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PROCEEDINGS

UNEP/FAO/WHO
Workshop on sustainable approaches for pest and vector management and opportunities for collaboration in replacing POPs pesticides

Bangkok, March 6-10, 2000

UNITED NATIONS

Prepared by UNEP Chemicals

IOMC

INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS

A cooperative agreement among UNEP, ILO, FAO, WHO, UNIDO, UNITAR and OECD

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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 OECD (Participating Organizations), following recommendations made by the 1992 UN Conference on Environment and Development to strengthen cooperation and increase coordination in the field of chemical safety. In January 1998, UNITAR formally joined the IOMC as a Participating Organization. The purpose of the IOMC is to promote coordination 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.

UNEP CHEMICALS

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PROCEEDINGS

Workshop on sustainable approaches for pest and vector management and opportunities for collaboration in replacing POPs pesticides
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UNEP/FAO/WHO
Workshop on Sustainable Approaches for Pest and Vector Management and Opportunities for Collaboration in Replacing POPs Pesticides

March 6-10, 2000 in Bangkok, Thailand

Introduction

Following the United Nations Environment Programme (UNEP) Governing Council decision 19/13c in 1997 on international actions to reduce/eliminate releases of Persistent Organic Pollutants (POPs), UNEP Chemicals, in collaboration with the Intergovernmental Forum on Chemical Safety (IFCS), organized during 1997-1998 a series of regional/sub-regional awareness raising workshops on POPs. The workshops aimed at assisting government authorities of developing countries and countries with economies in transition to prepare for the negotiations of a legally binding instrument on POPs that started in Montreal, Canada in mid 1998.

UNEP Chemicals subsequently started a new cycle of regional/sub-regional workshops on POPs management and replacement methods aiming at the reduction of the releases of POPs chemicals into the environment. As part of this new cycle this workshop addressed sustainable approaches to reduce and/or eliminate the uses and releases of POPs pesticides, that is sustainable use of alternative methods, including chemical and non-chemical ones.

The POPs pesticides; aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, and toxaphene, have been used to control several pests and vectors since their introduction. In recent years, most countries have legally curtailed most uses. However, continued application includes use of DDT for vector control of disease-bearing pests like malaria mosquitoes and chlordane, heptachlor, and mirex for termite and ant control. Alternative strategies are available, but often are more expensive and require a commitment to change established practices and accelerate integrated pest management, which draws on a variety of measures, including non-chemical and safer chemicals.

The aim for this workshop was to identify opportunities for coordinating efforts among different sectors, in particular between health and agricultural sectors, and assess how such coordination could bring mutual benefits and contribute to cost savings and reduced pesticide use. This first workshop on Sustainable Approaches for Pest and Vector management and Opportunities for Collaboration between health and agriculture authorities in replacing POPs pesticides was organized jointly with FAO and WHO.
Government experts and decision makers from Indonesia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, and Vietnam attended the workshop.

The objectives of this workshop were to:
- Review the current state of the art and explore alternative approaches to POPs pesticides in pest and vector management and identify more sustainable strategies using the principles of integrated pest management;
- Identify opportunities provided by the collaboration of IPM and IVM programmes, as well as the constraints to such collaboration, and to identify needs (including capacity building needs) in support of IPM and IVM programmes and their collaboration; and

- Begin developing a joint decision making process through which IPM and IVM programmes can collaborate and be mutually supportive, leading to (national) action plans for reducing/eliminating POPs pesticides as well as contributing towards an accelerated reduction in pesticide use

The expected outputs of for the workshop were:

- Professional staff awareness raising on IPM and IVM, and on opportunities and constraints for collaboration between IPM and IVM programmes at community and national levels
- Identification of needs to support and strengthen the collaboration between IPM and IVM programmes, as well as recommendations to initiate a joint decision making process within national action plans on POPs pesticides
- Basis to further develop pilot field activities to establish collaboration between IPM and IVM programmes
- Report of the workshop with recommendations

This document includes: the programme, list of participants, the report of the meeting, working group reports and expert and country presentations. These proceedings will also be made available on the POPs Internet homepage at: http://www.chem.unep.ch/pops/

Workshop on sustainable approaches for pest and vector management and opportunities for collaboration in replacing POPs pesticides
Bangkok, March 6-10, 2000

UN Conference Center, Bangkok

Day 1

8.30 - 9.00	Registration	
9.00 - 9.30	Opening	*Mr. N. Andrews, Regional Director UNEP ROAP* *Robert Bos, WHO* *Patricia Matteson, FAO* *John Whitelaw, UNEP*
9.30 - 9.45	Introduction of participants	
9.45 - 10.00	Status of immediate actions on POPs and the Negotiations of a Global Treaty to Reduce and/or Eliminate their releases	*John Whitelaw, UNEP*
10.00 - 10.30	Coffee break	
10.30 - 11.00	Roll Back Malaria Programme; DDT Action Plan	*Robert Bos, WHO*
11.00 - 11.15	Alternative Approaches to POPs and rationale for collaboration between IPM and Vector Control	*Agneta Sunden, UNEP*
11.15 - 11.45	Integrated Vector Management	*Willem Takken, WAU*
11.45 - 12.15	Implications of health sector decentralization for vector control in Sri Lanka	*Dr. F.P. Amerasinghe, Sri Lanka*
12.15 -12.30	Discussion	
12.30 - 14.00	Lunch break	
14.00 - 14.30	Community IPM and Vector Management opportunities	*Patricia Matteson, FAO*
14.30 - 14.45	Guidance Document on IPM/IVM, UNEP/WHO/FAO	*Johan Morner*

14.45 - 15.30	Round table discussion on ongoing IPM / IVM programmes in participating countries	
15.30 - 16.00	<u>Coffee break</u>	
16.00 - 16.45	The Role of Policy Analysis and Policy Formulation in Replacing POP's Pesticides in IVM/IPM	*Hermann Waibel, University of Hannover*
16.45 -17.00	Presentation of relevant UNEP Clearinghouse activities	*Alwin Kool, UNEP*
17.00 - 17.45	Preparations for Field Trip	*Marjon Fredrix, UNEP, Patricia Matteson FAO*

<u>Day 2</u>

8.00	departure from hotel Field trip to IPM Training of Trainer, Ayuttaya Province	
	Morning IPM Concepts and Experiences in Thailand and meeting with IPM Trainers and Farmers	*Rice Training of Trainer Representative*
	Discussion on IPM	*Rice Training of Trainer Representative*
	Afternoon IVM Concepts and Experiences on Malaria Control Activities in Thailand	*Department of Communicable Disease Control Representative*
	Discussion on IVM	*Department of Communicable Disease Control Representative*
15.00	return to Bangkok	

<u>Day 3</u>

8.30 - 9.30	Reporting back on the field trip, discussions on IPM and IVM at community level
9.30 - 10.30	Policy Framework - Analysis and discussion
10.30-11.00	<u>Coffee break</u>
11.00 - 12.30	Continue Policy Framework discussion
12.30 - 14.00	<u>Lunch break</u>

14.00 - 17.30	Country Presentations IVM and IPM programmes Some specific suggested topics: Community IPM programmes - Indonesia IPM farmer group collaboration with Research, and Health - Vietnam The Philippines experience in eliminating DDT use for malaria	*several country representatives*

Day 4

8.30 - 12.30	Working Group sessions on Opportunities, Constraints and Needs to strengthen collaboration between Agriculture and Health in efforts to manage pests and vectors. Two groups will be formed to discuss issues at community and national level. Different aspects of collaboration will be discussed: technical, policy issues, institutional arrangements, management implications, human resource development.	
12.30 - 14.00	Lunch break	
14.00 - 15.00	Continue Working Groups	
15.00 - 15.30	Coffee break	
15.30 - 17.00	Reporting back of Working Groups, discussion	
17:00 – 17:30	Presentation on Information Clearing house on Financial assistance	*Alwin Kool, UNEP*

Day 5

8.30 - 11.00	Working Groups to develop action plans to strengthen collaboration (including identification of possible pilot field activities)
11.00 - 11.30	Coffee break
11.30 - 12.30	Reporting back of Working Groups, discussion with focus on creating supportive policies, institutional arrangements, human resource development and generic recommendations from the workshop
12.30 - 14.00	Lunch break
14.00 - 14.30	Workshop evaluation
14.30 - 15.30	Review of final recommendations proposed
15.30	Closing

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General discussion on opportunities for IVM-IPM collaboration, Conclusions and Recommendations

General

The workshop was opened by the Director of UNEP's Regional Office for Asia and the Pacific, Dr. Nirmal Andrews, followed by welcoming statements by representatives from WHO and FAO. Presentations explaining background and the objectives of the workshop were provided by the secretariats of UNEP, WHO and FAO. Discussions were initiated through several presentations then made by different experts and by country participants through which they exchanged and shared information on IPM and IVM experiences in their countries. During the second day further exchanges were made during a field trip to a center for IPM training of trainers in the Ayuttaya Province. In Working Group sessions, participants reviewed during two days, for two separate sub-regions (group (1) Thailand, Vietnam, Myanmar, Indonesia; group (2) Indonesia, Nepal, Philippines and Sri Lanka) the following issues:

- The potential for generating synergies between IPM and IVM in different ecological/disease settings
- Opportunities for an integration of IPM and IVM, both in terms of capacity building and in operations
- Constraints on the joint delivery of IPM and IVM services

The outcomes of the Working Group sessions, and the subsequent concept proposals that were developed by each country show that there are indeed opportunities for mutual benefits for health, agricultural production and the environment from collaboration between programmes for disease vector control and IPM. However, much work is still needed including the field testing of synergistic methods to confirm expected outputs and development of training curricula. Careful evaluation is needed to assess whether adequate levels of vector control can be ensured with approaches that are relying less on pesticides and perform at a higher level of sustainability, causing less harm to human health and the environment. Comparative economic evaluations need to take all aspects into account, including environmental costs, public health outcomes and agricultural productivity. Resources could be saved by using less pesticides, while preserving biodiversity.

This final general discussion focused on two questions that are of importance in moving ahead with joint IVM/IPM activities in the near future:

1 -What mechanisms can be used to get governments to accept IPM-IVM principles? Are there bureaucratic roadblocks to getting stakeholders together?

To initiate collaborative IVM/IPM activities, a mode of cooperation will need to be agreed between Health and Agriculture sectors. The agriculture sector may be reluctant to embark on a collaboration that may require additional resource inputs, and increase the workload of its staff. Some ideas were formulated to ensure that a possible collaboration between Health and Agriculture on IVM/IPM could be explored:

- Middle management level should play a role to inform higher levels in ministries;

- Representatives from different ministries should be invited to national level IPM programme meetings working through existing multi-agency organizations (e.g. a national IPM steering committee)
- These should be briefed on IPM/IVM and the POPs treaty;
- If such a steering committee does not exist, then it should be established, with representation from relevant ministries – Agriculture, Health, Environment and others, as relevant. Individual countries should decide which ministry takes the lead, or whether there is shared and equal responsibility, (e.g. by way of rotating chairmanship.)
- Coordination and collaboration will be required between sectors, as well as, between central, regional and community levels. Both vertical and horizontal integration is required.
- Guidelines could be developed as to how IPM-IVM at national level can be organized; including structure of an intersectoral forum.
- The Proceedings of this Workshop should be used as basis for further development of IPM-IVM in individual countries.

2. What is the role of the International & Regional Community

International Organizations and the Regional Community can play a role in promoting IVM/IPM in several ways:
- Assist in demonstrating that IPM-IVM works (scientific validation, training etc.);
- Assist in information exchange on IPM-IVM between international organizations, national governments (e.g. Case studies on IPM-IVM);
- Create an enabling environment for different national sectors to collaborate. This should be a role for PEEM, which is a multiagency UN expert panel with a mandate to promote environmental management for vector control in a multisectoral context. PEEM should be re-activated to mediate the above aspects, and to link with WHO's RBM programme.

Conclusions and Recommendations

The Workshop concluded that there are realistic opportunities for integration of IPM and IVM activities for the mutual benefits of agriculture, health and the environment.

The Workshop, therefore, recommends:
1. that the concept of Integrated Pest and Vector Management, IPVM, should be adopted as a sustainable and environmentally sound means of pest and vector management
2. that an objective and independent study be done to evaluate the cost effectiveness of POPs pesticides in pest vector management.
3. regional cooperation for exchange of information be encouraged, supported by UNEP and other international Organizations.
4. further Workshops be organized with a focus on other POPs application areas.

Evaluation

Finally participants were asked to evaluate the workshop itself. There was in general a very positive sense of the usefulness of the workshop including the field trip. Most felt that interactive discussion had been most useful and some felt that more time were needed to analyze the country situations.

Working Group I: Thailand, Vietnam, Myanmar, Indonesia (IPM)

Thursday, 9 March 2000

Thailand, Vietnam and Myanmar participated in Working Group I, as there are certain similarities in their ecosystems and Indonesia further contributed with its relatively well established experience in IPM.

The Working Group started discussions with exploring opportunities that might exist to integrate IPM and IVM activities at field level. A list of ideas was developed on how IVM could be included into IPM Farmer Field Schools or Follow-up activities:

- Training of farmers on disease cycles, life cycles of vectors, mosquito identification, breeding and biting habits
- Monitoring of mosquitoes (small vs large mosquito larvae, pupae) and populations by farmers
- Analysis of situation: risk levels - regular basis
- Decision making: to control or not - options available for control of mosquitoes
- Experiment in FFS with biocontrol (e.g. fish, fungi etc) (depending on whether national biocontrol facilities exist); intermittent irrigation (dual purpose brown planthopper/mosquito control)
- Use publicity through posters, leaflets, education etc.

Several advantages and opportunities for including IVM into IPM training activities were identified. IPM farmers already have knowledge on different aspects and elements of the agro-ecosystem, and including mosquitoes (or other vectors) should be possible and training could include various relevant IVM aspects.

As a next step, major agro-ecosystems were identified for each of the countries, together with the vector borne diseases associated with each of the systems. The discussion is summarized in the following table.

Major agro-ecosystems and associated vector borne diseases in Thailand, Myanmar and Vietnam.

AGRO-ECOSYSTEMS	**Thailand**	**Myanmar**	**Vietnam**
Universal (urban and rural)	Dengue Leptospirosis	Dengue Leptospirosis, plague	Dengue
Lowland: Rice double crop, irrigated	filariasis, Japanese encephalitis	Japanese encephalitis, filariasis, (occassionly) malaria	coastal malaria, Japanese encephalitis
Deepwater rice	-	n.i.	n.i.
Fruit/rubber	malaria	n.i.	n.i
Sugarcane	-	-	Japanese encephalitis
Forest (timber)	malaria	malaria	n.i.
Peanuts	n.i.	-	-
Cotton (irrigated)	n.i.	potential malaria	n.i.
Sesame (dry)	n.i.	-	n.i.
Vegetables	n.i.	n.i.	Japanese encephalitis
Highlands			
rice – irrigated (1 crop/yr)	malaria, filariasis	malaria (!!)	n.i.
rice – rain-fed (1 crop/yr)	n.i.	n.i.	-

Fruit	-	n.i.	-
Forest (natural, cultivated)	malaria	malaria	malaria
Plantation crops	n.i.	potential malaria	n.i.
Coffee	n.i.	n.i.	malaria
Tea	n.i.	n.i.	-
Rubber	n.i.	n.i.	malaria
Maize	n.i.	n.i.	n.i.

n.i.: not identified as major agro-ecosystem
-: no major vector borne diseases in particular agro-ecosystem

After this rough inventory of the vector-borne diseases together with the (agro-)ecosystems where these are prevalent in Thailand, Myanmar and Vietnam, each disease was discussed in more detail. The specific disease vectors were identified for each country and (agro-) ecosystem together with the habitat of the vector. The opportunities that exist to combine IPM and IVM activities were discussed as well as the needs for implementing such approaches. The discussion is summarized in the table below. Several situations were identified where mutual benefits could be achieved from collaboration between efforts to manage pests in agriculture and efforts to control disease vectors, notably rice and malaria. Through environmental management methods different pests and vectors can, for example, be controlled at the same time if these methods are implemented at the right time and place, e.g. intermittent irrigation.

Clearly opportunities exist that combine IVM and IPM training in specific ecosystems. Building on existing IPM training experience and IPM groups that are already engaged in community IPM activities provide an excellent opportunity to test training and IVM methods at field level. The existing IPM training experience can provide a platform to develop a training curriculum for IVM. Based on ecology and discovery/learning activities IVM methods can eventually be tested and conducted by farmers and community members. The existing IPM groups are already familiar with basic ecology, and are often engaged in implementing local research activities in IPM and agriculture for the benefit of the wider community. Expanding their activities to include training in IVM, with field testing and evaluating IVM measures should represent a fairly small step for such groups.

The most obvious opportunities for IVM and IPM collaboration exist for vector borne diseases that are associated with rice, since most IPM FFS are focussed on rice. Malaria in Forest-Rice interface (highland and lowland) and coastal rice could be addressed in IPM FFS or in Follow-up Field Schools. Opportunities were also identified for IVM/IPM collaboration for Japanese encephalitis and Filariasis associated with rice ecosystems. Dengue is not directly associated with mosquitoes breeding in rice fields. At community level, however, FFSs or Follow-up Field Schools in rural areas can address dengue by identifying breeding sites and testing IVM measures to reduce relevant mosquito populations.

Rats are reservoirs for the pathogens causing plague and leptospirosis. Rat Management Field Schools are being conducted in Vietnam and Indonesia, often as a follow-up activity after a rice FFS. The main reason for these Rat Management Field Schools is the loss of agricultural production caused by rats. However, if leptospirosis is of importance in a certain area it could be included into the training activities. Each of the countries developed proposals for IVM/IPM collaboration in more detail (see country proposals).

Before IVM and IPM activities can be field tested and implemented, some needs and constraints will have to be addressed, both at community level and national level. Such needs and constraints at the different levels are summarized in the tables below as identified by the group. For activities at community level on IVM/IPM a training curriculum needs to be developed, that should build on IPM experiences (ecology, participatory training, non formal adult education). Trainers need to be trained in this. At community level problems with vector-borne diseases need to be identified, and the community should decide whether they are prepared to actively participate in IVM/IPM activities. The limited number of IVM experts that are available for training is a constraint. Also to get the community interested in IVM and to sustain programmes might become an issue in some areas.

At national level collaboration between sectors is needed to ensure that IVM/IPM activities can take place. There is a need for an inventory identifying where combined IVM/IPM activities would be relevant, as well as a need for increased awareness among policy makers of the advantages and needs for IVM/IPM collaboration. At national level, policy makers should be provided information on opportunities and experiences from field activities that combine IVM/IPM. Capacity building and networking that promote such IVM/IPM activities need to be encouraged. Some constraints are the lack of coordination between sectors, limited funding for training, pilot studies, awareness raising activities and extension services, as well as the lack of an adequate national policy and the shortage of experienced vector personnel. Myanmar also expressed their need to initiate work on IPM and FFS in the first place.

POTENTIAL VECTORS PRESENT IN THE REGION AND OPPORTUNITIES FOR IVM:

Disease and main vector	**Country**	**(Agro-) Ecosystems associated with vector**	**Habitat vector**	**Opportunities for IVM/IPM**	**Needs**
MALARIA					
An. dirus (formerly 'balabacencis')	Myanmar, Thailand, Vietnam	<u>Forest ecosystems</u> Forest and forest edge	*An. dirus* breeds in forest and forest edges In Myanmar: breeds in wells	An. dirus breeding in wells might be controlled by fish	
REMARK: IN TRADITIONAL/NATURAL FORESTS AND IN PLANTATIONS, IVM FOR MOSQUITO CONTROL IS NOT FEASIBLE! HERE, OTHER INTERVENTION METHODS SHOULD BE CONSIDERED (e.g. bednets, drainage???, screening etc.)					
An. dirus + *An minimus*	Myanmar, Thailand, Vietnam	<u>Forest-rice interface</u> rice fields	Water channels, ponds, rice fields	Conduct experiments in the field, develop training manual Farmers are prepared to participate because it is likely to improve their quality of life! Environmental methods: removal of aquatic vegetation, mosquito fish	Evaluate preparedness of community to participate Build on IPM trainees and farmer groups Develop curriculum for IVM (jointly with IPM) Identify pilot areas for field studies Monitor incidence of malaria (and dengue) in relation to mosquito density Benefits: Reduction of pesticide use for indoor spraying/net treatment Self reliance on health care

An. minimus	Myanmar, Thailand	Lowland rice Rice – Forest edge		similar opportunities for IVM as in highland areas	
An. sundaicus	Vietnam	Fish and shrimp farms	Brackish water lagunas	Village schools in coastal areas have had FFS Easy access to coastal areas Ongoing community activities on IPM	
An. sinensis	Vietnam	lowland rice	Impoundments and reservoirs; swamps; rice fields	Mosquito bednets in use in and outside rice field areas Facilities to experiment with biocontrol are present People can be trained to analyse prevalence of vect.borne disease	see where IVM can be linked to IPM Study methods developed in China/Indonesia for sinensis control
JAPANESE ENCEPHALITIS					
Culex tritaeniorhynchus	Myanmar, Thailand, Vietnam	lowland rice and pigs	Problem: strong association with domestic pigs Problem: insecticide resistance present due to pesticide use in rice (example: Thailand), for instance golden snail control with Endosulfan	Type of IPM-related activities: screening of pigpens, intermittent irrigation, propagation of fish in rice fields	
FILARIASIS					
Culex quinquefasciatus	Myanmar, Thailand, Vietnam	lowland rice	Nuisance mosquito par excellence; vector of bancroftian filariasis Breeds in polluted water (pit latrines, polluted ditches, borrow pits etc.); often found in villages and urban areas	Env. Management, Hygiene, Biopesticides, Polystyrene beads, Drainage etc. Nice example for a case study IVM in relation to IPM	Community (including farmers) must agree whether they want to conduct control and for which method they choose Identify whether nuisance

			Area with highest filariasis incidence: Kerala state, India Biting in early evening and night(In Sri Lanka: linked to coconut fibre cottage industry (coconut husk pits))		or also disease vector
DENGUE					
Aedes aegypti/Ae. Albopictus	Myanmar, Thailand, Vietnam	universally present (urban and rural)	breeds in small containers, artificial fish ponds, discarded tyres, broken cans, flower vases etc. Disease is on the increase!!	Removal of breeding sites (env. Management), bio-control (Rangoon example), bio-pesticides (Neem, Bti, Bs)	convince the community to undertake joint action! This is a problem that the community can take in its own hands. National policy to support a control strategy
PLAGUE AND LEPTOSPIROSIS					
Rats, vectors of Leptospirosis, Natural hosts of plague bacillus (*Yersinia pestis*)	Myanmar, Thailand, Vietnam	distribution not exactly known	Thus far: control with rodenticides (highly toxic!) Myanmar: public health control = flea control		Identify whether IVM/IPM is possible? Community participation
			Agriculture: what is the economic significance of rats?	trapping, cultural control (removal of hiding sites), environmental hygiene (removal of refuse and garbage). Predators (owls) Direct link with IPM, in Indonesia and Vietnam rats are being controlled through IPM follow-up field schools on rat management	

COMMUNITY LEVEL

NEEDS	CONSTRAINTS
• Develop training strategy manual (participatory approach) • Link agric. IPM with IVM people: call it IVPM • IVM expert required to assist with development of curriculum • Problem identification • Consultation with community about vector problems and the ability/preparedness to participate actively in IPM/IVM • Select pilot sites (provinces) from where IPM trainers can be retrained in IVM • Train trainers (special adult educational programme) • Train farmers • Establish training sites (country wide) • Mobilise mass organisations, work with existing organisations (farmers organisations) • Relations with local governments	• Limitation in number of IVM experts needed for training • Limited educational programmes in IVM • Budget • Sometimes lack of interest by the community • Poverty? • Difficulty to sustain IVM • Lack of coordination between communities

NATIONAL LEVEL

NEEDS	CONSTRAINTS
• Collaboration between sectors • inventory of areas where IVM is relevant (epidemics, prevalence etc.) • understanding and awareness of decision makers of the need for IVM/IPM (example of Indonesia, 1986), leading to endorsement • Review evaluation of activities • use of public information and mass media (TV, drama etc.) • regional exchange and capacity building (networking) • involvement of experts and researchers • demonstration projects • development of core groups	• Lack of coordination between sectors (at government level) • Lack of funding for - training - pilot studies - awareness raising - extension services • Lack of national policy • Shortage of experienced vector personnel

Working Group II: South and Southeast Asia

Thursday, March 9, 2000

Indonesia, Nepal, Philippines and Sri Lanka participated in this group. Similarities exist between the countries for ecosystems and associated vector borne diseases. All countries have IPM FFS programmes ongoing, though the size varies.

The discussion in this group focussed initially on what kind of vector borne diseases occur in the different countries, and for which vector POPs pesticides have been used, or are still being used. The table below summarizes the vector borne diseases occurring in the different countries. In the past POPs pesticides were used for vector control in malaria and plague. At present no POPs are being used for vector control in these countries.

Agroecosystem related health issues*

Country	POPs associated	Others
Indonesia	(malaria) (plague)	Filariasis Japanese encephalitis Leptospirosis Schistosomiasis
Nepal	(malaria) (but illegal use in agriculture as well)	Filariasis Japanese encephalitis Leptospirosis
Philippines	(malaria)	Dengue Filariasis Japanese encephalitis Leptospirosis Schistosomiasis
Sri Lanka	(malaria)	Filariasis Japanese encephalitis Leptospirosis
All		Pesticide poisoning

*(brackets) = POPs pesticides used in the past, but no longer

The group then discussed in more detail which vector species is involved in the transmission of a vector borne disease, and which agro-ecosystems these species favour. The following table summarizes the discussion.

Disease	Country	Vector species	Agroecosystem
MALARIA	Indonesia	*Anopheles aconitus* *An. barbirostris* (Sulawesi and Timor/Flores)	Flooded ricefields Irrigation canals (rice)
		An. balabacensis	Salak plantations Rubber plantations
		An. sundaicus & subpictus	Brackish water Fish/prawn ponds
	Nepal	*An. annularis*	Irrigated agriculture—rice and vegetables
	Philippines	*An. flavirostis*	Natural streams
		An. littoralis	Coastal areas
		An. balabacensis	Rubber plantations
	Sri Lanka	*An. culicifacies*	Irrigation canals—rice, vegetables (big onions,

			beetroot), chillies, tobacco, groundnuts, agro wells, borrow pits for infrastructure development
SCHISTOSOMIASIS			
	Indonesia Philippines		Livestock health Rice paddies and earthen irrigation channels Buffalo wallows Borrow pits, large puddles, *etc.*
JAPANESE ENCEPHALITIS			
	All countries	*Culex tritaeniorhynchus* *C. gelidus* *C. vishnui*	Rice (paddies only), Where pigs are kept within mosquito flight radius (2 km)
FILARIASIS			
	Indonesia *(Wucheria, Brughia malayi, B. timori)*	*An. barbirostris* (Sulawesi and Timor/Flores), *Culex spp.* *Mansonia spp.* *Aedes spp.*	Rice Reservoirs with aquatic weeds (*Mansonia spp.)*
	Nepal *(Wucheria bancrofti)*		Rice, vegetables (Jayapu indigenous farmers in Kathmandu valley)
	Philippines *(Wucheria, Brughia malayi)*	*Aedes spp., Culex spp., Mansonia spp., Anopheles, spp.*	Abaca, banana (*Aedes*), vegetables (*Culex*, polluted barrow pits) Rice
	Sri Lanka *(Wucheria)*	*Culex quinquefasciatus*	Coconut husk pits
LEPTOSPIROSIS	All countries	Rodents (rats) are reservoir	Rice, maize (Philippines)
PLAGUE	Indonesia (East Java, isolated hill villages)	Rodents (rats) are reservoir	Sweet potato, corn
DENGUE	Philippines rural areas	*Aedes albopictus, A. aegypti*	Coconut shells (plantations also)

After having identified vectors and the agro-ecosystem in which they occur, the discussion focussed on identifying the opportunities arising from IVM/IPM collaboration, as well as the problems that obstruct possible IVM/IPM collaboration.

Opportunities resulting from an effective IVM/IPM alliance

- Increased motivation for farmers to practice IPM and participate in local IPM, IVM, and other development activities
- Greater productivity (savings on production costs)
- Reduction of reliance on pesticides in pest and vector control, and optimal management of pesticide resistance
- Enhances farmer understanding of local ecology
- Further increase educational level and self-help capabilities of communities

- Opportunity to create crop insurance programs and other risk reduction measures
- Optimized use of human resources at community level, makes the combined programme more robust, and contributes to economies of scale
- Income-generating activities for the community (*e.g.*, fish production, mosquito net production)
- A starting point for the formulation of a policy framework for intersectoral action
- Technical expertise is available in the countries
- Creates new research opportunities of a more holistic type
- More community self-reliance in health monitoring and epidemic detection
- Global environmental issues involved will facilitate high level policy support
- Health status of local communities will improve
- Protect local biodiversity
- Generation of documented success stories to enrich educational curriculum
- Reduce sprayman and householder exposure to pesticides

<u>Problems that need to be overcome to establish IVM/IPM collaboration</u>

- Lack of knowledge among community members, health and agriculture officers about vector biology, habitat, link between vector ecology and disease incidence
- Lack of awareness, communication skills and information exchange between health and agriculture officials
- Lack of faith in IPM (fear of abandoning familiar methods and reducing dependence on pesticides) and fear of risk
- Lack of intersectoral coordination in planning and execution of activities
- No structural framework in the public sector to facilitate collaboration on intersectoral issues
- No uniform national IPM/IVM policy and strategy
- Lack of well-documented success stories
- Lack of genuine citizen participation in the health sector as decision makers, planners, managers, evaluators instead of just volunteer labor carrying out top-down government programs
- Problems of bringing small scale local initiatives to broad enough scale to have significant impact
- Finding funds, allocating resources, flow of funds, community willingness to contribute
- Farmer demonstration of IVM is more difficult than in IPM
- Researchers unwilling to collaborate on farmer research (with farmers helping set priorities (needs assessment), advising on methodology, ideas to be tested, *etc.*) rather than plan and make all the decisions themselves
- Lack of appropriate training materials
- Lack of field personnel with necessary skills (facilitating needs assessments, field studies to determine vectors and their habitat, *etc.*)
- Competing needs at household level : IVM and IPM too time consuming for farmers, with no short-term benefit (especially poorer farmers) compared with income-generating activities

Fieldtrip to Training of Trainers course on rice IPM, Ayuttaya, Thailand

Mr. Samart Vongprayoon of the Malaria Division, Department of communicable disease control, Ministry of Public Health, Bangkok, Thailand, presenting IVM and malaria control activities in Thailand.

Mr. Lakchai Meenakanit, Director of the Biological Agriculture and Farmer Field School Center explains activities on rice IPM in the Training of Trainers Course

Participants of the workshop discussing the rice ecosystem of the study fields with trainers and farmers

Participants of the workshop looking at the study fields of the Training of Trainers course.

Concept proposal

Indonesia

Strengthening IPM/IVM Collaboration to control malaria in rice field ecosystems in Java

Justification

Pesticides and especially POPs pesticides used to be applied intensively by farmers and government field workers to control rice pests and malaria. The impacts of excessive use of pesticides for human health and environment have prominent and significantly detected for the last decades. The joint effort between agricultural and health sectors to reduce the dependency upon POPs pesticides and pesticides as a whole must be initiated to reacht the efficient and effective results especially under the framework on integrated agro-ecosystem management.

Recent development of the emergence and resurgence of malaria incidence in the last 4 years (1996-1999) has shown that malaria is still a major threat for the community health in some areas in Java/Central Java. Several factors have been identified as the main cause of malaria resurgence:

1. lack of recent malaria control coverage
2. lack of budget and resources
3. lack of community participation in the malaria vector prevention and control measures
4. egosectoral approach of malaria control and less coordination with other sectors especially agriculture at the field level

In other sides, agriculture sector have been developing IPM approach in managing rice agro-ecosystems, especially to control rice pests and reduce the pesticide use. IPM Farmer Field Schools systems implements the participatory approach to enhance the capability and capacity of farmers to make their own appropriate decisions under their field conditions and production needs. Through IPM training and implementation farmers have gained awareness, knowledge and skills of reducing their dependency on pesticides and rely upon natural control mechanisms.

Since 1989, through the IPM National Programme have succesfully trained more than 1,000,000 rice farmers in IPM approach and technology and 8,000 trainers of IPM. These national assets could be expanded its utilization for implementing IPM and IVM in the rice ecosystems. The objectives of IPM and IVM implementation at the field level are:

- increase rice production
- maintain rice pests under natural control mechanism
- increase farmers income
- improve health status including prevention of malaria and other vector borne diseases
- reduce prevalence of intoxication
- empower the community to improve their welfare, the quality of environment, and sustainable development
- reduce and eliminate the use and emission of POPs pesticides and other pesticides

2. Objectives

1. As a pilot project for the establishment of IPM and IVM integration to manage the rice agro-ecosystem
2. To reduce malaria prevalence and incidence
3. To institutionalize participatory approach by farmers
4. To reduce the use of hazardous pesticides for agriculture and health purposes.

3. Proposed Activities

1. Selection of Project Location
   a. To ensure the achievement of the project objectives the selection of the project location is the first crucial decision to be made. The specific conditions to be met by the project area are:
      - center of rice production
      - farmers at least have participated in IPM-FFS
      - endemic malaria area
      - main vector and its bionomic has been identified and studies
      - the availability of trained government field staff on IPM and vector control
      - full supports from the government especially the local government
      - areas where pesticides have been used to control agricultural pests and malaria vector

   b. From the existing data for the first time it is proposed that the project area will be located in:
      - Magelang district, Central Java Province
      - Kulan Progo district, Yogjakarta province

2. Establishment of a coordination mechanism at national, provincial and local levels

3. Development of the strategy and implementation plan at national and local levels.

4. Development of the curriculum and training materials for IVM and IPM training for the trainers and farmers.

5. Training and retraining of IPM and IVM field leaders which consist of existing IPM trainers and health supervisors

6. Development and management and implementation of farmers training at field level

7. Monitoring and Evaluation and improvement of the training programme and project.

Time Schedule

1. Project location	Year 1, season 1
2. Coordination Mechanism	Year, 1, season 1-2
3. Strategy and implementation plan	Year, 1, season 1-2
4. Curriculum development	Year 1 season 2 - Year 2 season 1
5. Training and retraining field leaders	Year 1 season 2 - Year 2 season 1
6. Training implementaion	Year 2 season 1
7. Monitoring and evaluation	Year 2 season 2

Stakeholders

A. Government
- Central
- Ministry of Environment
- Ministry of Agriculture
- Ministry of Health
- Ministry of Public Works
- Ministry of Home Affairs
- Ministry of Education (incl Universities)
- Office of national plan
- etc

- Provincial
- Local

B. Private sectors
  - Pesticide industry association

C. NGO
- IPM farmer association
- Environmental NGO
- farmer groups
- etc

D. Scientists, researchers
E. Consumers
F. Local Communities
G. Donors

Inputs, outputs
Inputs:

- IPM FFS
- Field leaders
- Farmers trained
- Field Laboratory
- Health Volunteers
- Health Centers
- community leaders
- IPM/IVM Coordinating team

Outputs

1. Establishment of IPM/IVM integration
2. Reduction of malaria incidence
3. Institutionalization of farmer participatory approach
4. Reduction of used hazardous pesticides for agriculture and health purposes.

Concept proposal

Myanmar

The prospect of IPM and IVM collaboration to reduce POPs usage and to control vector borne diseases in Myanmar.

Objectives
1. To increase yield in rice production
2. To reduce rice field vectors of malaria and other vector borne diseases
3. To improve income and better management of malaria without IRS
4. To gain knowledge and experiences in collaboration of IPM/IVM for future expansions

Proposed activities
- Formation of Working Group for pilot project at central level (Agriculture and Health, Technical and Administrative purposes)

- Selection of Area: Bago Division, malaria endemic, risk of Japanese Encephalitis. Lower Burma, has both plain and forest (high land). The area to be selected will be at the forest fringe area covering 100 to 200 acres (1 month)

- Establishment of Farmer Field School at trial area, 3 schools with 25 farmers each will be established. Training will be provided (Trainers - 2 months)

- Intermittent water management and sanitation commencing from July (main) will be supported by other IPM activities (5 months - coincide with local malaria transmission season)

- Provision of pyrethroid impregnated bednets at trial area (From May). Estimated households covered in the trial area 150 to 200 (population 1000).

- Improvement of environmental condition in and around villages:
    - proper garbage and waste disposal
    - source reduction for mosquitoes

Evaluation
- Measurement of yield increase in rice
- Measurement of Anopheles and other mosquito larval densities
- Measurement of malaria morbidity and mortality, SPR%
- Compliance of FFS procedure, use of mosquito nets, source reduction and Environmental improvements (2 to 3 months)

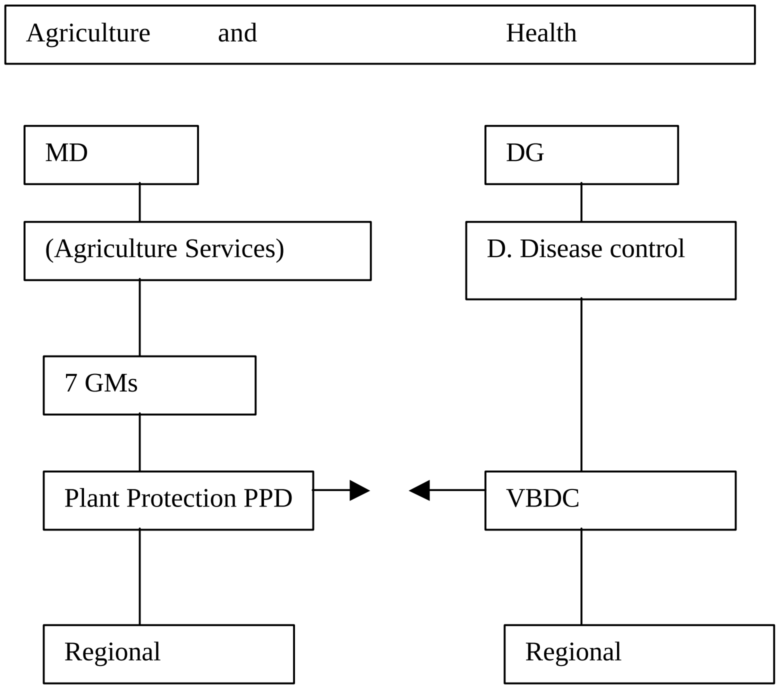
Stakeholders
Community, Agriculture, Health, NGOs

Inputs/Outputs
Budget, Technical, Manpower, Central and Regional Admin commitments

Outputs
Income increase of the community, better health and regional development.

Supportive Policies
Policy Steering committee was formed for IPM

Institutional Arrangement



Concept proposal

Nepal

Integration of IPM and IVM programmes in ongoing Community IPM

Justification
There is little or no awareness in regard to IVM programmes at community level. This is also because no IVM is included in the 'Training of Trainers'. Considering the present global scenarios, there is an urgent need to incorporate an integrated programme at the community level to save the public health and local biodiversity.

Objective
To introduce the concept of IVM into on-going IPM programme at community level

Proposed activities

Activities	Time schedule
1. Development of Human Resources in terms of IPM/IVM integration	month 1
2. Development of curriculum integrated with ongoing IPM programme	month 1
2.1 Identification of agro-ecosystem related to public health	month 1
2.2 Types of vectors associated with malaria	month 1
2.3 Understanding of biology/ecology of the mosquito	month 1-2
2.4 Introduction of control measures to reduce the population of vectors in the affected area * bio-environmental agents/tools (parasite, predators, microbials, trappings, pheromones, etc) * water management (intermittent irrigation etc) * environmental management (manipulation of ecosystems) * cultural practices (crop rotation etc)	monts 4 -9
3. Development of training materials	month 1-2
4. Demonstration on IVM programme (to create public awareness)	month 2-3

Area of implementation: irrigated agriculture with rice and vegetables in 5 potential rice growing district in the form of a pilot project.

Stakeholders/Institutional linkages

- Ministry of Agriculture
- Ministry of Health
- Ministry of Population and Environment
- Ministry of Finance
- National Planning Commision
- Ministry of Industry
- NGOs/INGOs
- Pesticide association of Nepal
- Society for Environmental Journalists
- Consumer Association
- Farmer Association
- Community leaders

Inputs/outputs

Input (ongoing)

- Community IPM Programme in Rice
- Farmer Field Schools
- Demonstration plots

Outputs

- Minimisation of misuse, overuse and abuse of pesticide use
- Promotion of eco-friendly alternatives to pesticides
- Elimination of POPs pesticides
- Awareness raising in all sectors: government, industry and community
- Protection of the health of the local community and protection of local biodiversity
- Support to WHOs global strategy

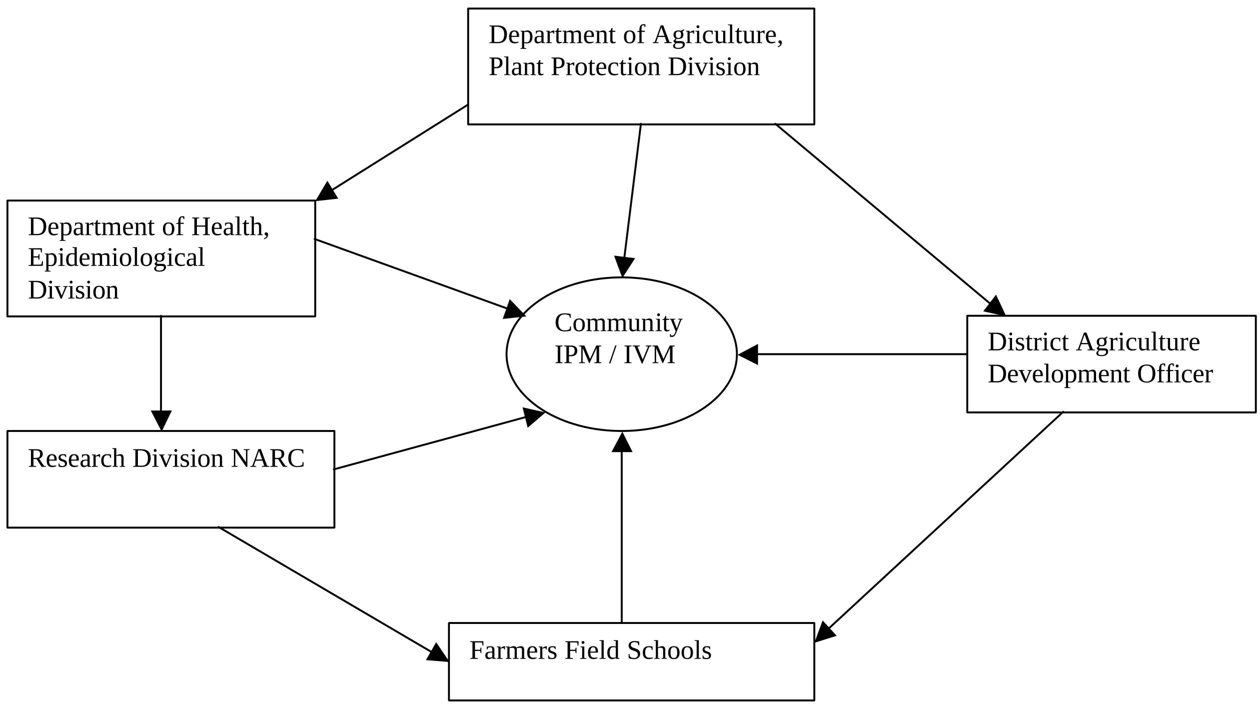
Linkages (Institutional)

Steering Committee

Chairperson:	Secretary, Ministry of Agriculture
Vice:	Joint Secretary, Ministry of Health
Member:	Ministry of Population and Environment
Member:	Representative, Farmers Association
Member:	Representative, Pesticide Association Nepal
Member:	Nepal Agriculture Research Council (NARC)

Technical Committee

Chairperson:	Department of Agriculture, Plant Protection Division
Vice chairperson:	Entomology Division NARC
Member Secretary:	Pesticide Registrar, Pesticide Registration Office
Member:	Department of Health, Epidemiological Division
Member:	Plant Protection Officer, District Agriculture Development Officer
Member:	Plant Pathology Division NARC
Member:	Representative Farmer Field School


Department of Agriculture, Plant Protection Division
Department of Health, Epidemiological Division
Community IPM / IVM
District Agriculture Development Officer
Research Division NARC
Farmers Field Schools

Concept Proposal

Philippines

Model Pilot Programme for IVM - IPM integration Project in the Philippines
(Ma. Nerissa N. Dominguez, M.D., MPH, Department of Health, Philippines)

I. Situation
The Philippines is a tropical country confronted with problems on specific vector-borne diseases directly related to agricultural work and practices. Specific areas both in rural and urbanized parts of the country are affected by diseases like malaria, Dengue, Schistosomiasis, Filariasis, sporadic occurrence of Leptosomiasis and Viral Encephalitis. These disease have existing effective IVM control programmes implemented by the health department of each affected municipalities and provinces and could therefore be strengthened if they will be integrated to the IPM programmes of the Agricultural agencies.

II. General Objective
To implement a model pilot programme for IVM - IPM Integration Project in selected agricultural areas in the Philippines

III. Specific Objectives
1. To establish collaboration between Department of Health (DOH) and Department of Agriculture (DA) on IVM - IPM Integration Project
2. To develop a training curriculum for IVM - IPM Integration Project
3. To develop appropriate training materials for IVM - IPM Integration Project
4. To conduct IVM - IPM Integration Project using the FFS and other applicable agricultural agency programmes.

