary funds. This overview describes only those activities that focus specifically on IPM development and implementation by farmers. Other activities carried out by the Plant Protection Service, such as pesticide management, biological control and pest control in general, although relevant to IPM, were considered outside the scope of the overview.

FAO focuses on IPM as a way to maximise the value of the crop to farmers while minimising environmental and health risks in a sustainable way. Farmers practising IPM rely on a range of pest management practices such as cultural practices, biological control, host plant resistance and pesticides used only as needed and in an integrated way. IPM is not a technology but a problem-solving process whereby farmers learn from their own experiences and carry out their own research to develop and implement solutions for their crop management problems.

The Plant Protection Service's main vehicle for farmer training is the Farmer Field School (Farmers Field School). Most schools are organised for groups of about 25 participants with common interests who can support each other, both with their individual experience and strengths and to create a "critical mass." The schools are conducted by trainers who are skilled in non-formal education techniques.

Characteristic of the Farmer Field School approach is its season-long training, experimenting by farmers in their own fields, group discussions, and the taking of informed crop management decisions based on field observations. Participation is the key element in the school curriculum. The curriculum begins with various pest control disciplines but it is quickly enlarged to cover agronomy, crop management, and effective use of inputs such as fertiliser, varieties of crops, and water.

The first Field Schools were established in 1989 in Central Java. From this activity developed the Inter-Country Programme for the Development and Application of IPM in Rice in South and South East Asia that started its fourth phase in 1998 with a five year duration. The programme's annual budget, provided by various donors, is in the order of US\$5 million. Assistance is provided to 12 Asian countries: Bangladesh, Cambodia, China, India, Indonesia, Laos, Malaysia, Nepal, Philippines, Sri Lanka, Thailand and Vietnam.

This Inter-Country Programme has trained over one million rice farmers in more than 60,000 communities in the use of IPM in rice and rice-based farming systems. The farmers have experienced significant increase in rice yields and a more rational use of inputs after adopting IPM. These results reflect the improved crop management that results from the IPM training.

Based on the experiences with the rice programme, an Inter-Country Programme for the Development and Application of IPM in Vegetable Growing in South and South East Asia was launched in 1996. Initially the Programme covered four countries -- Bangladesh, Lao PDR, Philippines and Vietnam -- but it was later expanded to include Cambodia, Indonesia and Thailand. The objective is to train about 13,000 vegetable farmers in each country during the four year project. The annual budget of this programme is around US\$1.5 million per year.

Other IPM programmes being implemented by the Plant Protection Service include:

- A large rice IPM farmer training project in Bangladesh that is supported by the United Nations Development Programme (UNDP), and operates in close collaboration with IPM projects supported by the governments of Denmark and the UK, and the European Commission (the latter two implemented by CARE, an international non-governmental organisation).
- A cotton IPM project started in Sudan in 1979, continued with some interruptions until 1996, and now continued with funds from FAO's Technical Co-operation Programme. The project showed that the use of pesticides in cotton could be reduced substantially and therefore the last phase was focused on IPM in vegetables using farmer field schools as the training methodology.
- Four projects on rice IPM financed from FAO's Technical Co-operation Programme in Ghana, Cote d'Ivoire, Burkina Faso and Mali, that are transferring the experience gained in Asia to Africa. Initially, trainers from Asia had to be used to run the farmer field schools but gradually a nucleus of French and English speaking African trainers is being formed. These projects terminated in 1997, but a follow up three-year project within the framework of the UNDP's National Poverty Reduction Programme was approved for Ghana in 1997. Discussions with interested donors are ongoing for follow-up activities in the other countries.
- A project on cotton IPM financed by FAO that is being implemented in Zimbabwe.
- IPM implementation projects that are planned in various Latin American countries including Cuba, Peru, Paraguay and parts of Brazil.
- Workshops on various IPM topics that are regularly organised in different parts of the world, often in collaboration with other organisations.

In addition to these activities, FAO is a co-sponsor and host of the Global IPM Facility, which facilitates many of the field activities mentioned, especially in Africa and Latin America.

## **THE GLOBAL IPM FACILITY**

### **Objectives**

The Global IPM Facility was established in 1995 under the co-sponsorship of FAO, the United Nations Development Programme, the United Nations Environment Programme and the World Bank, and its Secretariat began operating in 1997 with core support from the Netherlands, Norway and Switzerland. The Facility's annual budget is about US\$2 million.

The Facility is intended to address the problem that, despite wide recognition that IPM contributes to ecologically sound and sustainable agriculture, IPM implementation in a global context, has been disappointingly slow. This is in a large part due to a lack of specialised technical expertise, dedicated and skilled field trainers, detailed analyses of policy, social and economic issues at the national and local levels and political commitment.