IV. Plan of Activities

Objectives/ Activities	**Time schedule**	**Institutions responsible**	**Input**	**Output**
A. to establish collaboration between DOH and DA on IPM - IVM Integration Project	April to May 2000	DOA, DA	meetings	MOA
B. To develop a training curriculum for IVM - IPM Integration Project				
1. Training course on IVM - IPM	June 2000	UNEP, FAO, WHO	Training course	Attendance
2. Orientation / workshop on DOH IVM programmes and DA IPM programmes	July to August 2000	DOH, DA, funding source	Technical expertise from DOH, DA, NGOs, TNA (Farmers Association)	2 drafts of IVM-IPM training curriculum
3. Develop a final training syllabus and curriculum	September 2000	DOH, DA, Extension Officers	Draft curriculum	Final curriculum
4. Reproduction	October 2000	DOH, DA, funding agency	-	Reproduction for use
C. Develop				

appropriate training materials				
1. Gather and review available materials	September 2000	DA, DOH	Teaching materials available	Review
2. Workshop in developing teaching materials	October-November 2000	DOH, DA, Extension offices, Funding agency	Technical Socio-Cultural considerations (Farmers Associations, Universities)	New or revised teaching materials
3. Reproduction	December 2000	DA, DOH, Funding Agency	-	Reproduction for use
D. Conduct IVM _ IPM Integration Project				
1. Incorporate and IVM - IPM integrated approach in FFS and other agricultural agency programme	rice planting season	DA, DOH, Extension office	Teaching materials	IVM - IPM curriculum integrated training
2. Monitor IVM - IPM activities	6 months after training	DA, DOH, Extension offices	monitoring tools	Monitoring data for evaluation
3. Evaluation of the project	after monitoring	DA, DOH, Extension offices	meeting	Evaluation report Lessons learned

V. Stakeholders / Institutional linkages

- DOH
- DA
- DENR
- NGOs
- Other GOs
- POs
- WHO
- FAO
- UNEP
- IRRI

VI. Expected outcome:

- Standards, guidelines and policy development
- Funding source
- Institutionalization of IVM - IPM Integration Project

Concept proposal

Sri Lanka

Sustainable approaches for pest and vector management in collaboration with IPM and IVM in Mahaweli system 'B' area

Justification
- Started in 1983
- Number of farmer families: 17,000
- Command area: 25,000 ha
- Main crop: Paddy
- IPM initiated in 1986
- Vector borne diseases: Malaria, Japanese Encephalitis
- At present diseases are controlled by Government Health sectors, by using insecticides (pyrethroids).

Objectives
General objective
- To develop sustainable pest and vector management in Mahaweli System 'B' area

Specific objectives
- To develop intersectoral collaboration with agriculture/health and irrigation sectors

- To develop curriculum for farmer communities to enhance their knowledge in vector biology and environmental means of vector control

- To train trainers in IPM/IVM

Activities
1a. Formulate a Regional Core group with representatives from health, agriculture and irrigation and Divisional Secretariat by August 2000.
1b. Awareness programme - by December 2000.

2. Develop curriculum for farmer communities - by December 2000.

3a. Develop concept for training programme for trainers - by March 2001.
3b. Training of trainers

Implementation of the Programme
Stage I
Select 2-3 farmer communities en train them - by August 2001.

Stage II
Monitoring and Evaluation - from August 2001 to March 2002.

Stakeholders

- Regional/local politicians
- Regional Health, Agriculture and Irrigation officers
- Field level Health, Agriculture and Irrigation workers
- Community leaders
- NGOs
- Banks

Inputs

- Human resources
- Training materials
- Supporting requirements for training

Outcome

- Increased KAP of farmer communities in IVM/IPM
- Reduced Morbidity and Mortality of Malaria and Japanese Encephalitis in the farmer community
- Protect local biodiversity
- Savings of the expenditures on pesticides

Concept proposal

Thailand

IPM and IVM project in lowlands rice fields in Ratchaburi Province

Background
Ratchaburi is in the west of Thailand, close to the border part of Myanmar which have high risk cases of malaria. Agriculture such as growing rice in irrigated areas is the main production. The reduce the use of existing stocks of POPs pesticides in Thailand and chemical poisoning cases and vector diseases cases, we try to initiate the IPM and IVM project in lowlands rice fields in Ratchaburi. In Ratchaburi malaria programmes exist.

Objectives
- to develop IPM/IVM project
- to reduce chemical uses in the rice fields
- to decrease vector diseases cases

Activities
1. awareness raising workshop on IPM/IVM with relevant agencies
2. training of trainers through FFS that have been established
3. develop training strategy manual in :
   - objective
   - method
   - outcome
4. training of farmers in
   - identifying problems in that area
   - ecology system
   - disease cycle
   - life cycle of vectors
   - suitable IPM/IVM methods for that area (fish culture in rice fields, biocontrol, biopesticides)
5. experiment in FFS with biocontrol and biopesticides
6. evaluate cost-benefit analysis in agricultural pest management compared to traditional farming and evaluate cost-effectiveness analysis in disease vector control
7. beside of the training of farmers, we also educate the children at school.

Time schedule - 1 year after harvesting

First crop - training of farmers by trainers
2 pilot projects in different areas, evaluate result

Second crop - training farmers by trained farmers from the 1st crop projects
10 pilot projects in different areas

Experts (DOAE, DCDC) train (30) trainers (DOAE (10), DCDC (10) and DIE (10)) that train farmers, teachers, children in school
Farmer trainers and teacher trainers to be backstopped by trainers in following seasons

Stakeholders/Institutional linkages

Government:

- Department of Agricultural Extension, Ministry of Agriculture (through FFS programme)
- Department of Communicable Disease Control, Ministry of Public Health
- Department of Informal Education, Ministry of Education

Local Community leaders

Donors

Output 1

Expect to expand the pilot project around Ratchaburi province

Output 2

Farmers use IPM and IVM instead of traditional methods

Output 3

Decreased evidence of poisoning cases and vector diseases cases

Concept proposal

Vietnam

Improving Coastal Malaria management on base of collaboration between IPM and IVM

Justification

- Coastal malaria is severe problem that has been difficult to control
- Mosquito populations are building up not only in the pond, stream but also in the coastal rice fields
- IPM programme is well developed in the coastal areas

Proposed activities

1. Pilot provinces: Quang Binh, Quang Tri; one village per province. Those villages will have big problem with coastal malaria.
2. Prepare studying curriculum
3. Field Study: by farmers with support of IPM trainers and health officers (first year):
    - mosquito ecology, biology
    - density of mosquitoes
    - environmental activities in other places
    - habitat, movement of mosquito
    - epidemiology of malaria
    - number of mortalities, outbreaks over time
    - natural enemies of mosquitoes in the fields
4. Pilot follow-up rice field school to develop IPM/IVM training curriculum (second year)
5. environmental management: removal of breeding sites
6. increase education: different media, posters, volunteers
7. using of natural enemies, bednet for mosquito control
8. community activities on malaria control
9. use IPM farmers as volunteers for education, communication, spraying to control outbreaks

Stakeholders

- IPM steering committee (9 agencies)
- Environmental agency
- Plant Protection Department
- Department of Preventive Medicine
- Local Government
- Research Institutes
- Farmers Associations
- NGOs

Input

- Budget from national or international
- International expert, farmers
- Equipment
- Documents

Output

- Curriculum of Training for Training of Trainers and Farmer Field Schools on IPM/IVM
- Evaluation of activities of collaboration
- Trained trainers and farmers on IPM and IVM.

Opening statement at the UNEP/FAO/WHO workshop on sustainable approaches for pest and vector management and opportunities for collaboration in replacing Persistent Organic Pollutants pesticides. Bangkok 6-10 March 2000.

by Mr Nirmal Andrews
UNEP Regional Director for Asia and the Pacific

Ladies and gentlemen,

It is with great pleasure that I welcome you to Bangkok and to this *"Workshop on sustainable approaches for pest and vector management and opportunities for collaboration in replacing Persistent Organic Pollutants pesticides"*.

The threats to human health and livelihood posed by pests and vector-borne diseases are as urgent to address as ever before. In spite of an on-going worldwide effort to apply new tools and means of controlling these pest- and decease carriers we are in many areas still far from being successfull. It was only a few weeks ago that we could read in Thai newspapers about new outbreaks of malaria along the Cambodian border – an area that was already previously notorious for the high incidence of drug resistant varieties of malaria. Many other kind of vector-borne diseases also continues to be a problem, as does reduced crop output and damaged plantations, due to pest, in several areas of the region.

And this is only one side of the coin. In our attempt to control the spread of pests and vectors we have made widespread use of pesticides based on persistent organic pollutants in agriculture, forestry, food production and industry. While the primary reasons to use these chemicals may be worthwhile we now also know that persistent organic pollutants are highly toxic, last for a long time in the environment, and travel long distances far from the source. They are also of particular concern to human health, and especially to children, because they build up in fatty tissues of living organisms and undergo accumulation and biomagnification as they move up the food chain. They are also found with increasing frequencies in a variety of food products with millions of people potentially exposed to dangerous levels.

So - in our only half-successful attempts to control pests and vectors, we have unwittingly exposed ourselves to a cure that is almost as bad as the disease. And as anyone would agree, we don't want to be remembered as in the old joke about the surgeon who wrote in the patient's journal "the operation was successful, but unfortunately the patient died".

In short, it is important that we start to apply truly sustainable approaches to pest and vector control. - It is imperative that we phase out the use of pesticides based on persistent organic pollutants. Only by doing this can we offer people living today and generations to come an environmentally secure future.

UNEP is working on a multi-tier track to address the problems caused by persistent organic pollutant pesticides. On one hand we work through the Intergovernmental Negotiating Committee for an international legally binding instrument for implementing international action on certain organic pollutants, with a tight deadline to be met already this year. On the other hand, we have joined hands with the Food and Agriculture

Organization and the World Health Organization, in undertaking capacity building activities to help countries reduce and/or eliminate reliance on pesticides that are persistent organic pollutants.

This workshop is one of the important components in the capacity building program. This program also include a database on chemical and non-chemical alternatives; a system for identifying relevant expertise; a collection of studies and actions plans for replacing and reducing releases of POPs; and strategy guidance for sustainable pest and vector control.

Over the next few days, you will spend much time discussing POP pesticide replacements, integrated pest and vector management strategies, and how to combine biological and mechanical measures to address the challenges in pest and vector management. You will also spend some time and effort on coming up with ideas and suggestions for how collaboration between Agriculture and Health can be enhanced in this area. It has been pointed out in previous workshops that it is of central importance to ensure co-ordination, consistency and coherence in addressing POPs problems in the region. Your presence at this workshop is an important step in this direction.

I will not dwell more on the specifics on this workshop as there are many experts here more qualified and better suited than me to address these issues. I will, however, wish you hard work and good success in your endeavor over the next few days.

For our foreign visitors I also hope that you will find some time to sample some impressions of Bangkok while you are here. One of the advantages of living in a polluted mega-city is that the incidence of malaria is very low as the disease carrying mosquitos have difficulties finding water clean enough to breed in. This is maybe not the most attractive feature of Bangkok but at least will allow you to relax from the theme of the workshop for a while. And indeed there are many worthwhile attractions in Bangkok, including the Grand Palace, the many markets and the excellent cuisine of Thailand. No visit to our city is complete without at least some cultural sampling having been done.

Finally I would like to thank our colleagues in WHO, FAO and UNEP-Chemicals for making this workshop possible and for bringing it here to Bangkok. Again, I wish you a productive workshop and all the best success.

Thank you.

Opening statement by WHO

Robert Bos, WHO

Distinguished participants, colleagues of sister UN Organizations, ladies and gentlemen

It is my pleasure to convey to you greetings from Dr. Gro Harlem Brundtland, the Director General of the WHO, and also from the Regional Directors of WHO Regional Offices for South East Asia and the Western Pacific.

WHO strongly supports the UNEP-driven process to put in place an international, legally binding instrument on the elimination of the production and use of Persistent Organic Pollutants. For one of these, however, the WHO position has only emerged after an indepth debate, reflecting the concerns expressed by various stakeholders at large. Reference is often made to the "DDT dilemma". From the current WHO perspective this is not a true dilemma. The Organization's position wants to be proactive, opportunity oriented, and in pursuance of a win-win solution.-

The position of the WHO is consistent with the recommendations made by the WHO Expert Committee on Malaria at its 20th meeting (October 1998): "Restriction on DDT for public health use contained in a future POPs Convention should be accompanied by technical and financial mechanisms to ensure that effective malaria control is maintained, to at least the same level, through vector control methods that depend less on pesticides generally, and on DDT in particular."

WHO is committed to the implementation of its strategy and Action Plan for the reduction of reliance on DDT. It wants to support its Member States in making informed decisions concerning the effects of a reduction and/or elimination of DDT on the burden and transmission of vector-borne diseases, in particular malaria. On the basis of such informed decisions, WHO will assist Member States in the development of national action plans for the reduction of reliance on DDT as part of Roll Back Malaria country action, that will effectively link with the implementation component of a future POPs protocol. WHO draws attention to the opportunities offered by current international efforts, in terms of adjustment and strengthening of national vector control programmes, of resource mobilization for vector control activities and of re-enforcing the contribution of vector control to rolling back malaria.

The objectives of this workshop focus on alternatives to POPs pesticides, and in the context of malaria/DDT, WHO defined these as alternative products for chemical and biological control, alternative methods in the application of chemical and biological control, environmental management and personal protection, and alternative strategies for programme implementation, based on scientifically sound criteria, cost-effectiveness analyses and delivery systems compatible with current trends in health sector reform.

The workshop wants to explore synergies between IPM and IVM. This is an area of great potential in the Asian setting. Integrated Pest Management in agriculture is well established and well-rooted in many Asian countries. There is a longstanding historical perspective of malaria vector control (Ross in India, Watson in Malaysia and Swellengrebel in Indonesia), and a strong knowledge base on species delineation, ecological requirements of individual vector species, and links between agricultural practices and the vector requirements.

In a forward looking approach towards a joint effort between IPM and IVM, questions that need to be answered address technical compatibility of the two approaches, managerial procedures conducive to IPM/IVM, conditions for the field testing of IVM, and the need for establishing decision making criteria and procedures.

I wish you all successful deliberations.

UNEP/FAO/WHO Workshop on Sustainable and Coordinated Approaches for Pest and Vector Management in Reducing/Eliminating POPs Pesticides, Bangkok, Thailand, 6-10 March, 2000

Opening statement on behalf of FAO, March 6, 9 AM

Patricia C. Matteson

It is a special pleasure to represent FAO in expanding its already considerable contributions to the international effort to phase out pesticides that are persistent organic pollutants (POPs).

Since 1989, FAO has been collaborating with UNEP to implement Prior Informed Consent (PIC) procedures which prevent unwanted trade in hazardous chemicals. The PIC programme allows countries to assess the risks associated with certain hazardous chemicals and to register a prohibition on their import. The PIC procedure is a provision of FAO's International Code of Conduct for the Distribution and Use of Pesticides. DDT and most of the other nine POPs pesticides are on the PIC list. The PIC scheme is operated jointly by the FAO Plant Production and Protection Division, which is the lead agency for pesticides, and by UNEP through its International Register of Potentially Toxic Chemicals, as the lead agency for all other chemicals.

FAO is the only international organization with long term experience in the prevention and disposal of stocks of obsolete and hazardous pesticides, whether they were used for agriculture, public health, or industrial purposes. First in Africa and the Near East, now in Latin America, and soon in Asia, FAO has been inventorying stocks of obsolete pesticides, providing guidance for their proper management, storage, and transport, and promoting and coordinating cooperative action between stakeholders to dispose of obsolete stocks safely. FAO has offered its support in this regard to WHO and UNEP for eliminating POPs pesticides.

The present workshop draws on another key FAO capability : its global leadership in integrated pest management (IPM) training and implementation. Through Farmer Field Schools and followup Community IPM activities, farmers acquire the skills and knowledge to understand and manage their crop ecoystems such that productivity is maximized while pesticide use is minimized. This effort has long been recognized as deserving the participation of, and providing benefits to, the health and environmental sectors as well as the agricultural sector.

Under Community IPM, farmers are equipped and encouraged to lead local IPM programmes that form the basis for applying their abilities to a broad range of community development activities, including those addressing public health and environmental problems. Since the principles of IPM and integrated vector management (IVM) are the same, it seems logical and appropriate for IPM-trained farmers to use their skills for more sustainable management of vector-borne disease in their communities. This includes the identification and application of alternatives to POPs pesticides (particularly DDT), and an overall reduction, through IVM, in insecticide use in public health programs.

As the representative of FAO, and as part of FAO's Community IPM Programme, I am delighted to join you in highlighting opportunities for collaboration between IPM and

IVM programmes at community and national levels, and to develop recommendations for action. In light of the experience and capabilities of this group, these workshop proceedings should be interesting and exciting. We have a lot to look forward to.

Thank you very much.

Status of immediate actions and the Negotiations of a Global Treaty to Reduce and/or eliminate their releases.

John Whitelaw, UNEP

Slide 1

Status of Negotiations of a Legally Binding Instrument on POPs

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Slide 2

What are POPs and why are they a concern?

- o Toxic
- o Persistent
- o Bioaccumulative
- o Mobile in the environment

Continued environmental release leads to <u>increasing</u> levels

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Slide 3

Action to date on POPs

- national actions
- regional based agreements
- negotiating POPs treaty

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Previous International initiatives to address POPs

- UNEP Global Programme of Action (Marine)
- UNECE LRTAP POPs Protocol
- Helsinki Convention (Baltic)
- Conference to Protect the North Sea

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Previous International initiatives to address POPs (cont)

•Oslo-Paris Convention (North-East Atlantic)

•Barcelona Resolution (Mediterranean)

•Arctic Environmental Protection Strategy

•NAFTA/NACEC Resolution (3 POPs)

•Canada/USA Great Lakes Agreement

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What is being negotiated?

A legally based instrument for implementing international action on certain persistent organic pollutants (POPs), initially beginning with the 12 specified POPs.

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Which POPs are included?

Aldrin, chlordane, dieldrin, DDT, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene, PCBs, dioxins and furans

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Background to Negotiations

UNEP GC Decision 18/32 (May 1995):

Invited IOMC, IPCS and IFCS to initiate an expeditious assessment process:

- o beginning with: PCBs, dioxins, furans, DDT, aldrin, dieldrin, endrin, chlordane, mirex, heptachlor, hexachlorobenzene, toxaphene;
- o taking into account circumstances of developing countries and countries with economies in transition; and

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UNEP GC Decision 18/32 (cont)

GC requested IFCS to develop for the 1997 sessions of the UNEP GC and the World Health Assembly :

- recommendations and information on international action,
- information needed for possible decision on appropriate international legal mechanism on POPs,

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UNEP GC Decision 18/32 (cont)

IFCS recommendations to be based on:

•results of assessment process; and

•outcome of UNEP Conference on Protection of Marine Environment

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UNEP Conference on Protection of Marine Environment

Washington, D.C. (November 1995)

Recommended a global legally binding instrument on POPs

Referenced elements of mandate in Decision 18/32

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CONCLUSIONS & RECOMMENDATIONS

sufficient science to warrant immediate international action to protect health and environment

immediate international action to protect health and environment from 12 POPs

different treatment for pesticides, industrial chemicals, and by-products & contaminants

develop global legally binding instrument (start in 1998, conclude by 2000)

involve all participants in negotiations

scientific criteria to identify additional POPs

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UNEP Governing Council Decision 19/13C (May 1997)

Three Key Elements:

1. Begin negotiations of a legally binding instrument on POPs to be concluded by year 2001

2. Develop criteria and a process for including possible additional POPs in the convention

3. Undertake “Immediate Actions”

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Timetable for Negotiations

- INC1: Montreal (29 June 29 - 3 July 1998)
- INC2: Nairobi (25 - 29 January 1999)
- INC3: Geneva (6-11 September 1999)
- INC4: Bonn (20-25 March 2000)
- INC5: Johannesburg (4-9 December 2000)
- Diplomatic Conference: Sweden (May2001)

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Major Issues in POPs Negotiations

•measures to reduce or eliminate releases

•process for adding more POPs

•technical and financial assistance

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Status of Negotiations

- 10 deliberately produced POPs proposed for elimination - differing timing
- interim DDT use limited to vector control
- some progress on measures on D/F
- process for adding more POPs accepted

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Status of Negotiations

But

at this stage, nothing is final.

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Status of Negotiations

D. Measures to reduce or eliminate releases

Prohibition of the production and use of certain persistent organic pollutants /

1. [Subject to the accessibility of financial and technical assistance,] each Party shall [prohibit] [prohibit [and] [or] take [other] [the] legal measures necessary to eliminate] [take the legal measures necessary to eliminate], the production[, import, export] and use of the chemicals listed in Annex A (Elimination), in accordance with the provisions in that Annex.

[1 bis. Each Party shall ensure that chemicals listed in Annex A, once their production and use have been banned, shall not be exported or imported except for the purpose of environmentally sound [destruction] [or] [disposal].]

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Measures to Reduce or Eliminate Releases

- Goal for intentionally produced POPs is to ***eliminate production and use***:
  – aldrin, endrin, toxaphene - at entry into force of the convention
  – chlordane, dieldrin, heptachlor, mirex, HCB - some critical uses may be permitted, but reviewed at specified dates

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Measures to Reduce or Eliminate Releases

- DDT: ***elimination of production for all except public health uses*** (*e.g.* malaria) but review the need for remaining uses to see when production may be completely halted.

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Measures to Reduce or Eliminate Releases

- PCBs: ***elimination of production for all new uses*** **but permit continued use of PCBs in equipment, and**
  - **phase out "as soon as possible"**
  - **may specify a deadline**

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Measures to Reduce or Eliminate Releases

By-products (dioxins, furans, HCB):
- goal is not yet agreed
- "minimization, elimination"
- agreement on reducing releases

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Measures to Reduce or Eliminate Releases

By-products:

- Promote use of strategies & measures:
  - to reduce releases and/or eliminate sources by feasible & practical means
  - to prevent formation and release
  - to apply BAT for new & existing sources
  - national and sub/regional action plans

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Measures to Reduce or Eliminate Releases

By-products:

- National and sub/regional action plans:
  - evaluate current & projected releases
  - develop & maintain source inventories and release estimates
  - evaluate adequacy of laws & policies
  - develop strategies to prevent & reduce release based on obligations & evaluations

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Measures to Reduce or Eliminate Releases

By-products:

- National and sub/regional action plans (cont):
  - education, training & awareness of prevention & reduction strategies
  - implementation schedule
  - monitoring progress of strategies and review success every [x] years

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Measures to Reduce or Eliminate Releases

- POPs wastes:
  - strategies for identification of articles, products & wastes
  - environmentally sound waste destruction
    - concern for dioxin & furan generation and POPs release to environment
  - technical & financial assistance for less developed countries

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Slide 27

Process for Adding New POPs

- New industrial chemicals & pesticides should be screened for:
  - persistence
  - bioaccumulation
  - toxicity
  - potential for long range transport

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Funding and Technology

•availability of financial and technology recognised as crucial

•tentative agreement that use of current mechanisms should be optimised

•dedicated mechanism has been proposed, but no agreement

Slide 29

Funding and Technology (cont)

•proposal that GEF be a financial mechanism

•welcomed by some delegations

•some concern about GEF's ability to fulfill role

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Expected Progress

INC-4 20-25 March 2000, Bonn

Key matters -

1. Implementation Aspects - draft articles J & K
2. Substantial drafting progress
3. All issues on the table

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Expected Progress (cont)

INC-5 December 2000, South Africa

Key matters -

1. Conclude negotiations

2. Develop any needed resolutions for the Diplomatic Conference

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Expected Progress (cont)

Diplomatic Conference

21-23 May, 2001 Stockholm

Adopt and sign convention and final act

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POPs negotiations - Summary

Stepwise process:

1. Assessment (IPCS, UNEP, IOMC)
2. Recommendation (IFCS)
3. Decision (UNEP/GC)
4. Action (UNEP)

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POPs negotiations - documents

UNEP POPs Home Page

– http://www.chem.unep.ch/pops

UNEP

Roll Back Malaria Programme
Robert Bos, WHO

Slide 1

INTRODUCTION

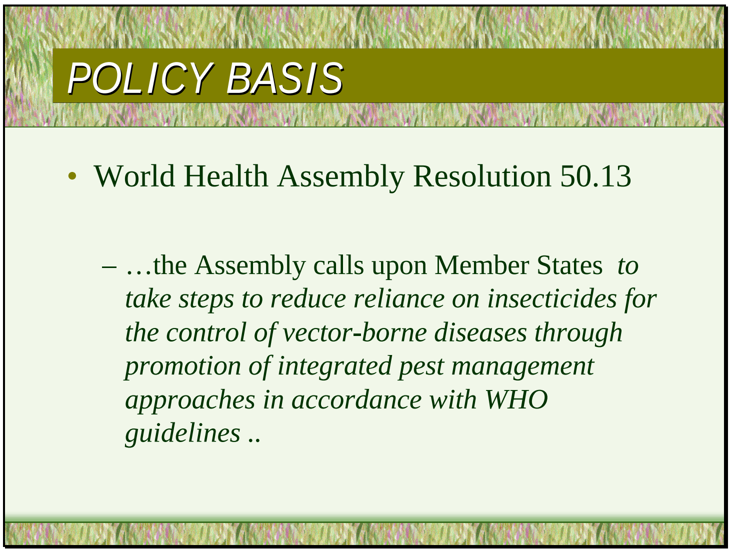
- WHO policy basis
- Progress over the last 12 months
- WHO Action Plan
- Next steps

Slide 2

POLICY BASIS

- World Health Assembly Resolution 50.13

Slide 3



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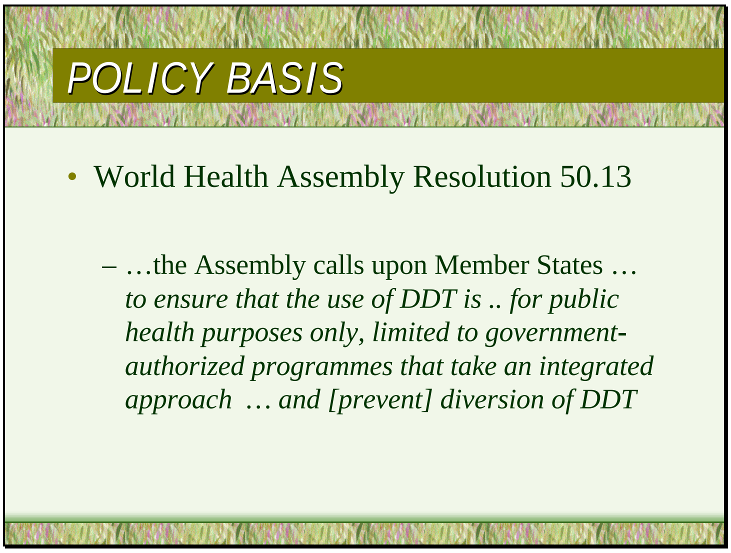

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POLICY BASIS

- World Health Assembly Resolution 50.13
  - …the Assembly requests the Director-General *… to participate in the INC on the currently identified POPs, in the drafting of a legally binding instrument for the "PIC" procedures and in other intergovernmental meetings … in particular those relating to the use of pesticides for vector control …*

Slide 6

POLICY BASIS

- 20th meeting of the WHO Expert Committee on Malaria (October 1998):
  - *It is anticipated […] that there will continue to be a role for DDT in combating malaria, […]. Restrictions on DDT for public health use contained in a future POPs Convention should therefore be accompanied by technical and financial mechanisms to ensure that effective malaria control is maintained, at least at the same level, through vector control methods that depend less on pesticides in general, and on DDT in particular.*

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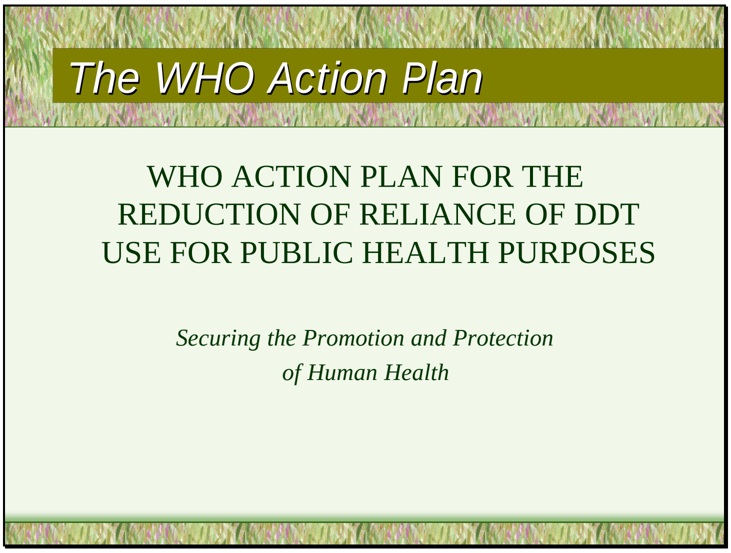


Slide 9

The WHO Action Plan

Three strategic principles :

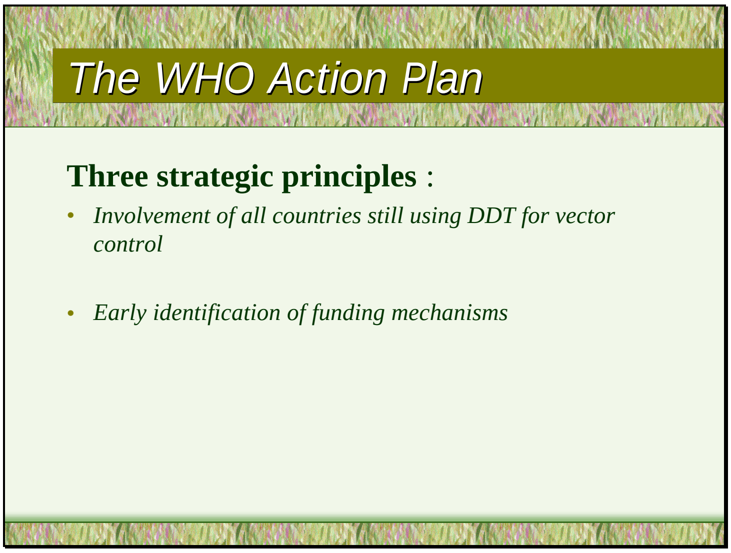
Slide 10

The WHO Action Plan

Three strategic principles :

- *Involvement of all countries still using DDT for vector control*

Slide 11



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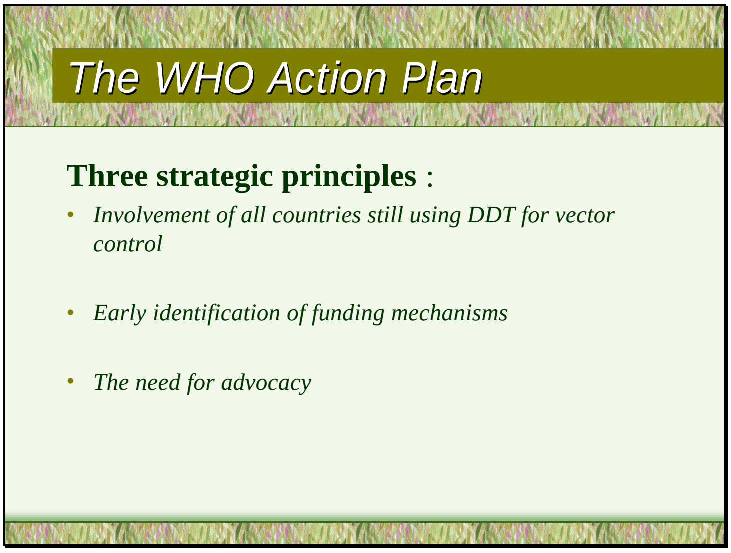

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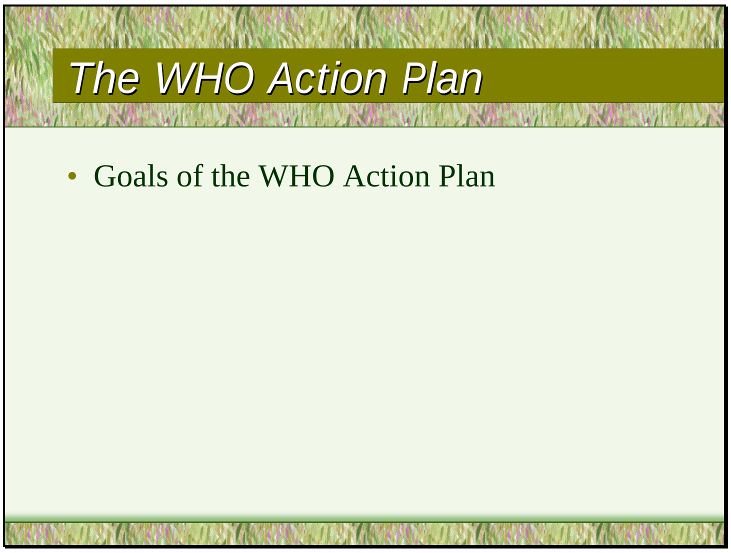

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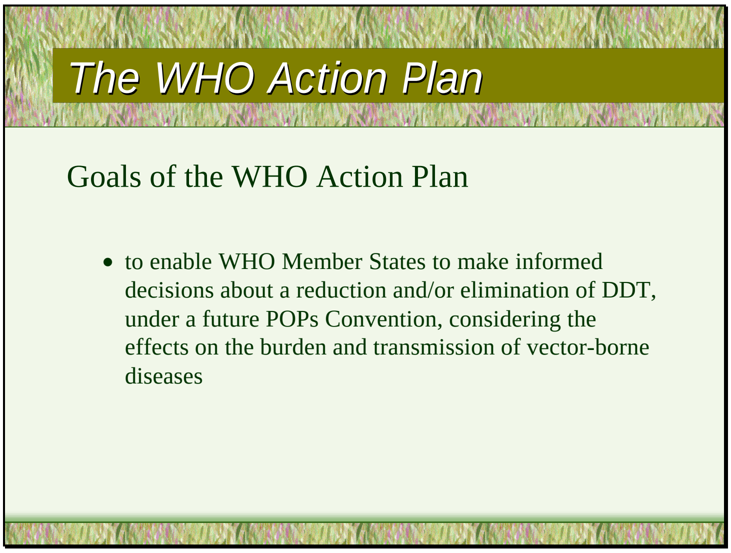

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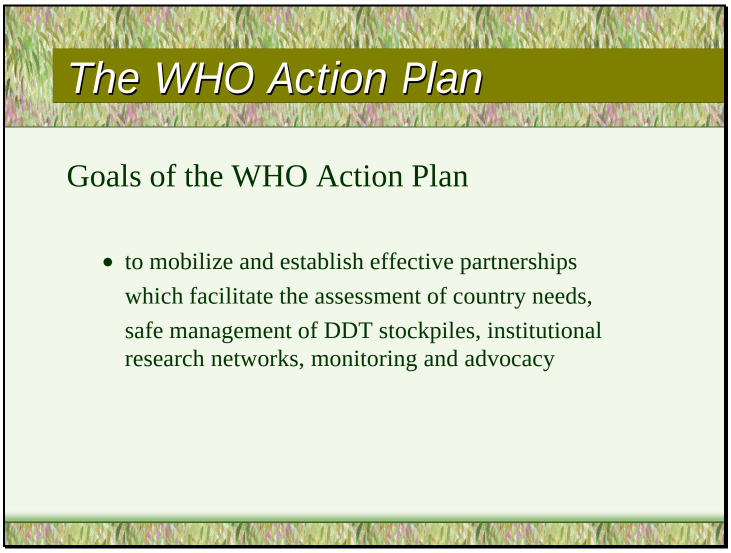

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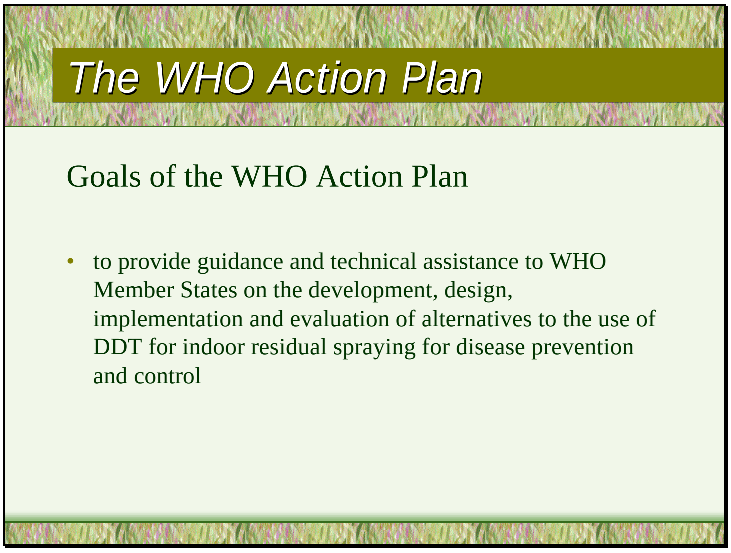

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The WHO Action Plan

- Objectives have been formulated for five areas:

  » country needs assessments
  » safe management of DDT stockpiles
  » institutional research network
  » monitoring
  » advocacy

  over an immediate, intermediate and long-term time schedule

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Next steps

- Completion of the Action Plan into a prioritized work plan with detailed activities, expected outputs and a realistic time frame

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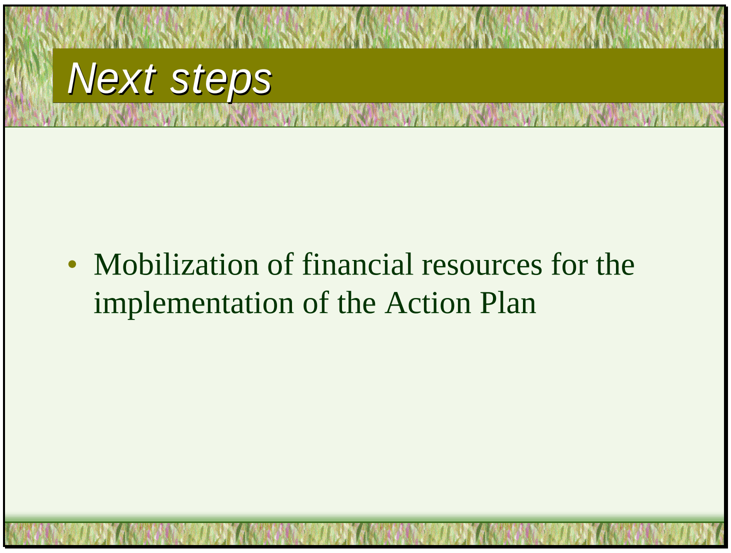

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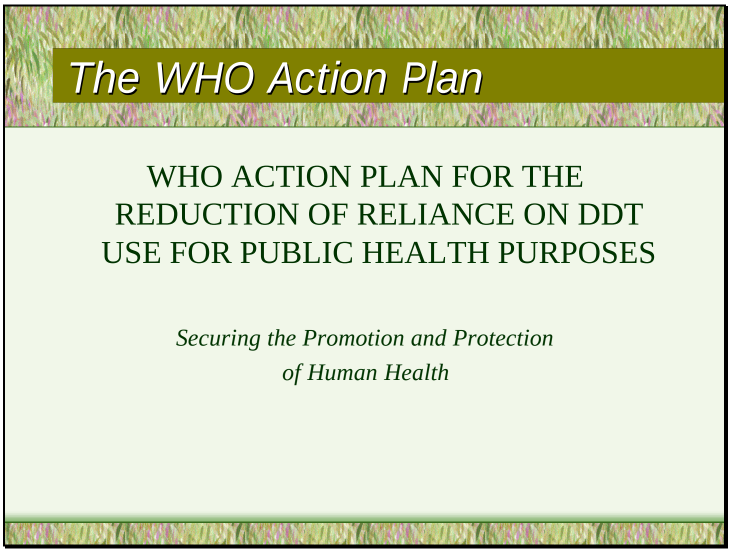
Slide 21


Next steps
• Promoting and co-ordinating research proposals and projects on alternatives

DDT Action Plan
Robert Boss, WHO

Slide 1



Slide 2

Slide 3

The WHO Action Plan

Three strategic principles :

- *Involvement of all countries still using DDT for vector control*
- *Early identification of funding mechanisms*
- *The need for advocacy*

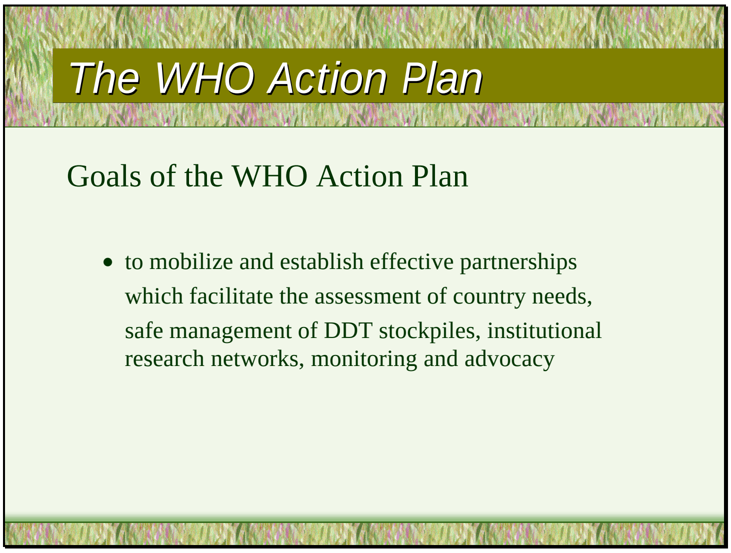
Slide 4

The WHO Action Plan

Goals of the WHO Action Plan

- to enable WHO Member States to make informed decisions about a reduction and/or elimination of DDT, under a future POPs Convention, considering the effects on the burden and transmission of vector-borne diseases

Slide 5



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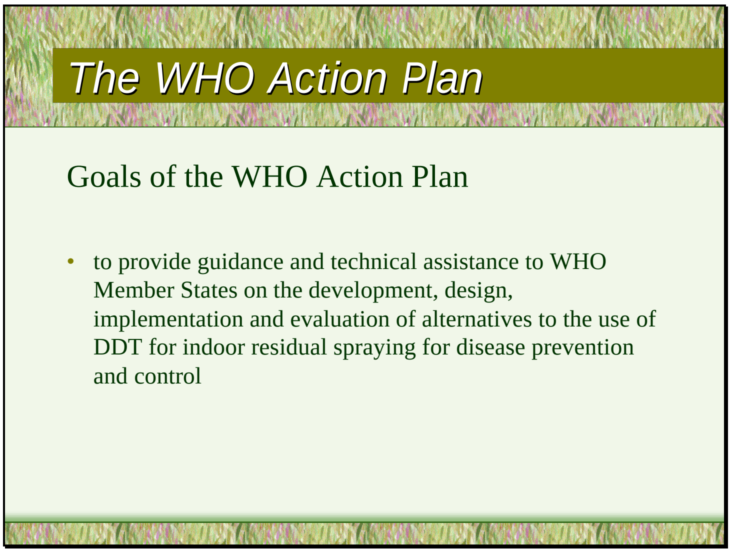

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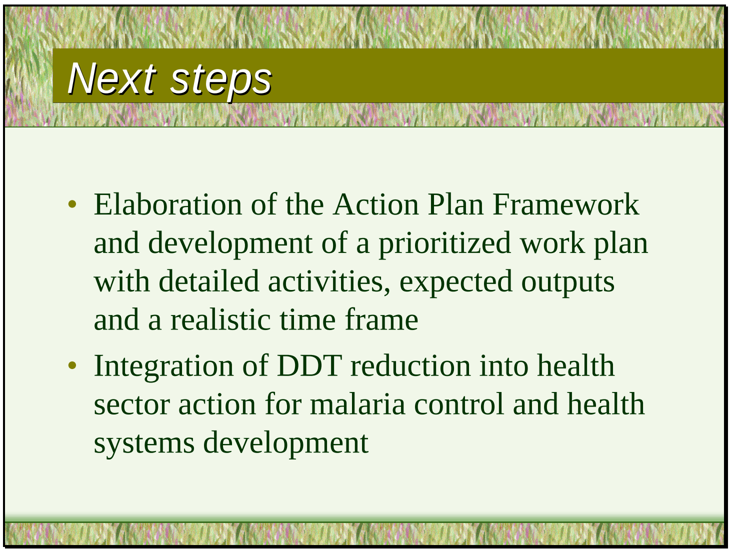

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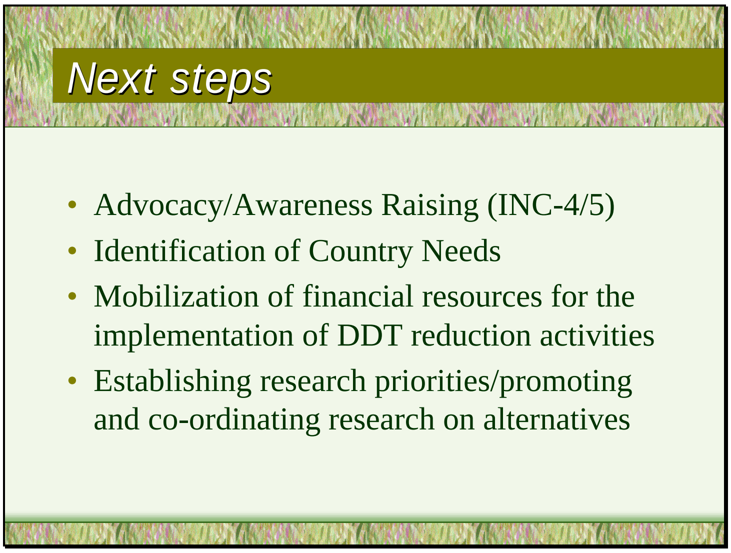


Alternative Approaches to POPs Pesticides

Agneta Sundén Byléhn, UNEP

POPs are persistent, bioaccumulative substances that pose a threat to human health and the environment as concenrations build up. A global legally binding instrument to reduce and /or eliminate releases of POPs has been requested by the international community, through the IFCS and the UNEP Governing Council, since these chemicals are transported via air, water and biota across borders also to regions where they have never been used or produced.

POPs pesticides include presently Aldrin,. Dieldrin, Endrin, Chlordane, Heptachlor, Mirex, HCB and Toxaphene (Camphechlor). More are expected to be considered for international action as the convention is to include criteria and a procedure for adding new substances as candidates for international action..

Measures to reduce or eliminate releases of the 12 POPs are included under Article D of the current draft convention text. Paragraphs D1 and D2 concern respectively, prohibition and restriction of production and use of intentionally produced POPs, and their two annexes A (elimination) and B (restriction) contain information on specific measures and exemptions for each substance. All nine pesticides are included in the elimination annex, although DDT appears in both annexes in brackets, as it is not yet fully agreed as to how the annexes should be used, and there is no difference in the text for DDT in the two annexes. For DDT there is an overall exemption foreseen for vector control purposes, and for a number of the pesticides some country specific exemptions were identified, including DDT. Dates for phase out or review are still to be negotiated for the elimination, as well as for most exemptions. The third negotiating session that took place in September 1999 requested that further information on country specific exemptions be collected and distributed for INC4. The information collected until the end of 1999 is contained in document INC4/INF2. Uses for which a number of countries have indicated continued need are: vector control (DDT) and termite control (chlordane, heptachlor and mirex).