The Global IPM Facility draws on local, national and international resources to assist in identifying, designing and monitoring selected IPM projects. It aims to meet two overall objectives: (a) to improve and implement programmes that put IPM practices in the hands of farmers through farmer networks, extension services and research institutions; and (b) to link farmers, NGOs, researchers and extension services to promote and develop IPM.

### **Key Activities**

The Facility meets these objectives through a number of activities such as study tours and field visit exchanges for farmers, technical leaders and policymakers that create awareness of IPM's potential. The Facility is involved in designing and facilitates the funding and technical support of pilot projects which focus on farmer-oriented approaches to IPM, such as Farmers Field Schools (Farmers Field School) and Training of Trainers (TOT) initiatives, and assists countries with successful pilot projects to move into a full-scale national programmes. It also helps to strengthen existing national and regional IPM programmes by field oriented links to other national IPM programmes.

The Technical Support Group (TSG) to the Global IPM Facility, based at CABI Bioscience in Ascot (UK), is involved in creating a documentation and resource centre for various farmer-led research activities such as TOT course curricula, and related scientific material. As part of this the TSG produces and distributes customised technical information and training materials for Facility activities.

The Pesticide Policy Project at the Institute of Horticultural Economics at Hanover University is also a partner of the Global IPM Facility, with field collaboration in Africa, Asia, and Latin America and policy analytical work in Germany.

### **Field Cases in Africa**

The Global IPM Facility is working with African and global institutions to begin building successful IPM programmes. Two national programmes in Zimbabwe and Kenya illustrate the type of facilitation carried out by the Facility.

In Zimbabwe, the Ministry of Agriculture and FAO have established a Technical Cooperation Project to train national extension staff with IPPM (Integrated Production and Pest Management) and management skills that we allow them to run a national IPPM training programme in the second phase. The Facility supported international study tours of Zimbabwean policy makers in Pakistan and Bangladesh to learn from local, national, and NGO run IPM training programmes. During the first phase of the project, trainers from CARE Bangladesh and Vietnam Cotton Company, as well as the Global IPM Facility itself, assisted in carrying out the first IPM Core Trainers training. This training in turn became a case study for 13 African and 2 South American countries to observe first hand cotton IPM implemented by farmers.

The Facility will continue to link extension, research, NGOs, and lending institutions across Africa. It is currently identifying Africa expertise and appropriate institutions to ensure that the IPM programme development is sustained by local efforts and creativity.

Small-scale farmers in Central Kenya growing vegetables and coffee were spending an increasing proportion of their production costs on insecticides and fungicides. A pilot Farmers Field School project funded by the Facility was set up in 1996 in Kenya by CABI Bioscience collaborating with the Kenya Institute of Organic Farming (KIOF) and the Coffee Research Foundation. Through the project local government extension staff assisted farmers' groups to carry out experiments on non-chemical soil treatments to reduce soil borne diseases and insect pests and to experimented with organic methods. Several Farmers Field School groups were involved, conducting experiments on the management of such problems as potato and tomato blight and wilt, and black rot of *Brassicas*. The farmers' groups are now actively seeking methods to reduce pest and disease damage without using pesticides, and are beginning to drive Farmers Field School curriculum development demanding, for instance, training on grafting new disease resistant cultivars onto existing root stocks for coffee.

IPM trainers from the local extension staff in a parallel project in maize and bean growing communities in Western Kenya had originally received IPM training skills for Farmer Field Schools in the Philippine National IPM Programme. Farmers increased yields and profits compared with standard packages, largely through better management of plant nutrients.

## **The Future**

By the end of year 2000 the Facility hopes its impact will be reflected at both field level and policy/institutional level. At the field level, national IPM programs will have been established in several countries, the majority in Africa. Training of Trainers and Farmer Field Schools will have been implemented in several countries with technical support from Facility partners or through expert exchanges between national IPM programme partners. New IPM based solutions to field level problems will have been incorporated into national and regional IPM programmes. At the policy and institutional levels, regional meetings will have been held and regional IPM programmes developed through dialogue between donors and entities within individual regions. Participating national IPM programmes will have evaluated plant protection and extension policies and programmes, and begun to strengthen them by placing a stronger emphasis on farmer education and community action.

## **EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANISATION**

### **Status**

The European and Mediterranean Plant Protection Organisation (EPPO) is an intergovernmental organisation responsible for international cooperation in plant protection in the European and Mediterranean region. In the sense of the article IX of the FAO International Plant Protection Convention, it is the regional plant protection organisation for Europe. Founded in 1951 with 15 member governments, it now has 39 member governments including nearly every country of Western and Eastern Europe and the Mediterranean region. EPPO Member Countries (position at 1997-09): Albania, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Guernsey, Hungary, Ireland, Israel, Italy, Jersey, Jordan, Latvia, Luxembourg, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK, Ukraine.