When moving to alternative approaches a number of factors need to be considered, *e.g.* present status with regard to production and use of the POPs pesticide, availability of alternatives; costs and other implications of these; obstacles for their introduction; costs of switching over *etc.*

Important characteristics of the alternatives would include: effectivity, economical, sustainable and durable, environmentally sound, healthy. To this could also be added «easy to introduce», which often means replacing a pesticide simply with another pesticide. Experience has shown that such an approach is not likely to bring durable and sustainable solutions, but can result in other problems for a variety of reasons. Why POPs are bad is largely due to chronic effects thanks to the build up of concentrations. Other pesticides also have potentials of causing adverse effects, although they could be of different nature, many being acutely toxic. In addition, there are several examples of problems with resistance, pesticide failure and even secondary pests demonstrating the need for careful preparations when selecting new approaches. Furthermore, resistance problems in vectors have often been connected with the use of the same and similar pesticides in agriculture. It started with DDT resistance, *e.g.* in areas of western Africa. The same pattern of resistance is now emerging for pyrethroids. For these there is in addition a problem of cross-resistance between different pyrethroids and also with other pesticide families, organophosphates and organochlorines.

To maintain the efficacy of pesticides and to keep a balanced ecology, especially natural pest enemies, the integration of approaches as defined by Integrated Pest Management in Agenda 21 gives the best answer. In addition, the problem of resistance and cross-resistance demonstrate the need for coordinated approaches between sectors. It is further believed that mutual benefits for agriculture, health and the environment can be achieved through collaboration between the sectors, especially between IPM and IVM programmes. The three UN agencies do hence want to work towards win-win situations and help create collabotation at national and local levels. Such collaboration should lead to greater efficiency and effectiveness in efforts towards achieving the different objectives. For example, IVM programmes could probably benefit from the system of IPM farmer field schools, and farmers can certainly benefit from better control of vectors and less exposures to chemicals. Identification of ways forward as well as needs to support and strengthen such collaboration at both national and community level is an important output we hope to get from this workshop.

UNEP

A. Sundén Byléhn

Slide 1

POPs Pesticides

- ALDRIN
- DIELDRIN
- ENDRIN
- CHLORDANE
- HEPTACHLOR
- DDT
- MIREX
- HEXACHLOROBENZENE
- TOXAPHENE

Slide 2

Measures to reduce or eliminate releases

Draft treaty text

Art. D1 / D2 :

Prohibition / restriction of production and use of intentionally produced POPs, with

Annexes A / B:

global and country specific exemptions

Slide 3

Needs for continued use Present Status

- Aldrin - (local ectoparisiticide, insecticide)
- Chlordane - termiticide, (local ectoparisiticide, insecticide)
- DDT - vector control (globally)
- Heptachlor - termiticide; wood treatment
- HCB - pesticide solvent; (+ some non-pesticide applications)
- Mirex - termiticide
- Dieldrin, Endrin, Toxaphene - none

Slide 4

Alternative approaches

Some considerations:

- Present production and use?
- Availability of alternatives?
- Costs & other implications of alternatives?
- Obstacles for their introduction?
- Costs of switching over?

Slide 5

Selecting Approaches

- Effective
- Economical
- Sustainable and durable
- Environmentally sound
- “Healthy”

Slide 6

Issues

- problems associated with POPs as well as alternative pesticides
- pesticide resistance
- pesticide failure
- stocks of (obsolete) pesticides
- costs of changing strategies

Slide 7

Integrated Approaches

Agenda 21:

Integrated Pest Management should be the guiding principle for pest control; it is the best option for the future as it guarantees yields, reduces costs, is environmentally friendly and contributes to the sustainability of agriculture.

Slide 8

Effective and Sustainable

- Need for holistic, cross-cutting approaches, consistent regulations and cooperation between different sectors
- Policies and strategies within and between sectors must be consistent and mutually supportive

Slide 9

ALDRIN

- Probably not produced anymore
- Possible “residual” uses through stockpiles

Reported uses include:

- termite control in tree nurseries and buildings
- insect control in grain storage
- soil pests in maize
- possibly control of tsetse flies and
- ectoparasites on cattle

Slide 10

DIELDRIN

- Probably not produced anymore
- Possible “residual” uses through stockpiles

Reported uses include:

- locust control
- termites control in buildings, crops, nurseries and forest plantations
- insect control in grain storage
- possibly control of tsetse flies and
- ectoparasites on cattle

Slide 11

ENDRIN

- Probably not produced anymore
- Possible "residual" uses through stockpiles (although it seems not to be used anymore)

Reported uses include:

- Control of lepidopteran pests in crops (maize, rice, cotton, and sugarcane)
- control of mice and water voles

Slide 12

CHLORDANE

- US manufacturer stopped production in 1997

Reported uses include:

- termite and ant control in buildings, crops, nurseries and forest plantations
- control of Rhinoceros beetles

Slide 13

HEPTACHLOR

- US manufacturer stopped production in 1997

Reported uses include:

- termite and ant control in buildings, crops, nurseries and forest plantations
- control of cut worms

Slide 14

DDT

- Still in production - (up to 50 000 tons per year acoording to certain estimates, probably including production as an intermediate for dicofol manufature)

Reported uses include:

- vector control: malaria mosquitos; sand and tsetse flies (leishmaniasis and trapanosomiasis); fleas (plague)
- illicit control of crop pests, eg lepidopteran

Slide 15

HEXACHLOROBENZENE (HCB)

- Produced as an intermediate in dye production and as a by-product in manufacture of other chemicals
- Probably not produced as a fungicide anymore

Reported uses include:

- fungicide, particularly effective against bunt and dwarf bunt on wheat

Slide 16

MIREX

- Some production of smaller quantities may still take place

Reported uses include:

- termite and ant control in crops, grassland, forests and buildings
- (fire retardant)

Slide 17

TOXAPHENE (Camphechlor)

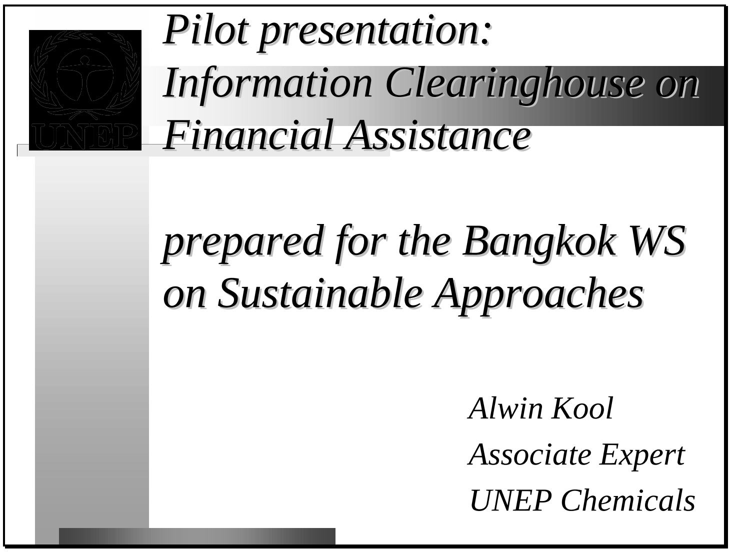
- Believed to be out of production
- Possible “residual” uses through stockpiles

Reported uses include:

- insect control mainly in cotton, but also in soybeans, vegetables and on livestock pests
- possibly control of tsetse flies and
- ectoparasites on cattle

UNEP Clearing House activities
Alwin Kool, UNEP

Slide 1



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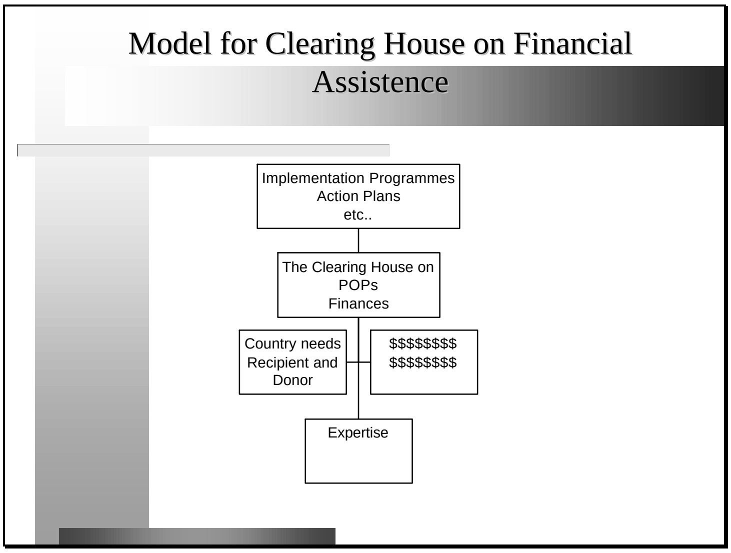

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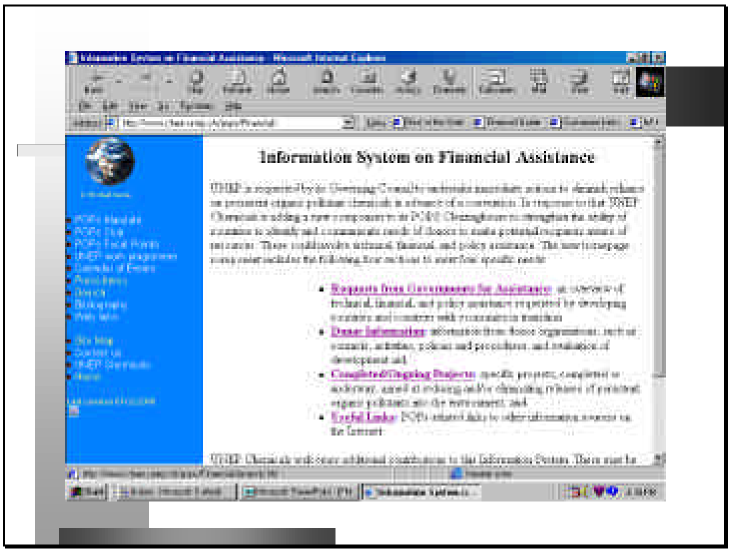
Objective

- *In theory:*
- *To strengthen the ability of countries to identify and communicate needs of donors and recipients*
- ***Translated to us:***
- *Showing the information we gather, have, offer and will offer in the future through UNEP POPs Clearinghouse*
- ***UNEP Chemicals Needs Now:***
- *steering and feedback from users*

Slide 4



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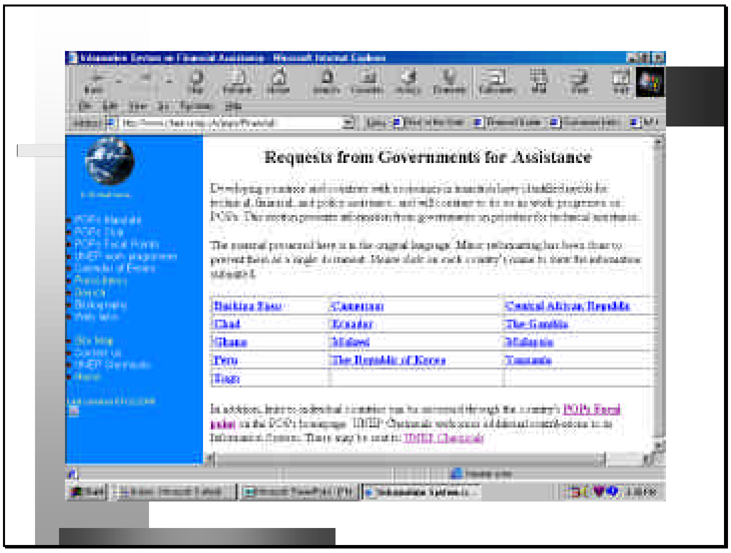

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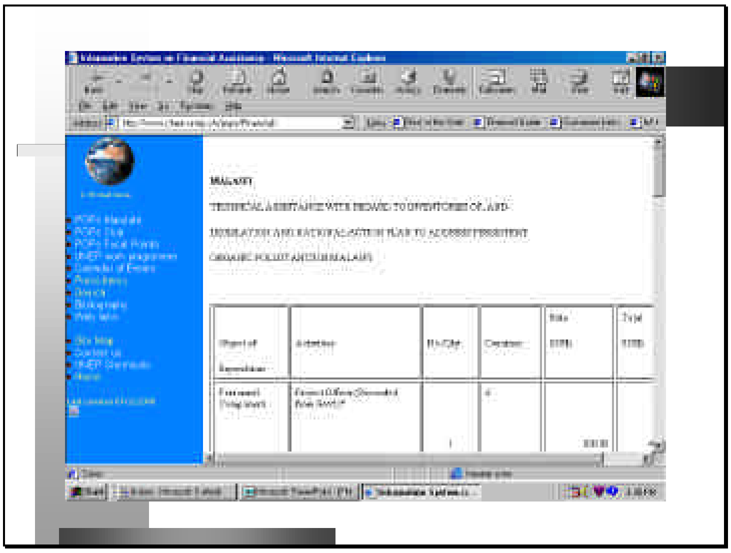

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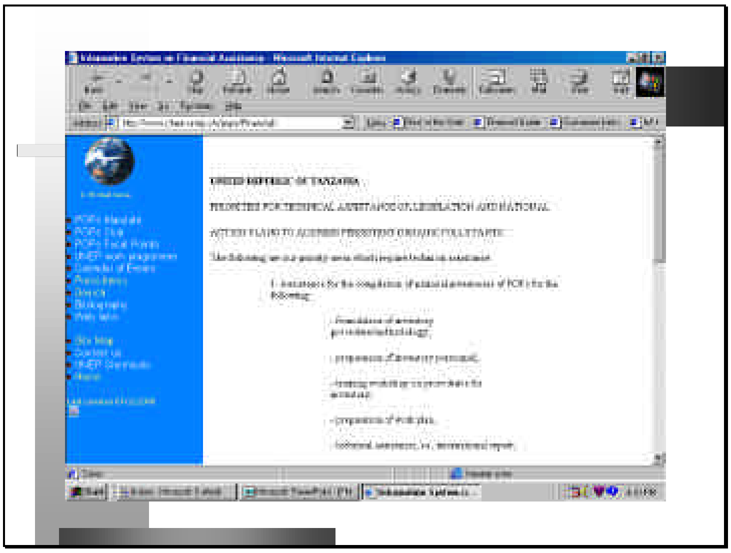

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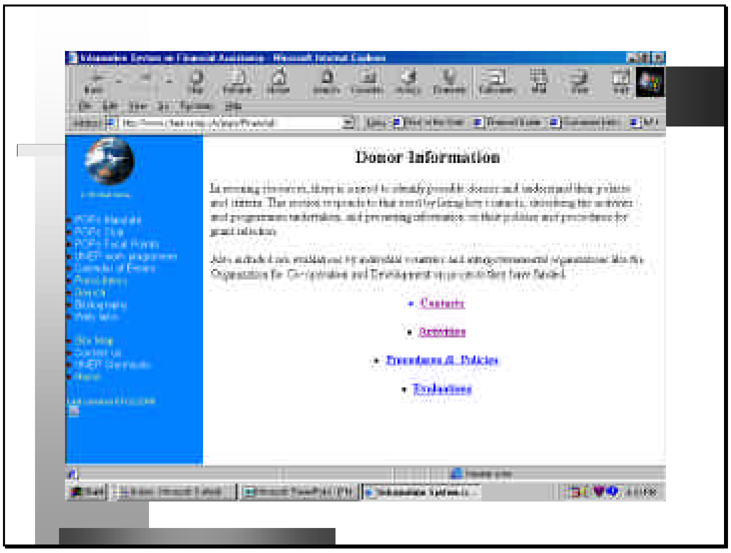

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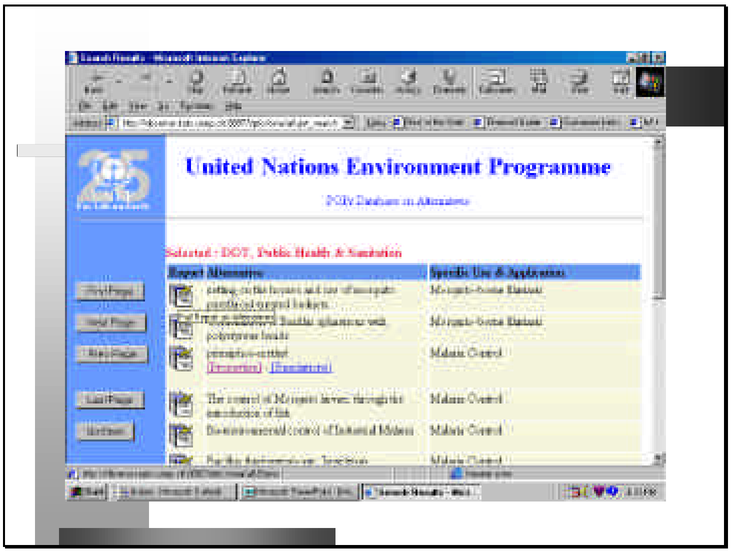

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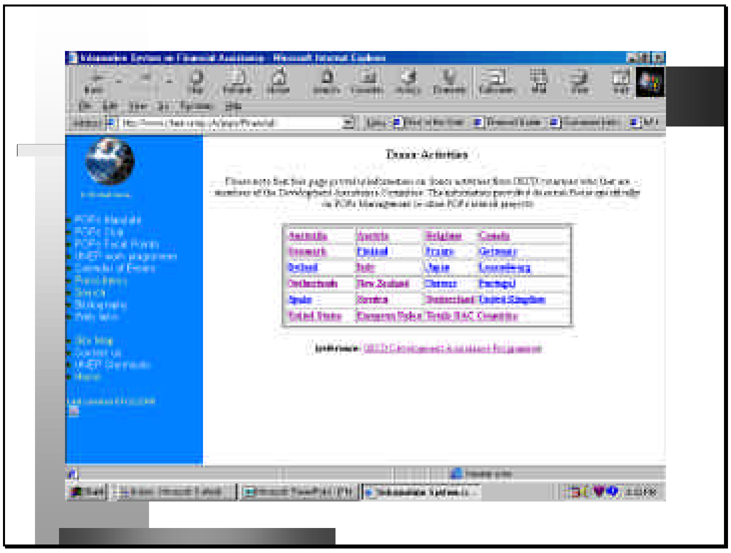

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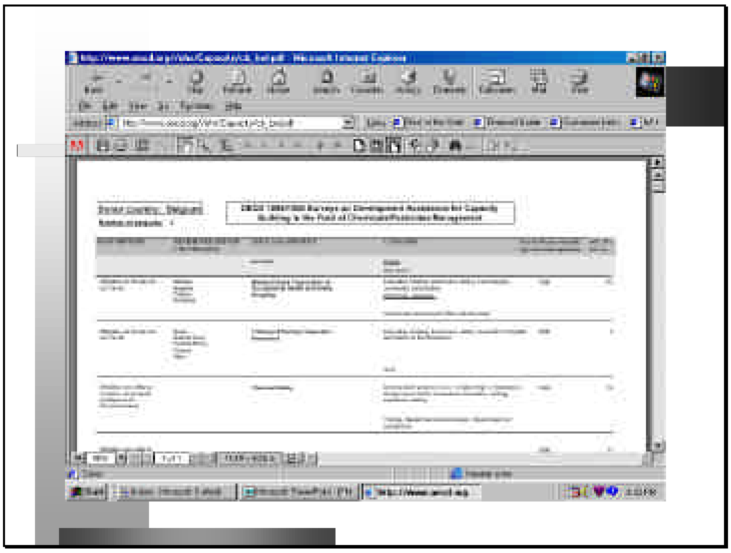

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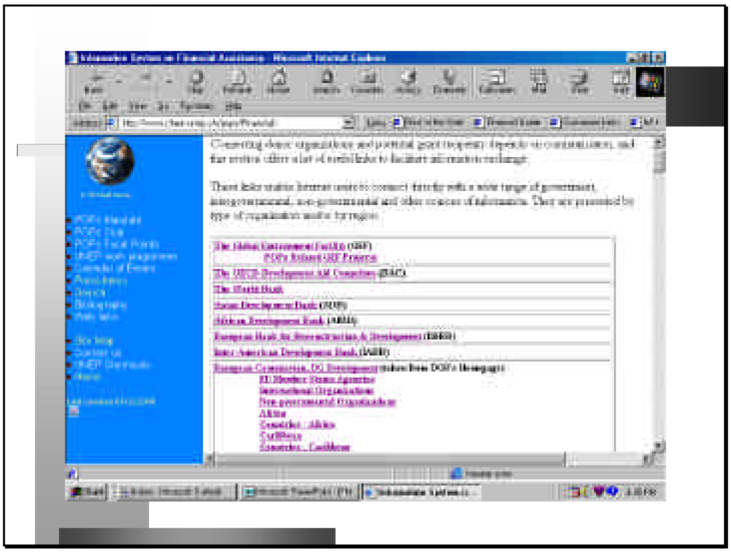

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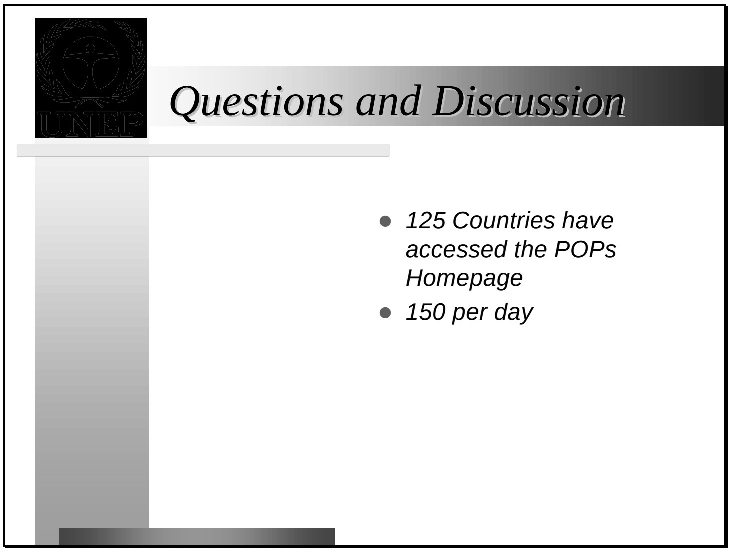

Questions and Discussion
125 Countries have accessed the POPs Homepage
150 per day

UNEP Clearing House activities
Alwin Kool, UNEP

Slide 1

Information Clearinghouse on POPS and their Alternatives prepared for : ***UNEP/FAO/WHO workshop on sustainable approaches in replacing Persistent Organic Pollutants pesticides. Bangkok 6-10 March 2000.***

Alwin Kool
Associate Expert
UNEP Chemicals

Slide 2

Objective

– ***In theory:***
- *Clearinghouse mechanism facilitates information exchange and "the right to know" principle*

– ***Translated to us:***
- *Showing the information we have, we offer and will offer in the future through UNEP POPs Homepage*

Slide 3

Presentation coverage

- The UNEP Information Clearinghouse on POPs
  - – The Homepage
- The UNEP information Clearinghouse on POPs Alternatives
  - – The Homepage
    - Action plans
    - Database on POPs Alternatives
    - Expert address list on POPs Alternatives' "know how"

Slide 4

UNEP Chemicals Homepages

- Chemicals
- GEENET (WHO)
- PIC
- PRTRs
- Biosafety
- POPs

- http://www.chem.unep.ch/pops/

Slide 5

The Pops Homepage

- ***The POPs Negotiations***
- ***The POPs Club***
- ***GEF and other POPs related Projects***
- ***Proceedings, Documents and Case Studies***
- ***Information on POPs and their Alternatives***

  - ***Go to the Homepage***

Slide 6

Information on POPs Alternatives

- *Action Plans and Studies to replace/reduce the releases of POPs*
- *Database on POPs Alternatives*
- *Address list of Experts on POPs Alternatives*

Slide 7

Action Plans and Studies

- *Action Plans to replace/ reduce release of POPs*
- *Studies to replace/ reduce release of POPs*

- *(Show on the POPs Homepage)*

Slide 8

The POPs Alternative Database

- *Topics:*
  - *The way the Database is designed*
  - *The way the Database works*
  - *How the Database will be maintained*

Http://www.chem.unep.ch/pops

Located on UNEP Chemicals POPs Clearinghouse

Slide 9

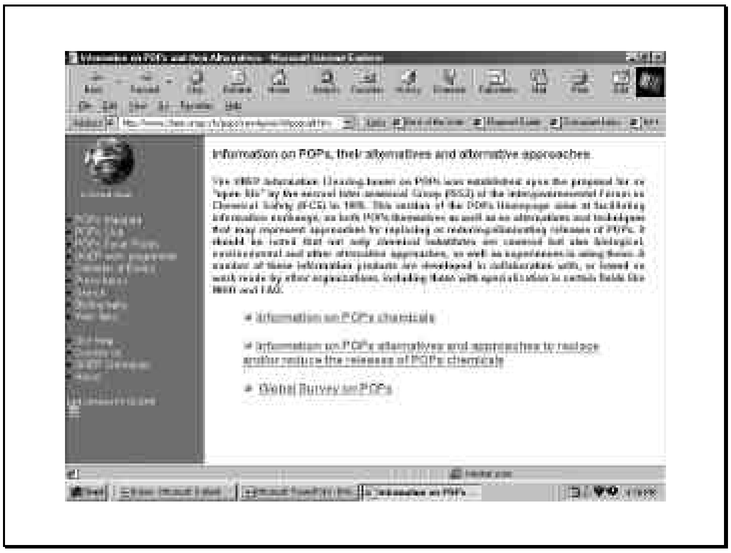
The Database Now

- **Questions:**
  - **POPs Chemical**
  - **Socio-Economic Sector**
  - **Specific Application**
  - **Source**
  - **Alternative category**

- **Answers:**
  - **The POPs Alternative**
  - **The Reference**
  - **Properties of POPs Alternative**
  - **Regulatory Information of POPs Alternative**
  - **The Potential Implications**
    - **Go to the Database**

Slide 10

Slide 11



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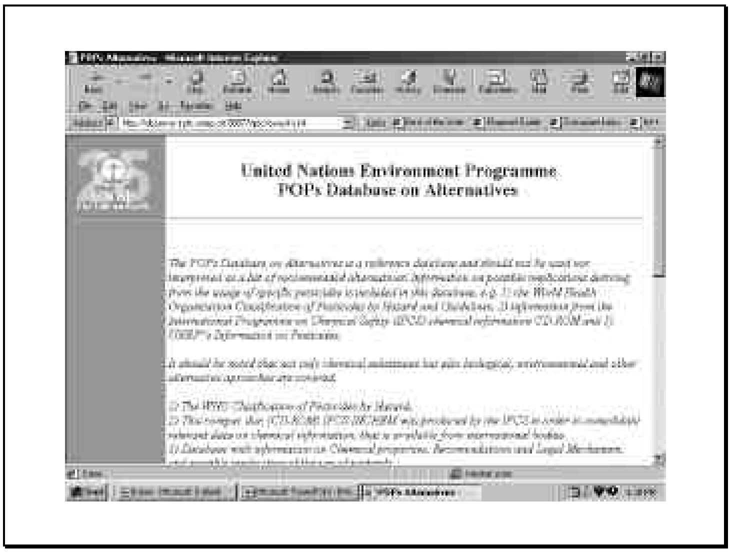

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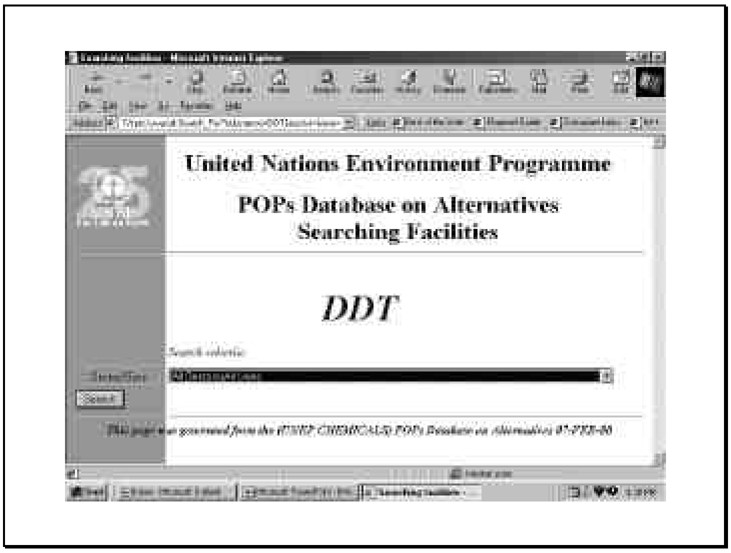

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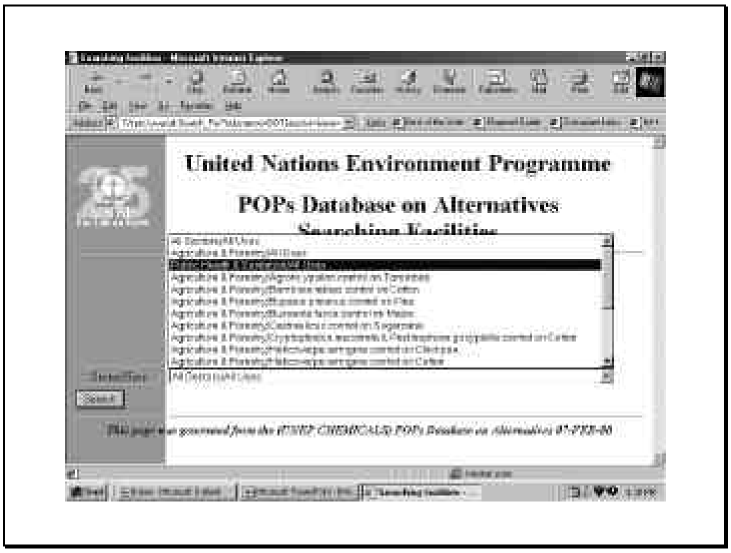

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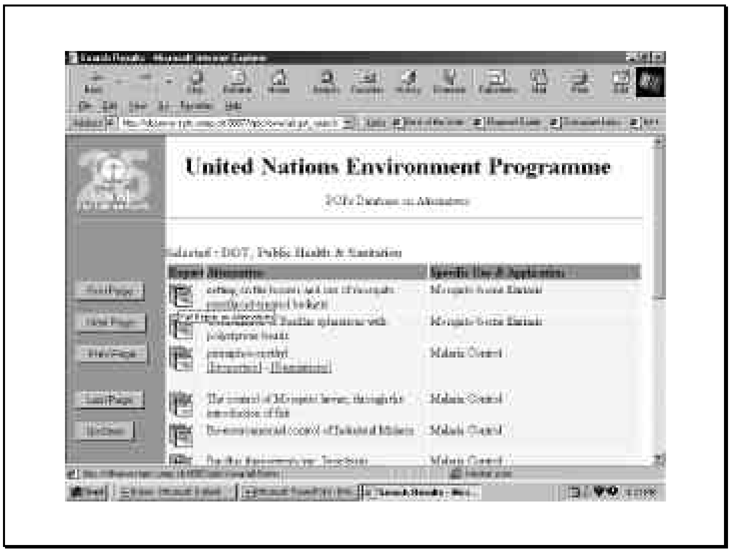
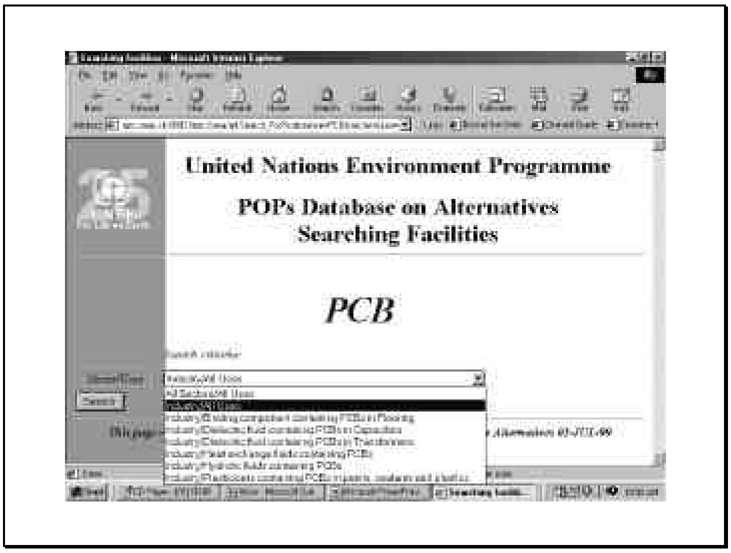


Slide 16

Slide 17



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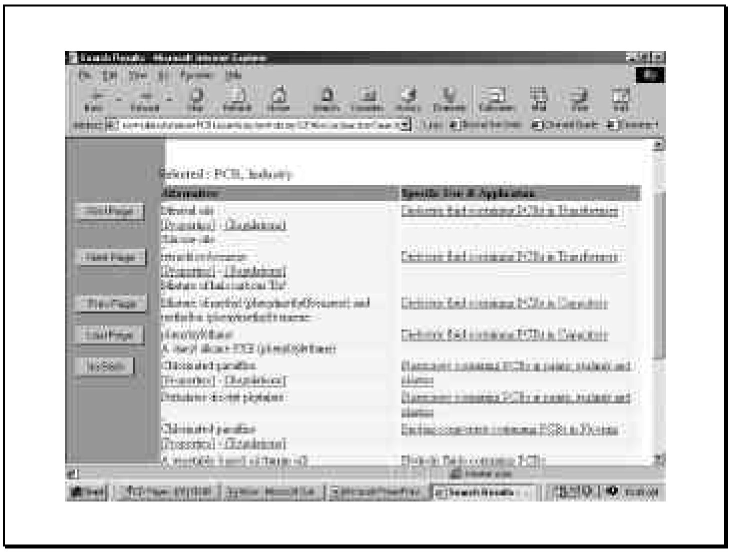


Slide 19

The Database in the future

- **OUTPUT NOW**
  - **Alternative**
  - **The Reference**
  - **Properties**
  - **Regulatory Information**
  - **Potential Implications**
- ***OUTPUT in the Future***
  - **Interactivity**
  - **Links to action plans**
  - **Links to Case studies**
  - **Links to Experts**
  - **Links to Legal File**

Slide 20

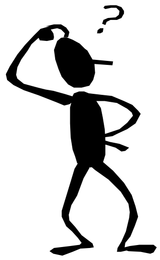
Experts on POPs Alternatives

– The near future

- *Name/ Institute/ Organization*
- *Field of Expertise (Alternative)*
- *Region/Country*
- *Interactive*
- *Comments section*
- *Availability of the Expert*

Slide 21

Questions and Discussion



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Integrated Vector Management
Willem Takken, Wageningen University, the Netherlands

Slide 1

INTEGRATED VECTOR MANAGEMENT

Willem Takken
Laboratory of Entomology
Wageningen University
The Netherlands

Slide 2

INTEGRATED VECTOR MANAGEMENT

Most important vector-borne diseases in humans

Malaria	global tropics
Lymphatic filariasis	global tropics
Leishmaniasis	global tropics
Onchocerciasis	Africa, Latin America
Trypanosomiasis	sub-Saharan Africa
[Schistosomiasis]	Africa, S. America, E. Asia
Chagas	Latin America
Arbo-viral diseases:	
Dengue	S.E. Asia, Central America
Yellow fever	Africa, S. America
Japanese encephalitis	S.E. and E. Asia
others	…………………..

Slide 3

INTEGRATED VECTOR MANAGEMENT

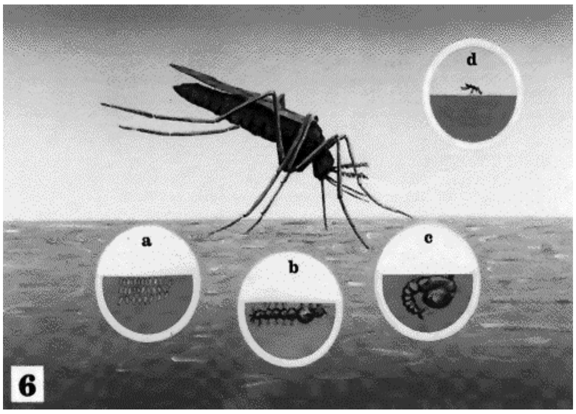
Most important vector-borne diseases in livestock

Tick-borne diseases:

Anaplasmosis	global (sub)tropics
Babesiosis	global (sub)tropics
Heartwater	global tropics
East Coast Fever	Africa
Trypanosomiasis	global tropics, particularly Africa
Blue tongue	global (sub)tropics
African horse sickness	N. Africa, S. Europe

Slide 4

INTEGRATED VECTOR MANAGEMENT



Slide 5

INTEGRATED VECTOR MANAGEMENT

Possibilities for IVM:

Malaria	**++**	**global tropics**
Lymphatic filariasis	**+++**	**global tropics**
Leishmaniasis	**-**	**global tropics**
Onchocerciasis	**+++**	**Africa, Latin America**
Trypanosomiasis	**++**	**sub-Saharan Africa**
[Schistosomiasis]	**+++**	**Africa, S. America, E. Asia**
Chagas		**Latin America**
Arbo-viral diseases:		
Dengue	**++**	**S.E. Asia, Central America (urban only)**
Yellow fever	**?**	**Africa, S. America**
Japanese encephalitis	**+**	**S.E. and E. Asia**
others …………………..		

Slide 6

INTEGRATED VECTOR MANAGEMENT

Possibilities for IVM:

Tick-borne diseases:		
Anaplasmosis	**+**	**global (sub)tropics**
Babesiosis	**+**	**global (sub)tropics**
Heartwater	**+**	**global tropics**
East Coast Fever	**++**	**Africa**
Trypanosomiasis	**++**	**global tropics, particularly Africa**
Blue tongue	**?**	**global (sub)tropics**
African horse sickness	**+**	**N. Africa, S. Europe**

Slide 7

INTEGRATED VECTOR MANAGEMENT

History of vector control (1):

***Before 1945*:**

- **Cultural control (environmental management)**
- **Larval control (Paris green = copper acetoarsenite; mineral oils)**
- **Personal protection (bed nets, screens)**

***After 1945*:**

- **Synthetic pesticides (acaricides, insecticides)**
- **1955: Adoption of policy of global malaria eradication**

Slide 8

INTEGRATED VECTOR MANAGEMENT

History of vector control (2):

1960: growing evidence of development of insecticide resistance, particularly in anopheline vectors of malaria

1962: publication of Silent Spring

1969: formal recall of malaria eradication policy

1970's: prohibition of use of persistent organochlorine pesticides (POPs) in industrialized countries

Where did this leave the vector control policies and recommendations for vector control????

Slide 9

INTEGRATED VECTOR MANAGEMENT

1980-2000:

- **Chemical larval control (re-emphasized)**
  Problems: **- insecticide resistance**
  - concerns about pollution (drink water supply, useful organisms)

- **Limited house spraying (o.a. Brazil, Mexico, South Africa, Ethiopia, India, Indonesia)**
  Problems: **- insecticide resistance**
  - high costs
  - public unwilling to cooperate
  - can only be applied under specific conditions

Slide 10

INTEGRATED VECTOR MANAGEMENT

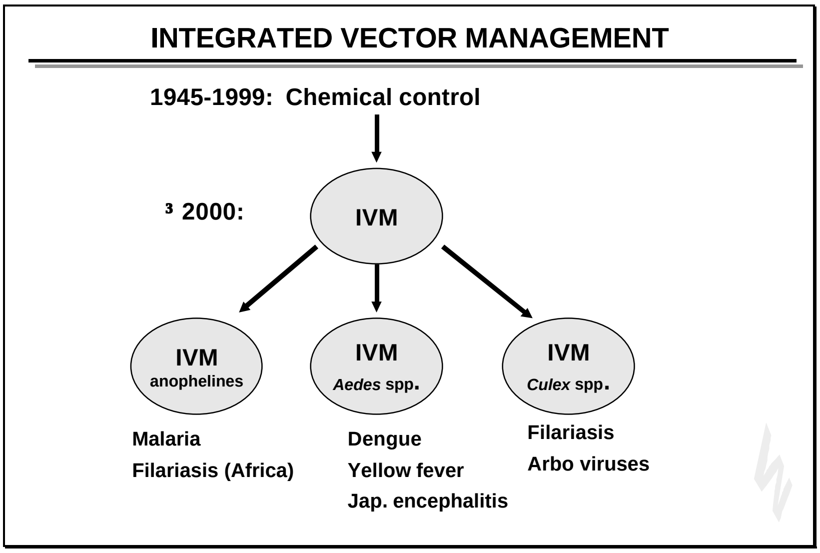
1980-2000:

- **Chemical larval control (re-emphasized)**
- **Limited house spraying (a.o. Brasil, Mexico, South Africa, India, Indonesia)**

Large scale experiments with:

- **Insecticide-impregnated bed nets**
- **Bio-pesticides: *Bacillus thuringiensis*, *Bacillus sphaericus***
- **Bio-rationale agents: insect growth regulators (IGRs)**
- **Biological control: fish, fungi, nematodes**
- **Cultural control: intermittent irrigation, drainage**
- **Community participation: hygienic measures, sewage control**

Slide 11



Slide 12

INTEGRATED VECTOR MANAGEMENT

IVM
anophelines

Malaria (world)
Filariasis (Africa)

Integrated control of anophelines:

- **Personal protection (bed nets, house improvement)**
- **Water management**
- **Biological control (larval control)**
- **Bio pesticides (larval control)**
- **Indoor spraying with insecticides**

Slide 13

INTEGRATED VECTOR MANAGEMENT

IVM
***Aedes* spp.**

Dengue
Yellow fever
Jap. Encephalitis
Rift Valley Fever
West Nile fever

Integrated control of *Aedes* spp. :

- **Removal/coverage of breeding sites**
- **Selective chemical treatment of breeding sites**
- **Bio pesticides (larval control)**
- **Biological control (fish, nematodes, copepods)**
- **In- and outdoors fogging (epidemics only)**
- **COMMUNITY PARTICIPATION**

Slide 14

INTEGRATED VECTOR MANAGEMENT

IVM
***Culex* spp.**

Filariasis
Arbo viruses

Integrated control of *Culex* spp. :

- **Removal/coverage of breeding sites**
- **Hygiene**
- **Polystyrene beads**
- **Bio pesticides (larval control)**
- **Personal protection (repellents, mosquito screens)**
- **COMMUNITY PARTICIPATION**

Slide 15

INTEGRATED VECTOR MANAGEMENT

What about non mosquito-borne vector-borne diseases?

Leishmaniasis	• **bed nets and appropriate health care**
Trypanosomiasis	• **odour-baited traps, community participation**
Schistosomiasis	• **community participation, construction of taps, latrines etc., water management**
Chagas	• **house improvement, indoor insecticidal paint**
Onchocerciasis	• **drug treatment, insecticides**

Slide 16

INTEGRATED VECTOR MANAGEMENT

Current use of POPs in vector control:

only DDT for malaria control

Although numerous other synthetic pesticides are available (Organophosphates, Carbamates, Synthetic Pyrethroids), their use should be considered only if all other aspects of the IVM package have failed or are insufficient to achieve the desired level of health or protection

Slide 17

INTEGRATED VECTOR MANAGEMENT

IVM
anophelines

malaria

Question: what is different in anopheline control between Asia and Africa???

Integrated control of anophelines:

- **Personal protection (bed nets, house improvement)**
- **Water management**
- **Biological control (larval control)**
- **Bio pesticides (larval control)**
- **Indoor spraying with insecticides**

Slide 18

INTEGRATED VECTOR MANAGEMENT

Management of vector control (WHO, 1995):

Vector control delivery

- **Make use of health service facilities**
- **Make use of primary health care networks**
- **Obtain the support of NGO's and communities**
- **Establish infrastructures and mechanisms**

Entomological inputs

- **Establish entomological components within malaria control programmes**
- **Re-orient entomological activities to meet the requirements for selective vector control**
- **Establish programmes for routine entomological monitoring, active/special surveillance and emergency planning and to support community and intersectoral actions**
- **Develop evaluation procedures for vector control**
- **Collaborate and interact with research and academic institutes**

Slide 19

Implications of health sector decentralization for vector control in Sri Lanka,

F.P. Amerasinghe, IWMI, Sri Lanka

Slide 1

IMPLICATIONS OF HEALTH SECTOR DECENTRALIZATION FOR VECTOR CONTROL IN SRI LANKA

FELIX P. AMERASINGHE

International Water Management Institute
Sri Lanka

Slide 2

VECTOR CONTROL

- **Primarily aimed at malaria, executed by the Anti-Malaria Campaign**
- **Vectors of other mosquito-borne diseases (eg. Japanese encephalitis, Dengue, Filariasis) attacked only sporadically**
- **Even in respect of the latter diseases, control is effected through the resources of the Anti-Malaria Campaign**

Slide 3

MALARIA VECTOR CONTROL

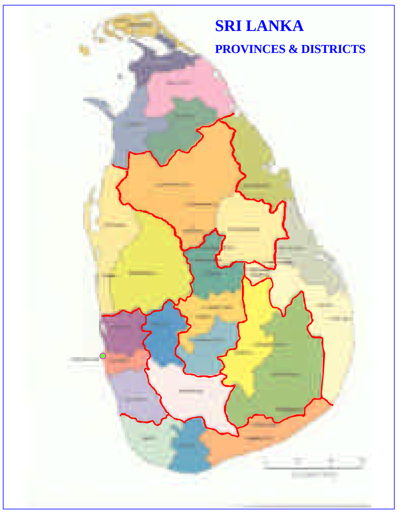
- **Primary strategy is indoor residual spraying 1950's - DDT; 1970's & 80's - malathion; 1990's - deltamethrin, fenitrothion**
- **Larviciding by Temephos (Abate) in stream & river systems**
- **Impregnated bednets (recent, permethrin or deltamethrin)**
- **Other strategies (eg. Fish, Flushing) sporadic, not sustained**

Slide 4

A LITTLE HISTORY

- **1958: Malaria eradication by ANTI MALARIA CAMPAIGN set up as a separate vertical program within the Ministry of Health**
- **1980's: Clamor for integration of health services**
- **1989: Amendment to Constitution of Sri Lanka; Administration decentralized to Provinces; Malaria control decentralized and integrated into the provincial health system.**

Slide 5



Slide 6

THE OLD STRUCTURE

Director General of Health Services

↓

Deputy DG, Public Health Services

↓

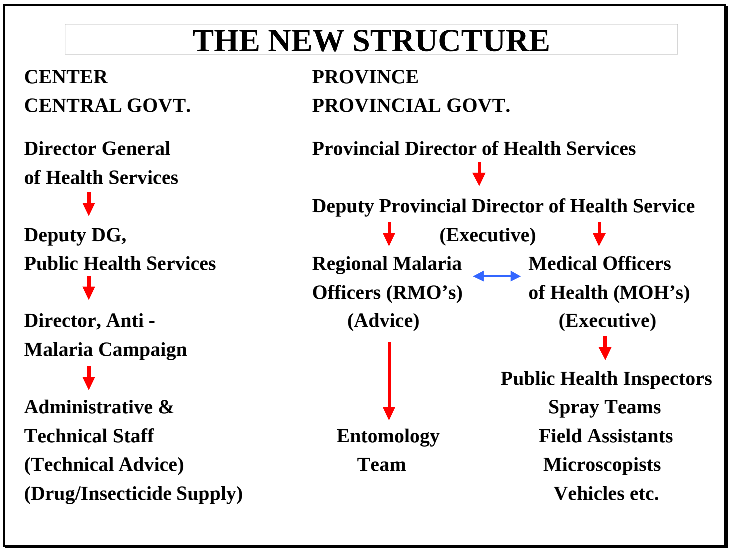
Director, Anti Malaria Campaign
(Executive authority)

↓

Regional Malaria Officers (RMO's)
(Executive authority)

Public Health Inspectors ←	→ **Entomology Team**
Microscopists ←	→ **Spray Team**
Field Assistants ←	→ **Vehicles & Equipment**

Slide 7

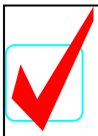


Slide 8

AMC - PRESENT FUNCTIONS

- **Formulate national policy for malaria control (drug regime, vector control etc.)**
- **Drug & insecticide supply & distribution**
- **Provide technical advice & coordinate activities**
- **Link with WHO and donors**
- **Coordinate research**
- **Monitor & evaluate malaria control**

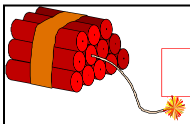
Slide 9



ADVANTAGES

- **Shorter lines of communication**
- **Quicker decision-making**
- **RMO’s have more freedom to recommend changes in existing control strategy**
- **RMO’s have greater freedom to test alternative control strategies**
- **RMO’s have freedom to develop multi-disciplinary approaches**

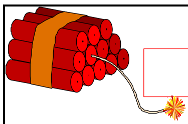
Slide 10



DISADVANTAGES

- **Variable prioritization for malaria control at provincial political and administrative level**
- **No separate component for malaria in provincial health budget**
- **RMO has no executive authority to implement vector control**

Slide 11



DISADVANTAGES

- **Staff and vehicles previously reserved for malaria control now assigned for other duties. Rapid emergency mobilization difficult**
- **No logistical support from the center, and no means to rapidly mobilize resources from other districts in an emergency.**
- **No effective inter-agency forum either at center or provincial level**

Slide 12

THE NEW STRUCTURE

CENTER
CENTRAL GOVT.