### **Aims**

- To prevent the introduction and spread of pests which attack and damage crops and forests.
- To develop a common strategy against the introduction and spread of pests, particularly by the harmonization of phytosanitary regulations.
- To ensure cooperation and harmonization in all areas of plant protection where Governments take official measures (registration of plant protection products, certification of plant material, forecasting and warning systems).
- To promote the use of modern, safe and effective pest control methods, according to the principles of good agricultural practice.
- To provide a documentation service for provision and exchange of information in all areas of activity.

### **EPPO Activities**

EPPO's technical activities are directed by two Working Parties (on Phytosanitary Regulations, and on Plant Protection Products). Their respective programmes cover: limiting the spread of pests between countries (broadly plant quarantine) and controlling plant protection activities within countries. Each Working Party meets once a year (in June and May, respectively). The meetings are held in Member Countries throughout the EPPO region.

The Working Parties draw up their programmes subject to the approval of the Executive Committee and Council. They assign specific tasks to Panels, composed of specialists from Member Countries, nominated as individuals, which prepare detailed draft recommendations for the Working Parties. Every year, 10-15 Panel meetings are held in Paris or in scientific centres throughout the region. The technical work of the Organization depends on the active and continued participation of experts from Member Countries in the Working Party and Panel meetings. The Secretariat prepares and runs all meetings, and coordinates the activity which arises from them. It is responsible for all publication and documentation services (including computer data bases). EPPO has published over 200 guidelines on efficacy evaluation

of plant protection products, 12 guidelines on good plant protection practice and 9 sub-schemes of the decision-making scheme for environmental risk assessment.

EPPO guidelines on good plant protection practice (GPP) are intended to be used by National Plant Protection Organizations, in their capacity as authorities responsible for regulation of, and advisory services related to, the use of plant protection products. For each major crop of the EPPO region, GPP guidelines cover methods for controlling overall pest spectrum. The main purpose of the guidelines on GPP is to provide recommendations on how to use products safely and effectively, but also to encourage integrated control.

**Some of the EPPO Panels are:**

- Panel for the Efficacy Evaluation of Fungicides and Insecticides
- Panel for the Efficacy Evaluation of Herbicides and Plant Growth Regulators
- Panel on Rodent Control
- EPPO/Council of Europe Panel on Environmental Risk Assessment of Plant Protection Products
- Panel on Good Plant Protection Practice (GPP)
- Panel on Resistance
- Panel on the introduction of exotic biocontrol agents

**WORLD WILDLIFE FUND**  
**Ecologically-Based IPM**  
**WWF’s Vision for Reducing Reliance on Pesticides**

WWF, known in the United States and Canada as World Wildlife Fund and as World Wide Fund for Nature in other countries, is an international network of 29 organisations dedicated to protect the diversity of life on earth. Now in its fourth decade, WWF works in more than 100 countries around the globe and has over 4.5 million supporters’ world wide. WWF’s goal is to stop, and eventually reverse, the accelerating degradation of our planet’s natural environment, and to help build a future in which humans live in harmony with nature. Responding to the global threat to biodiversity and ecosystem function from toxic chemical pollution, WWF has established a Toxic Chemicals Strategy. The purpose of this strategy is to promote an informed understanding of the effects of toxic chemicals on ecosystems, wildlife and humans—the lethal as well as sub-lethal, chronic effects, including disruptions to reproduction and development—and to reduce and eliminate, as warranted, the production and use of those chemicals that may cause significant harm, while offering ecologically sound alternatives and solutions.

WWF promotes the increased adoption of ecologically-based IPM as a means to achieving reduced risk and reliance on highly toxic pesticides in agriculture. Increasing adoption of biointensive IPM is a win-win strategy for agriculture and the public, a strategy that can both maintain economic competitiveness and ensure environmental stewardship so vital to a healthy planet. IPM systems exist along a continuum ranging from treatment oriented practices dependent on chemicals to prevention oriented approaches that rely on biological processes. WWF has been instrumental in developing the concept of the IPM continuum and identifying costs-efficient approaches to measure adoption of IPM and capture changes in pesticide risk and reliance.

*IPM systems can achieve real pesticide risk reduction when reliance on chemically based treatments is reduced and biologically based prevention interventions are maximised.*

<b>No IPM</b>	<b>← Transitional Systems →</b>		<b>High or Biointensive IPM</b>
	<b>Low</b>	<b>Medium</b>	
→ → → Shifting Reliance From Treatment to Prevention → → →			
→ → Chemically Based		→ → → Biologically Based → → →	

WWF organisations are engaged in efforts around the world to support pesticide risk reduction and IPM adoption including.

- Advocating for the establishment of national IPM adoption and pesticide risk reduction goals, timetables, and risk reduction indicators. Agricultural producers, governments and international Organisations need to commit to moving incrementally along the continuum of IPM systems to prevention oriented approaches that rely on biological processes.
- Developing and promoting use of transparent, credible IPM and risk reduction measurement systems to track progress over time. Broad-based participation by stockholders needs to be incorporated to ensure establishment of meaningful goals and systems of accountability. WWF US has developed with others a measurement system to evaluate the degree of adoption of IPM systems and reductions in pesticide use, risk and reliance.

- Actively working with agricultural producers to identify and implement ecologically based IPM.
- Communicating to the public the benefits of IPM. Garnering marketplace rewards and greater public recognition for food and fiber produced using IPM provides additional incentives for growers to move along the continuum.

**For further information on WWF's activities on pesticide risk reduction and IPM contact:**

WWF US, Sarah Lynch, 202.778.9781, sarah.lynch@wwfus.org, web site: <http://www.worldwildlife.org>

WWF Canada, Julia Langer, 416.489.4567, julia.langer@wwfcanada.org, web site:

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WWF Germany, Ulf Jacob, 0049.421.6584.614, jacob@wwf.de, web site <http://www.wwf.de>

**GLOBAL CROP PROTECTION FEDERATION**  
**Integrated Pest Management and Risk Reduction - The Way Forward**  
**for the Global Crop Protection Industry**

The Global Crop Protection Federation represents the crop protection product manufacturers and their regional associations in Asia, Africa and Middle East, Europe, North and South America, and Japan. In all, GCPF covers around 90% of the Crop Protection Industry in 73 countries.

GCPF has formally adopted a policy to support the aims of sustainable agriculture to produce sufficient affordable food and fibre in an economically viable, environmentally sound and socially acceptable manner. This includes supporting the practice of IPM as defined by the FAO Code of Conduct on the Distribution and Use of Pesticides<sup>(1)</sup>.

This commitment to and policy on IPM has been incorporated into a GCPF Declaration of Crop Protection Industry Policy on IPM, which has been signed at the highest management levels in the industry. The full text of this declaration can be found in the GCPF Monograph "IPM - The Way Forward for the Crop Protection Industry", copies of which will be available at the IPM Risk Reduction Workshop or can be obtained from the GCPF secretariat.

To put this policy into practice, GCPF and its members will

- provide farmers and growers with products and services that can be used safely and effectively in the protection of the crop against unacceptable damage caused by weeds, pests and diseases;
- encourage the implementation of IPM by developing and making available products, techniques and services that integrate with IPM programmes;
- work with farmers, agricultural researchers, advisers, and other relevant partners to develop and test IPM strategies;
- train farmers and growers in understanding and applying the principles of IPM as well as in the safe and effective use of crop protection products;
- measure progress of member companies in adopting IPM principles and complying with the GCPF declaration on IPM.

GCPF is committed to a continuous drive towards risk reduction from the use of crop protection products well beyond promoting the adoption of IPM as a component of integrated crop production. This is exemplified by the GCPF Safe Use Project, which started in 1991 in the three pilot countries Kenya, Guatemala and Thailand. In phase 2 (1995-1997) and phase 3 (1998-2000) activities of this Safe Use Initiative which is now run in partnership with governments, donors and NGOs have been extended to Sri Lanka, Indonesia, The Philippines, Bangladesh, Malaysia, Vietnam, Tanzania, Zimbabwe, Malawi, Zambia, Sudan, Argentina, Brazil, Dominican Republic, Chile, Colombia, Bolivia, Nicaragua, Costa Rica, Mexico, Belize, Honduras, El Salvador, Paraguay, Ecuador, Venezuela and Panama. Several million farmers have meanwhile been trained.

Other activities include the production of Guidelines which contribute to the reduction of risk in crop protection product manufacture, distribution and use; the discovery and development of newer, more specific products for use at ever decreasing dose rates; formulation and pack developments designed to

reduce the risk both in the product supply chain and in the spraying operation (including container opening, measuring product, dispersing it and rinsing the container).

All this demonstrates the crop protection industry's commitment to risk reduction, in which IPM can play an important role. GCPF is ready to collaborate in the promotion of world-wide adoption of IPM with interested parties such as Governments, FAO, the World Bank, donors and aid agencies, the food industry, NGOs and the farming industry. The essential part industry has to play in stimulating IPM is described in detail in the Monograph mentioned above. Industry has the capabilities relevant to making IPM a reality in the hands of farmers, growers and their advisers who try to manage weeds, pest and diseases with minimal risk and in a sustainable way.

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<sup>(1)</sup> IPM is defined by the FAO Code as a pest management system that, in the context of the associated environment and the population dynamics of the pest species, utilises all suitable techniques and methods in as compatible a manner as possible and maintains pest population at levels below those causing economically unacceptable damage or loss.