Director General of Health Services
↓
Deputy DG, Public Health Services
↓
Director, Anti - Malaria Campaign
↓
Administrative & Technical Staff
(Technical Advice)
(Drug/Insecticide Supply)

PROVINCE
PROVINCIAL GOVT.

Provincial Director of Health Services
↓
Deputy Provincial Director of Health Service (Executive)
↓ ↓
Regional Malaria Officers (RMO's) (Advice) ↔ **Medical Officers of Health (MOH's) (Executive)**

Regional Malaria Officers (RMO's) → **Entomology Team**

Medical Officers of Health (MOH's) → **Public Health Inspectors, Spray Teams, Field Assistants, Microscopists, Vehicles etc.**

Slide 13

OVERALL ASSESSMENT

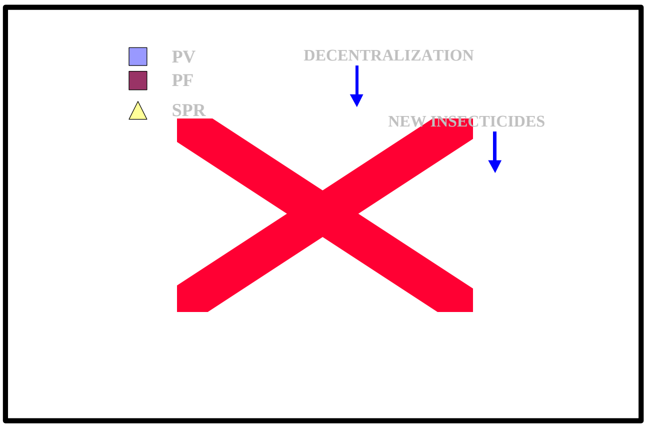
- **Variable performance of the system in different Provinces and Districts**

  In regions where top level administration is supportive, malaria control in general and vector control activities in particular, are effective

  In regions where political/administrative support is lacking, control activities suffer

Slide 14

MALARIA IN SRI LANKA



COMMUNITY IPM/HEALTH COLLABORATION IN THE LOCAL MANAGEMENT OF VECTOR-BORNE DISEASES

Presented at the UNEP/FAO/WHO Workshop on Sustainable Approaches for
Pest and Vector Management and Opportunities for Collaboration in Replacing POPs
Pesticides,
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March 2000

The usefulness of intersectoral collaboration between agriculture and health programmes has long been recognized. An important example is the scope for integrated pest management (IPM) extension programmes to collaborate with health agencies in controlling vector-borne disease. IPM--which includes the disease vector-targeted variant called integrated vector management (IVM)--is considered best practice in both agriculture and public health. Agriculture/health cooperation for farmer training in IPM/IVM could be a mutually beneficial way to optimize the use of scarce human and financial resources.

Such synergies are more important now than ever. In most developing countries, responsibility for basic health care programmes, including the management of vector-borne diseases, has been decentralized to local governments with an emphasis on community-based programmes. Too often, local health agencies are not given adequate funds or training.to discharge these new responsibilities adequately (Matteson 1999). Agricultural extension programmes, too, are generally underfunded.

The idea of collaboration between IPM and IVM programmes was addressed in 1991 and 1992 by a series of three inter-regional workshops on ‘Promotion of Environmental Management for Disease Vector Control through Agricultural Extension Programmes,’ organized by the Panel of Experts on Environmental Management for Vector Control (PEEM) drawn from four United Nations agencies: WHO, the Food and Agriculture Organization (FAO), the United Nations Environment Programme (UNEP), and the United Nations Centre for Human Settlements (UNCHS/HABITAT). The workshops, which were funded by the United States Agency for International Development (USAID) and Canada’s International Development Research Centre (IDRC), generated country action plans (PEEM 1995).

The present workshop series is similar, but with the added focus of seeking sustainable approaches for replacing pesticides which are persistent organic pollutants (POPs). DDT and other organochlorine insecticides dominate the list of POPs, which are compounds with characteristics that make them especially hazardous to ecosystems and human health: toxicity, persistence, long-range atmospheric transport and deposition, and bioaccumulation. Current international treaty negotiations seek to minimize or eliminate POPs production and use (UNEP 2000).

The proposal to eliminate DDT is controversial. Vector-borne disease control programmes in some poorer countries still rely on DDT application to house interiors to kill malaria mosquitoes and the sandflies that vector leishmaniasis. Many malaria control specialists oppose phasing out the production and use of DDT, which is inexpensive, until First World financial support puts cost-effective IVM alternatives in place (Curtis & Lines 2000). Progress toward that goal, as well as toward overall pesticide use reduction in public health programmes, can be furthered by collaboration between IPM and IVM programmes for farmer implementation of environmental management measures that reduce malaria mosquito breeding.

This paper offers a practical scenario for mutually beneficial collaboration between IPM and IVM programmes. The context of the scenario is farmer training implemented with support from the FAO Programme for Community IPM in Asia, which is the name for Phase IV of the FAO Inter-Country Programme for IPM in Rice in South and Southeast Asia. This FAO regional IPM programme has been operational since 1980, and currently comprises 12 member countries.

FAO-IPM Farmer Field Schools (FFS) operate under the principle 'Farmer as Expert,' giving farmers the skills to manage their crops for maximum productivity under farm-specific conditions and priorities. Community IPM activities offer FFS graduates opportunities for further learning and strengthen their community development skills, with a view to establishing sustainable farmer-led local IPM programmes and supporting other development initiatives. This approach to farmer education and community development is being adapted for implementation in other parts of the world (Global IPM Facility 1999).

Farmer Field Schools and Community IPM

IPM Farmer Field Schools educate farmers in applied agro-ecology. Attachment 1, *The IPM Farmer Field School* (FAO Community IPM 1999a), provides a full description of FFS organization and training. In summary, a FFS is a group of 25-30 farmers that meet in their crop for half a day each week during an entire cropping season. In these class meetings, IPM trainers facilitate a participatory, 'discovery' learning process focusing on the biology, ecology, and life cycle of the crop, its insect pests, diseases, and weeds, and the beneficial organisms that usually keep pests and diseases under control. Farmers gain hands-on experience managing their agroecosystem in order to grow a healthy crop, promoting and enhancing natural pest controls and thereby eliminating or minimizing the use of toxic pesticides (Matteson, Gallagher & Kenmore 1994, Kenmore 1996).

Every decision about how a crop is grown affects the crop's condition and vulnerability to harm from weeds, pests, and diseases. Therefore, IPM FFS are a complete production course rather than being focused narrowly on 'pest management' topics. The first column of Table 1 lists some of the many subjects addressed in a basic rice FFS. FFS curricula have also been developed for vegetables, cotton, soybeans, peanuts, tea, and other crops.

The FFS training methodology accents skills development for crop management. Each class session centers on an agroecosystem analysis (AESA) exercise wherein trainers facilitate farmer practice of

--*observation* of current ecological conditions in the crop

--*analysis, presentation* and *discussion* of their observations, and
--*decision making* to arrive at recommendations for crop management during the coming week. Each week, AESA is supplemented by training in a special topic relevant to local field problems in that particular stage of the crop. These special topics often involve
--*experimentation* by farmers to fill knowledge gaps and test ideas. For instance, farmers make 'insect zoos' to study the behavior, food habits, and life cycle of insect pests and their natural enemies.
Skill-building activities are complemented by games that apply group dynamics for fun and to enhance learning, engender solidarity and trust between FFS participants, and illustrate the advantages of cooperation.

FFS graduates are encouraged to keep applying their new knowledge and skills, observing their crops regularly as a basis for sound management decision making. Many of them want to continue learning and experimenting, and to address new problems. A wide range of Community IPM activities for FFS alumni, described in Attachment 2, *What Is Community IPM All About?* (FAO Community IPM 1999b), provides opportunities for this. Among those activities are farmer-planned and -implemented field studies carried out with technical support from research scientists and IPM trainers. Farmers' field studies can provide the basis for 'Follow-up FFS' in new crops or with a special focus (e.g., managing rats or golden snails in rice).

Including mosquito larvae and pupae in weekly ecosystem observations of rice paddies is not much of a stretch for FFS graduates. Indeed, monitoring them is appropriate for IPM agroecosystem analysis as well as for IVM purposes. Agricultural ecologists have recently underscored the importance of detritivores and plankton feeders, such as Collembola, midges, and mosquitoes, for natural pest control. These insects are among the first colonizers of newly-prepared paddies. Early-arriving general predators that normally suppress pests later in the season (e.g., spiders, water striders) depend on them as a food source. Early-season pesticide applications in rice can lead to pest outbreaks not only by killing natural enemies directly, but also by removing their neutral' insect prey (Wu 1994, Settle et al. 1996). Broadening rice farmers' capabilities through Community IPM field studies of mosquito ecology and
management could provide an exciting new way for them to keep learning and to apply that learning in a new sphere--by helping safeguard their communities from mosquito-borne disease.

Scenario: Follow-up FFS in Ricefield Mosquito Management

It is important to note that there are many possibilities for the community-level implementation of IPM for controlling disease vectors. A single practical example is presented herein: Follow-up FFS in Ricefield Mosquito Management. There are several reasons to choose this ricefield mosquito IPM/IVM scenario. Reducing populations of adult mosquitoes can reduce the need for customary insecticide applications that are hazardous to environmental and human health: 'space spraying' or fogging of terrestrial mosquito habitat, and interior house spraying with DDT or other insecticides,. Moreover, ricefield mosquito management is relevant to many problems, including the control of nuisance mosquitoes and a number of vector-borne diseases such as malaria, filariasis, Japanese encephalitis, and yellow fever. By shifting the focus slightly to snails in rice paddies, this scenario can also be applied for schistosomiasis control. In addition, it can be extended to any irrigated crop.

Field studies in association with pilot FFS, carried out by rice IPM FFS graduates with technical support from IVM specialists and IPM trainers, could generate the curriculum for a Follow-up FFS in Ricefield Mosquito Management. Rice paddies do not always produce problem mosquitoes (IRRI 1988). This Follow-up FFS option is only viable where they do, and the community considers the mosquito nuisance and/or mosquito-borne diseases to be a serious burden worthy of group effort to overcome. Ideally, the training would be facilitated collaboratively by local IPM extension staff and health officers responsible for IVM.

Table 1 summarizes possibilities for adapting the basic rice FFS curriculum for a Follow-up FFS. Participating farmers can learn to manage a number of environmental factors so as to make their rice paddies less suitable habitat for problem mosquitoes. Major factors that determine mosquito preferences for water habitats include the degree of disturbance and speed of flow, shade or exposure to sunlight, temperature, salt content, surface vegetation, and degree of pollution. It is impossible to predict the applicability of any one form of environmental management to a certain rice-growing area or community. Various vectors have differing abilities to survive in specific conditions. Farmers’ decision about what action to take must depend on a detailed study of local circumstances. In general, agroecosystem management methods for vector control in rice paddies must satisfy five criteria to justify their adoption:
--they must be known to be effective against the identified problem vector or vectors;
--they must be socially acceptable;
--they must be cost effective when compared with other feasible methods;
--they must be economically sustainable by the community, at some agreed level of responsibility; and
--they must be compatible with locally practicable crop production techniques (FAO 1984).

Where rice paddies are not the only breeding site for problem mosquitoes, ricefield mosquito management would have to be part of a series of coordinated activities which, together, held promise of reducing mosquito breeding success over a wide enough area to lower disease transmission significantly. In some cases, environmental management will be impractical or impossible because there is too much uncontrollable vector habitat. Health officials should facilitate an accurate and thorough health risk assessment by farmers at the initial field study stage, as a basis for feasibility decision making.

Table 1: Rice IPM Farmer Field Schools and Ricefield Mosquito Management

Rice FFS topic	Focus for Follow-up FFS on Ricefield Mosquito Management	Notes
Biology, ecology, life cycles of rice and of weeds, insect pests, and diseases and their natural enemies	Mosquito species present, and their natural enemies; biologies, ecological roles, and feeding habits; vector and/or nuisance status of the different mosquitoes; disease cycles and epidemiology; changes in mosquito and natural enemy habitat, density, and distribution throughout seasonal and annual cropping cycles; etc.	Customary mosquito sampling techniques--sweep nets, dippers--are easy for farmers to use. Different mosquito species reach maximum densities at different stages of rice growth. Farmers can make aquatic insect zoos’ in empty glass jars for studying life cycles and predator-prey relationships

Cropping patterns (e.g., seasonal timing, crop synchrony, crop rotations)	Planting date options; synchronized planting; single vs. double or triple cropping; rotation of rice with dryland crops	Avoid growing rice during optimal season for mosquito breeding. Fewer rice crops, synchronized planting, and crop rotation can reduce availability of mosquito habitat but may cause problems by reducing predator populations too
Land preparation	Tillage and sowing practices; paddy leveling; design and maintainance of bunds, drainage channels and canals; soil amendments	No-till, dryland preparation and dry seeding can reduce availability of water habitat. Eliminate pools and stagnant water, weed-choked channels, seepage and overflow. Physical characteristics and chemical and microbiological composition of soils affect water quality
Varietal selection	Effect of plant height, shape, stature, hairiness, tillering ability, drought tolerance, etc. on mosquito habitat	Mosquito species have specific habitat preferences: sun/shade, temperature, shelter, etc. Dense canopy may inhibit mosquito oviposition. Drought-tolerant cultivars allow a reduction in paddy flooding
Plant spacing/density	Effect of rice hill spacing, transplanting versus broadcasting on mosquito habitat	Mosquito species have specific habitat preferences: sun/shade, temperature, shelter, etc. Dense canopy may inhibit mosquito oviposition
Water management	Good water control for adequate drainage and intermittent irrigation; flow rate effect on problem mosquitoes; water quality and its differential effect on problem mosquitoes and their natural enemies	Intermittent irrigation suppresses populations of both mosquitoes and brown planthopper, reduces water consumption, and often raises yield. Adjusting water flow can reduce numbers of mosquito larvae. The source, clarity, ionic composition, and organic content of water all affect mosquitoes
Fertilizer management	Effects of different types of fertilizers and application practices on nutrient cycles in soil and paddy water, rice plant development, and growth of plankton and weeds	Fertilizer choice and application practices affect quality of soil and water. Nitrogen deficiency can cause formation of rice root mats that harbor mosquito larvae. Mosquito larvae filter-feed on plankton. Aquatic weeds affect mosquito habitat.
Weed management	Aquatic and waterside vegetation effects on habitat quality for key mosquito species and their natural enemies; *Azolla* for biological fertilizer and mosquito management	Weeds can provide shade, shelter, and a favorable microclimate for some mosquitoes, but also may harbor their natural enemies. Solid mats of the aquatic fern *Azolla* interfere with mosquito

		oviposition and development and the emergence of adults
Biological controls	Evaluation of biopesticides (*Bacillus thuringiensis israelensis, B. sphaericus*); improving conditions for, or augmenting, natural enemies of mosquitoes; feasibility of local production and distribution of biological control agents	Many biological control agents can be considered, including larvivorous fish, parasitic nematodes, pathogenic fungi and bacteria, and predacious arthropods--even predatory mosquito species
Pesticide management	Insecticide, fungicide, and herbicide effects on plankton; their differential effects on mosquitoes and mosquito predators, parasites, and pathogens; pesticide resistance in mosquitoes	Pesticides affect water quality and flora and fauna in paddy water. Effect of ricefield pesticide applications on vector-borne disease is variable and situation-specific; they can cause outbreaks of both mosquitoes and rice pests by killing natural enemies. Insecticide use in rice areas can induce pesticide resistance in malaria vectors
Rice/fish systems	Fish production for income generation combined with biological control of weeds and/or mosquito larvae and pupae	Larger commercial species often combined with small larvivorous fish. Herbivorous fish can help control aquatic weeds. Rice yields often higher in paddies with fish. Feasible only where no toxic pesticides applied

Sources: WHO 1982, FAO 1984, IRRI 1988, Lacey and Lacey 1990, Meek and Olson 1991

Effective mosquito management at the community level, like rat management, would probably require collective action by an entire village or several contiguous villages. Rat Management FFS give farmers a basis for area-wide rat control initiatives by providing a framework for mapping rat habitats and monitoring rat reproductive cycles and movement over time in entire villages. A similar approach might usefully be taken by Mosquito Management FFS.

Complementary Community IPM activities

Field studies by farmers and follow-up FFS are two of many Community IPM activities that could serve IPM/IVM collaboration (FAO 1997, 1998; Morales Abubakar 1999). Other Community IPM activities complementary to ricefield mosquito management could help maintain farmer motivation while contributing to a wider effort that may be necessary to achieve the desired reduction in disease transmission. Such complementary activities might include:

C *Health studies* The benefits of ricefield mosquito management efforts must be apparent in order to maintain farmer motivation. Until now, FFS and Community IPM health studies and surveillance systems have focused on pesticide applicator poisoning (Murphy 1998a, 1998b). IPM-related health surveillance systems implemented by farmers could be extended to include intensified case detection and treatment of vector-borne diseases. Volunteer support to local health programmes would allow IPM farmers and trainers to monitor the community impact of their mosquito management measures. They would also be well-placed to estimate the economic returns to IPM/IVM collaboration in terms of productive labor hours gained and hospitalization and treatment expenses saved.

- *IPM Clubs* FFS graduates often form IPM Clubs in their community. Besides helping with case detection and treatment, IPM Club members who are managing disease vectors in their fields could support village bednet programs, house improvement/screening campaigns, and group mobilization to eliminate habitats for mosquito breeding (e.g., removal of aquatic weeds from ponds, filling depressions that form puddles during the rainy season, placing biological control agents such as larvivorous fish into larger bodies of water). All these measures help eliminate the need for house spraying with DDT or other insecticides. IPM Club members could also be involved in monitoring local compliance with national commitments for the reduction and phaseout of POPs pesticides.

- *Livestock management* Farm animals can be reservoirs of vector-borne disease and should be managed so as to inhibit disease transmission to people. For example, the *Culex* mosquito vectors of Japanese encephalitis breed in flooded rice paddies, and pigs are an important intermediate host for the disease organism (Kettle 1993). Keeping village pigs well away from rice paddies can help protect them and their owners from infection.

- *Village planning meetings* Community IPM-supported planning meetings allow farmers to develop village- or agroecosystem-wide strategies for IPM programme development and community mobilization (Vietnam National IPM Programme, 1999). They would be equally useful for disease management and IVM initiatives requiring broad-scale community action.

Synergies of IPM/IVM collaboration

Collaboration between IPM and IVM programmes should be supported by good communication and cooperation between the agriculture and health sectors from local up to national level. Institutions such as WHO, IRRI, and the Asian IPM Network, and national research scientists from both sectors can help supply a scientific framework for the development of locally-appropriate strategies. The advantages of Community IPM/IVM partnerships and their consistency with widely recognized goals favor the creation of this kind of intersectoral, multi-institutional coalition.

Community IPM farmers would benefit from:

- Health resources and field staff where staffing and operational budgets are thin;

- Additional motivation to continue practicing AESA and good crop management; and

- A new opportunity to apply the ecological education, community development skills, and networking fostered by Community IPM programmes.

Advantages to Health include:

- Access to Community IPM farmers, resources and field trainers would ease problems caused by inadequate personnel, transport, and budgets.

- Reinforcement of community health education programmes, which are essential for successful vector and disease control. For instance, adequate community knowledge about malaria transmission can motivate people to use bed nets during seasons when malaria transmission rates are high but mosquito numbers are not (Shiff et al. 1997).

- Strengthening community participation for the control of vector-borne diseases. Although vector-borne disease control programs have been aided enormously by citizen health volunteers, most programs have not been truly participatory. Local people are generally given no role in devising solutions to problems or in the planning, management, and evaluation of interventions (Ulate and de Keijzer 1985, Agudelo 1990). Moreover, certain activities can be carried out best by local residents who have been educated; an example is the continuous, 24-hour human bait samples that should be taken in a given location to detect all the biting mosquito species present. Health programs seldom have the resources to implement such studies (Meek and Olson 1991).

- Risk from vector-borne diseases reflects a wide, continuous spectrum of eco-epidemiological conditions, not a limited number of sharply defined situations (FAO 1984). Community IPM farmer field studies are a way to meet the challenge of finding realistic, sustainable, locality-specific solutions for managing vector-borne disease, addressing problems pointed out in the 1991/92 PEEM IPM/IVM workshops (PEEM 1995):
  --inadequate or nonexistent mechanism for transfer of research findings from health research institutes to the extension system;
  --the need for a better understanding of the limitations of environmental management in different epidemiological and ecological situations;
  --insufficient knowledge of the compatibility of environmental management measures and agricultural production; and
  --premature decisions to promote IVM methods which have not been properly tested under local conditions, undermining the credibility of agricultural extension workers.

Current institutional goals would also be furthered by the proposed IPM/IVM collaboration:

- It is complementary to implementation of a World Bank/WHO agreement to build the environmental management of disease vectors into the design of irrigation systems and other engineering projects.

- IVM and pesticide use reduction, resulting in the relegation of house spraying to an occasional strategic role in malaria control programs, are part of the Global Strategy for Malaria Control that was adopted as official policy in 1992 by WHO and its member governments (WHO 1993).

For these reasons, an IPM/IVM partnership, particularly in the context of FAO's Community IPM programmes, is as desirable as ever. Community IPM farmers' increased knowledge and their experimentation and agroecosystem management skills hold promise for minimizing the hazard of vector-borne diseases associated with irrigated cropping systems while simultaneously controlling agricultural pests. The health of farming communities would be further protected by pesticide use reduction achieved under IPM/IVM. Moreover, where IPM/IVM collaboration targets malaria mosquitoes and thus reduces the need for house spraying, it will contribute to necessary conditions for the proposed global phaseout of DDT.

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ATTACHMENT I

Community Education ☆ Environmental Management ☆ Sustainable Agriculture

Community INTEGRATED PEST MANAGEMENT

COMMUNITY IPM

The IPM Farmer Field School

These pages focus on the rice IPM FFS as it was developed in Indonesia as the standard approach to the design and conduct of an FFS. The goal is to present a standard as the basis for appropriate variation. Familiarity with what might be the standard considered design will enable one to successfully adapt the FFS approach to other crops. There have been variations in the standard rice IPM FFS design related to the number of FFS meetings and number of participants. In both cases the variations have represented increases. In some countries the number of meetings of the FFS has been extended to 16 meetings and the number of participants has been increased to 30. When and FFS is conducted in a crop other than rice, there are necessarily changes based on the various actors in the typical agroecosystem of that crop (for example plant physiology, insects, etc.). The process of any FFS should be the same; it is the content that would change as the FFS is conducted with different crops. The four principles of the IPM FFS should always be observed:

- grow a healthy crop;
- conserve natural enemies;
- conduct regular field observations;
- farmers become IPM experts.

The Typical Rice IPM Field School

The IPM Field School is a field based learning experience for 25 farmers. The Field School lasts for a full cropping season, meeting at least 12 times with an approximate length of four to five hours per meeting. Each meeting consists of a set pattern of activities: agroecosystem field observation, analysis and presentations; special topics; and group dynamics. The IPM Field School meets throughout the cropping season in order that participants can observe and analyse the dynamics of the rice field ecology across a full season.

The primary learning material at a Field School is the rice field, which is where most Field School activities take place. The size of the fields of an IPM Field School varies up to a total area of 1,000 m2. Field School plots receive two treatments. A set of plots will be designated to receive an IPM treatment and another set will be designated as non-IPM or Local Treatment. The primary difference between the two is that the non-IPM fields receive a basal treatment of carbofuran and only nitrogen fertiliser (this tends to be standard farmer practice in Indonesia). The IPM fields will receive a balanced fertiliser treatment (NPK) and may be planted at lower densities with wider spacing than is typical of the local farmer treatment if that is appropriate. Other differences in treatments will reflect the decisions of FFS participants. These decisions usually reflect the principle of growing a healthy crop. Because of the importance of the field study plots to the learning process, the Field School meeting place is usually close to the field study plots. Although it is important that the meeting place is out of the direct sun, any simple structure—such as a terrace or bamboo hut—or even a comfortable, shaded area will do.

Participants. IPM Farmer Field Schools are designed for 25 participants. This is not an arbitrary number. During field observations, agroecosystem analysis and other activities, farmers divide into five 'small groups' of five participants each. This is an ideal size for small group discussions. This number allows for sufficient diversity of opinion without being so large as to discourage less vocal participants from taking an active role. Larger groups may become either chaotic or passive depending on the temperament of the group. After the Field School is completed twenty-five farmers constitutes a neighbourhood support group for IPM of a reasonable size within the context of a village.

Selection of participants takes place at a meeting led by the IPM Field School facilitator with the members of the Farmers Group from which participants will be drawn. At this meeting the Field School process is explained. The facilitator also explains to prospective participants that they will be expected to attend every week for the duration of the season. Prospective participants are given an opportunity to either agree (the 'learning contract') or withdraw.

Activities. The basic format of an IPM Field School for farmers consists of three activities: agroecosystem observation, analysis, and presentation of results; a 'special topic'; and a 'group dynamics' activity. Agroecosystem analysis is the Field School's *core activity*, and other activities are designed to support it.

Agroecosystem Analysis. The agroecosystem analysis process sharpens farmers' skills in the areas of observation and decision making and helps develop their powers of critical thinking. The process begins with small group observations of the IPM and non-IPM plots. During the observation process participants collect field data—such as the number of tillers per hill and varieties of insects and their populations—and samples of insects and plants. These data are collected from ten rice hills. The facilitator is present throughout the observation to help participants in their observations.

Following the field observation, the farmers return to the meeting place and, using crayons, draw what they have just observed in the fields on a large piece of newsprint or poster paper. The drawings include:

- pests and natural enemies observed in the fields (pests on one side, natural enemies on the other);
- a rice plant that indicates the size and stage of plant growth, along with other important features such as the number of tillers, the colour of the plant and any visible damage;
- important features of the environment (the water level in the field, sunlight, shade trees, weeds, and inputs).

All members of the small group are involved in the creation of the drawing and analysis of data. While drawing, farmers discuss and analyse the data they have collected in the field. Based on their analysis they determine a set of action decisions to be carried out in the field. A summation of these action decisions as agreed by the group is also included in the drawing.

One member of each small group then presents these findings and decisions to the larger group. After this brief presentation of results the floor is opened for questions and discussion. Good large group discussions often involve the posing of alternative scenarios, for example questions such as "What would you do if...." This cycle of presentation, question and answer and discussion is repeated until all five small groups have presented their results. Agroecosystem drawings from previous weeks are kept on hand as a reference and as material for discussion later in the season.

Agroecosystem Activity Matrix

Activity	**Critical Steps**	Notes	Indicators
AESA (Primary FFS activity Develops Good IPM: Habits: -observation -analysis -decision making Farmers become IPM experts)	Observation & Drawing Of Agro-ecosystem	Participants need to understand process of observation and its purpose or objective. Participants in field observing, taking notes, collecting specimens. Purpose of drawing to summarise observation, focus of analysis.	1. Before activity participants told a)goal of activity and b)process to be followed in activity. 2. Participants all in the field. 3. Process of observation includes the whole plant. 4. Observations written down. 5. Specimens collected. 6. Drawings summarise observations.
	Presentation & Analysis	Results of analysis presented to large group by one member of each small group problems posed, questions asked. Purpose: to discus field conditions & solve "what if scenarios. Objective: to improve decision making & analytical skills based on ecosystem observation. Facilitator helps group achieve objective by asking probing questions to help analytical process.	1.Presentations made by member of each small group. 2.Participants ask questions of presenter. 3.Facilitator asks questions appropriate to analysis 4.Groups discuss field conditions & agroecosystem relationships. 5."What if" scenarios discussed. 6.Previous weeks agroecosystem drawings used for comparisons. 7.Field management decisions critically examined by group. 8.Other factors in addition to economic thresholds are analysed (e.g. plant stage, natural enemies) 9.Facilitator uses leading questions to help participants analyse what was learned during activity.

The "Agroecosystem Activity Matrix" describes what an observer should be able to see when an agroecosystem analysis activity is being conducted. While this is primarily an outline, the 'indicators' column presents those observable processes that are fundamental to the process. Note that the role of the facilitator is to help participants learn, not to teach them.

Special Topics. Special topics support the agroecosystem analysis by delving more deeply into specific issues relating to the rice agroecosystem and IPM principles. Special topics also provide training in basic experimentation methods. Popular special topics include rat population dynamics and rat control, plant physiology, functions of insects and their interactions, issues surrounding pesticide use, and general field ecology. Good special topics do not degenerate into 'chalk and talk sessions'. After the trainer introduces the topic and explains the steps to be used in the process, the participants, in small groups, take on the active management of the experiment or small group activity. As with agroecosystem analysis, the skills of observation, data collection and analysis are emphasised.

Special Topics Activity Matrix

Activity	Critical Steps	Notes	Indicators
Special Topics (focus on topics such as ecology, rats, biology, etc.)	Statement of goal	Participants must know purpose of activity and what they will learn.	1. Before activity begins participants told goal and process of activity.
	Small group process	Participants clear about what they must do and why. All materials at hand.	1. All participants active and involved in the activity. 2. No small group dominated by one person to the point that others are totally excluded.
	Presentation	Activity analysed by participants. Facilitator asking leading so that participants know what happened during activity and why Special topics provide opportunity to learn of topics important to IPM.	1. Participants present results of their work during the activity summarising what has happened and why. 2. Leader asks leading questions to help participants examine steps in process of activity and apply learning to"real life".

Special topics concern many issues relative to IPM: plant physiology, insect life cycles, functional guilds, rats, economics, field ecology, etc. Note that these are not lecture sessions. In general they are discovery learning activities that depend upon the facilitator's ability to pose questions that will help participants to critically analyse what they have observed during the activity.

<u>Group Dynamics</u>. The purpose of the group dynamics activity is to help participants develop an understanding of how:

- groups work in given problematic situations;
- cohesiveness and collaboration can be developed;
- communicative action is a fundamental element in well functioning groups.

These activities generally begin with an introduction by the trainer, who sets up a problem that the group needs to solve. Many of the exercises are physical and active, while others are more on the order of 'brain teasers'. In either case, the group has some fun while sharing the experience of working to overcome a specific problem and learning about how to better help people collaborate.

Group Dynamics Activity Matrix

Activity	Critical Points	Notes	<u>Indicators of Quality</u>
Group Dynamics (enhances teamwork & problem solving skills.	Process	Participants informed about objectives and process before activity begins. Materials for activity, if needed, are on hand before activity begins. Time allowed for activity is sufficient to achieve objective. Logistical issues do not disturb process.	1. Before activity begins participants told goal and process of activity. 2. All participants involved/active, no single individual dominating activity.
	Synthesis	Leader takes time to: review objective of activity; lead discussion concerning what happened during the activity; point out important issues arising during activity; helps participants draw conclusions based on their experience during the activity.	1. Leader: a)reviews goal and process of activity; b)helps participants identify key learning points based on activity; c)asks questions which help participants learn from the experience.

The role of the facilitator is to help participants analyse what they have experienced so that they reach a greater understanding of how people tend to behave in various social situations.

Materials. Some of the materials required to support these activities include plywood sheets (as bases to draw on), large pieces of newsprint or poster paper, crayons, and large felt-tipped pens. Learning materials are learner generated. Farmers generate their own learning materials, from drawings of insects to analytical tools. These materials are always consistent with local conditions, are less expensive to develop, are controlled by the learners and can be discussed by the learners with others. Learners know the meaning of the materials because they have created the materials.

Outsider Views on IPM Field Schools

The basis for the training approach . . . is non-formal education, itself a 'learner-centred' discovery process. It seeks to empower people to solve 'living problems actively by fostering participation, self-confidence, dialogue, joint decision making and self-determination.
. . . the 'discovery learning' by farmers on the basis of 'agro-ecosystem analysis', which uses their own field observation, is science informed. The agro-ecosystem analysis methodology was developed carefully on the basis of the latest entomological knowledge. Hence this participatory approach does not represent a violation of the 'integrity of science', but rather a new interactive way of deploying science. **(pp. 163-165)**

Roling and van de Fliert in Facilitating Sustainable Agriculture

The Key Principles of Farmer Field Schools

1. *What is relevant and meaningful is decided by the learner, and must be discovered by the learner. Learning flourishes in a situation in which teaching is seen as a facilitating process that assists people to explore and discover the personal meaning of events for them.*

2. *Learning is a consequence of experience. People become responsible when they have assumed responsibility and experienced success.*

3. *Co-operative approaches are enabling. As people invest in collaborative group approaches, they develop a better sense of their own worth.*

4. *Learning is an evolutionary process, and is characterised by free and open communication, confrontation, acceptance, respect and the right to make mistakes*

5. *Each person's experience of reality is unique. As they become more aware of how they learn and solve problems, they can refine and modify their own styles of learning and action.*

Jules N. Prettty, Regenerating Agriculture, p. 256

The well proven reduction of insecticide use by FFS graduates, the stable or even increased yield, and the reduced risk for farmers following the IPM principles imply that farmers are directly profiting from the programme. Over and above, FFS's have two main results: Farmers regain the competence to make rationally based decisions concerning the management of their crops (in contrast to the instructions which were part and parcel of the Green Revolution packages). Secondly the participants gain social competence and confidence to speak and argue in the public.

Peter Schmidt, Jan Stiefel, Maja Hurlimann,
Extension of Complex Issues, p. 19

ATTACHMENT II

Community Education ✯ Environmental Management ✯ Sustainable Agriculture

Community INTEGRATED PEST MANAGEMENT

COMMUNITY IPM

RECENT ADDITIONS:
News about the FAO Cotton IPM Programme
(31 May 2000)

The FAO Programme for Community IPM in Asia

The misuse of pesticides is harmful to human health and is damaging to the environment. Millions of people are poisoned by pesticides every year, and pest problems are often made worse when the balance between beneficial and harmful insects is disturbed by applying toxic chemicals.

In the last two decades the Food and Agriculture Organisation of the United Nations has taken a leading role in developing and supporting training which helps farmers to learn about the ecology of their fields and, as a result, enables them to make and implement decisions which are safe, productive and sustainable. This ecological approach to plant protection is called Integrated Pest Management, or IPM. Not only does it involve minimising the use of pesticides, it also involves a wide range of other practices aimed at growing a healthy crop.

The training approach which is promoted by FAO is based on the Farmers Field School (FFS). This involves weekly meetings by a group of farmers. Instead of listening to lectures or watching demonstrations, these farmers observe, record and discuss what is happening in their own fields from the time of planting to the time of harvest. This discovery-learning process generates a deep understanding of ecological concepts and their practical application. Since 1990 more than two million farmers have graduated from FFS.

In recent years, IPM farmers have started organising themselves in order to carry out field experiments, train other farmers, and interact more effectively with government agencies. These developments have given rise to a new term, Community IPM.

This website is a source of information about Community IPM in Asia. The site is divided into six major sections:

Member Countries:
Details of IPM training activities in 12 countries in South and Southeast Asia, and how to make contact with key IPM experts.

Concepts and Cases:
Includes an account of how Community IPM developed in Asia, and a description of the Farmer Field School process.

Spider Web Newsletter:
An on-line version of a newsletter produced every six months, with information about government and NGO training programmes

Documents to Download:
A small (but growing) library of training materials, case studies and scientific papers relating to IPM.

Internet Links:
Including sites on sustainable agriculture, pesticides and health, IPM Training Partners and Programme Donors.

News:
Information about recent or forthcoming events

This site is maintained by the FAO Programme for Community IPM in Asia. The Programme currently supports advisory and training activities in 12 countries. Funding for these activities is generously provided by the Governments of Australia, Netherlands and Norway.

For more information, you can contact Russ Dilts, the Regional IPM Coordinator, who is based in Jakarta, Indonesia.

FAO Programme for Community IPM in Asia
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This site was created on 19th Oct 1999
Last updated: 31st May 2000

Replacing Persistent Organic Pesticides – Guidance on strategies for sustainable pest and vector control

A document being developed by UNEP/WHO/FAO

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Introduction

In its decision 19/13 (1997), the UNEP Governing Council requested that guidance on the selection of replacements for POPs pesticides be developed. In recognition of the significant agricultural and health implications of the POPs elimination process, UNEP has collaborated with WHO and FAO in preparing the document.

The POPs elimination process is a part of global efforts aimed at improving health and protecting the environment for the benefit of present and future generations. UNCED and Agenda 21 drew attention to the links between sustainable development, sustainable management of natural resources, pollution prevention and chemical risk reduction. Simply attempting to replace POPs pesticides with non-POPs pesticides would not be in linve with this understanding. Agenda 21 specifically names IPM as the pest control option for the future, and emphasises reduced pesticide use.

The aims of the document are thus two-fold:

- to provide guidance on strategies for changing pesticide use away from POP pesticides
- to promote the adoption of Integrated Pest Management (IPM) and Integrated Vector Management (IVM) as the approaches of choice, leading to reduced pesticide reliance

Replacing POPs pesticides involves not only identifying and implementing alternatives, but also identifying the sources and present uses of POPs. These aspects are given attention, serving as starting points for the replacement process.

The document addresses the issues on a global scale. Location-specific recommendations are not given, as conditions will vary widely. There are obvious differences between regions (climate, pest problems) as well as between countries (pesticide problems, policy situation). Detailed strategies and action plans for identifying and implementing alternatives will need to be developed at the national level, with strong involvement of the community and farm levels. Training materials for use at these levels are also being developed.

Who should use the document?

The document is meant for the "champions" in the transition away from POP pesticide use, such as policy-makers, decision-makers and opinion-makers in agriculture, public health or any other sector where pesticides are presently being used.

Present focus

The most crucial issues in relation to replacing the currently identified POPs pesticides are

- uses in vector control, particularly for malaria
- uses for termite protection of buildings and wooden constructions

These are the main areas where POPs are still being used, and where immediate action to develop and implement alternative control strategies is called for.

In addition to this, stocks of obsolete pesticides play a central role as potential or real sources of POPs pesticides for various purposes. Substantial stocks have accumulated in many countries. An inventory in 1996[1] shows that about 40% of the 20 000 tons stored in Africa and the Near East are of the organochlorine type, and a large part of this is POPs. Effective containment and disposal of these stocks is important in preventing leakages to the environment, but also to the grey and black markets.

Scope of the document

It is hoped that the document will be useful not only in the present situation, but also in the future. Most uses of the current nine POPs pesticides have already ceased, and remaining uses are fairly limited. It is furthermore also to be expected that the efforts now in progress will lead to the final elimination of these remaining uses. The principles for choosing alternative strategies are however equally applicable to other pesticides. Procedures and criteria are being developed for adding other persistent chemicals to the list of POPs to be covered by the coming convention. In addition to this, many pesticides have highly objectionable qualities such as high acute toxicity, carcinogenicity and endocrine disruptivity, making it particularly urgent to replace their use with less harmful practices. The WHO classification process (placing particularly hazardous pesticides in categories Ia, Ib and II) and the 22 pesticides covered by the PIC (Prior Informed Consent) procedure are examples of international efforts to draw attention to some of these pesticides.

The scope of the guidance document is therefore wider than just to cover current uses of POPs. Agriculture is the most important sector in global pesticide use (even though few or no POPs are believed to be used here today). Most pesticides globally are used in agriculture. Present and future pesticide risk reduction efforts must therefore have a significant agricultural focus. Agricultural applications of the IPM approach are for this reason also emphasised in the document.

<u>Preliminary structure of the document</u>

1 FAO. 1997. Prevention and disposal of unwanted pesticide stocks in Africa and the Near East. Second consultation meeting. FAO Pesticide Disposal Series no. 5.

Chapter	Content
Introduction	**The environmental and health impact of POPs is outlined. POPs are characterised by persistence (slow degradation), ability to be transported over long distances, and health hazards for animals and humans.**
Elimination the use of POPs pesticides and selecting alternative management strategies: a roadmap	**This chapter leads the reader through a series of questions, helping to focus on the crucial issues in the POPs elimination process. Question address** **- if POPs are used at all** **- possible illegal uses** **- why POPs are still used** **- needs for pesticide use** **Recommendations on approaches and factors to consider when using pesticides are given.**
Approaches of choice – IPM and IVM	**The two approaches are described separately, even though they share a common philosophy – the imaginative combination of a range of control methods for limiting damage or disease spread. Pesticides, though not excluded, are limited to an absolute minimum, and often used only as a last resort. The IPM concept, which has a history dating back some 40 years, has over time evolved from being mainly technical into what now focuses also on social, participatory factors. IVM, which also has a long history, fell out of fashion when residual pesticides became available. Negative effects of pesticides are now prompting its reintroduction.**
Specific issues	- ***Vector borne diseases*** **– Malaria now being the (probably) main target of POPs use makes this an important issue. Other important vector-borne human and livestock diseases are also mentioned.** - ***Pesticide resistance*** **– The development of pest resistance to pesticides is one of the factors that has prompted the development and adoption of IPM and IVM. Factors leading to resistance are described. Resistance is costly, as pesticides are rendered useless, and maintaining pesticide efficacy may be vital in life-threatening situations. Minimising pesticide use is the main method for preventing resistance.** - ***Eliminating the use of POPs pesticides against termites*** **– Termites are currently the other main target of POPs use. The persistenct character of POPs has provided long-term protection that replacement chemicals alone have not quite been able to equal, and integrated control methods must therefore be put in place.** - ***The costs of changing pest control strategies – and the costs of not changing*** **– Economic benefits of pesticides are often exaggerated. Changing pest control strategies can bring economic benefits, particularly if external costs of pesticides are considered. Such external costs include health effects (hospitalisations etc.), contamination of produce, pesticide resistance, resurgences, pesticide management and environmental deterioration.** - ***Pesticide stocks and the obsolete pesticide problem –*** **Accumulation of obsolete pesticides is an environmental “time bomb”, and stocks are also sources of illegal pesticides. Proper management and disposal is vital, and measures to prevent build-up are needed.**
Case studies	**A number of case studies are provided to illustrate changing control practices and a number of other relevant issues:** - ***Bio-environmental management of malaria in India*** - ***Water management for malaria control in Sri Lanka***

Chapter	Content
	- ***Malaria control in the Philippines*** - ***Biological control of dengue vectors in Vietnam*** - ***Integrated management of Japanese encephalitis vectors*** - ***Eliminating DDT for malaria control in Mexico*** - ***Termite control in Australia*** - ***IPM and Farmer Field Schools in cotton in Pakistan*** - ***IPM of the coffee berry borer*** - ***Phasing out methyl bromide – a parallel case*** - ***Pesticide reduction schemes in Europe*** - ***Disposal of obsolete pesticides in Tanzania***
A three-stage process: who will be involved?	**The process from assessment of the present situation, through the identification of alternative approaches, to final implementation of alternatives will require the involvement of many stakeholders:** **Farmers and local communities - *"learn by doing" research in their own fields – participating in Farmer Field Schools and learning to make well-informed decisions.*** **Unions for farm workers, construction workers, health staff, and other groups *on the labour market can push for safer pest and vector control methods.*** ***Pesticide companies* can pledge "from cradle to grave product stewardship", favour the development of pesticides compatible with IPM/IVM and inform on pesticide risks.** *Governments, including the public sector*, can promote IPM and IVM through information exchange, training and financial assistance. Governments can revise legislation and policies on pesticides and pest and vector management to make them coherent with each other and supportive of IPM and IVM, implement international agreements regulating trade and use of hazardous chemicals, upgrade facilities for chemical analysis, and address the obsolete pesticide situation. Systems and structures can ensure that new stocks do not accumulate. **International government organisations and non-government organisations *can influence and facilitate policy reform, lobby to influence policy-makers, disseminate information and set up pilot projects.***

Chapter	Content
	Donors can finance many needed activities. In general, it is important that aid policies are coherent and supportive of IPM and IVM. *The national and international research community* can carry out research in areas of key importance to the development and implementation of IPM and IVM, particularly on alternatives to POP pesticides. They can also increase research on pesticide effects on health and environment. *Consumers and consumer groups* can demand environmentally acceptable production methods. *Schools and universities* can introduce modern, integrated control concepts in curricula.
Annexes	- **Hazard classification of POPs and PIC pesticides** - **POPs residue data – Arctic organisms and freshwater fish** - **Half-life of POPs in soil** - **Selected bibliography (by subject)** - **International organisations and networks of relevance** - **Internet resources on specific issues** - **Glossary/acronyms**

The Role of Policy Analysis and Policy Formulation in Replacing POP's Pesticides in IVM/IPM

By
Hermann Waibel, University of Hannover, Germany

- **The Problem**
- **Policy Analysis**
- **Policy Formulation**
- **Empirical Examples from IPM**
- **Recommendations**

The Problem

- The Pesticide Use Crop Loss Paradox
- The Food Security – Food Production mix-up
- The Agricultural Path Dependency
- The IPM dilemma
- The Entomology Perspective in IPM
- The Nature of Goods involved in IPM/IVM
- The Policy Perception

Factors Leading to Overuse of Pesticides

	Price Factors	Non-Price Factors
Obvious	**I** – Subsidies or free distribution of pesticides through government or development organizations – Subsidies for agro-chemical industry – Enclosure of pesticides in credit programs – Subsidies for complementary inputs – Preferential rates for tax or exchange rates	**III** – Main focus of research in pesticides – Government activities in reducing pesticide damage – Diversification of production to pesticide intensive crops – Export promotion of agricultural products – Inadequate government research in environmentally benign pest management
Hidden	**II** – Plant protection service, Outbreak Budget – Externalities of pesticide production – Externalities of pesticide use	**IV** – Lack of adequate procedures for the definition of crop loss and pests – Lack of transparency in regulatory decision making – Insufficient information about risks and alternatives – Curricula of agricultural extension and education – Misinformation of farmers by chemical industry

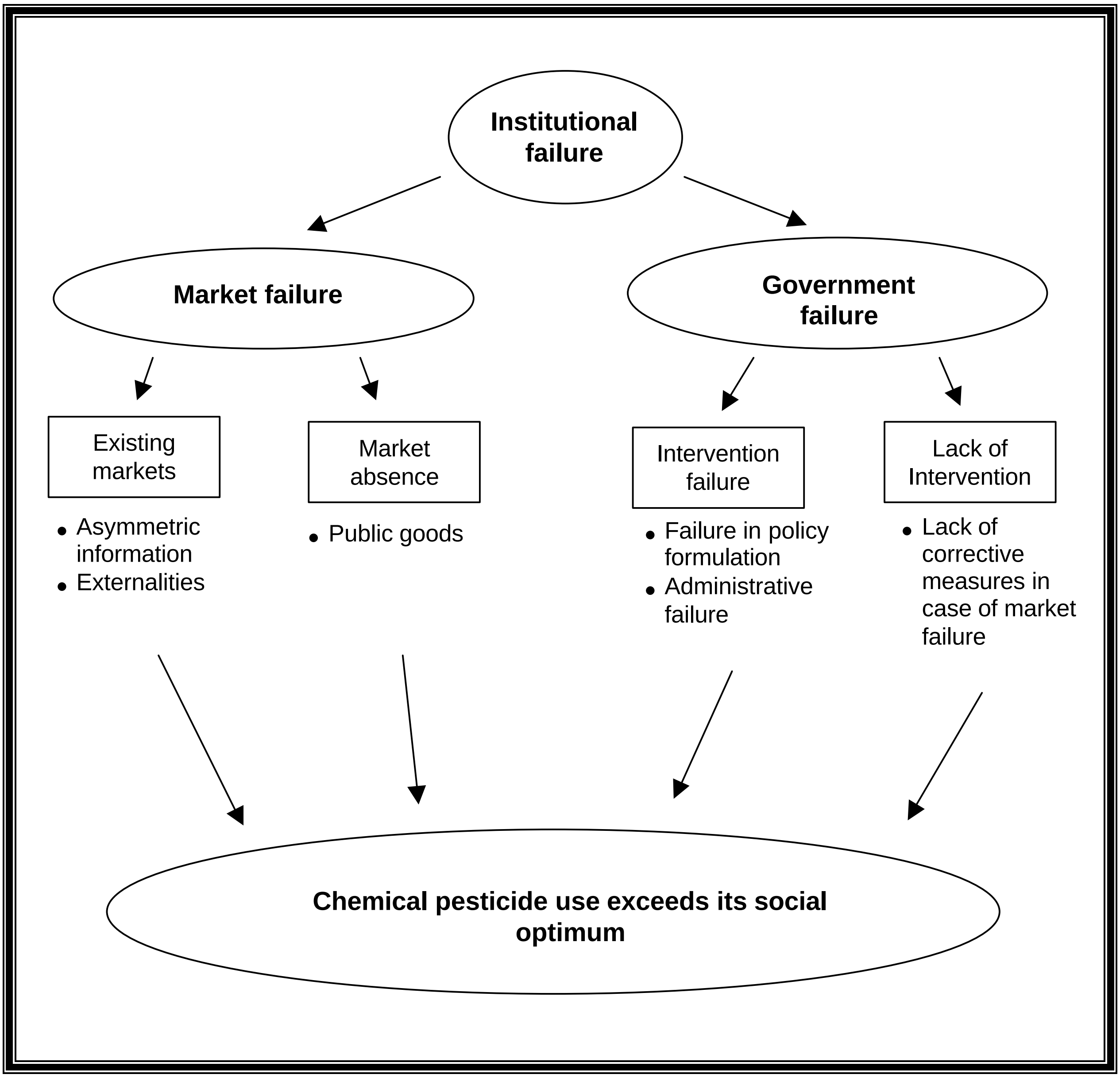
Source: WAIBEL (1994)

Table 1: Estimated External Costs of Chemical Pesticide Use

Type of costs	Derived from	Estimated annual costs (million Baht)
Health	- official health data from Epidemiology Division - Estimated acute poisoning cases related to quantity of pesticide used from case study results (section 6.1)	1.00 13.00
Residues in food	- Residue analysis in fruit (f) and vegetable (v) (section 6.2)	2,067 (v) 2,950 (f)
Resistance and Resurgence	- Costs related to BPH outbreak in 1989/90 (section 6.3)	57.40
Research budget related to chemical pesticides	- Budget of Entomology Division, DOA, for research in pesticide related issues(section 5.4)[1]	25.29
Pesticide quality and residue monitoring budget	- Budget of Toxic Substances Division, DOA[2]	48.47
Budget for pesticide regulation and market monitoring	- Budget of Regulatory Division, DOA[2]	46.00
Budget for govern-mental extension related to chemical pesticides	- Budget of PPSD, DOAE[3]	284.64
Total		
Lower boundary[4]		**462.80**
Upper boundary[5]		**5,491.80**

Source: [1] Annual report, Entomology Division, DOA, around 40% of the total budget (63,235,520 Baht) are spent for pesticide related research,
[2] DOA, personal communication
[3] DOAE, personal communication - budget for fertilizer purchase and for Thai-German IPM Project not included; author's calculations
[4] lower boundary includes official health data and excludes residue costs estimations,
[5] upper boundary includes all costs listed above and considers the estimated acute poisoning cases

Reasons for pesticide use deviating deviation from its social optimum



Policy Analysis

The Policy Framework

Issues

Objectives

Criteria (Efficiency, Equity, Stability)

Time Frame

The Policy Instruments

Command and Control (regulations, restrictions prescriptions)

Market-based Incentives

Direct Government Investments

Information and Persuasion

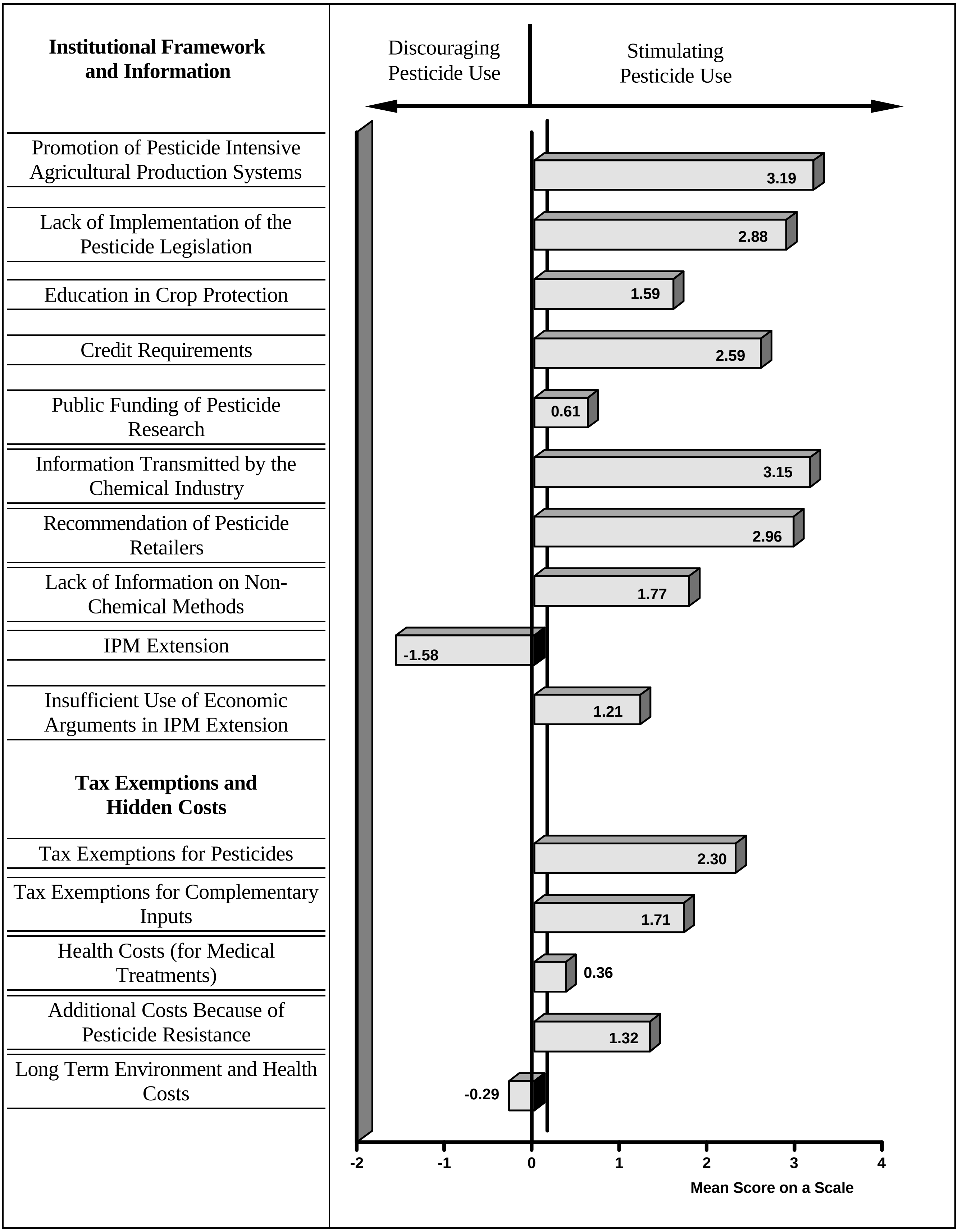
The Assessment Criteria

Criteria for the evaluation of environmental policy instruments

	CANSIER (1996)	REUS, WECKSELER and PAK (1994)	TURNER and OPSCHOOR (1994)
ENVIRON-MENT	• ecological effectiveness	• effectiveness	• effectiveness in reaching the environmental goal • risk reduction
ECONOMY	• economic efficiency	• efficiency • application of the polluter pays principle	• economic efficiency
EQUITY	• impact on competitive position of an industry	• economic consequences for farmers	• equity / impact on farm income
POLICY	• political acceptance	• feasibility and maintainability • support among farmers	• political feasibility • acceptability by societal groups
IMPLEMEN-TATION			• administrative simplicity / administrative cost of implementation
INNOVATION POTENTIAL	• incentives for innovation • impact on structural flexibility		

Source: Agne, 1999

Figure 3: Determinants of Pesticide Use and their Impact According to an Expert Survey in Costa Rica



Policy Formulation

(i) The stakeholders

Influence

Level of Advocacy,

Transactions costs,

per capita gains and losses

(ii) Institutional Arrangements

Procedures

Flexibility

Ability to change

Existing paradigms

(iii) The Driving Forces for Change

Consumer driven

External Forces

“Show” Events

A case study on the impact of pesticide taxation in Coffee in Costa Rica

Table 1: The own-price elasticity of pesticides

Author	Type of pesticide and location	Time horizon	Own-price elasticity
Econometric models			
DUBGAARD (1991)	herbicides (Denmark)	long-run	-0.69
	fungicides and insecticides (Denmark)	long-run	-0.81
AALTINK (1992)	all pesticides (Dutch horticulture)	short-run	-0.21
		long-run	-0.22
OSKAM et al. (1992)	all pesticides (Dutch agriculture)	short-run	-0.25
		long-run	-0.29
DUBBERKE and SCHMITZ (1993)	all pesticides (Germany)	long-run	-0.78
	all pesticides (Schleswig-Holstein)	long-run	-1.78
	all pesticides (Lower Saxony)	long-run	-0.50
	all pesticides (North Rhine-Westphalia)	long-run	-1.60
	all pesticides (Hesse)	long-run	-1.38
	all pesticides (Rhineland-Palatinate)	long-run	-1.90
	all pesticides (Baden-Württemberg)	long-run	-1.42
	all pesticides (Bavaria)	long-run	-1.53
	all pesticides (Saarland)	long-run	-1.37
RANDLEMAN (1993)	all pesticides (USA)	long-run	-1.74
GREN (1994)	herbicides (Sweden)	long-run	-0.93
	fungicides (Sweden)	long-run	-0.52
	insecticides (Sweden)	long-run	-0.39
RUSSEL, SMITH and GOODWIN (1997)	all pesticides (UK, Model I)	medium-run	-1.12
	all pesticides (UK, Model II)	medium-run	-1.09
Linear programming models			
SCHULTE (1984:252) (elasticities derived with a 100% tax on pesticides)	fungicides (Germany)	long-run	-0.45
	fungicides (Rhineland)	long-run	-0.67
	fungicides (Schleswig Holstein)	long-run	-0.80
	fungicides (Hesse)	long-run	-1.00
OHLHOFF (1987) (elasticities derived with a 100% tax on pesticides)	location without nematodes (Germany)		
	herbicides	long-run	-0.84
	fungicides	long-run	-0.51
	growth regulators	long-run	-0.08
	insecticides	long-run	-0.00
	all pesticides	long-run	-0.62
	location with nematodes (Germany)		
	herbicides	long-run	-0.84
	fungicides	long-run	-0.51
	growth regulators	long-run	0.15
	insecticides	long-run	-0.43
	nematicides	long-run	-1.00
	all pesticides	long-run	-0.75

DUBGAARD (1991) (elasticities derived with a price increase of 200 DKr per labelled dosage = increasing the average pesticide price by 120%)	all pesticides (Denmark)	long-run	-0.30

Source: Agne, 1999

Table 2: Own-price elasticities of Pesticide Use in Coffee Production in Costa Rica

Input	Own-price elasticity
WHO II herbicides	-0.68
other herbicides	-0.34
Fungicides and foliar nutrients	-0.84
Nematicides	-1.18
Fertilizer	-0.15
Labour	-0.23

Source: Agne, 1999

Table 3: Simulation of the impact of pesticide taxation on input demand in coffee (% change over base value)

	Scenario 1: **10% tax on all pesticides**	Scenario 2: **50% tax on all WHO I+II pesticides**	Scenario 3: **20% tax on all WHO I+II plus + a 5% tax on other pesticides**
WHOII herbicides	-0.24%	20.15%	5.92%
other herbicides	-0.48%	-1.99%	-0.84%
fungicides +foliar nutrients	1.30%	36.00%	11.45%
nematicides	-1.44%	-36.36%	-11.63%
fertilizer	-0.22%	18.76%	5.52%
labour	0.95%	-2.82%	-0.37%

Source: Agne, 1999

Table 4: The impact of pesticide taxation scenarios on the gross margin in coffee in Costa Rica

	Scenario 1: **10% tax on all pesticides**	Scenario 2: **50% tax on all WHO I+II pesticides**	Scenario 3: **20% tax on WHO I+II, 5% tax on other pesticides**
sample average	-0.63%	-0.86%	-0.57%
coffee area ≤ 5 ha	-0.53%	-0.76%	-0.50%
coffee area > 5 ha	-0.77%	-1.00%	-0.68%

Source: Agne, 1999

Recommendations

- *Improve the Understanding of Pest Management Specialists in Policy Analysis*
- *Provide more empirical evidence on the role of policy factors in IVM/IPM*
- *Increase the transparency of the decision-making process in regulatory decisions*
- *Strengthen the Role of Economic Arguments in Pesticide/IPM/IVM Policy*
- *Explore the Possibilities of Policy Strategies based on a combination of Policy Instruments*

Water Management and Mosquito Control, Sri Lanka

F.P. Amerasinghe, IWMI, Sri Lanka

Slide 1

WATER MANAGEMENT FOR MOSQUITO VECTOR CONTROL

FELIX P. AMERASINGHE

Workshop on Sustainable Approaches for Pest and Vector Management and Opportunities for Collaboration in Replacing POPs Pesticides

Slide 2

KEY ENVIRONMENTAL FACTORS

SURFACE WATER
CLIMATE
TOPOGRAPHY
SOIL

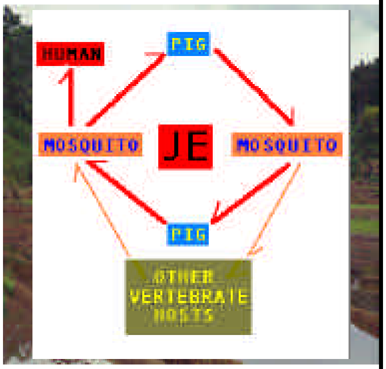
ADD
MAN-MADE STRUCTURES

Slide 3

WATER & JAPANESE ENCEPHALITIS

DISEASE ASSOCIATED WITH IRRIGATED RICE ECOSYSTEMS, ESPECIALLY WHERE PIG HUSBANDRY IS PRACTICED

- Major vectors breed in rice fields and associated habitats
- Pigs act as the major peridomestic reservoir hosts of the virus



Slide 4

WATER AND MALARIA

- HISTORICAL: MALARIA ASSOCIATED WITH HUMAN SETTLEMENTS, AGRICULTURE & IRRIGATION
- CONFLICTING EVIDENCE, NO DIRECT CAUSE-AND-EFFECT RELATIONSHIP
- RECENT: LINKS BETWEEN MALARIA AND ENVIRONMENTAL FACTORS ARE COMPLEX AND SITUATION-SPECIFIC

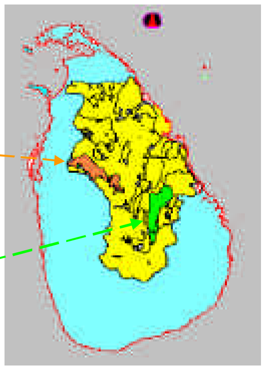
Slide 5

IRRIGATION AND MALARIA

MAHAWELI, SRI LANKA
Malaria high in System ‘H’;
Low in System ‘C’

System ‘H’: Old + New. Canal/cascade tank system. Vector breeds freely.

System ‘C’ - New. Canal system. Vector low because major breeding habitats altered .



(Amerasinghe et al. 1988 - 1994)

Slide 6

ENVIRONMENTAL MANAGEMENT

BREEDING SOURCE REDUCTION
(SPECIES SANITATION)

- DRAINING WETLANDS
- LANDSCAPING TO MINIMIZE PUDDLING
- MANAGEMENT OF WATER IN RESERVOIRS, CANALS, FIELDS
- MANAGEMENT OF WATER IN RIVER AND STREAM SYSTEMS

Slide 7

PLANNING ENVIRONMENTAL INTERVENTIONS - 1

- AN ECOSYSTEMS APPROACH (Watershed; Irrigation Command)
- WHAT IS THE MAJOR VECTOR OF EPIDEMIOLOGICAL SIGNIFICANCE?
- WHAT IS ITS MAIN BREEDING HABITAT OF THE VECTOR?
- WHAT COMPONENTS OF THE ECOSYSTEM CONSISTENTLY GENERATE THE VECTOR?
- CAN THESE COMPONENTS BE MANAGED?

Slide 8

PLANNING ENVIRONMENTAL INTERVENTIONS - 2

- TECHNICAL INPUTS REQUIRED FROM NON-HEALTH AGENCIES?
- WILL MANAGEMENT HAVE A LOCAL OR SYSTEM-WIDE IMPACT?
- COMMUNITY INVOLVEMENT?
- ESTIMATED COSTS OF INTERVENTION?
- HOW DO COSTS COMPARE WITH OTHER MALARIA CONTROL STRATEGIES?

Slide 9

WATER MANAGEMENT FOR MALARIA CONTROL: CASE STUDY FROM SRI LANKA

International Water Management Institute

Wim van der Hoek
Flemming Konradsen
Yutaka Matsuno Masahiro Tasumi

University of Peradeniya

Felix P. Amerasinghe
Priyanie H. Amerasinghe

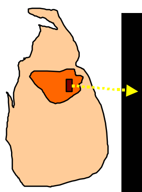
Anti Malaria Campaign

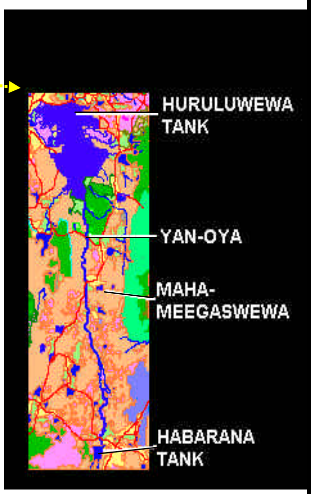
Devika Perera

Slide 10

SRI LANKA

HURULUWEWA WATERSHED

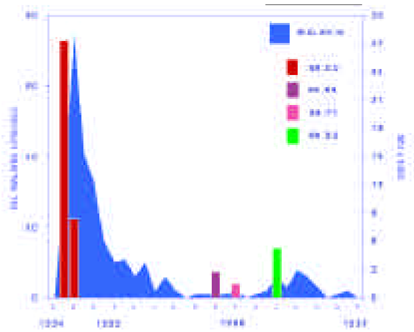




- North Central Province, Sri Lanka
- Watershed forest and ancient tank-cascade rice and slash-and-burn agricultural system
- Yan-Oya stream, serves as feeder canal to the Huruluwewa Reservoir
- 3000 people live in the watershed area within 3 km. of the stream

Slide 11

MAHAMEEGASWEWA
INFECTIVE VECTORS AND MALARIA

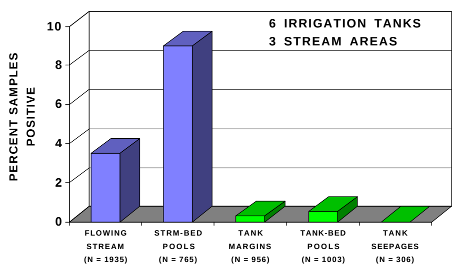


Field and laboratory studies on mosquito adults showed that *An. culicifacies* was the vector of epidemiologic significance

Amerasinghe et al. 1999

Slide 12

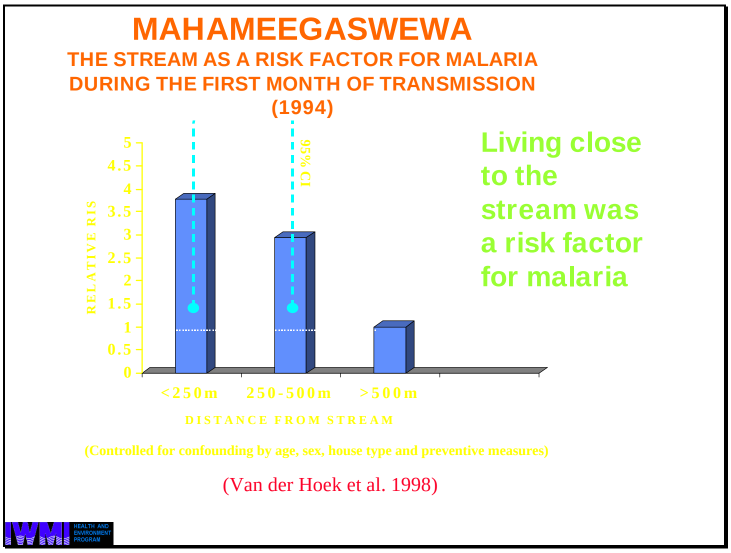
HURULUWEWA WATERSHED
MAJOR *AN. CULICIFACIES* BREEDING HABITATS



Larval surveys established that the stream was the major breeding habitat of the vector

Amerasinghe et al. 1998

Slide 13



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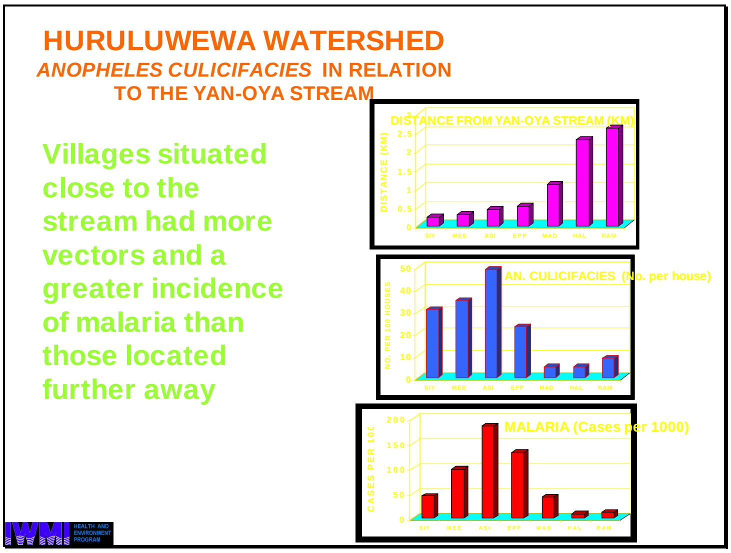

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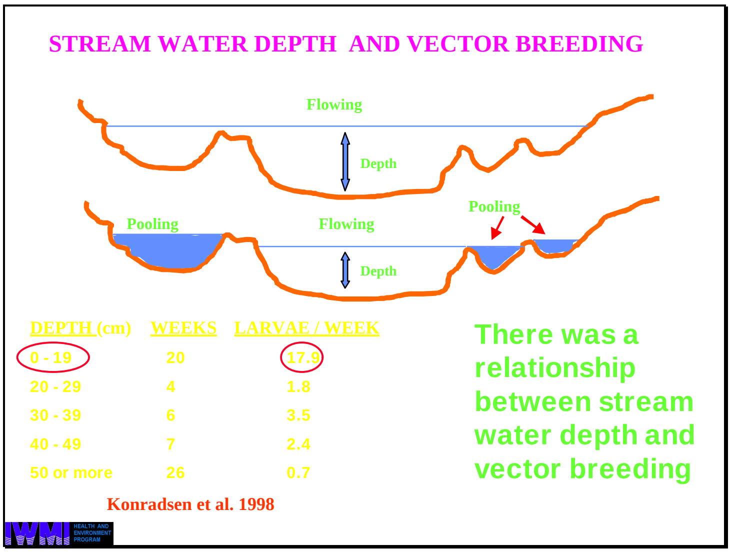

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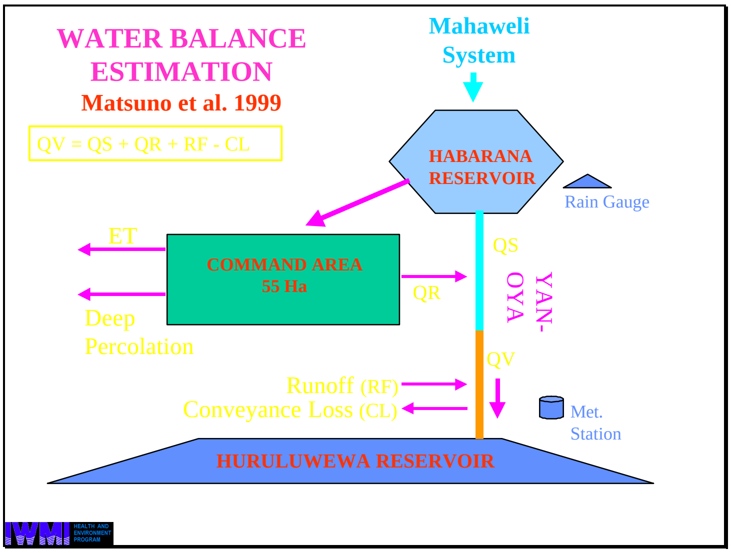
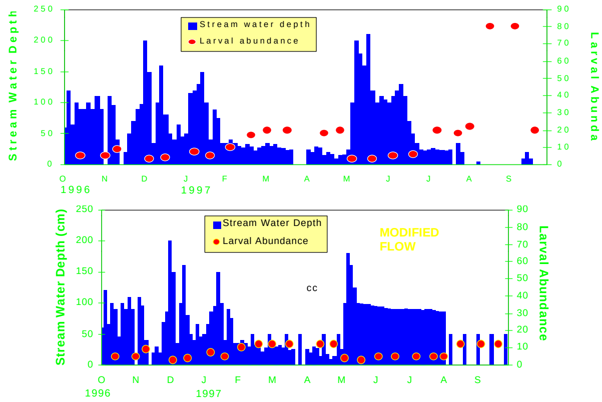


Slide 17



MATSUNO ET AL. 1999

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GOVERNMENT OPERATING & CAPITAL COSTS: PREVENTIVE

	ANNUAL COST PER PERSON PROTECTED (US$)
SPRAY (FENITROTHION)	3.53
SPRAY (MALATHION)	2.45
BEDNET (PERMETHRIN)	1.02
LARVICIDING (ABATE)	0.51 *
WATER MANAGEMENT	0.25 *

* Mode of protection not comparable with previous 3 methods

Konradsen et al. (1999)

Slide 19

HURULUWEWA STUDY

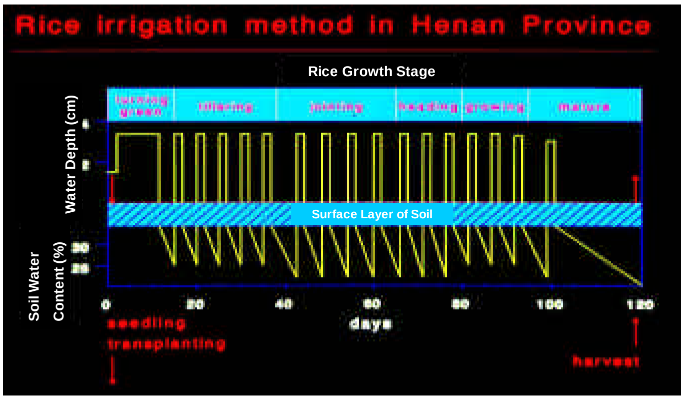
We have presently commenced phase-II of the study, in which a water management strategy for malaria control will be tested in partnership with Mahaweli Authority of Sri Lanka

Slide 20

ALTERNATE WET AND DRY IRRIGATION (AWDI)

- Water Saving
- Yield Gains
- Disease Vector Control
- Rice Pest Control?

Slide 21



(Source: WHO)

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ON-FARM WATER MANAGEMENT - INDIAN COUNCIL OF AGRIC. RESEARCH (ICAR)

Center	Soil	Water Regime	Yield Increase	Water Saving
Orissa	Loam	7 cm water 3 dry days	16%	44%
Gujerat	Clay	7 cm. water 1 dry day	10-23%	20-29%
T'Nadu	Porous	5 cm water 1 dry day	25%	23%
Kerala	Sandy	7 cm water 1-2 dry days	77%	79%

(Source: Batta, Singh & Sharma, 1998)

Slide 23

AWDI STUDIES: WATER, YIELD & MOSQUITOES

AREA	YEAR	VECTOR	PERCENTAGE CHANGE WATER	MOSQ	YIELD
Bali	1936	*An. aconitus*		-75	-8
Portugal	1936-39	*An. atroparvus*	-18	-80	+6/+8
China	1978-79	*An. sinensis* *Cx. Tritaeniorhynchus*	-53	-81	+13
India	1990-91	*Cx. Tritaeniorhynchus*		-75	0/+4

Kenya	1998-99	*An. arabiensis*	(unpublished)
India	1999-2000	*Culex, Anopheles*	(in progress)
Sri Lanka	2000	*Culex, Anopheles*	(proposed)

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IMPLEMENTING WATER MANAGEMENT - CONSTRAINTS

Lack of knowledge and understanding of the problem - engineers and irrigation managers

Lack of interest or commitment
("this is a health sector problem")
- engineers & irrigation managers

Unrealistic expectations of health sector, without an understanding of water dynamics and associated factors

Slide 25

IMPLEMENTING WATER MANAGEMENT - CONSTRAINTS

Irrigation water losses due to poor construction/maintenance; inadequate water for multiple use: crops / domestic consumption / livestock / pests and vectors

Resistance from farmers concerned about water availability for crops

Poor institutional links between health, irrigation & agriculture

Country Reports on IPM, IVM

INSTITUTIONALIZATION AND SOCIALIZATION OF INTEGRATED PEST MANAGEMENT (IPM) IN INDONESIA

by

ATI WASIATI HAMID

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MINISTRY OF AGRICULTURE
2000

INSTITUTIONALIZATION AND SOCIALIZATION OF INTEGRATED PEST MANAGEMENT (IPM) IN INDONESIA 1)

By

Ati Wasiati Hamid 2)

Abstract

The implementation of IPM in Indonesia has been on going since 1979. IPM as the national pest control strategy in Indonesia declared through on Presidential Decree No. 3/1986. The policy of the IPM Program is further enhanced by The Government Law No. 12/1992 and the Government Decree No. 6/1995. The crop protection system has to be carried out through IPM system and all activities by government and the Indonesia community must be aligned with this system.

The ultimate goal of the National IPM Program is to institutionalize IPM at the farmer level. IPM trained farmers provide the foundation of sustainable agricultural sector. The core activities of "IPM by farmers" is planned and coordinated efforts by the National IPM Program.

The IPM Farmer Field School (IPM-FFS) approach is the basis for farmer training. Now, IPM is viewed primarily as a Human Resource Development Program promoting sustainable agriculture in Indonesia. During the IPM project funded by the World Bank, 1.048.584 farmers (including 27.092 farmers as an IPM field leader) and 7.498 agricultural field workers (2.253 pest observers, 4.912 field extension workers, and 333 IPM field leaders) were trained in field IPM practiced. Farmer IPM-field leader is realized of the develop the personal and organizational capacities necessary for sustaining agricultural and community development.

The IPM-FFS through the participatory approach have enhanced the self confidence, improve knowledge and skills changed attitudes and empowered farmer.

1) Presented in Workshop on Sustainable Approaches for Pest and Vector Control in Replacing POP's Pesticides, 6--10 March 2000, Bangkok, Thailand

2) Subdirector of IPM for Food Crops, Directorate General of Food Crops and Horticulture, Ministry of Agriculture

INTRODUCTION

The IPM Program in Indonesia started in the 1970s to address major concerns in crop protection for improvement of the country's agricultural protection.

In 1986 through the Presidential Decree Number 3/1986 the President declared IPM as a National Crops Protection Policy. The decree banned 57 insecticides, phased out rice pesticides and subsidy and provided training of extension workers in IPM. This decision was based on research evidences indicating many problems in past crop protection strategies, particularly in rice. Because of farmer's excessive and indiscriminate use of chemical pesticides, pest resistance developed and consequently resurgent out breaks occurred. Specifically, heavy losses in rice yield due to brown plant hopper (BPH) infestation.

The Decree Number 3 / 1986 is the basis for the National IPM Program and its has further enhance by the Government Law Number 12 / 1992 and the Government Regulation Number 6 / 1995.

In 1989 Phase 1 of the National IPM Training and Development Program began. The program operation were funded by the USAID and it received technical assistance through FAO. The program training component provided knowledge and skills on the application of IPM techniques to pest observers and farmers in some provinces. Another component addressed the need to come up with scientific bases for the IPM-related training programs through scientific investigation. This phase has trained some 300,00 farmers from IPM-farmers field schools.

In 1993 the program was expanded as phase II covering 12 provinces and targeting the training of more than 800.000 farmers in critical rice-producing provinces. The main goal was to achieve a "critical mass" of trained farmers, field workers and local government officials necessary to establish IPM as the standard and sustainable crop protection practice within Indonesia agriculture community. Apart from rice, the project also studied the application of the IPM in other crops such as soybean, carrot, shallot, cabbage and potatoes.

THE OBJECTIVE OF THE IPM PROGRAM

The main objective of the Program is to train farmers on the principles and application of IPM to promote a stable agricultural production, particularly rice and environmentally sound crop production system. This is carried out by strengthening institutions and providing policy support to strengthen the regulatory and environmental management framework for pesticide to reduce risk associated with their manufacture, distribution and application. The project is expected to have impact on foreign exchange due to reduce expenditures on pesticide, yield, environment, human health, and life span of rice new varieties, as well as increased woman participation in IPM application.

Several studies on the impact of IPM on pesticides application found that FFS alumni farmers implementing IPM technology have reduced the use of pesticide application significantly. An project impact evaluation study showed that IPM farmers has reduced about 42% of pesticides costs by eliminating unnecessary pesticide application, In addition, IPM farmers have become aware of the hazard and dangers of pesticides, and now they were taking safety precautions, such as not spraying during a windy weather, stored or stocked pesticides in an unreachable place by other people. Another health related aspect found by the study was the incident of illness. Among the six provinces surveyed, the study indicated that IPM farmer had lower incidents of headaches compared to non-IPM farmers. Since the IPM Program has been launched there have not been any major pest outbreaks on rice.

In regard to the achievement of the output project, it was recorded that the number of farmers trained in: (1) Rice-FFS was about 755.494; (2) secondary crops-FFS was about 59.962; (3) Vegetable-FFS was about 55.750. The project has conducted bio-control training for about 4.170 farmer trainers, and special topics based on farmer needs for about 65.625 farmers. The number of trainers trained in IPM as follows: (1) about 369 field extension workers was trained in 1 year IPM training; (2) 721 pest observers graduated in D-1 program; (3) 23.072 farmer trainers were participated in TOT. The Project was able to provide training for local officer and laboratory technicians, and provided fellowship to 21 pest observers taking D-3 and S-1 program.

The other outputs of the project were also achieved such as strengthened Pesticide Commission, field management information system in 121 districts, 121 contracted out research, action research facilities in 6 locations. Pesticide information system was also strengthened the cooperation with USEPA and five pesticide manufacturing plants were audited.

IPM IMPLEMENTATION

The activities for developing IPM at farmer's level were initiated by conducting the IPM Project. The cores guiding in the development of IPM Project are : (1) human resource development; (2) supporting studies and field investigation; and (3) strengthening regulation and management of pesticides.

Human resource development aims at improving the ability of farmers and field officers in the implementation of IPM practices through FFS and other IPM related training, as well as support for management information systems. Some of FFS alumni farmers in several project locations were able to train other farmers. Through the project, trained farmer trainers became more closely involved in what was really happening at the farm. IPM-FFS methodology used in farmer training has empowered farmers to be rational and more independence in decision making made for their frame activities. Through FFS, farmers were encouraged to solve their own frame problems by conducting farmer field investigation on their own farm. This has motivated farmers to be expert in their own farm.

Another benefit gained by IPM-farmers was economic benefit of their farm. Regular farmer field observation made the farmer to reduce the use of pesticide application in the farm resulting the reduction of pesticide cost significantly. The project pointed out that in some areas, IPM-farmer trainers have conducted FFS at their own villages. These social benefits motivated the majority of IPM-farmers to sustain and disseminate IPM program.

This commitment was visualized by the establishment of IPM-farmers network at village, sub-district, district and national level. The major objective of these farmers network is to exchange information on IPM related technology among IPM-farmers through various media such as farmer technical meetings, and to establish marketing network of IPM agricultural product. These farmer networks are the bases for the establishment of " IPM critical mass".

Supporting studies and field investigation aimed to support activities leading to the development of new and refined IPM practices to more effective implementation of IPM in the field, particularly for rice.

Strengthening regulation management of pesticide aimed at supporting and agreed action plan strengthening regulatory and environmental management of pesticides through: (a) strengthening the role and function of Pesticide Commission; (b) review pesticide related regulatory policy; (c) collation and dissemination of information for pesticide management; and (d) undertaking environmental audit of pesticide manufacturing.

Advocacy for the policies regulating the distribution and use of hazardous pesticides has been the major milestone under this component. Another accomplishment achieved by the project was on capacity building including training for staff on the use of commercial chemical safety database and the internet for accessing US EPA database. In addition to capacity building, another significant result identified under this component was the strengthening of the Pesticide Commission to carry out the mandatory task including recommending pesticide policies to the MOA Minister.

CONCLUSION

1. IPM is a sound approach to be development. This concept as a multi-disciplinary program which requires a smooth coordination. It does not only involve technological skill but also socioeconomic as well as socio cultural aspect.

2. To anticipate the possibilities of pest occurrence and to control pest out break, implementation of IPM is a strategic policy. In Indonesia, IPM as the national pest control strategy is planned and coordinated efforts to institutionalize the principles of IPM by farmers. Within the farming community it self will spreading of IPM within the general public as part of broad promotion of sustainable, environmentally sound agricultural development.

3. The Indonesian IPM farmer's emphasis on human resources development has laid the strong foundation for disseminating and developing IPM. The sustainability of IPM will depend very much on the continuity of human resources development, strengthening the development and establishment of IPM and coordination among involved institution. This approach which aims at creating good coordination, integration, and synchronization in order to ensure the implementation of IPM can be practiced effectively and efficiently.

4. The National IPM Program is viewed as a leading vehicle for the renewal of agricultural practice leading to timely sustainable agriculture in Indonesia. We realize that reaching this goal will not be easy, but we are committed to giving our best effort to make IPM. The Indonesian IPM Program now contributed a proven IPM model for other countries.

FUTURE OPERATION

The project has created a "critical mass" of 1.048.564 trained farmers, 333 field leaders, and 22.580 IPM farmer trainers, 2.253 trained pest observers, 4.912 field extension workers in 12 provinces. These cadres of IPM are expected to do sustain the institutionalization of IPM. Trained IPM farmers will disseminate IPM to neighboring farmers who have not had the opportunity to attend IPM FFS through weekly or biweekly farmer group meetings. The IPM farmer trainers will continue to train other farmers in FFS funded by local community or local government and conduct farmer studies to develop local specific technology which will solve problem faced by the farmers. In the future, IPM Farmer Association established recently will take over more Government responsibility in expanding and strengthening institutionalizing of IPM.

At sub district level the trained pest observers and field extension workers will form an IPM extension team. This team will sustain the institutionalization of IPM with the sub-district. This team will support the activities of the IPM farmer trainers including farmer studies, action research facility, farmers' technical meeting and facilitating development of agribusiness partnership in pesticide residue-free production and marketing. The district local government will be responsible to provide fund to continue IPM program in each district.

LESSONS LEARNED

The Integrated Pest Management Training Project succeeded in institutionalizing IPM concept and practices to farmers. The participatory FFS model brought farmers and government workers together in a learning process, which improved their confidence in decision meeting skill. Farmers' innovativeners and creating in addressing their crop production constraints was improved.

Through FFS and follow-up activities, the farmers were able to develop stronger partnership with other stakeholders leading to more sustained IPM activities. These stakeholders become active participants in applying IPM principles and practices through partnership in the production and marketing of IPM product that lead to sustainable agriculture and development.

From this experience, the farmers learned that food self sufficiency can be sustained not only by- applying high-chemical input technology, but by applying agro-ecosystem based and low cost production practices. The farmers will benefit more by applying low-cost technology by sustain the productivity.

VECTOR CONTROL POLICY IN MALARIA CONTROL PROGRAMME IN INDONESIA

Thomas Suroso, Bona Sianturi and Budi Pramono

Abstract

Malaria is one of the communicable diseases considered as a major public health problem in Indonesia. The incidence of the diseases has increased-since the last 3 years.
Indoor residual spraying using DDT had been applied as the main method of control. However following the resistance of vector to this insecticide and it's pollutant impact, DDT has been withdrawn since 1993 and replaced, by OP, Carbamate and Pyrethroid synthetic.
At present the strategy to control the diseases is interruption of malaria transmission through treatment of cases, vector control, and individual protection against mosquito bites. The integrated vector management (IVM) has been intensified in the malaria control program in Indonesia. Vector control methods other than insecticide spraying has to be sought in each malaria endemic area. The alternative control methods include environmental management and the use of fishes to control mosquito larvae and other measures to prevent man-mosquito contact such as using bed nets and cattle-barrier. However, due to the lack of entomologists and weakness of the intersectoral collaboration, the policy has not covered all malarious areas

1. Malaria Situation

Malaria is endemic in many areas of Indonesia. Especially in the eastern part of the country. There are 14 Anopheles species act as malaria vectors, scattered in different ecological conditions.
Over 2 million clinical malaria cases and about 100 deaths were reported annually from the health institutions throughout the country .
Since the last three years, there has been an increasing trend of malaria incidence due to the occurrence of malaria outbreaks in several areas (annex 1). In Java - Bali, the API of 0,12 per 1000 population in 1997 increased 0,4 cases per 1000 population in 1999; whereas in outer island the Annual Malaria Incidence increased from 16 per 1000 population in 1997 to 25 cases per 1000 population in 1999 (annex 2 & 3)
The increase of malaria incidence was mainly due to neglected fish ponds in the coastal area and the limited coverage of control activities as the consequences of the economic crisis since 1997.

lI. Development of vector control policy

The policies on vector control in Indonesia can be divided into 7 period as follows :

1 . Up to 1952, Environmental management
Environmental management was conducted to control *An. sundaicus*, the main vector in the coastal areas. The activities coverage irrigation, drainage to prevent the stagnant brackish water in the harbor of town of Cilacap, Tegal, Sibolga and Belawan. No insecticides was used during this period.

2. 1952 - 1959, DDT & dieldrin spraying

Environmental management was maintained and DDT and dieldrin spraying was applied in limited areas of Java island and several areas of other areas. In 1955 total population covered by this measure was 18 millions.

3. 1959 - 1968, DDT spraying in large scale.
In 1959 malaria eradication programme was launched in Java -Bali and limited areas of others island. About 65 % of total population of the country have been protected. Annual Parasite Incidence was reduced to 0,1 cases per 1000 population in most of the areas treated. Environmental management have been continuously maintained in the coastal areas.

4. 1969 - 1976, DDT spraying in selected areas
In 1968 malaria eradication programme was converted to malaria control programme (MCP) and since then has been integrated into general health services.

5. 1977 - 1992 Alternative insecticides introduced
Insecticides other than DDT have been used for indoor residual spraying during this period. Fenithrotion spraying has been introduced in 1977 in areas were the vector has developed resistance to DDT. Bendiocarb and L.cyhalotrine have been used since 1991 and 1992 respectively whereas *Bacillus thuringiensis* has been applied to control larvae of *An.sundaicus, An.subpictus* and *An.maculatus* In addition to the use of insecticides for larvae and adult mosquito control, in 1991 insecticides treated bednet have been introduced. During this period plumbing constructions were built in the coastal areas of 15 Provinces (annex 4) to control *An.sundaicus,* the brackish water breed mosquito.

6. 1993 - 1998 : Alternative insecticides replaced DDT
DDT was banned in 1993 due to the development of vector resistance in large areas. In addition, DDT spraying has been refused the people especially in mean with better housing condition, as the spraying spoiled the walls and furnitures. Moreover DDT has caused pollution to the environment including agriculture products. In some Provinces it caused serious impact to the export commodities. DTT was replaced by organo-phosphate, carbamate and pyrethroid synthetic. During this period, vector control methods other than IRS have been intensified. Similarly the use ITN and larviciding have been applied in a wider areas. (Annex 5)

7. 1999 - Up to the present : New vector control policy
New policy on vector control has been developed in 1999. The policy consists of three strategies aiming at interruption of malaria transmission. The strategies are : (i) treatment of cases to eliminate malaria parasite (ii) vector control to reduce population and (iii) individual protection to prevent mosquito bites. The policy emphasizes on the implementation of integrated vector management (IVM).
Vector control methods other than insecticide spraying has to be sought in each malaria endemic areas. The alternatives control methods include environmental management and the use of fishes to control mosquito larvae. The environmental management cover the plumbing construction , cleaning up water surface from algae, mangrove planting, filling, drainage etc. In addition to the above, other measures to prevent the transmission including the use of bed nets, cattle barrier are encouraged, wherever appropriate. However, due to the lack of entomologists and weakness of the intersectoral collaboration, the policy has not covered all malarious areas.

Ill. **Some experience in integrated vector management to control malaria**

1. To breed of fishes in rice field ("mina padi").
Poecilia reticulata the larvivorous fish were released in rice field together with *Cyprinus carpio*, a consumed fish in District of Banjarnegara, Central Java Province. The two species of fishes were breed during planting period of the rice cultivation. The aim of putting *Cyprinus carpio* was to ensure the rice field got sufficient water level for the fishes to breed, so the larvivorous fishes would survive and eliminate the larvae of *An.aconitus.* The farmer would take care in keeping the water level as, they would get benefit to harvest the fishes. This "mina padi" had been practiced since 1979. Larva density reduced from 3.35 per trap in 1979 to 0.01 per trap in 1984. Malaria Slide Positive Rate (SPR) also reduced from 16.5 % in 1979 to 0.2 % in 1984 (Sustriayu Nalim et al, 1988).

2. Intermittent irrigation.
Study on intermittent irrigation had been conducted in small scale in Suruh village, Semarang district, Central Java Province. Study of project is conducted by national institute of Health Development Research supported by local staff of Ministry of agriculture. It was reported that larva density reduced significantly (Sustriayu Nalim, 1980).

3. To breed consumed fishes i.e. *Nilapalvata sp* and bandeng.
Malaria outbreak occurred in the coastal areas, Cilacap District in 1999. The vector was *An.sundaicus* which breed in brackish water. The high density of vector larvae was due to neglected fish / shrimps ponds that caused floating algae on the water surface. The two species of fishes were breed in the neglected fish ponds to eliminate the alga, so that the waters surfaces were cleared from floating vegetation. This condition would no longer favor to *An.sundaicus* larvae. In addition to this larvae control measures, insecticides spraying in limited areas and treatment of cases were also conducted. The integrated control management has succeed to control the epidemic

IV. **Summary** :

Malaria is still a major health problem in different parts of Indonesia**.** Various method of vector management have been implemented to control malaria. DDT spraying has been withdrawn since 1993. OP, carbamate and pyrethroid synthetic has replaced DDT. Vector control method other than insecticides spraying has been encouraged under the newly developed policy of vector control in Indonesia.

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2. Sustriayu Nalim, Damar Tri Boewono, Arief Haliman dan Elias, Winoto 1998 Control Demonstration of the Ricefield breeding mosquito *Anopheles aconitus* Donitz in Central Java, using *Poecilia reticulata* through community participation 3 Field trial and Evaluation. Bull.Peneliti Kesehatan 16 (1) 6 - 11

3. Departemen Kesehatan Direktorat Jenderal Pemberantasan
Penyakit Menular dan Lingkungan Pemukiman 1993
Malaria, Program pemberantasan

Annex 1

Malaria Outbreak In Indonesia 1998 - 1999					
No	**Province**	**District**	**Village**	**Case**	**Death**
1	South Sumatera	Belitung	3	396	4
2	D.I. Yogyakarta	Kulonprogo	14	96323	33
3	Lampung	Lampung Selatan	4	1447	2
4	Central Java	Purworejo	34	61517	0
		Cilacap	2	206	3
5	North Sumatera	Asahan	3	1180	1
		Labuhan Batu	2	350	11
6	West Nusa Tenggara	Lombok Timur	4	82	4
7	East Nusa Tenggara	Belu	?	74	8
8	East Java	Sumenep	17	515	0
9	West Sumatera	Peseisir Selatan	1	206	1
10	West Java	Ciamis	4	95	4
	Total		84	19689	71

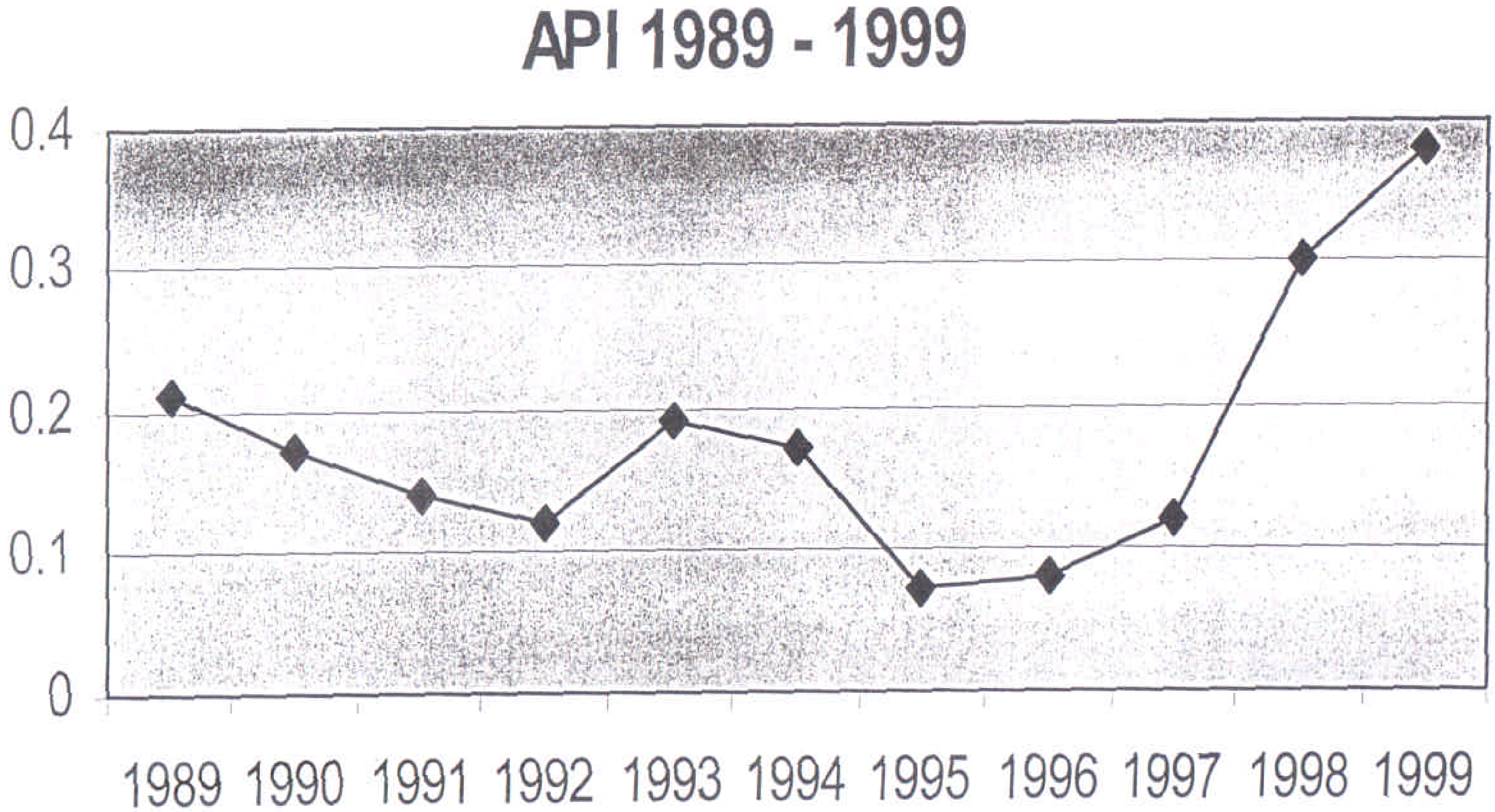
Annex 4

No.	**Provinces**	**No. Plumbing construction were built yearly (unit)**					
		1989	**1990**	**1991**	**1992**	**1993**	**Total**
1	DKI Jakarta	0	0	0	0	0	0
2	Jawa Barat	0	1	1	0	0	2
3	Jawa Tengah	0	0	0	0	0	0
4	DI Yogyakarta	0	0	0	0	0	0
5	Jawa Timur	0	1	1	1	1	4
6	Bali	0	1	2	1	1	5
7	DI Aceh	2	0	0	0	0	2
8	Sumatera Utara	0	0	0	0	0	0
9	Sumatera Barat	0	0	1	1	1	3
10	Riau	4	2	2	4	4	16
11	Jambi	0	0	0	0	0	0
12	Sumatera Selata	0	0	0	0	0	0
13	Bengkulu	0	0	0	0	0	0
14	Lampung	0	0	0	0	0	0
15	Kalimantan Barat	0	0	0	0	0	0
16	Kalimantan Teng	0	0	0	0	0	0
17	Kalimantan Selat	0	0	0	0	0	0
18	Kalimantan Timur	0	0	0	0	0	0
19	Sulawesi Utara	1	1	0	0	0	2
20	Sulawesi Tengah	0	1	1	0	0	2
21	Sulawesi Selatan	1	1	1	2	2	7
22	Sulawesi Tengga	1	2	2	0	0	5
23	NTB	0	0	2	1	1	4
24	NTT	2	2	2	3	3	12
25	Maluku	3	1	2	2	2	10
26	Irian Jaya	0	2	2	0	0	4
27	Tim Tim	0	0	0	0	0	0
	Total	14	15	19	15	15	78

Annex 5. Amount of Insecticides for Vector Control Activities Used in Indonesia, 1969-1999

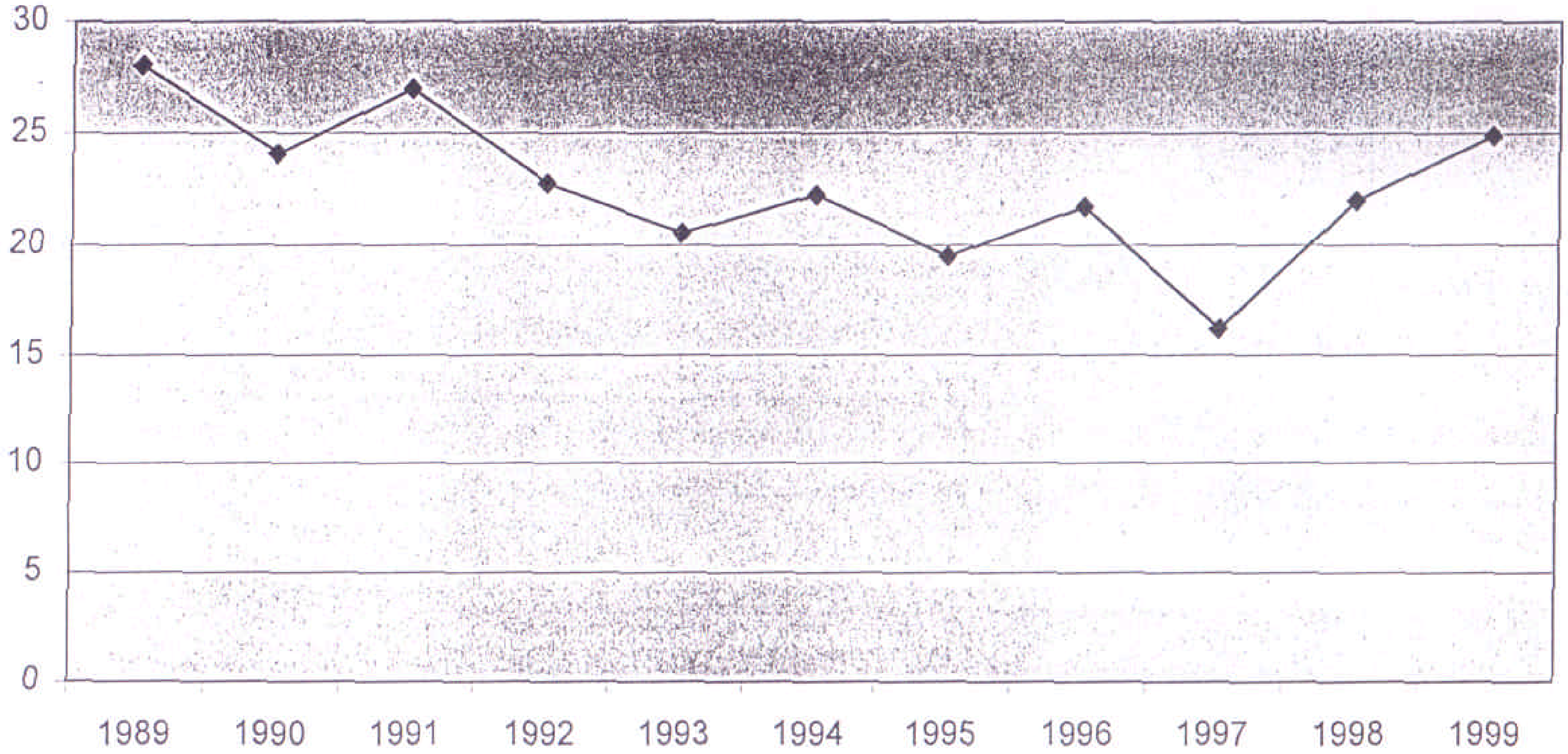
Tahun	Figures in metric ton/litres								
	DDT 75 WP	Fen. 40 WP	Bendiocarb 80 WP	L. cyhalotrin 10 WP	Fenthion 40 WP	Deltametrin 5 WP	Etofenprox 20 WP	Bacillus Thuringiensis H-14 (ltr)	Permethrine 100 EC (Itr)
1969	204.2	0	0	0	0	0	0	0	0
1970	1282.8	0	0	0	0	0	0	0	0
1971	1026.2	0	0	0	0	0	0	0	0
1972	1612.3	0	0	0	0	0	0	0	0
1973	1669.95	0	0	0	0	0	0	0	0
1974	1357.8	0	0	0	0	0	0	0	0
1975	1804.46	0	0	0	0	0	0	0	0
1976	3578.7	0	0	0	0	0	0	0	0
1977	3867.6	8	0	0	0	0	0	0	0
1978	3741.6	1.9	0	0	0	0	0	0	0
1979	2549.2	6	0	0	0	0	0	0	0
1980	1752.1	89.6	0	0	0	0	0	0	0
1981	1983.6	135.73	0	0	0	0	0	0	0
1982	1677.4	35.2	0	0	0	0	0	0	0
1983	692.75	4.32	0	0	0	0	0	0	0
1984	1305.01	84.6	0	0	0	0	0	0	0
1985	1112.5	156.5	0	0	0	0	0	0	0
1986	765.8	100.4	0	0	0	0	0	0	0
1987	325.7	60.8	0	0	0	0	0	0	0
1988	318.2	63.9	0	0	0	0	0	0	0
1989	762.58	214.2	0	0	0	0	0	0	0
1990	563.2	359.4	0	0	0	0	0	0	0
1991	544	153	2.13	0	0	0	0	3500	10236
1992	28.15	178.3	18.9	0.25	0	0	0	5605	6720
1993	0	194.8	22.3	12.84	0	0	0	15500	11000
1994	0	76.5	30.2	43.02	0	0	0	14075	16040
1995	0	63	27.5	41.52	0	0	0	9089	17994
1996	0	18.8	6.52	22.3	21.3	0	0	10239	18855
1997	0	0	7.3	24.55	20.2	10.9	0	5483	9496
1998	0	0	4.65	3.64	21.54	10.91	45.3	2693	2960
1999	0	0	0.875	0.8	0	2.4	1.8	0	0
Total	***34525.8***	***2004.95***	***120.375***	***148.92***	***63.0.***	***24.21***	***47.1***	***66184***	***93 301***

ANNUAL PARASITE INCIDENCE JAVA-BALI Annex 2
1989-1999



Annual malaria Incidence, 1989 - 1999

Annex 3



Management and Registration Status of POP Pesticides in Indonesia

Kasumburo Untung, Ate Hamid, and Thomas Sumoro

In Indonesia, activities regarding with pesticide management are fully controlled under a basic legislation namely the Government Decree No. 7 of 1973 on the Control of Distribution, Storage, and Use of Pesticides. It is clearly stated in this decree that any pesticide for whatsoever purpose of use has to be first registered with the Minister of Agriculture prior to its commercial distribution and use. This decree then has been spelled out into a number of Agricultural Ministerial Decrees on the registration and approval of pesticides including POP pesticides.

With regard to the registration and approval of pesticides, the Minister of Agriculture in running his activities has been assisted by a non-structural coordinating organization so called Pesticide Committee whose main task is providing recommendations on pesticide registration in particular to the Minister.

The Government of Indonesia through the Pesticide Committee, Ministry of Agriculture gives the top priority on the safety aspect of pesticides to both human health and the environment in the registration process. This policy applies to any pesticide including POP pesticides. The following is the management and registration status of POP pesticides in Indonesia

1. Nowadays, none of the nine POP pesticides is being permitted for any purpose of use in Indonesia. Due to safety concern, some of them were banned years ago, and the others have been subject for rejection for further registration. As stated earlier, those which are not registered with the Minister of Agriculture are prohibited for use in the country.

2. Most of pesticides (the technical ingredients) distributed in Indonesia have been from overseas. Before they were banned, POP pesticides had been legally imported from abroad (chlordane, dieldrin, and toxaphene).

3. Monitoring on the statistics/data of pesticide usage is considered difficult especially for the detailed information. Even though the pesticide registration holder is required to submit the report on the procurement of pesticides (by import quantity), the data would not reflect their real usage in the field. This problem was also found for POP pesticides.

4. Of the nine POP pesticides, only chlordane, dieldrin, and toxaphene had ever been registered and in use in Indonesia. Chlordane and dieldrin had been used for public hygiene and construction purposes to control subterranean/wood termites. Whereas, toxaphene had been utilized in crop management. Thereafter, toxaphene, chlordane, and dieldrin were banned for any purpose of use in 1980, 1992, and 1992, respectively.

5. As pesticides, POPs are no longer used in Indonesia. DDT has been withdrawn for agriculture uses in 1974 and for malaria control in 1993. DDT for malaria control has been replaced by OPs, Carbamates and Pyrethroid synthetics.

6. There are a number of chemical alternatives to POP pesticides, particularly to chlordane and dieldrin, for the same purpose of use, namely chlorpyrifos and phoxim. However, to control pests in common (for food crops and horticulture) the use of biological pesticides is strongly encouraged. Among biological pesticides that are registered in Indonesia are Bacillus thuringiensis and NPV.

7. More information is still needed to explore the source of biological pesticides as alternatives to POP pesticides. Although biological pesticides are considered to be relatively safer, the information on their toxicological aspect is still required.

8. POP pesticides were banned/rejected for registration by means of Agricultural Ministerial Decrees. This policy has been effectively enforced by strengthening the registration processes and improving the monitoring and control of pesticides directly in the field.

9. At present, there is no more subsidy for pesticides.

Role of Plant Protection relating to food safety, environment & sustainable development

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Introduction

Pesticides, inevitable for protection of crop losses & human health are on the other hand regarded as mixed blessings to human life. The proper management of these chemicals is of major concern for authorities all over the world. Hence, the authors try to highlight current endeavors made in Myanmar to control the negative effects of the pesticides and to minimize their impact on human health and environment. The areas discussed cover, chemical residues relating to food safety, persistent organic pollutants and their management, toxicity and quality of registered pesticides and integrated pest management in support of sustainable development in agriculture.

Food safety (Chemical)

The pesticide consumption in Myanmar is very low compared to many neighboring countries. Based on general observations in farmer's fields, some most important crops looking from pesticide residue stand point, amount of pesticide use and their PFU are compared to the official recommendation below.

Table - 1. Pesticide use in some food crops

No.	Pesticide used	Crop	Farmer's practice amount/ac	PHI Generally observed	Officially recommendation
1.	Monocrotophos	Pulses, Vegetables, Fruit trees, Rice, Maize	10 cc/9 li water	10 days	
2.	Mancozeb	Rice, Potato, Tomato, Beans, Groundnut, Chilli, onion, Garlic, Apple, Pear, Grape	100gm/20 gallon water	20 days	
3.	Dimethoate	Beans, Rice, Sugarcane, Citrus, Fruits, Vegetables	30cc/gallon water	21 days	
4.	Chloropyriphos	Peas & beans, Coffee, Vegetables, Groundnut, Maize	30cc/gallon water	7 days	

The Plant Protection Division of Myanmar Agriculture Service, Ministry of Agriculture & Irrigation has established capacity to monitor pesticides residues for food in commerce.

Before looking into the residue data it is important to introduce the term applied in principles for setting Maximum Residue Limits and make them understand.

GAP = Careful use according to the approved label direction of registered pesticide product. This implies
that the desired control of pest will be achieved without leaving residues in food more than necessary.

Use Pattern (Registered) = dosage, frequency, PFH. resulted from efficacy trials.

NOAEL = No Observable Adverse Effect Levels.
when a compound has been administered in the feed of the test animals, the test animals, the highest dose which produces no toxic effect in the most sensitive test species is termed the "no observable adverse effect level". Subchronic feeding studies of 90 days' duration are carried out in at least two species of animals. These studies are essential to determine the effects of repeated short term exposure to oral intake of the pesticide. Chronic feeding studies consist of continuous daily oral administration of the 'compound to two test species throughout a period approaching their normal life span. It is expressed as milligrams per kilograms of body weight per day.

ADI = Acceptable Daily Intake
is the daily intake which, after a life time of exposure at that level, is almost certain not to result in injury of any kind. It is usually base on a daily intake which has no observable effect on a sensitive species of animal. Then emergence of safety is applied to allow for differences in sensitivity between animal species and human beings, the wide variation in sensitivity among human and the small numbers of experimental animal in comparison with the human population which might be exposed. When a satisfactory NOAEL has been established the ADI is obtained by dividing the NOAEL by a suitable safety factor. The units are milligrams per kilogram body weight per day.

MRL = Maximum Residue Limits means the maximum concentration of a pesticide that is legally permitted or recognized as acceptable in or on a food, agricultural commodity or animal feed stuff. It is expressed as mg of pesticide per kg of crop

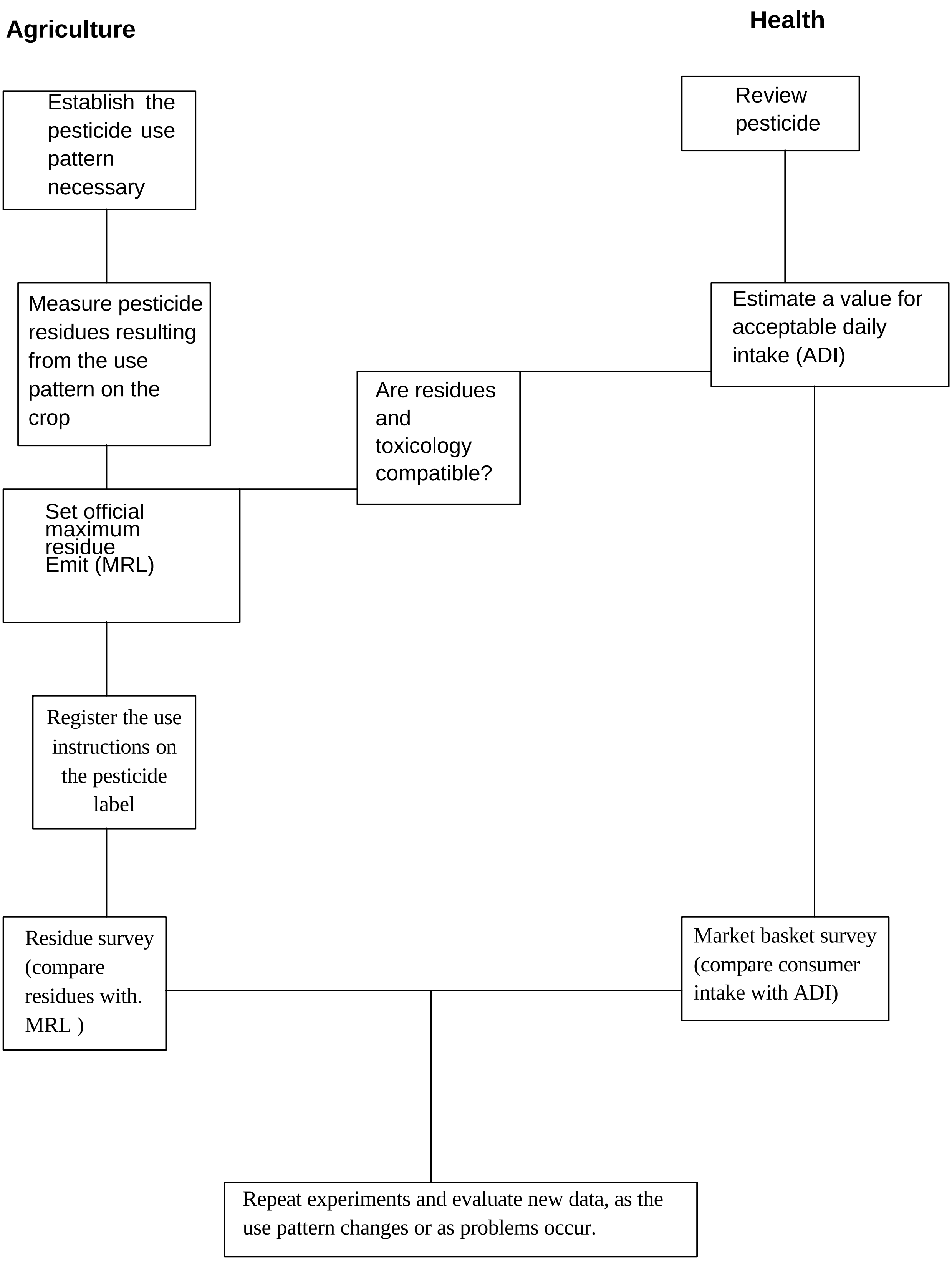

Figure -1 demonstrate the evaluation of pesticide use on food crop. The establish meastures to assure consumers and offer a decision between food, which is legally considered fit or unfit to ceat.

In Myanmar, in early 90's the country had some trade problems relating to pesticide residues in food. The residues detected were mainly organo-chlorine. The violation of residue limits for food commodities is presented in table - 2.

Table - 2 Residues survey in food commodities and violation of MRL's (1989 - 1999)

Year	No. of sample analysed (Food)	Sample violating Codex Limits (%)	Sample violating National MRLs (%)	Detected Residue Level	
1989-90	190	44 (23%)	44 (23%)	DDT Aldrin + Dieldrin	0.3-0.4 0.1-0.2
1990-91	244	45 (18%)	45 (18%)	DDT Aldrin + Dieldrin	0.2-1.0 0.2-1.3
1991-92	51	0	0	0	
1992-93	49	3 (6%)	3 (6%)	DDT Aldrin + Dieldrin	0.03-0.2 0.01-0.06
1993-94	115	15 (13%)	20 (17%)	DDT Aldrin + Dieldrin	0.01-0.05 0.01-0.05
1994-95	44	7 (16%)	7 (16%)	DDT Aldrin + Dieldrin	0.15-0.2 0.01-0.02
1995-96	60	0	0	0	
1996-97	40	2 (5%)	2 (5%)	DDT Aldrin + Dieldrin	0.05 0.03
1997-98	36	0	0	OCI detected < LD	
1998-99	159	0	0	OCI detected < LD	
1999-2000 (Feb.)	61	0	0	0	

It may be noted that in the early 90's the violation of MRLs (National & Codex) were due to Organochlorine pesticide residues.

With the enactment of Pesticide Law, the use and import of many Organo Chlorine Pesticides has been banned or restricted in this country.

Currently, the pesticides used for these crops are mainly fast degrading OP's and Synthetic pyrethroids consequently the residues in food crop produced in this county well below the MRL's established by the joint WHO/ FAO codex Alimentarious Commission.

ASEAN MRL harmonization.

As Myanmar has become an ASEAN member country, the survey for residue levels of pesticides of ASEAN harmonized MRL's , was carry out starting from last year.

The samples are taken from various regions of important crop growing areas as listed below.

Table - 3 Crop samples for ASEAN MRLs

Crop	sample size	No of sample	source of sample
1. Cabbage	1-2 kg	15	Shan state
	1-2 kg	8	Mandalay division
	1-2 kg	15	Bago division
2. Tomato	1-2 kg	15	Shan state

The number -of formulated products related to the ASEAN MRLs and used in this country is listed below.

Table - 4 Pesticides related to ASEAN MRLs

No	pesticide	formulation type	AI %	No of registered formulated product
1.	Dithiocarbamate			
	(a)mancozeb	W.P	80	10
		W.P	72	1
	(b)zineb	W.P	80	1
2.	Monocrotophos	WSC	40	12
		TG	70	1
3.	(a)Chlorpyriphos	E.C	20	3
		E.C	21.5	1
		E.C	40	2
		E.C	40.8	1
		TG	94	1
	(b)Chlorpyriphos	G	15	1
4.	Dimethoate	E.C	40	10

Based on the samples taken last year, the commodities are well within the ASEAN harmonized MRL's.

Table - 5 Implementation of ASEAN harmonized MRLs

Crop	No. of Sample	Pesticide	Limit of determination	Recovery %	Detected mg/kg	ASEAN MRLs	Codex MRLs
Cabbage	0	Dithiocarbamate	Method validation			5	*
Tomato	0	Dithiocarbamate	Method validation			3	3
Cabbage	38	Dimethoate	0.02	106	<0.02	2	2
Tomato	15	Dimethoate	0.24	55	<0.24	1	1
Cabbage	0	Methamidophos	Not registered			1	1
Tomato	0	Methamidophos	Not registered			2	2
Cabbage	38	Monocrotophos	0.02	115	<0.02	0.2	0.2
Tomato	15	Monocrotophos	Method validation	-		1	1
Cabbage	38	Chloropyrifos	0.02	93.18	<0.02	0.05	0.05
Tomato	15	Chloropyrifos	0.02	66	<0.02	0.5	-

The PAL (Pesticide Analytical Laboratory) Plant Protection Division (PPD), Myanma Agriculture Service (MAS), Ministry of Agriculture and Irrigation, is carrying out analysis of sample taken for this year.

Another area though not related to pesticide, but which is a serious concern in food safety is aflatoxin (Aspergillus flavus) contamination. Analysis data presented in table-6, carried out by PAL for 6 years, 1994 to 1999, indicates the importance of this natural toxin contamination, lies in crops, Peanut, Chilli and Maize.

Table - 6 Aflatoxin contamination in food crops (1994 to 1992)

No	Commodity	Year							Aflatoxin detected	Detected Level (PPB= :g/kg)	
		1994 - 1995	1995 - 1996	1996 - 1997	1997 - 1998	1998 - 1999	1999 Jan.	Total	No.	B I-	B2
I .	Peanut	1	45	6	1	5	1	59	33 (56%)	10-2400	15
2.	Maize	-	43	3	1	35	8	90	31 (34.4%)	5-250	<5 - 10
3.	Chilli	10	44	-	2	5	6	67	15 (22%)	<15 - 200	-
4.	Peanut snack	-	2	3	-	-	-	5	1 (20%)	<5 - 15	-
5.	Sesame snack	-	3	-	-	-	-	3	-	<5	-
6.	Chilli sauce	-	-	-	2	1	2	5	-	<6	-
7.	Tomato sauce	-	-	-	5	1	-	6	-	<6	-
8.	Peanut Oil	-	1	-	-	-	-	1	-	<10	-
9.	Sesame	-	12	3	3	2	-	20	-	<5 - <10	-
10.	Rice	-	11	1	1	-	3	16	-	<6	-
11.	Bamboo shoot	5	-	-	-	-	-	5	-	<5	-
12.	Tamarind	-	-	-	-	-	2	2	-	<6	-
13.	Sunflower seeds	-	-	-	-	-	1	1	-	<6	-
14.	Black mapte	-	-	-	-	-	3	3	-	<6	-
15.	Pigeon pea	-	-	-	-	-	2	2	-	<6	-
16.	Green matpe	-	-	-	-	-	1	1	-	<6	-
	Total	16	161	16	15	49	29	278	80		

Violation to national tolerance levels is presented in table - 7.

Table - 7 Aflatoxin in food crops and violation to National Limits.

No.	Year		No. of samples		Sample violating national		tolerance level (B1)		
		analysed	Detected	Aflatoxin :g/kg	Japan <10 ppb	Thailand Hongkong <20ppb	India <30 ppb	Malaysia <35ppb	Taiwan China < 5Oppb
1 .	1994-95	16	11	9-20	10 62.5%	-	-	-	
2.	1995-96	161	56	5-2400	45 27.95%	41 25.46%	37 22.98%	36 22.36%	33 20.49%
3.	1996-97	16	4	5 - 15	1 6.25%	-	-	-	-
4.	1997-98	15	1	15	1 6.67%	-	-	-	-
5,	1998-99	49	4	31 - 74.4	4 8.16%	4 8.16%	4 8.16%	3 6.12%	2 4.08%
6.	1999 - 2000	29	5	20	5 17.24%	5 17.24%	-	-	-
	Total	286	81		66 23%	50 17.5%	41 14.3%	39 13.6%	35 12.2%

It should be noted that WTO SPS agreement also requires proper control of pesticide residues and aflatoxins in food commodities. In order to facilitate international trade in agriculture commodities, it is very important that an agroeconomic based country, like Myanmar observe there international trade agreements regarding food safety standards.

Persistent Organic Pollutants (POPs Pesticides)

Among the 12 POP's internationally recognized as needing immediate global action, 9 are pesticides. POP's are a special problems because they:
- persist in the environment for a long time
- trend for long distances to all parts of the glob
- accumulate in the tissue of most living organisms
- poison humans and wild life

The management of POP's pesticides and their stockpile is presented in table - 8. below.

Table - 8 Existing national legislation on POP's (Pesticides) in Myamnar

No:	Pesticide	category	National Legislations	Stockpile
1.	Aldrin	I	bans for all use	nil
2.	Chlordane	I	not used, no registration	no use
3.	Dieldrin	I	bans for all use	nil
4.	DDT	I	restricts to malaria control	25% EC 169 li (Agri) 75% WP 523 kg (Agri) 75%WP 20405kg(Health)
5.	Endrin	I	bans for all use	nil
6.	HLB	F	not used, no registration	no use
7.	Heptachlor	I	not used, no registration	no use
S.	Mirex	I	not used, no registration	no use
9.	Toxaphene	I	bans for all use	no use

Pesticide Legislation and Quality Control

Legislation of pesticides in the country has improved the safe use of pesticides use in the country. Most toxic (WHO toxicity classification Ia) products has been rejected for registration and less toxic formulations are allowed. The toxicity classification of registered products are presented in Table (9) below.

Table - 9 Hazard classification of registered Pesticides based on the WHO recommended guide lines

	Hazardous class	WHO toxicity class					Total
	Pesticides	Ia	Ib	II	III	Table-5	
1	Insecticide	-	37	94	50	2	183
2	Insecticide TG	-	4	32	6	2	44
3	Insecticide / Acaricide	-	4	1	4	-	9
4	Acaricide	-	-	-	1	-	1
5	Rodenticide	6	3	-	-	-	9
6	Herbicide	-	-	21	52	-	73
7	Fungicide	-	1	5	32	10	48
8	Fungicide / Bactericide	-	-	-	2	-	2
9	Insecticide/ Fungicide	-	-	1	1	-	2
10	Insecticide/ Nematicide	-	2	2	1	-	5
11	Insecticide/Mollusicide	-	-	1	-	-	1
12	Bioinsecticide	-	-	-	-	-	3
13	Stored pest control	8	-	-	-	-	8
14	Public Health	-	-	9	15	39	63
	Total	14	51	166	164	56	451

The quality, control programme carried out by the Pesticide Analytical Laboratory, PPD, MAS, indicated that number of products in line with FAO specification has significantly increased since the enforcement of the Law. On the other hand, only illegal products coming in through border areas remains to be controlled.

The quality, of the imported (registered products) are presented in Table (10) below.

Table (10) Pesticide registration and quality control.

No.	Year	No. sample analyzed				Sample inline with FAO specification	
		Registration sample	Tender Sample	Market sample	Total samples	No. of sample	% in line
1.	1992-93	-	9	34	43	35	81.4%
	1993-94	36	-	57	93	90	96.8%
3.	1994-95	34	27	13	74	70	94.6%
4.	1995-96	83	21	4	108	101	93.5%
5.	1996-97	72	14	29	115	111	96.9%
6.	1997-98	95	18	35	148	144	97.3%
7.	1998-99	51	137	21	209*	175	83.7%
8.	1999-2000 (Nov)	34	-	41	75	75	100%

* Sample include illegal products seized.

<u>IPM for sustainable agriculture</u>

To support sustainable development in agriculture, IPM strategy has been selected for Plant Protection measures. The pesticides are used judiciously but as a last resolution in IPM strategy. IPM supporting activities carrying out by PPD, MAS include:

- Biological control measures
    - *Campoletis* (parasitic wasp) for control of *Heliothis* in Cotton, Chick pea.
    - *Eocanthecona* (predatory bug) for control of *Heliothis* in Cotton, Chick pea.
    - *Metarhizium* (fungus) for control of Chafer grubs in Peanut
    - *Trichoderma* (fungus) for control of *Phytophthora* disease in Durian

- Non-chemical measures
    - SIT (Sterile Insect Technique) for control of Diamond backed moth in Cabbage.
    - Pheromone trapping for fruit flies in mangoes and oranges.

- Use of Biological pesticides
    - Neem pesticides (Azadirachtin)
    - *B. T (Bacillus thurengiensis)*

- Promotion of IPM compatible pesticides
    - IGR, Insect growth Regulator
        - Mimic 20 F (Tebufenozide)
        - Rampage (Cyclophenapyr)
    - Lesak 20 FS (Fipronil
    - Regent 3 G(Fipronil)
    - Trebon (Etofenprox)

In agriculture, Organic Technology, Biotechnology will become a key figure in the coming millennium. Nevertheless, being a developing country, Myanmar might have to stay with the chemical measures for some times in the near future, hence proper legal control of these products will remain highly important.

Pesticides and its Alternatives in the Context of Nepal

B.R. Palikhe and R. Sthapit

Abstract

Pesticides have been introduced to farmers who have scant knowledge about how to properly use them and respect their toxic properties. The general public is also ill informed about the hazards of pesticide and on methods for their safe and effective use. Due to this ignorance, many accidental poisonings occur annually. Taking into consideration this is high time to provide technology, chemicals and biological agents which from the environmental, medical and economic standpoints potentially may be appropriate alternatives to Persistent Organic Pesticides (POPs) and similar chemical pesticides, for the control of insect pests and vectors. IPM, no doubt is the base approach to reduce the pesticide use. Integrated Control systems are dynamic, involving continuous information gathering and evaluation, which in turn permit flexibility in decision making. IPM is not for farmers, it is by farmers. IPM is a farmer-centered approach to plant protection. IPM has been declared as the national plant protection strategy. Its mandate for the Government to adopt the philosophy of pest control is consistent with the pesticide management objectives.

Introduction

The agriculture sector dominates the economic scenario in Nepal. More than 89% of the active population is estimated to be involved in the agriculture sector. The food security is a major concern in Nepal. The crop losses due to insect-pests is approximately 35%. Chemical pesticides are used in Nepal for control of vector-borne diseases, pests and domestic pest control. Improper chemical use and handling as well as indiscriminate cause hazards to human and the environment. Of the chemicals used which are highly toxic and persist in the environment for long time has been labelled as Persistent Organic Pollutants (POPs). These POPs bio-accumulate, and are magnified as they go up the food chain. They travel longway from the source of emission or application.

We have only two choices: either to use pesticide judiciously for increasing production or to use some alternative methods for keeping the pest population below economic threshold level. Are there readily available alternative methods or these methods sufficient enough for the management of each pest problem? However, this is an urgent time to provide technologies, chemical and biological agents which, from the environmental, medical and economic standpoints potentially may be appropriate alternatives to Persistent Organic Pollutants (POPs) and similar pesticides for the control of insect pests and vectors.

1. Importance of Pesticides

The need of pesticides in Nepalese agriculture and public health has been well recognised in protecting the crops from pests and human health from vector borne diseases. They do have a role to play in agriculture, public health programmes and livestock production.

2. Impact of Chemical Pesticide Use

2.1. Usage of Major Pesticides

In general insecticides are heavily used in vegetable sector followed by fungicides. Weedicide use is very minimal in this sector. The farmers pay little attention to conform to the recommendation with respect to the pest, crop, dosage or application frequency.

2.2. Health and Environmental Issues of Pesticides

Pesticides being toxic in nature don't differentiate between target and non-target species, and hence require to be used safely and judiciously. Due to injudicious and indiscriminate use of pesticides many deaths have occurred in different parts of world and presence of pesticides in food, fruits, vegetables, environment and even in mother's milk is a matter of grave concern. Pesticides are dangerous substances and their overuse, misuse, abuse and unsafe use can cause widespread environmental damage and adverse health effects. Environment effects include: contamination of water, destruction of wildlife, livestock, pets and beneficial insects: resurgence of resistant pest population and secondary pest outbreaks, genetic damage and loss of bio-diversity; and reduction of crop yield in the long rune. The situation is most serious in almost all developing countries because there is little or no awareness of the inherent danger of pesticides.

Farmers are not aware about the proper and sage use of chemical pesticides. They are illiterate and need training to bring awareness like farmers field school (FFS). The FFS seems to be highly effective as compared to television, newspapers or radio programmes.

3. Safe Use of Pesticide

Pesticides are poison used to control pest and are widely used all over the world. Pesticides are also a cause of much morbidity and mortality, especially in developing countries. Most farmer do not understand the nature of pesticides.

Pesticides are like a double edged sword properly handled, they from an essential management tool in the production of food. When used according to directions. They should be effective and safe for the purposes claimed. But if misused, pesticides can pose grave hazards. Instructions written on the label or an accompanying leaflet need to be followed to obtain in recommended doses. Part of the Inspector's duties is to advise on safe use practices of pesticides. Protective clothing as indicated in the FAO Guidelines for personal protection when working with pesticides is required.

4. Illegal traffic

There is global /international concern that illegal international traffic in toxic and dangerous products is detrimental to public health and the environment, particularly in developing countries with economics in transition.

5. Integrated Pest Management (IPM) in Nepal

5.1 What is IPM?

Integrated Pest Management is the careful integration of a number of available pest control techniques that discourages pest population development en keep pesticides and other interventions to levels that are economically justified and safe for human health and the environment. IPM emphasises the growth of a healthy crop with the least disruption of agroecosystems, thereby encouraging natural pest control mechanism. Promoting IPM would be one way of reducing chemical pesticide use, but there is still no universally accepted definition of IPM. It is probable that the forms of IPM that will be encouraged will rely on biological approaches with the judicious use of some chemical pesticides. IPM strategy is undebatable most appropriate and sustainable approach for the control management of ever-growing pest population. However in Nepalese context, we still need sufficient research efforts to develop a practical IPM package and utilise all the way in farmers' field effectively.

5.2 Basic Foundation of IPM

Pest population and their natural enemies in a given agro-ecosystem is assessed and evaluated through different sampling techniques. The sampling techniques are developed when biology and ecology of each species of insect pest is understood in order to establish control threshold. Detail study on biology and ecology of a given pest species also helps to locate weaker points for their control.

5.3 Principles of IPM

IPM as a corner stone of sustainable agriculture, seeks to improve farmer practices in order to crate higher profiles while improving environmental quality and community health. In order to do this, IPM implementation is based on four practical principles:

- Grow a healthy crop
- Conserve natural enemies
- Observe field regularly
- Farmers become experts

5.4 Ongoing programme of IPM

IPM is a strategy for crop protection already endorsed by the government of Nepal to achieve increased crop productivity on a sustained basis. The current Agricultural perspective Plan (1995-2015) and the Ninth Five Year Plan (1995-2002), both recognise it as a strategy for sustainable agricultural development.

A pilot scale programme on Integrated Pest Management in rice had been conducted based on season long Farmer Field School in 1997. Between 1997 and 1999, 116 season long FFSs in rice covering 25 districts of Terai and Hills were conducted, which trained 2834 farmers including 1000 women farmers in the area of ecological pest management. This is a significant achievement towards the sustainable crop production considering Nepal's late entry into this programme.

5.5 Benefits of IPM

A. Farmers save production cost while yield is improved, and health hazards from pesticides is reduced.
B. Reduction of environmental pollution from pesticides
C. Protection of consumers from unnecessary toxic residue
D. The farmers attending a full season IPM Farmer's Field School develops capacities in observation, analysis, decision making and field management.

6. Alternatives

There has been wide acceptance of eco-safe alternatives globally. There is a niche market for "Green Label" (no chemical use). Research efforts have been made on several control tactics using Integrated Pest Management tools to reduce the use of pesticides in the field. It is however to be noted that these tools are being employed as 'alternatives' and not as 'substitutes' for pesticides. One has to be careful to promise an effective alternative methods for every single pest problem. Major research thrusts have been given on: augmentation of parasites and predators, utilisation of microbial agents, use of botanical pesticides (plant origin pesticides), use of different traps, and manipulation of cultural practices.

IPM tools are safe from health hazard point of view, environmentally sound ecofriendly. IPM tools can be chosen as one of the alternatives to chemical pesticides.

Parasites
(An organism deriving all or a portion of its nutrition from another organism)
Trichogramma is an egg parasitoid. Trichogramma parasites are the tiny wasps to combat many caterpillar pests. These beneficial parasitoids are produced in billions in several countries for biological control of a variety of crop pests. In Nepal, two species of Trichogramma are mass produced. Borers of sugarcane, cotton, maize, tomato and other crops are the pest targeted by the Trichogramma. eg. Trichogramma chilonis and T. japonicum

Predators
Predators that feed on insects are helpful in insect control and are of importance in biological control. Predators are those insects which catch and devour the harmful insects while parasites make their homes on or inside the body.

Predator: Rodolia cardinalis
Host insect: cotton cushion scale (Icerya purchasi)

Microbials
A pathogenic micro-organism or its product (toxins) used to suppress on insect population. Bacillus thuringiensis (BT) is used as a microbial insecticide against lepidopterous larvae.

Botanical insecticides
The insecticides of plant origin extracted from seed, flower, leaves, stem and roots are termed as botanical insecticides. Unlike synthetic organic pesticides they are safer to use, but they are expensive and lack residual toxicity. These insecticides tend to be unstable and short

lived, but they have good knockdown qualities. They are of low mammalian toxicity. Their use has been limited in Nepal.

Neem seeds
The seeds of neem (Azadirachta india) possess insecticidal properties. Neem is a natural product ideal to meet the problems of pest and chemical residues in our crops. Need is the ideal insecticide for a safe eco-friendly protection of crops. Neem is the most environment friendly botanical insecticide. The powder material in the ration of 1:100 serves as protectant of grains against storage pests.

Ricini
The leaves of Ricinus communis (Castor oil plant) contain the alkaloid ricinin which has been found toxic to the larvae of moths.

Benefits
- Easily biodegradable
- No toxic residues
- Not toxic to beneficial insects
- No known insect immunity
- No phytotoxicity (The word phytotoxicity is used to describe adverse side effects of chemicals and formulations on the crops)
- Adds value as an organic produce
- Compatible with IPM programmes
- Perfectly safe on all counts

Use of traps
Many mechanical traps have been made to catch insects. Light traps are generally used against those insects which are phototrophic i.e. attracted towards light.
eg Sticky traps

Pheromone Funnel Traps
The use of Methyl eugenol attracts the male fruit fly (Dacus dorsalis - Dipteran fly) thereby reducing the population of the fruit fly.

Cultural Practices
Cultural control may be defines as control of a pest by slight variation, introduction or suppression of farm practices which are normally adapted in the cultivation of a crop.
e.g. Crop rotation, proper management of the field

Many alternatives to POPs pesticides for designated purposes were not available. No alternatives were reported by other notifying countries, However, examples of chemical alternative to DDT in vector control are: bendiocarb (Ficam VC), cyfluthrin (Solfac 10 WP), lambda cyhalothrin (Icon), deltamethrin, fenitrothion, permethrin. The pyrethroids high insecticidal action and relatively low mammalian toxicity make them an attractive replacement to DDT and other insecticides. However, taking into account the relatively rapid degradation of the synthetic pyrethroids and the potential to biomagnify in biota is considered to be of a lower magnitude, compared to the listed POP pesticides. Synthetic pyrethroids are very highly toxic to aquatic organisms such as fish, crustaceans and molluscs. The acute toxicity to honey bees and other non-target arthropods is high, the toxicity to birds and domestic animals is low.

Remaining POP pesticides users today are largely resource-poor farmers in developing countries. DDT seems to be the only one of the twelve POPs which is still being used on a large number against agricultural pests. DDT is banned for agricultural purposes in almost all countries. It is therefore emphasised that alternative pest control methods must focus on non-chemical techniques, since these often are more affordable.

7. Recommendations

- IPM training need is high and should be a priority
- IPM needs to be launched as a community level activity
- Form farmer groups to facilitate contact and flow of information to non-IPM farmers
- More technology/materials provided to farmers
- Leader farmers must be mobilised effectively to disseminate IPM to neighbours
- Guidelines should be developed and disseminated for safe and suitable pesticide use
- Learn by doing research in farmer field
- Promote farmer participatory IPM programmes through
    - conducting TOT and FFS
    - Support programmes on PAR (Participatory Action Research)
- Conduct training on pesticide effects on natural enemies
- Promote and develop alternative substances and technology to replace POP pesticides and for incorporation into IPM/OF such as
- biopesticides and other biological control agents
- appropriate cultural techniques
- practical trapping devices
- other suitable alternatives
- Adopt, promote and support IPM/OF/IVM/IDM at government level
- develop pesticides compatible with IPM/IVM
- Make the information on IPM/IVM methods and experiences in different regions readily available
- Awareness campaigns for local communities/traders/user groups
- Watchdog activities

Conclusion

In order to reduce the pesticide load of pesticides from economic point of view and due to environment considerations, the efficiency of pesticides need to be improved for recommending lower doses. The management based on pesticides must be efficient, environmentally acceptable and compatible with production practices. IPM have the merit that it would allow to replace pesticides or reduce their doses by using a proper mix of agronomic practices that create the competition in favour of crop. There is an urgent need to investigate on appropriate alternatives in replacing POPs for control of insect pests and vector borne diseases.

INTEGRATED VECTOR MANAGEMENT:
Experiences from the Philippines

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I. Malaria Control Program
65 out of 79 provinces are endemic
1953 = 502/100,000 popn.
1959 = 229/100,000 popn.
1960 - 1965 = 90/100,000 popn.
1966 – 1982 = 80/100,000 popn.
1983 – 1987 = 211/100,000 popn.
1988 – 1990's =
1998 = 72/100,000 popn.

Stratification of Malarions Areas

CRITERIA	MAL. "A" (22)	MAL. "B" (25)	MEPA (18)
1. SPR	2	2	2
2. Topography	**Mountaineous** **Forested**	Forest fringes Foolhills Plains Coastal	Any topography
3. Population	Mobile	Stable	Mobile/Stable

Malaria Control Measures (Vector)

Integrated Vector Control Measures			
	MAL "A"	**MAL "B"**	**MEPA**
1. IEC campaign	/	/	/
2. Mosquito net impregnation	/	/	/ / x
3. House Spraying	x	/	Focal
4. Stream Seeding	/	x	/
5. Stream Clearing	/	/	/
6. Personal Protective Measures	/	/	/

*In partnership with the community and local government units.

II. Dengue Prevention and Control Program

1953 – first reported in Manila, Philippines
1966 – biggest epidemic at 26/100,000 popn.
Trend of increase every 3-5 years
1990's – high level of endemicity led to prioritization as a public health problem
Endemic in all the 79 provinces and all cities
1993 – Dengue Program was born
1998 – 36,000 +
1999 – 11,000 +

Integrated Vector Control Approach (IVC) guided by the principle of primary health care (PHC)

1) Community participation and mobilization (espc. School, NGOs, Pos)
2) Health information/Advocacy
3) Legislation
4) Environmental sanitation/management
   - container management
   - source reduction
5) Mosquito control – use of personal protective clothings scruming houses mosquito nets repellants protective measures, biological control (guppies, tilapia), larvicides (temephos)

ULV spraying/fogging is only done during epidemic using Pyrethroids e.g. Permethrine, cyfhithrine.

Issues and concerns:

1. Policies are well stated the national level.
   International (?)
2. Some specific policies should be translated into law to give more strength in the implementation.
3. Police power (?)
4. Sanctions for violators (?)
5. Integration of IVM and IPM especially for the control of Leptospirosis, Viral encephalitis, Schisfosomiasis, Filariasis in areas endemic for the above mentioned diseases.
6. Endorsement from higher authorities (health, envt., agriculture) among different countries would be needed if IVM & IPM will be integrated (for sustainability & success institutionalization)
7. Capability building for integration
8. Responsible person (focal person) – health should be included.

III. Schistosomiasis Control Program*

1906 – first described in the Phil.
1932 – discovery of Oncomelania quadrasi
1961 – National program was developed
Endemic in 24 out of 79 provinces
Prevalence rate is decreasing
Integrated Snail Control Measures

1. Vegetation removal
2. Drainage
3. Earth filling
4. Ponding
5. Improved Rice culture
6. Observation on Snail Control Measure
7. Use of latrines and adequate water supply
8. Building foot bridges
9. Control of stray animals
10. Chemical control – Niclasamide WP 70

IV. Filariasis Control Program*

- No vector control activity
- Diagnosis and treatment
- Abaca plantations, banana, gabi

• Elimination campaign using mass treatment

V. Other Minor Diseases of public health concern

Viral Encephalitis
– rice fields
- rok of farm animals = pigs, chickens

Leptospirosis – rat - ricefields
- corn plantation
- sugar cane
- etc.
- flooding in the cities

Country Report - National IPM Programme, Sri Lanka

by
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The mainstay of Sri Lanka's economy had been agriculture until recent times**.** However from 1980's the trend changed with greater emphasis being given to industry and non-traditional products. Yet importance of agriculture cannot be overlooked for it still provides for about 20% of the GDP and direct and indirect employment opportunities for more than 75% of the population.

The agriculture component comprises of four different sectors: the food-production sector, the plantation sector, the export agricultural sector, and the agricultural-based industrial sector.

In the food-production sector paddy occupies 34% of the total cultivated area. About 1.8 million farm families are engaged in paddy cultivation. Therefore rice being the main food crop, all governments pay lot of emphasis to increase production and make rice cultivation profitable for farmers. Since income from rice cultivation has been declining rapidly due to high expenditure from the recent past, the government is presently seeking out ways to cut down on cost of rice production. The strategies adopted under the IPM programme had contributed greatly to satisfy this need by reducing the cost of inputs mainly by reducing use of pesticides and increasing yields through better management practices.

1. Organisation and Funding

The Seed Certification and Plant Protection Center of the Department of Agriculture under the Ministry of Agriculture and Lands is responsible for management of the Integrated Pest Management (IPM) programme in Sri Lanka with technical assistance and financial Support from the FAO. The real implementation of IPM takes place at provincial level.

There are eight provinces in the country with it's own Agriculture Ministry and the Department of Agriculture. Each province consists of two or three districts. The total number of districts in the country, is 24. Agriculture extension is the responsibility of the Provincial Department of Agriculture.

Another collaborator of the National IPM programme is the Mahaweli Economic Agency (MEA) under the Ministry of Mahaweli Development (see separate report in Annex 1). A major part of the irrigated rice comes under the jurisdiction of this Ministry, and these are high potential rice areas. Agricultural extension in these areas is the responsibility of the MEA. Agriculture Department provides research and technical support. Although the FAO - IPM Project does not have a direct commitment to support MEA, since it is a partner in the government agriculture programme, and also because a major portion of the rice extent come, under Mahaweli, some financial and technical support is provided.

Other organisations directly involved in IPM activities are "Sarvodaya Movement" and "CARE International" which are two NGOs. Sarvodaya operates in 10 districts, while CARE operates in 8 districts. The "Integrated Project" of CARE. came to an end in September 1998 and a new project on "Integrated Crop Management" has been commenced in two districts with IPM as an integral part of it.

1.1 Level of Resources

The only funding source for the FAO - DOA National IPM programme has been the Dutch -trough the FAO IPM Programme. These funds are shared with the Provincial Departments of Agriculture and Mahaweli Economic Agency. But for the fourth phase of the project funds have not been received to date. Some funds have been provided to bridge the gap until funds are made available.

The provincial Departments of Agriculture are directly involved in the implementation of the IPM programme. They have the capacity to execute as well as expand the programme with support from the National programme. Presently provincial IPM programmes receive funds from various sources like the FAO - IPM Programme, Provincial councils, Provincial Rural Development Projects etc. But the funding is on a seasonal basis. Hence it is difficult to plan a long term programme without ensuring financial support as in the earlier phases.

The trained personnel available in districts are not sufficient at the moment. Therefore it is an urgent need to increase the training capacity of districts through Season Long Training of Trainers courses if the programme is to gain more ground.

The DOA, Provincial DOAs and MEA run co-ordinated agricultural programmes as a practice and IPM is one such programme. Although the NGOs work independently, they were trained, and received technical backstopping, through the National Programme.

2. Training achievements

Two season long training of trainers courses have been carried out prior to 1998. These trainers from DOA and MEA as well as Sarvodaya and CARE have conducted season long training along with the Farmer Field Schools for their peers as well as subordinates. Simultaneously they also carried out short term training for fellow officers in order to change their training methods, develop training and decision making skills and also the manner they look at farmers' pest problems. The first category of officers who received season long training directly indulged in conducting FFSs during following seasons while the second category managed to create an awareness among farmers about the IPM principles and distance them from unwanted pesticide applications (Table 1).

Table 1. Number of IPM trainers trained within the National IPM Programme since 1998.

Organisation	*Type of Training*	*Category of Trainee*	*Number*
Dept. of Agriculture	FFS (Season Long)	Agriculture Instructors	150
	Short Term (01 Wk)	Agriculture Instructors	299
Mahaweli Economic Agency	FFS (Season Long)	Agriculture officers	7
		Field Assistants	28
CARE lnternational	FFS (Season Long)	Project Officers	7
		Agriculture Animators	25
Sarvodaya	FFS (Season Long)	Agricultural Extension Officers	16

2.1 Impact of IPM

Separate studies have been conducted to assess the impact of the IPM programs done by DOA, CARE. and Sarvodaya.

2.1.1 Impact study 1.

An Impact study was conducted by I.M.Gunawardene in January 1999, at five locations selected from three districts. The study aimed to assess both the impact and the benefits derived from the view point of participants of the IPM - FFS programme. Twenty three farmers and farm women were interviewed.

According to the participants responses all of them had derived substantial personal and economic benefits, resulting from participation in the IPM - FFS programmes. There were noteworthy decreases in the use of pesticides and increases both in terms of crop - yields and net profits. The benefits derived ranged from Rs 3,200 (=47 USD) (Kolonne) to Rs 16,000 (= 235 USD) (Paluwewa) per acre (= 0.4 ha), while the average increase in profits was approximately Rs.7000/- (103 USD) per acre.

It is particularly noteworthy that the farmer attendance was regular while an increase in the number of participants increased at the great majority of locations. The mobilisation of people and experiential learning achieved was observed to be of such a high standard that the approaches and methods used in conducting the Farmer Field Schools deserve to be considered for incorporation into the ongoing agricultural extension activities.

Creation of an interest among the farmers to engage in performing their own simple experiments and also undertake regular crop inspection, appear to have resulted from attending FFS sessions. The social benefits achieved in the communities, as a result of reflecting in "games and exercises" appear to have rekindled the community spirit among farmers. This has lead the farmers to form into an organisation which paid dividends subsequently, when they were looking for funds to proceed with community activities. The structure and style of conducting FFS sessions appear to be deserving their further utilisation and spread in the areas where rice farming is being practised, since they have proved to be effective in providing good results.

Table 2. The Cost involved (per acre) and the number of pesticides applications during a single cropping season.

Location	*Before FFS*		*After FFS*	
	Applications	Cost/acre	Applications	Cost/acre
Paluwewa	3 to 4	Rs 1500-2000	0	Rs 0
Ratmalgahawewa	2 to 3	Rs 1000-1500	0	Rs 0
Mahameegassagama	2 to 3	Rs 1000-1500	0	Rs 0
Tirappane	2 to 3	Rs 800-1000	0	Rs 0
Kolonne	5 to 6	Rs 1500-2500	0	Rs 0
Ambalantota	4 to 5	Rs 2500-4000	1	Rs 600

2.1.2 Impact study 2.

A separate study has been conducted to measure the cost effectiveness of Farmer Field Schools within the Sarvodaya IPM programme in March 1999.(Chintha Munasinghe et al., 1999). Some of the striking points emerging out of the study concludes that:

i. 90% of farmers practice IPM after FFS training.
ii. An average of 12 farmers learn the techniques of IPM from a FFS trained farmer.
iii. 61.9% of farmers ,who gained the know how, from FFS trainee practice IPM.
iv. Average savings on pesticides through IPM per season per acre is Rs.2541.85 (USD 93.45/Ha)
v. 62.9% experienced an increase in their harvest due to improved management.

vi. The average increase in income due to increased yield per acre is Rs. 17781- .(USD 65.36/Ila)
vii. The cost recovery rate in one season is 55%.
viii. Men : Women ratio for the programme outreach on participation is 1.33 : 1
ix. Benefit - Cost ratio for conducting a FFS is 7: 1.

Table 3. Other Benefits of IPM as seen by the farmers in a questionnaire.

Benefit	*% of farmers*	*No. of farmers*
Secured life	19%	13
Improvement in health condition	44%	31
Gain recognition in community gatherings	6%	4
Opportunities for additional Income generating activities	9%	6
Agricultural assets- increased agricultural equipment, land	20%	14
Domestic assets, house improvements, domestic appliances, land	31%	22
Family needs addressed	37%	26
Savings increased	39%	27
Insurance schemes	3%	2
Settled pending debts to village traders	27%	19

2.1.3 IPM for chilli:

Chilli is a high economy crop where farmers do not wish to take risks. According to information collected from Mahaweli "H" area in 1995/96 wet season the cost of cultivation for an acre of chilli was about Rs.32,000. The cost of pest control for an acre was around Rs. 12,000. Thus around 38% of the cost was on pesticide use. The farmers, were heavily dependant on pesticides. Their practice was to spray the crop weekly or at shorter intervals depending on the problem starting from about one week after transplanting. The number of sprays per acre per season was as high as 20 times. Their reliance on pesticides was further strengthened by aggressive propaganda.

In this background an attempt was made to educate and train a group of chilli farmers in Kalundegama in Mahaweli "H" area on Integrated Pest management practices during 1996 dry season.

A group of 11 farmers teamed up to form the Farmers' Field School. Officers from the FAO -IPM project and the Plant Protection Service of the Department of Agriculture visited the group weekly on a pre-determined date through out the season as facilitators.

During the training sessions, the training methods stressed on direct discovery, comparison and analysis. Farmers worked effectively in small groups. They established three plots as follows for comparison:

1. Farmers practice plot.
2. IPM plot.
3. ETL recommendations of the Dept. of Agriculture.

Data was gathered weekly from the three plots for analysis and making management decisions.

Table 4. Practices and Costs for Farmer Practice (FP), Integrated Pest Management (IPM), and Economic Threshold Level (ETL) plots.

Inputs		*Farmer practice*	*IPM*	*ETL*
Fertilizers	Basal (kg/acre)	60	60	60
	Urea -TD 1 (kg/acre)	100	25	25
	Urea -TD 2 (kg/acre)	100	25	25
	Urea -TD 3 (kg/acre)	100	25	25
	Muriate of Potash (kg/acre)	50	20	20
	Urea -TD 4 (kg/acre)	0	16	0
	Cost of Fertilizer/acre	Rs 4100	Rs 1710	Rs 1550
Pesticides	Pesticide applications	7	0	1
	Cost of pesticides/acre	Rs5290	Rs 0	Rs 820

* 1 acre = 0.4 ha; 1 USD = Rs 68/-

Yield data was lost half way due to the fact that the farmers were unable to keep the harvests separately in their homes because of limited space. However the yields did not appear to be different. As a matter of fact the plots without insecticide use survived longer than the FP plot, giving them the opportunity to take several more picks of chilli.

Although the FP plot was meant to be identical to farmers normal chilli plots, the number of pesticide applications for this plot was reduced to seven applications (Table 4) because the owner of that plot became reluctant to use pesticides having seen the results in the other two plots without pesticides. Otherwise the normal practice is to spray twice as much, pushing the cost of pest control still further. But the crops in the neighbourhood belonging to farmers who did not attend the training provided a good comparison for learning.

On a visit to the same site two years later, it was found that more farmers are now following the trained farmers. They have become their guides in pest control matters. According to R.M.K. Gunaratne, President of the Farmer Organisation, he has used insecticides only once at a cost of Rs.600 for half acre (l/5 of a hectare) during 1998 dry season. He has obtained a yield of 975 kg. green chilli and 446 kg. dry chilli from this half acre. The income was 73,160 rupees.

Having obtained experience with this group the IPM trainers are now continuing Farmers' Field Schools for chilli in this area with much enthusiasm.

3. Policy Developments

Taking into consideration the high annual death rate due to pesticide poisoning, mostly suicides; the President has appointed a Task Force to delve into this matter. This has become a strong point in favour of IPM, since the National IPM Programme has over and over again proved that pesticide use could be reduced drastically in our agriculture simultaneously improving the farmers living standards and environment.

IPM experiences were shared by number of other programmes such as the FARM project and IPM became a component in their programme. The pilot programme for Food Security has included IPM in their programme and Farmers' Field Schools as the training approach.

The Ministry of Agriculture has launched another programme in 1998 to increase the production in rice through large tract demonstrations. In this programme the target is to get a yield of over 6t/ha. The government provides seed and fertiliser on loan. IPM is taught through Farmers' Field Schools in most districts thereby making those farmers good managers of their crop. IPM thus complements many other important programmes.

Kurenegala district in the Wayamba province has embarked on an organic farming project for which expertise of the IPM trainers in the district are to be harnessed.

Some provinces like North Central and Central have mooted the idea of developing a participatory extension approach to replace the present system of extension. The Farmers' Field School approach adopted in the IPM programme has been considered as an example of a successful participatory approach at the discussions held so far.

4. Developments in Community IPM

Community IPM developed spontaneously among farmers at village level with support from the village extension officers. The motivation came in many forms such as demand from other farmers for training, having seen what was taking place in their own village or having reaped the benefits of practising IPM after training.

After FFS training many farmer groups thus started follow up activities on their own with very little follow up from the government or DOA. In a remote village in Ratnapura, the farmers after receiving IPM training came forward to help their fellow farmers in the village by organising and conducting Farmers Field schools themselves. The only support they received was from the Agricultural Instructor in their village. Subsequently they managed to organise themselves and obtain direct financial assistance from the Ministry of Environment to expand their project. Their target is to train all the farmers in the village on IPM through season long FFS.

In some other places the FFS groups maintained the cohesion of the group and they were able to obtain many services from government organisations that were not available to them in the past.

In many other places IPM trained farmers gained recognition and became leaders among their community who would advice and guide other farmers during pest outbreaks and on crop management issues.

This type of community IPM activities were taking place among trained farmers in number of places but proper cognizence was not made of the potential we have in involving farmers in the process of IPM expansion.

Now with the beginning of the fourth phase more emphasis is given to systematise these activities and get the farmers responsible for IPM activities in their areas through a national programme.

5. Other Developments

School children were not considered as a target group until recently in the national IPM programme. But they were exposed to IPM at various occasions such as field days held by FFS participants. IPM is now included in the school curriculum. As a consequence there is much interest among teachers as well as students to learn IPM. During 1998/99 wet season a FFS was conducted at a selected school for grade ten students. It helped both teachers and students to get an insight into what could be achieved through such training programmes. This season FFSs for school children will be replicated in other places as well.

The IPM experience gained from rice has been used effectively for other crops like tomato and cabbage as well as chilli. Several FFSs were carried out both by DOA and CARE for these crops successfully. Since there is no funding for this type of work it cannot be done on a large scale.

6. Future Plans and Priorities

The IPM programme which is stabilised at district level now has to be sustained in the future. Therefore it is planned to go in for community IPM in the next phase while the districts continue with training to further strengthen the farmers community IPM programmes.

At the same time programmes to enlighten the policy level in order to obtain more support to intensify and extend the programme would also be undertaken.

Studies to ascertain the impact and success of the IPM programme would be done with emphasis on indirect benefits such as health and environment.

Following activities are planned for the fourth phase.

Annex 1

Report on Integrated Pest Management Programme, Mahaweli Authority of Sri Lanka

The Mahaweli river development programme is the largest single integrated rural regional development programme ever undertaken by the government of Sri Lanka in the current era. The Mahaweli Ganga is the longest river in Sri Lanka. Generation of hydro-electric power, water storage, flood control, and the diversion of water for irrigation, settlement of land less, unemployed families by constructing and developing human settlement, irrigation, education, health, public economic overheads and communications infrastructures are the major components of the programme.

Mahaweli Authority is the organisation that is responsible for all the activities relevant to the above mentioned components of the programme. Organisational structure is shown in annex 1. Under the Mahaweli project there are five administrative systems called B, C, H, L, and Uda walawa, over 90000 hectares of land area spanning three agro-ecological regions and many administrative districts were taken up for irrigated agriculture with over 85000 farm families.

The main crop grown in the Maliaweli Project area is paddy which is the staple food of Sri Lankans. FAO is the organisation that helps us in providing funds where as Mahaweli Authority is also allocating funds in their budget for carrying out IPM programmes in the project areas. At the national level, Director / agriculture and his staff are co-ordinating the IPM Field School programme with the officers of FAO and Department of Agriculture , and also co-ordinating with field staff at the project and block level. (See Annex -1)

Training

Training activities and number of persons trained since 1998 are indicated in Table A-1.

Table A-1. Training Programmes Conducted by Mahaweli Authority since 1998.

Type of training	No.	Participants
Officer training on IPM (4 d)	1	28
IPM training for seed growers	1	26
FFS for farmers, 1997/98 wet season	156	4021
FFS for farmers, 1998 dry season	77	2070
FFS for farmers, 1998/99 wet season	104	3243
IPM exhibition for farmers	1	750

Table A-2. Example of results of a FFS conducted by the Mahaweli IPM Programme, wet season 1998/99

Detail	Farmer Practice	IPM
Average yield (kg/ha)	3946	4356
Cost of cultivation (Rs/ha)	25,577	23,130
No. of insecticide application	3	0
Cost for insecticide (Rs./ha)	1,740	-

Policy Development

There were no important changes in government policy regarding IPM programme.

Developments in Community IPM

One farmer group having practised IPM-FFS activities in their paddy fields; trained and shared ideas with farmers in a neighbouring village who later got involved in IPM activities in system B. These farmers conducted their own FFS for a group of 14 other farmers. Results are shown in the table below.

Table A-3. Results of an FFS conducted by farmers

	Before FFS (97/98 season)	During FF (98/99 season
Cultivated area (ha)	14	1
Cost of cultivation (Rs/ha)	24,300	22,90
Avg. yield (kg/ha)	3,900	4,40
Avg. no. of insecticide applications	4	[illegible]
Avg. cost of insecticides	1,300	[illegible]

It has been proposed to involve trained farmer groups to conduct FFS for other farmers in the future. In this exercise field assistants will act as facilitators under the supervision of Block Agricultural Officers while Mahaweli authority will provide necessary logistical support and other facilities. On the other hand three awareness programmes on IPM-FFS have been conducted for 143 School children and 6 teachers.

Future Plans and Priorities

Presently about 40% of the total number of farmers in the Mahaweli systems have been trained on IPM and it is been practised effectively by them. It is now planned to extend these activities such as Farmer to Farmer training and awareness programmes to attract more farmers rapidly, with the active participation of trained farmer groups. Main activities of the planned IPM programme are shown below.

IPM-FFS as well as Community IPM programme will be launched in the coming seasons. For this, following strategies will be adopted to improve the performance of different activities in the proposed programme.

- Use of mass media - radio programmes , news bulletins
- Refresher courses for field officers
- TOT training for officers as well as farmers
- IPM activities for schoolchildren, youth and other organisations
- Conducting IPM-FFS

Proposed Future Programme

Activities proposed from the dry season 1999 until the wet season 2000 are presented in Table A-4.

Table A-4. Activities proposed for 1999-2000, Mahaweli Authority.

Type of activity	dry season 1999	wet season 1999/00	dry season 2000	wet season 2000/01
1. Farmer Field Schools	80	150	80	150
2. Estimated no. of FFS participants	2070	4000	2070	4000
3. No. of farmer trainers to be trained	30	40	40	40
4. No. of IPM clubs to be formed	12	20	25	30
5.IPM Training courses for youths	4	8	8	8
6.Mass media programmes:				
-Radio programmes	8	8	8	8
-News bulletins	400	400	400	400

Integrated Vector Management Concepts and Experience on Malaria Control Activities in Thailand.

By

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Malaria epidemiology

Malaria is forest-related with the disease being prevalent along the international borders whereas in central plain areas, malaria transmission has been eliminated for more than two decades. Malaria transmission in the forested areas is intense, due to the presence of highly efficient vectors, enhanced vector longevity, and intensive population movement.

An. dirus and *An. minimus* are principle vectors. *An. dirus* is the most important vector within the forest setting while *An. minimus, plays a major* role due to its wide distribution in forest-fringe areas.

The parasites commonly found are *P. falciparum* (51%) and *P. vivax* (48%), *P. malariae* accounts for less than 1%. *P. ovale* is very rare. Proportion of *P. falciparum* is observed to be very much related with therapeutic efficacy of the national treatment guidelines and some certain epidemics that affected major transmission foci.

Current malaria situation

The epidemiological data showed a downward trend in total cases form some 209,866 cases in 1991 to 83,767 cases in 1996, after that the cases have been increase to 128,830 cases in 1999. In addition to Thai cases, foreigner cases have been on the increase, from 48,549 cases in 1991 to 79,490 cases in 1999.

During Fiscal Year 1997-2000, due to epidemics of *P.falciparum* in some provinces in the south and *P. vivax* along the Thai-Cambodian border, total Thai cases reported increased to some 128,830 (Figure 1). The annual parasite incidence (API) was 2.27 per 1000 population in 1999. Foreigner cases continued to increase to some 79,490 cases. Myanmar nationals account for 90% of foreigner cases, mostly *P. falciparum* (more than 80%). There were several causes of epidemics, one related to the financial crisis that coincided with the occurrence of epidemics. However, in spite of increasing morbidity, the mortality continues on a downward trend to a level of 1.00 death per 100,000 population in 1998, total deaths of 608 (Figure 2).

Malaria vector control.

Insecticide residual spraying (IRS) using DDT was introduced into the Malaria Control Programme (MCP) in 1949. Its impact on mosquito vectors and malaria was obvious. This measure was gradually expanded to cover all malaria transmission areas. During 1970s-1980s IRS remained single main vector control measure for the MCP. Its dosage was 2 gm-sq. m.

and it was applied 2 cycles per year in mountainous and high malarious areas, 1 cycle in the late attack phase.

In 1975 following increase of malaria in various areas, including resurgence of malaria in eradication areas, regular focal spray was introduced to cope with epidemics. In 1975 DDT emulsion was introduced in order to improve community compliance. Other alternative methods were tested or introduced into the MCP. Abate 50% EC, biological control using larvivorous fishes, mosquito repellents were also introduced.

In 1979 during massive malaria outbreaks along the Thai-Cambodian border space spraying (fogging) using Malathion was introduced to control explosive epidemics in refugee camps.

Various kinds of indigenous larvivorous fishes were tested; panchax, guppy and gambusia against different anopheles larvae. Various insecticides were tested against DDT; Bendiocarb (0.4 gm/sq.m 2 cycles/yr.) in 1980. DDT emulsion against DDT wettable powder, etc.

During 1982-1987 Fenitrothion was donated by the Government of Japan (JICA) and used in the Thai-Cambodian areas.

In 1988 the MCP gradually changed its philosophy from mainly relying on IRS (using mainly DDT) and adopted other vector control measures; i.e. integrated vector control. Personal protection using mosquito nets and mosquito repellents were recommended to use by the general population. In the malarious areas. Seed money for village fund were kindly sponsored by WHO. The objectives were to increase mosquito net coverage and its utilization. One of the Malaria Regional Offices trained hill tribe housewives to produce home-made net to expand net coverage.

A pilot study on IRS using synthetic pyrethroids (Deltamethrin and Lambdacybalothrin) was conducted in 1995. The MCP decided to change the insecticide policy. The last purchase was made in 1995. However there is still considerable amount of DDT leftover and is still being utilized in remote mountainous areas. Deltamethrin and lambdacyhalothrin were only two alternative pyrethroids available at the time and were comparatively tested against DDT in a large scale field trial. The results were reviewed and discussed by a group of experts. Following assessment in entomological , epidemiological, social and cost-effectiveness analysis the group recommended DDT be replaced by Deltamethrin. Since DDT has longer effect and currently being applied once a years whereas Deltamethrin has to be applied twice a year. The operational cost for IRS doubles that of DDT. The cost of Deltamethrin alone is 2 times higher than that of DDT.

Area stratification for malaria vector control activities

Area 1 Malaria transmission areas.
Primary: malaria adult vector control
Supplementary: Personal protection.

Area 2 Malaria transmission areas with migration of non-immune population.
Adult mosquito vector control and personal protection are both emphasised.

Area 3 Epidemic-prone areas which are low or non-transmission regions with the presence of vectors and migration population from intensive transmission areas.

Adult control and/or larval control

Current Vector Control

At present the vector control does not rely mainly on IRS as in the old days. Alternative vector control such as fogging, impregnated mosquito net, mosquito repellent and bio-environmental control are supplementary measures to IRS. In addition other compounds are being tested and compared with Deltamethrin.

In principle vector control is being carried out in all active transmission areas (i.e. A1 A2 areas in Table 1). It is also applied in B 1 areas where resurgence of malaria has been confirmed and in some circumstances such as massive movement of refugees or non-immune labours. Vector control activities during 1994-1998 are shown in Table 2. The criteria for application of each vector control activity are as follows:

Indoor residual spraying (IRS)

Deltamethrin 5%WDP. Has been operationally implement by the MCP. The dosage is 20 mg./sq.m. IRS is conducted twice a year in perennial transmission area (A1 areas) and once a year in periodic transmission area (A2 area) covering the transmission season.

DDT 75%WDP. is employed only in remote and difficult areas at the dosage of 2 gm/sq.m once a year. Its use has been phased out since 1996. It is expected that the MCP will use up the leftover stockpile by 1999.

Other chemicals such as Etofenprox, Alphacypermethrin, Bifenthrin, etc. are being tested.

Impregnated mosquito nets (IMN)

This activity has been introduced recently to supplement IRS. In areas where public acceptance to IRS is low and net coverage is higher than 60-70% IMN will replace IRS. The MCP staff treat villagers owned nets. In high malaria transmission areas free of charge nets offered by the MCP are distributed to the poor who can not afford to purchase nets.

Mosquito net are treated by dipping with Permethrin 0.3 gm./sq.m, twice a year. Other chemicals are now being tested and compared with Permethrin, e.g. Alphacypermethrin, Deltamethrin

Thermal fogging

Thermal fogging has a relatively limited role. It is applied during malaria outbreaks and or in uncontrolled transmission areas. In principle it is applied once a week, for 4 consecutive weeks. Chemicals used were Malathion in the old days and Deltacide (Esbioallethrin, Deltamethrin and Piperonyl Butaoxide) at present. Deltacide is now being used widely for DHF control.

Chemical larviciding

Temephose or Abate was used to control malaria vectors in urban areas but now it is abandoned.

Bio-environmental control

Environmental control was introduced for years through the primary health care approach without satisfactory success. At present biological control by using larvivorous fishes is now being encouraged by the MCP. At any MCP field office larvivorous fishes (mostly guppy) are distributed to villagers. Malaria volunteers also involve in rearing larvivorous fishes in artificial and natural breeding places. Fishes are now being promoted for DHIF control. Other biological control, such as bacteria was tested in field circumstances but never reach operational stage.

Table 1 Stratification of malarious areas, Thailand 2000

Number of population under different malaria stratified areas

	Area stratification	Population covered	% covered
I Control area			
	1.1 Control area with transmission	3,871,575	6.75
*	perennial transmission (A 1 area)	828,778	1.44
*	periodic transmission (A2 area)	3,042,797	5.31
	1.2 Control area without transmission	37,678,290	65.69
*	high risk area in presence of primary and/or secondary vectors (B1 area)	8,209,843	14.31
	low risk area, no known vectors, suspected vectors may be found (B2 area)	29,468,447	51.38
2	Pre-integration area (PA)	3,294,125	5.74
3	Integration area (IA)	12,512,581	21.82
	Total population	57,356,571	100

Table 2 Vector Control Activities
on Malaria Control in Thailand, 1995-1999

Activities	Population Protected (000)				
	1995	**1996**	**1997**	**1998**	**1999**
Indoor Residual Spraying	1.444	1.321	1.174	1.266	1.576
Biological control	6.269	2.337	3.209	5.504	4.970
Source reduction	0.054	0.030	0.052	0.032	0.029
Personal protection	0.343	0.469	0.547	0.629	0.525
Fogging	0.283	0.190	0.962	1.307	0.599
Larviciding	0.017	0.005	0.003	0	0

Malaria Situation, 1999

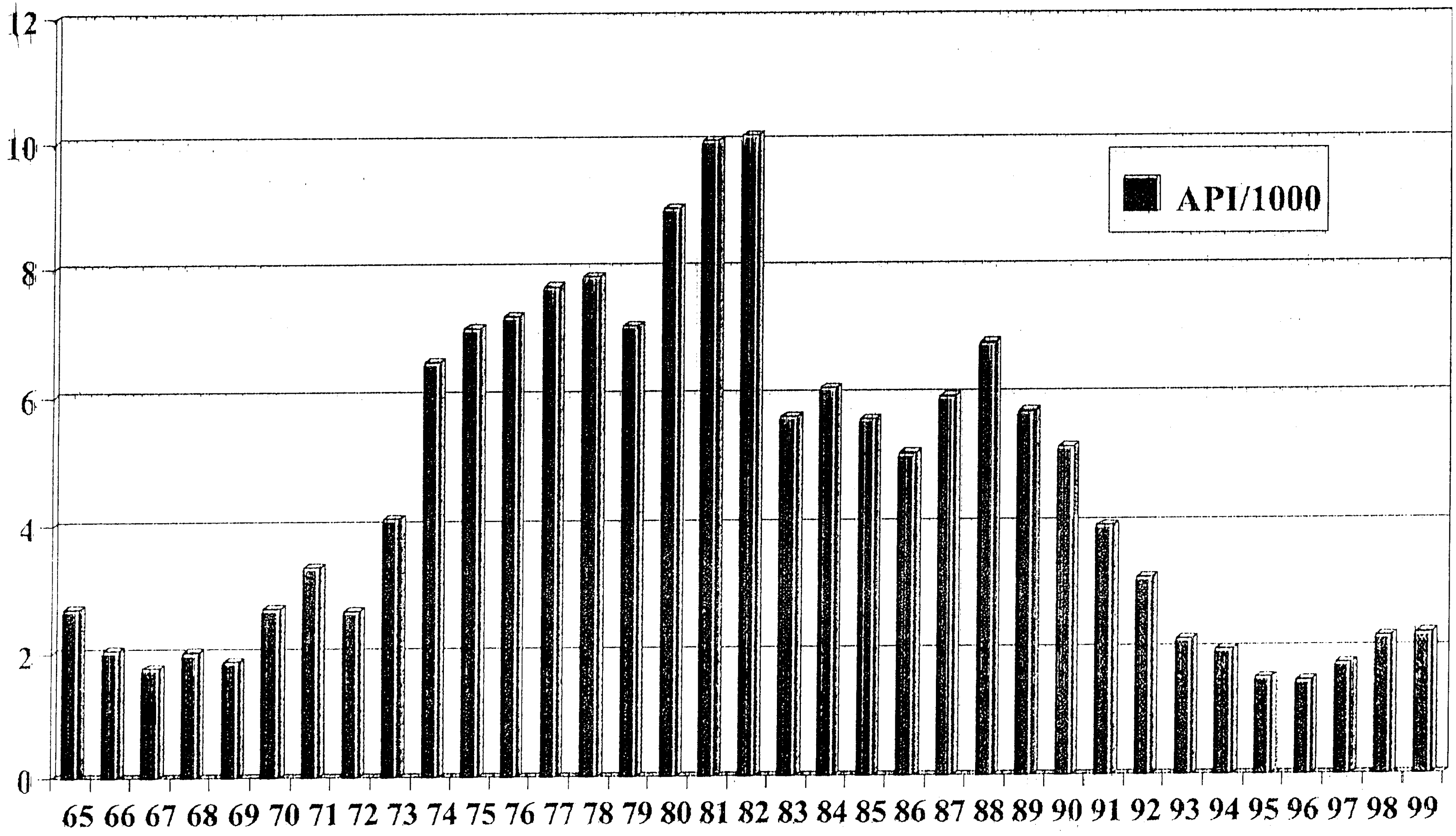
Total malaria cases (microscopically confirmed)	208,320
Thai cases	128,830 (62%)
Foreign Nationals	79,490 (39%)

(91% were from Myanmar)

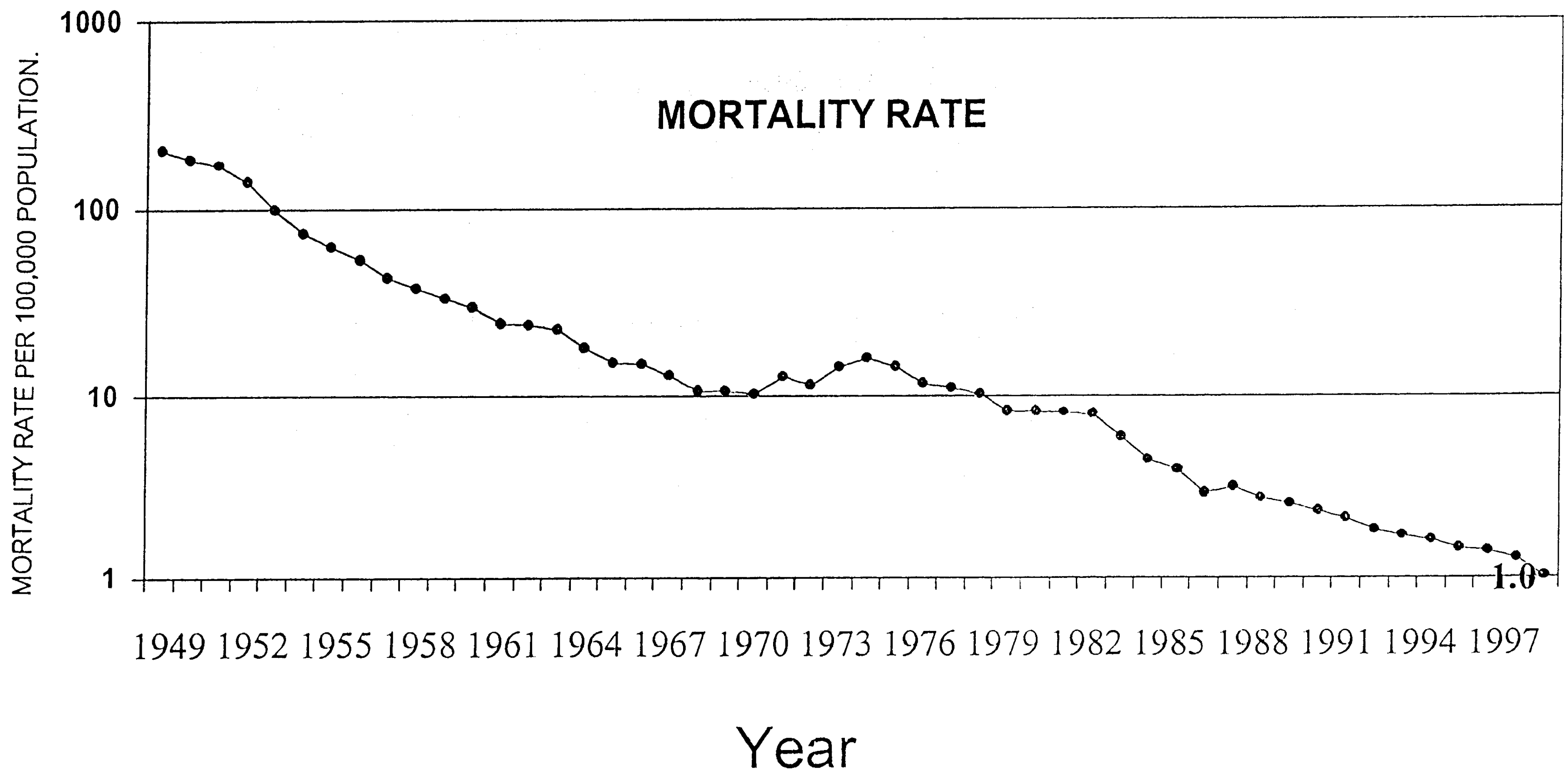
71% of Thai cases reported along the international borders

63% Thai-Myanmar border
24% Thai-Cambodia border
8% Thai-Malaysia border
5% Thai-Laos border

Malaria Incidence per 1000 population in Thailand, Year 1965-1999

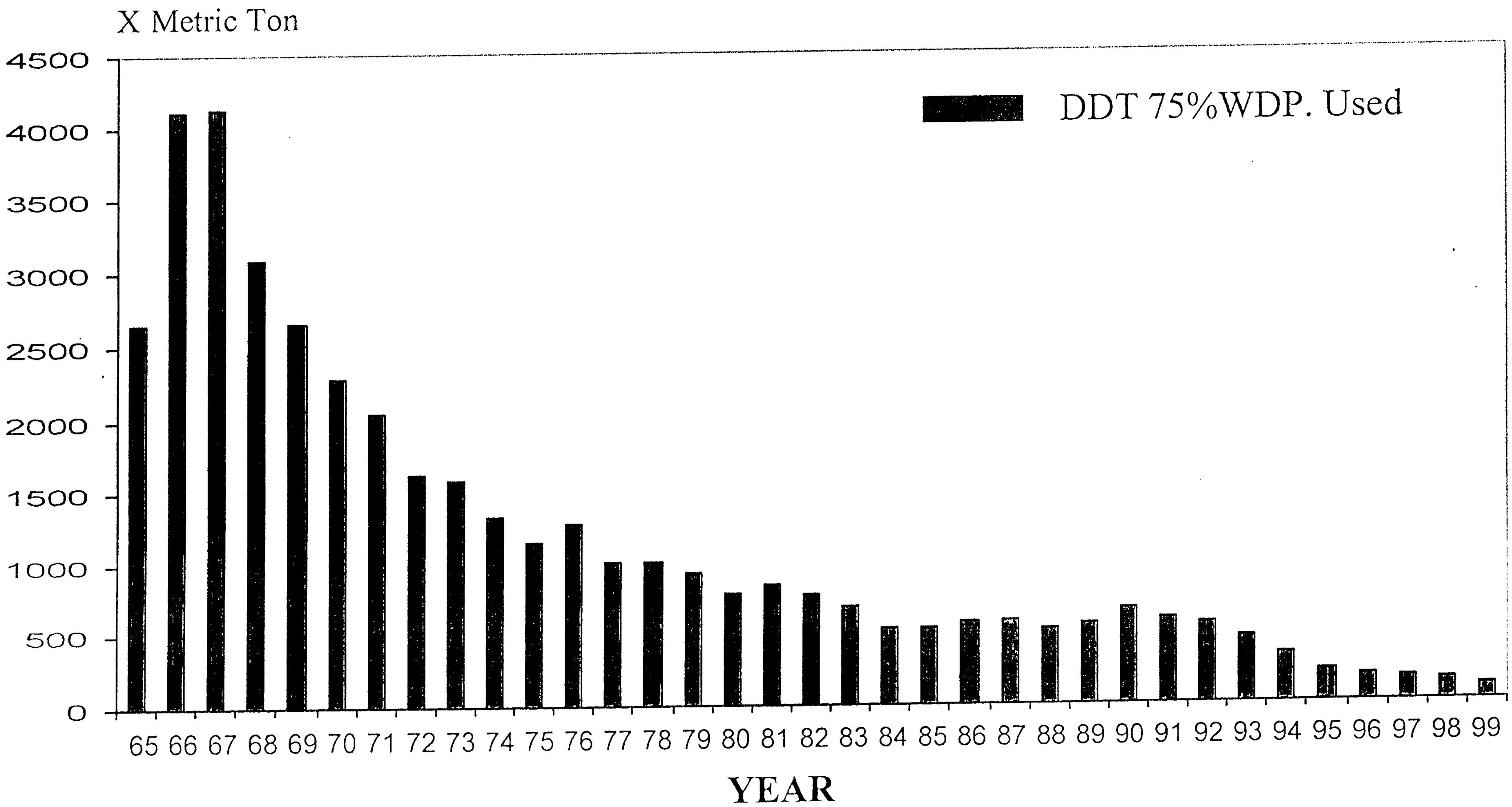


MALARIA MORTALITY RATE, 1949-1998



MALARIA DIVISION

DDT Used on Indoor Residual spraying, Malaria Control Programme, Thailand. Year 1965-1999



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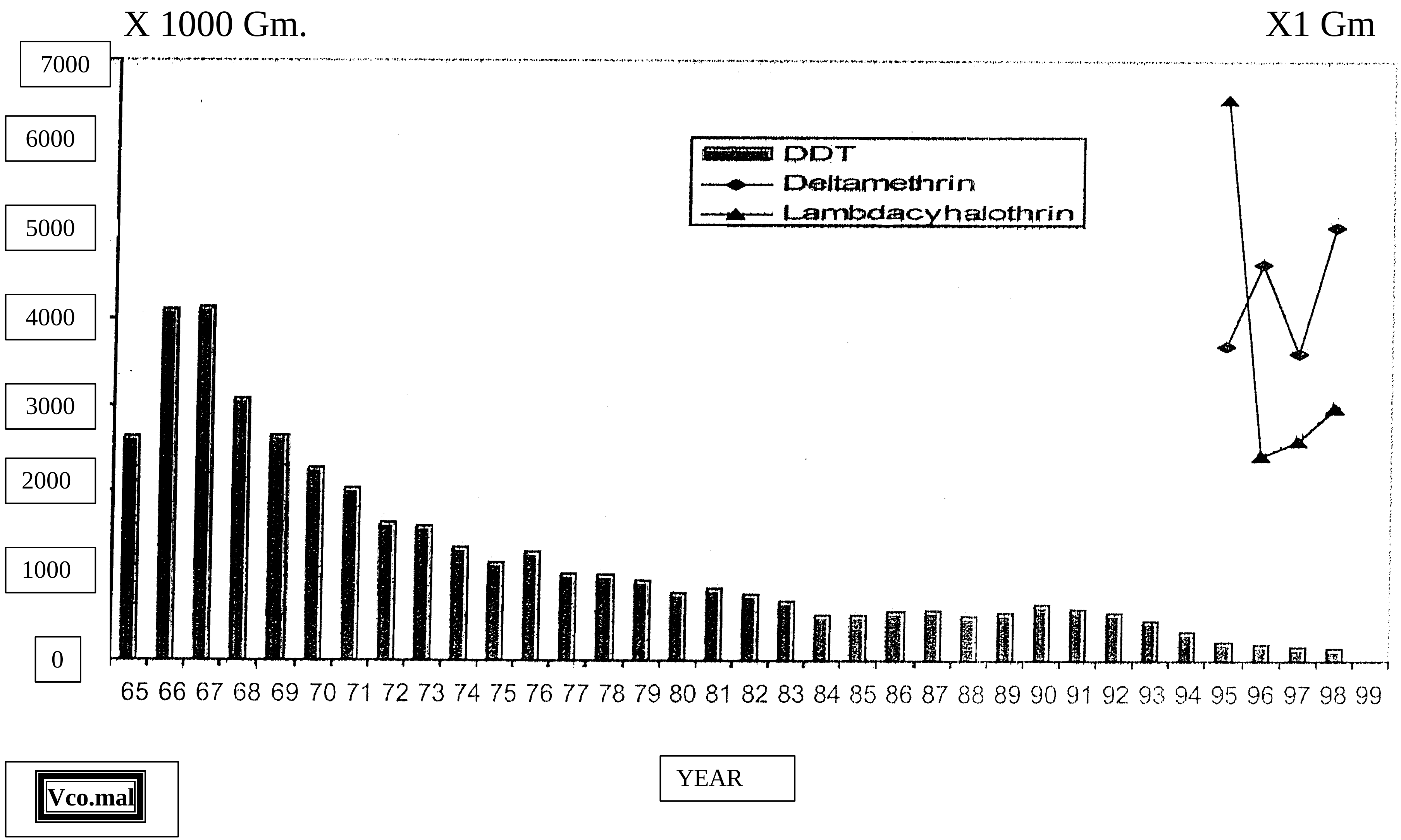
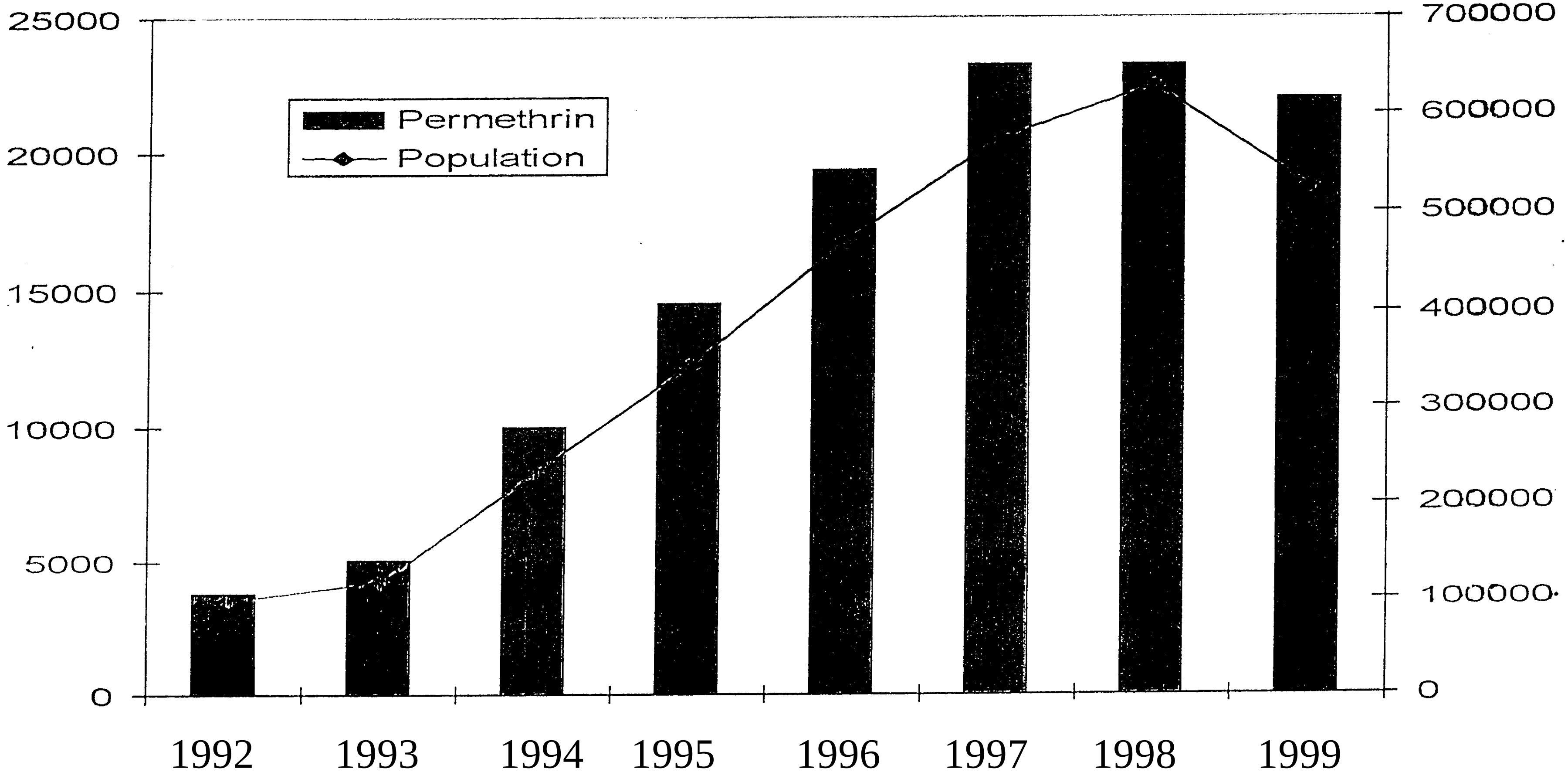
Insecticide Used on Indoor Residual spraying,

Malaria Control Programme, Thailand. Year 1965-1999

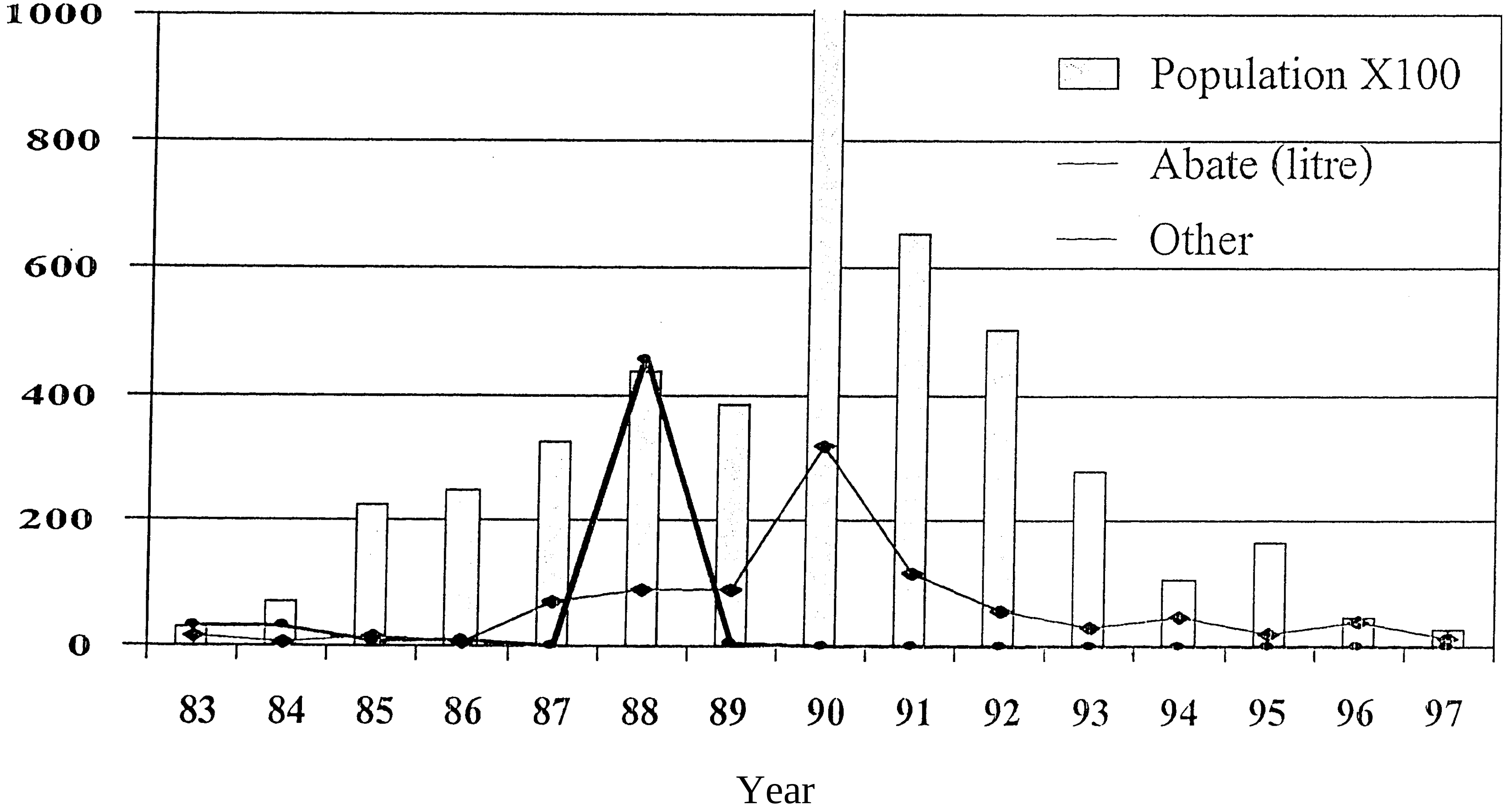


Show Impregnated Mosquito Nets in Malaria Control Programme

Thailand, 1992-1999



Insecticide for Larviciding,
Malaria Control Programme, Thailand. 1983-1997



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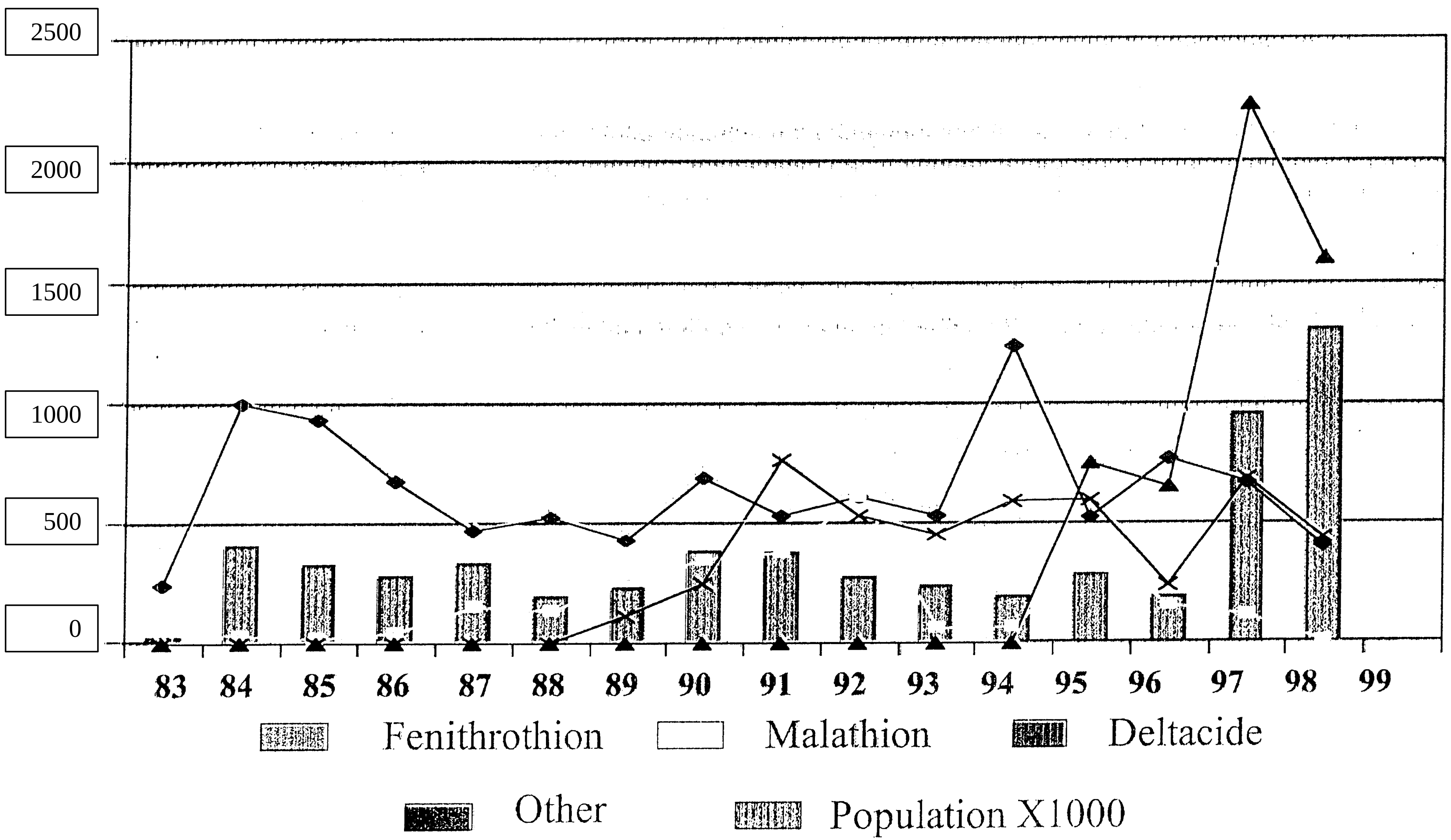
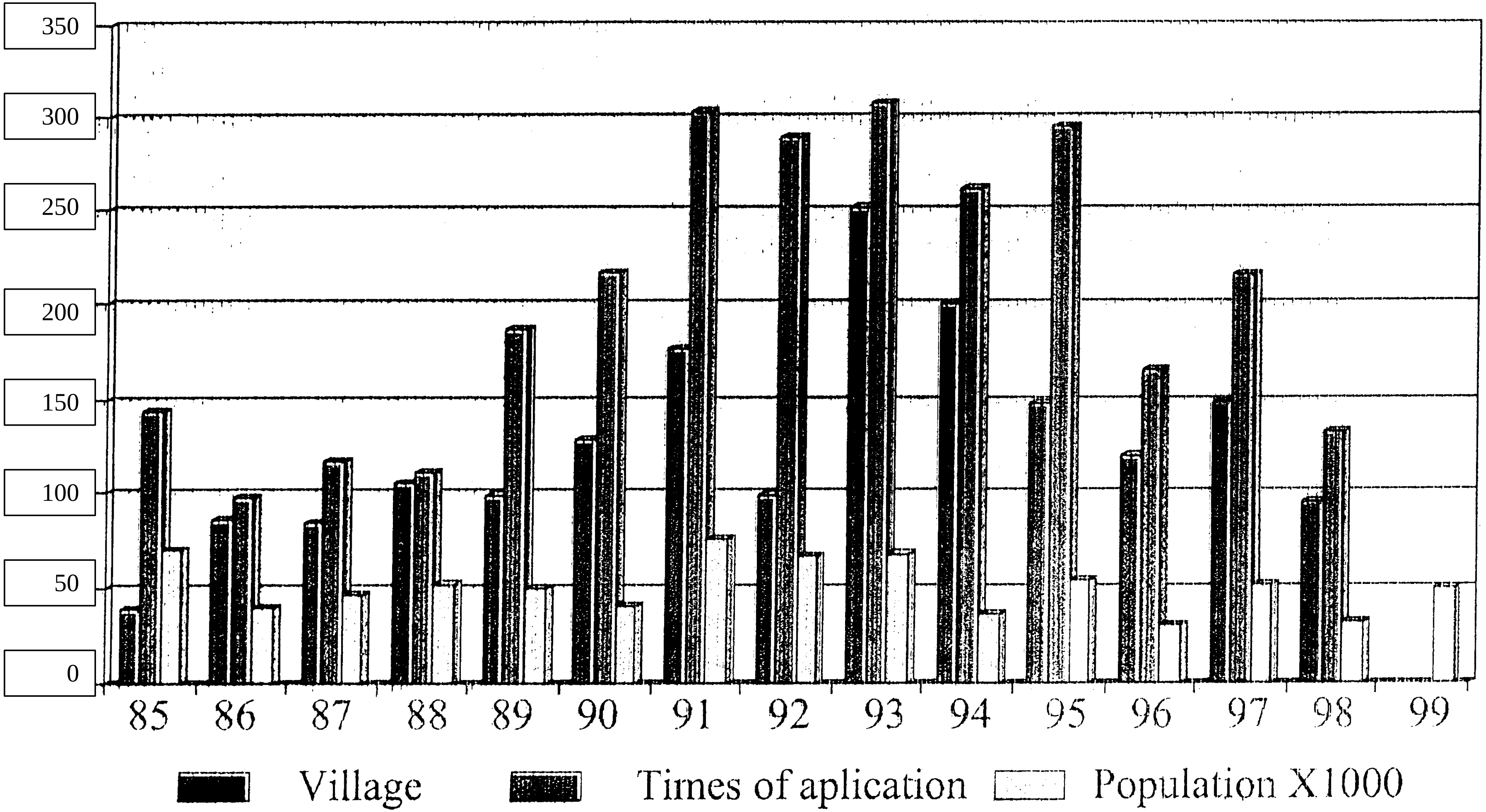
Insecticide Used in Fogging on Malaria Control Programme,
Thailand, Year 1985-1999



Environmental Management in Malaria Control Programme
Thailand, Year 1985-1999



FAO-DOAE IPM Implementation in Rice under Royal Initiative 1999/2000

Summary Report
by
Mr. Lakchai Menakanit, Director
Institute of Biological Agriculture and Farmer Field Schools,
Department of Agricultural Extension, Thailand

Summary Report	
Project:	FAO-DOAE IPM Implementation in Rice under Royal Initiative 1999/2000
Period:	1 September 1999 to 31 December 2000
Implementing Agency:	Institute of Biological Agriculture and Farmer Field Schools, Department of Agricultural Extension, Thailand
Officer in Charge:	Mr. Lakchai Menakanit, Director
Supporting Agency:	FAO Programme in Community IPM in Asia (GCP/RAS/167/AUL)

1. OVERVIEW

This report summarizes major activities, issues and tentative future plans for the *FAO-DOAE IPM Implementation in Rice under Royal Initiative 1999/2000* program for the period of 1 September through 31 December, 1999. Also included are preceding and preparatory activities from June through August leading up to this period.

2. MAJOR ACTIVITIES

2.1 Curriculum Development and Project Planning Workshop:

Held in early June at Nakhorn Sawan Province, this workshop included thirty participants from the central and regional levels, as well as those three provinces—Chainat, Phitsanuloke and Khon Kaen--where training of trainers (TOTs) were planned. In addition to plans for the TOTs, a curriculum and draft manual was produced for use by the trainers. Mr. Banharn Jantakomut from the Thai Education Foundation assisted in processing this curriculum

2.2 Training of Trainers

Three TOTs including 63 participants from 21 provinces were completed during this period:2

The TOT in Chainat Province, in the central region of Thailand, began on 14 June and ran 20 weeks through 27 October. Held at the Central Regional BAFFS Center in Chainat, the training included 24 participants--two Sub-District Extension Agents and one contract-hire staff--from eight provinces: Chainat, Singburi, Angthong, (in the central region), Prachinburi (in the eastern region), Suphanburi (in the western region), and Phattalung, Songkhla and Nakhorn Srithammarat (in the southern region).

Core training staff were persons from the National and Central Regional BAFFS Centers, and two, part-time FAO IPM Training Specialists. The training also included numerous guest lecturers.

Major field studies included in at the TOT training were: 1) IPM and farmers' practice, 2) De-tillering and defoliation, 3) Rice-fish and rice-frog culture, 4) Neem application, 5) Golden snail management, 6) BHP resurgence, 7) Fertilizer application

2. Please see specific TOT reports for more information on each of these trainings.

timing, 8) Rice variety comparison, and 9) Seeding rates. A small number of insect zoos, some study tours and a field day were also undertaken.

The TOT itself ran the first three days of each week, with participants then returning to their respective provinces to run field schools and conduct other duties for the remaining time. The ten field schools had been initiated by other agricultural officials before the commencement of the TOT, with the TOT participants assisting each week after the TOT began. Those participants from the south helped with three FFSs in Chainat Province.

In the lower-northern region, the TOT was held in Phitsanuloke Province from 21 July to 17 November at the Ratchamongkok Institute of Technology. Phitsanuloke, Phichit, Nakhorn Sawan, Petchaboun, Sukhothai, Kamphaengphet and Uthaithani Provinces each sent two Sub-district Agricultural Extension Agents and one contract-hire staff for a total of 21 participants.

The main training team came from the National and Phitsanuloke BAFFS Centers, as well as District Agricultural Offices, with technical and training support from two, part-time FAO IPM Training Specialists, and a number of guest lecturers.

Field studies in the TOT were: 1) IPM and farmers' practice, 2) Fertilizer application rates, 3) Defoliation and de-tillering, 4) BPH cage study, 5) Rice-fish and rice-frog culture, 6) Seeding rate, and 7) Rice varieties.

Participants conducted 14 farmer field schools—two in each province—on Thursday and Friday every week. These field schools included a total of 122 women and 206 men. As in Chainat, some of these FFSs began before the TOT, and the TOT participants supported their implementation.

In Khon Kaen (the upper northeastern region), the TOT was held at and near the BAFFS Center from 4 July to 30 November. The 18 participants came from six provinces in the northeast region—Khon Kaen, Udorn Thani, Kalasin, Mahasarakham, Roi-Et and Nakhorn Ratchasima.

Trainers included staff from both Northeastern BAFFS Centers and Regional Agriculture Extension Offices, as well as from the Province Agriculture Office in each participating province.

Field studies were separated for transplanted and broadcast rice. In transplanted rice, studies included: 1) Fertilizer application (farmers' practice and recommended), 2) Weed control, 3) Chemical and organic fertilizer, 4) De-tillering and defoliation. For broadcast seeded rice, studies were: 1) IPM, two spraying, weekly spraying and no spraying, 2) Seeding rate, 3) BPH cage studies.

Within the Royal initiative, 12 FFSs (two in each province) were conducted by the TOT participants.

2.3 Mid-Season Refresher, Review and Planning Workshop

Some 144 agricultural officials and specialists from 53 provinces and six regional offices attended a review and planning workshop in Nakhorn Phanom Province on 29 September to 1 October. The on-going TOTs in both rice and vegetables were discussed, and preliminary plans for continuation were formulated. Two FAO staff were also in attendance to assist and contribute.

2.4 Vientiane Refresher Training

From 15-21 December, six persons from central, regional and provincial BAFFS offices attended a *Program for Refresher and Planning Workshop* in Vientiane, Lao PDR. Experiences and skills gained from this workshop will be used to facilitate planning and support for the dry season 2000 field schools.

2.5 Pesticide Policy Workshop

The BAFFS Institute hosted the *Crop Protection Policy for Clean Products and Strategies for Social and Economic Analysis* workshop at Cha-am in Petchburi Province from 19-21 December. Representatives from government, industry and NGOs attended the workshop, which included presentations and discussions on topics such as barriers to the implementation of IPM; the economic, social and environmental effects of pesticides; research and development on appropriate pest control strategies for clean products; and the role of the private sector and NGOs for promoting clean products.

2.6 Promotional Activities

The IPM work enjoyed considerable promotional activity during the period. Some of the more significant events included:

- Mr. Pongpol Adireksarn, the Minister of Agriculture, and other senior ministry officials visited an FFS conducted in conjunction with the Chainat TOT on August 22.
- The Thai Prime Minister, Mr. Chuan Leekpai, and the DoAE Director General, Mr. Pramote Raksaras, visited the Chainat BAFFS center and an FFS in Manorom District on 3 October.
- A number of articles and programs on the IPM activities have also been featured in the press and on television.

3. MAJOR ISSUES AND RECOMMENDATIONS

As the first year of intensive IPM program work in Thailand, considerable progress was made, and several crucial difficulties were encountered. A listing of some of the more significant of these issues follows:

3.1 Institutional Support

FAO and the Inter-Country Program in Community IPM have afforded strong backing to the program. The Royal Initiative and concurrent media coverage has also catalyzed a great deal of government support. At the same time, however, the later has also brought high expectations for rapid expansion of program activity, while the basic institutional framework and human resources are currently insufficient to fulfill these expectations. Further, the longer-term, continuing support from the Royal Initiative to support the building of this basis is not assured.

At the regional, provincial and district levels, the work has also enjoyed substantial support--in many localities. There remains, however, a relative lack of understanding about the program, its objectives and requirements on the part of many administrative officials, as well as clearly defined lines of responsibility within these officials' agencies.

Regional, Provincial and District administrative staff should continue to be brought into the planning process at key points in order to increase their understanding, support and follow-up of the work, as well as to more clearly identify roles and responsibilities for these tasks.

3.2 TOT Scheduling

Both TOTs ran for three days each week, from Monday through Wednesday, with Thursday and Friday scheduled for participants to return to their home provinces to conduct field schools and other duties. This caused a number of problems:

- The momentum and camaraderie of the training suffered.
- Each Monday and Wednesday, time was lost due to the early departure or late arrival of those participants traveling from far-away locations.

- The three-or-less days per week was too short to cover sufficient content areas, field activities, facilitation practice, etc.

- It was difficult or impossible to maintain field plots, studies, and the like over the four day break each week.

Related to this, because the participants conducted field schools in their own provinces, often quite distant from each other and the TOT site, learning potential was limited in that participants had little opportunity to compare and exchange their field school experiences.

Although many believe that even the recent TOTs took too much time, nearly all TOT participants expressed that future TOTs should be conducted five days per week, with a possible one-week break in the middle of the season.

Concurrent to this, farmer field schools should be identified that are nearby to the training site, and participants should reside at the training site for most or all of the week.

3.3 TOT Sites

Particularly at the Chainat and Khon Kaen sites, the locations of lodging, meeting facilities, and field plots were quite far apart. This necessitated more time and effort for travel each day, detracted from an atmosphere conducive to building camaraderie among participants, and significantly limited opportunity for after-hours work and discussion.

To the extent possible, lodging, meeting facilities and field plots should be together, with participants and trainers staying at the same facility for at least five days per week.

3.4 Facilitation

By their own admission, most of the TOT trainers had little or no previous experience in IPM training models and methodologies, and in some cases, in general training methods. As a result, training too often depended on topic-specific guest lectures, with limited use of questioning, discussions, and participatory, experiential learning activities. In addition, there was often limited support from a core group of trainers working continuously with assigned groups of participants. Finally, the FAO IPM specialists arrived after the TOTs had begun, and could therefore not contribute to initial planning and preparation.

Although it is easier said than done in initial program stages, training staff should have had more previous experience in the approaches and facilitation of IPM training and farmer field schools. Limited reliance should be on guest lecturers--or lectures in general--and more on questioning, discussions and experiential learning guided by a core group of trainers.

Training staff should also reside at the TOT site to enable better coordination and planning among themselves, as well as more extensive interaction with the participants.

3.5 TOT Field Studies

For the most part, field trials conducted within the TOTs were identified with little input from participants, and were often not reflective of local conditions. Also, the trials sometimes lacked clear goals and study designs which would have improved their potential for learning. Thirdly, there were very few insect zoos and other trials resulting from participant's own initiative and analysis.

Field studies should arise from discussion between the trainers and participant groups in consideration of their interests, important local issues and practices. Clear goals, purposes, treatments and methods of data collection and analysis should be planned before the field study is initiated, and a specific group of participants should take responsibility for conducting the entire study. Thirdly, an experiential learning atmosphere should support and encourage participants to establish insect zoos and other shorter-term studies throughout the training.

3.6 TOT Participant Selection

Participants at the TOT trainings were Sub-district Extension Agents and short-term, contract-hire staff. The continued government employment of the contract-hire staff is uncertain, and Sub-district Extension Agents' responsibilities will increase as they become administrators of Sub-District Technology Transfer Centers in the immediate future.

Further consideration is needed in regard to the ability of Sub-District Extension Agents to function as the primary facilitators of farmer field schools in the immediate future.

3.7 Farmer Field Schools

With notable exceptions, farmer field schools were generally not conducted as an integral component of the TOTs. Rather, many were initiated before or well-after the TOTs had started, and were led by other extension personnel, with the TOT participants serving in support roles only. Hence, the TOT participants often missed out on the crucial planning and preparation stages for these field schools, as well as opportunities to apply experience they gained from the TOT.

Similar to the TOTs, many field schools relied too heavily on lectures, the "transfer of knowledge," and prescribed field studies, and too little on group discussions, decision-making and experiential learning. Many of the FFSs did not have identified IPM and farmers' practice plots, instead focussing on economic threshold analysis (or surveillance and early warning systems) conducted in various farmers' fields. As a result, thorough AESAs, comparisons across treatments, and longitudinal comparisons following crop growth stages, were often not possible.

Finally, no field school guide or curriculum was available for the TOT participants' reference, and too little time was made available within the TOT to plan for the weekly field schools, or to process experiences from them.

Ideally, weekly field schools should begin about two weeks after the start of the TOT and be located near to the TOT site (although baseline data collection, and farmer selection and orientation should be conducted well before this). Field schools should be a core activity of the TOT, with the TOT participants taking the lead role in conducting the field schools, and with sufficient time and support allotted within the TOT to plan, prepare and review them.

As the field should be central focus of study in field schools, each location should have specific plots identified for IPM and farmers' practice, other field studies identified through discussion with participating farmers, and continuing weekly AESAs. Likewise, there should be more focus on group discussions, experimentation and decision-making resulting from analysis of these field plots.

Although field schools should vary according to local interests and emerging field conditions, a curriculum should be developed and made available to provide facilitators with a common framework and approach. Such curriculum should clearly illustrate the different objectives and methods between economic threshold analysis and AESA.

3.8 Field Days

Field days conducted at each TOT were quite extensively prepared, well attended and beneficial. However, activities to promote and explain the IPM program to various officials sometimes overshadowed activities directed toward area farmers.

It might be better to schedule the morning of field days for various officials, and the afternoon for area farmers.

4. CONTINUING PLANS:

For the year 2000, the following activities are preliminarily planned for the rice IPM program:3

4.2 FFS Planning Workshop

Tentatively set for February 21 to 25 in Angthong Province, this workshop will serve to review the 1999 TOTs, and to plan and prepare for farmer field schools following from those TOTs. Participants will include the 63 graduates from the recent rice TOTs.

4.3 Dry-season Farmer Field Schools

Some 42 farmer field schools are currently slated for the 2000 dry season, including two field schools conducted by the three member team from each of the 21 provinces participating in the TOTs. More extensive detail regarding these field schools will derive from the FFS planning workshop above.

4.4 DNFE Rice TOT

The Department of Non-formal Education is currently planning a TOT in rice IPM to be held in Ayuthaya Province beginning in early February. Five or six staff from BAFFS Centers will participate in this TOT.

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3. Changes in the government budgeting process for training activities instituted in January has significantly affected many previously made plans.

4.5 Indonesia Workshop

Two persons from the BAFFS Centers in Chainat and Khon Kaen Provinces will attend a *Workshop on Science and Farmers* in Indonesia on 5 to 12 March. The overall objective of this workshop is to exchange and develop methods for supporting farmer research.

4.6 Wet-season Rice TOTs

Tentatively, up to six rice TOTs (one in each of the northern, northeastern, central, western, eastern and southern regions) will be conducted in the wet-season, beginning around July. Training teams of between five and six persons for each TOT will be selected from those conducting the dry-season field schools.

<u>Related Reports</u>

Other reports related to this Letter of Agreement include:

- Mid-Term Progress Report (27 October 1999)
- Chainat TOT report
- Phitsanuloke TOT report
- Khon Kaen TOT report

The Vietnam National IPM Programme
From 1992 to 1999
By Ms. Tran Thi Xuyen

In mid-1992, the Government of Vietnam launched a National IPM Programme in rice to address pest problems and widespread misuse of pesticides. The goal of the programme is to empower small-scale farmers to become skillful and better informed decision-makers in managing the rice production system. Four key IPM principles apply: (1) grow a healthy crop, (2) conserve natural enemies in the field, (3) observe the field regularly, and (4) farmers become experts.
From 1992 to 1995, programme activities focused on Training of Trainers (TOT) and Farmer Field Schools (FFS). From 1996 to 1998, Vietnam carried out a National Plan for IPM Training in Rice, which aimed to implement field schools in over 90% of all rice growing communes throughout the country. As of May 1999, the National Programme has accomplished 81 % of the National Plan target or over 5% of the total number of farm households in Vietnam. In many places, based on the momentum that FFS created, groups of IPM-trained farmers have carried on follow-up activities to strengthen IPM and agriculture in the villages. Local IPM movements have developed and served as a vehicle for promoting sustainable agriculture and addressing other community concerns. In 1998, the National IPM Programme began providing formal support to facilitate that process and to link local IPM movements into a Community IPM network that can provide a framework for nationwide IPM implementation.

Training of Trainers
IPM Training of Trainers (TOT) courses occupy a full rice-growing season. As of March 1999, 1486 trainers, of which one-third are women, have participated in 43 rice TOTS. Provincial and district plant protection workers improve their technical expertise in IPM, develop participatory training skills based on nonformal adult education methods, and enhance their management abilities. The experiential, field-based training emphasizes.

- Ecosystem
- Crop development
- Crop management - seeds, planting density, fertilizer, water, disease, pests, etc.
- Participatory training: facilitation, team building, group dynamics
- Organization and planning: farmer field schools, local programs
- Gender
- Special topics: for instance, pesticides and health, life cycles and food webs, rodents, etc.

Farmer Field Schools
A Farmer's Field School consists of a group of 25-30 farmers in one village which meets one morning every week during the rice cropping season. Each FFS has a study field of 1000m2 that is divided into IPM and Farmer Practice fields. Working in small groups of 5-6 persons, farmers observe all of the elements of the rice ecosystem weekly in both study fields. The groups summarize and analyze field observations through ecosystem drawings. The balance among the elements of the rice ecosystem is the basis for field management decisions made after discussion among all the field school participants.

FFS farmers carry out additional field experiments, such as defoliation studies to learn about plant physiological compensation after damage. They set up 'insect zoos' to study predation and parasitism. Special topics are also studied in the FFS, including the effects of pesticides on natural enemies and on human health.Team building and group dynamics activities build stronger farmer groups. Field days which include presentations in various folk media are organized for information dissemination and advocacy.

Over 9,616 FAO-funded and 5,740 locally-funded FFSs have trained a total of 407,322 rice farmers. The National Programme has organized activities in 70% of the 9,256 rice growing villages throughout the country. Initial results of participatory impact evaluation ongoing in nine Community IPM provinces show that the implementation of IPM is reducing pesticide use by rice farmers in northern Vietnam by about 65%. IPM farmers often also economize on fertilizers and seeds, but generally obtain the same or better
yields than non-I PM farmers. Overall, IPM farmers are able to increase net income per hectare by about 24%. Evaluations are also showing improved practices and benefits among Community IPM village farmers who have not yet graduated from FFS. Community IPM aims to facilitate and strengthen this farmer-to-farmer spread effect.

Towards an IPM Movement: Village Activities
After the Farmer Field Schools

Follow-up Activities in Rice

In many places, with the momentum that FFS attendance has created, IPM trained farmer groups carry out follow-up activities to strengthen IPM and agriculture in their villages. Several types of follow-up activities are going on.

Farmer-to-farmer field schools. Over 3,000 rice farmer trainers are active. These farmer trainers have conducted 2,749 farmer-to-farmer FFS in their own villages. Local governments have supported most of these field schools.

IPM clubs. About 1,000 clubs have been established country-wide. The structure and organization of IPM clubs vary, but all are trying to expand the IPM programme to as-yet-untrained farmers, and to improve agriculture in general in their communities.

Rice-fish studies. IPM has made it possible for farmers to raise fish again, which disappeared from rice fields with increased pesticide use. Rice-fish production brings in additional income and provides a valuable protein source for the family. 131 rice-fish production, studies have been supported by the programme and local governments.

Rat Management Field Schools. In response to the Government's request that the National Programme address the rat problem, a training curriculum was developed for Rat Management Field Schools. The initial curriculum development workshop brought together researchers, trainers, and farmers and resulted in an Ecological Guide and a Field Guide on Exercises for Rat Management. The Proqramme has supported 66 rat management field schools in 17 provinces since Summer 1998.

Seed rehabilitation studies. In collaboration with Can Tho University, seed rehabilitation studies have been carried out with farmers groups in four provinces in southern Vietnam. Because only a few rice varieties are available, farmers save and sow seeds of a given variety for a long time and the seeds deteriorate, i.e., lose their original traits. During seed rehabilitation studies, farmers work through three seasons to bring back the preferred characteristics of varieties, until they are close to their original state.

IPM for Vegetables

At the request of IPM farmers, trainers, and government officials, the National IPM Programme started to develop IPM training in vegetables in 1994-95. Two seasons of studies were conducted in cabbage and tomato by experienced rice IPM trainers familiar with basic ecological principles and training methods. In interactions with vegetable farmers, information was collected on farmers practices and major problems. Training curricula for TOT and FFS in Vegetable IPM were developed using this information and the experience of researchers and IPM programmes in other Asian countries. Four vegetable IPM TOTs have been organized, training 159 trainers. Each province has a core group of vegetable IPM trainers capable of designing and carrying out provincial vegetable programmes. Initial report on application of IPM in vegetable production in Vinh Phuc province in northern Vietnam has shown 40-50% reduction in costs for pesticides, 15-30% reduction in costs for nitrogenous fertilizers, 1-5% reduction in commodity price and 500,000-900,000 VND/hectare increase in profit. A comparative evaluation of economic benefits of vegetable IPM in the different vegetable growing regions of Vietnam is planned.

Provincial vegetable programmes include the following:

- **Farmer field schools.** 14, 526 farmers have been trained in 538 vegetable FFS supported by the National Programme.
- **Farmer-to-farmer FFS.** 111 farmer trainers in different provinces have gone through short courses to strengthen their technical and training skills. They have conducted 387 farmer-to-farmer field schools on vegetables. IPM trainers regularly visit FFS conducted by farmer trainers, to provide backstopping.
- **Curriculum development studies**. Farmers and trainers set up field studies to develop training curricula for other vegetable crops of importance in their regions. Studies have been conducted on French bean, long bean, cucumber, potato, bitter gourd, spinach, cauliflower, field cabbage, green peas, eggplant, kohlrabi, etc.
- **Parasite introduction and establishment.** The FAO Intercountry Programme for IPM in Vegetables, in coordination with CAB International, has introduced wasp parasites into Vietnam against two major cabbage pests, diamondback moth and the cabbage butterfly *Pieris*. The National Programme has supported parasite rearing units and ecological field studies on these parasites since 1996. After releases by IPM farmers and trainers, the diamondback moth parasite *Diadegma semiclausum* has been established in the highland area around Dalat, in southern Vietnam. Additional work is being done on the parasite *Cotesia glomerata* for *Pieris* control.
- **Microbial control agents.** One farmer study group has moved on to studying nuclear polyhedrosis virus of insect pests as a biological control agent. Technical backstopping was provided by the National Institute of Plant Protection (NIPP), which contributed the initial NPV cultures. The studies focused on the use of NPV on *Spodoptera exigua* and *S. litura* in cabbage and on *Heliothis* in tomato. Based on farmers' promising results, a curriculum has now been developed for a season-long follow-up field school on NPV.
- **Participatory action research.** Under a 1998 letter of agreement with the FAO lntercountry Programme for IPM in Vegetables, CABI is providing technical backstopping to the Vietnam National IPM Programme in the area of disease management. This includes support to pilot Participatory Action Research (PAR) by trainers (TOT graduates) and farmers (FFS graduates), so that farmers develop skills in designing field studies on disease management in vegetables. Pilot activities are ongoing in three provinces.

IPM in Other Crops
Because of the success that the farmers have experienced with IPM in rice, the National Programme constantly receives requests to develop IPM in other crops. Work in this direction includes curriculum development and training.

- **IPM in soybeans.** Farmers grow soybeans as a secondary crop after rice. IPM farmer groups, assisted by trainers, set up studies in 1994. In 1995, a curriculum for a follow-up field school on soybean was developed. Since then, 95 field schools have been conducted, supported by both the National Programme and local governments. Studies conducted in 1997-1998 FFS in two provinces, Vinh Long and Bac Giang, reported a 75% reduction in insecticide use and an increase in profit of 10-20% in IPM fields compared to Farmer Practice fields.
- **IPM in peanuts.** The International Crops Research Institute for the Semi Arid Tropics (ICRISAT), in collaboration with the National Institute for Plant Protection (NIPP) and the National Programme, started work on peanut IPM in several areas in 1995. Field studies to learn more about the crop were designed by IPM farmers and trainers with inputs from researchers. The study findings provided the basis for developing training curricula for a TOT and FFS. The National Programme and an NGO, International Cooperation for Development and Solidarity (CIDSE). have since supported a total of 35 FFSs on peanuts for 945 farmers in five provinces in northern Vietnam and two in southern Vietnam. FFS data show increased yields of 8% and increased net profits per hectare by about 57% in IPM plots compared to FP plots.
- **IPM in tea.** CIDSE supported farmers groups in setting up field studies in tea in 1994 - 95. The studies showed that yields increased 15-40% with improved cultural practices, i.e., shade trees and better irrigation. Only 6 pesticide applications per year were made in IPM plots, compared to 10 - 12/year in FP plots. A curriculum for TOT and FFS was developed in 1996 and revised in 1997. 32 field schools in tea have been organized in Thai Nguyen and Bac Can provinces. Through CIDSE, the National Programme is supporting the attendance of trainers from three additional Northern provinces Ha Giang, Tuyen Quang, and Yen Bai and the southern province of Lam Dong at the second TOT.
- **IPM in cotton.** The Vietnam Cotton Company (VCC) is responsible for cotton growing in Vietnam. When the National IPM Programme started rice activities in 1992, the VCC asked for assistance because it realised that the rice programme was based on the same ecological principles used in cotton IPM, and that the training methods used in the rice programme would be valuable for increasing farmers' knowledge of the cotton agroecosystem, cotton growing, and IPM. The first Training of Trainers (TOT) in cotton IPM was held for 23 VCC extension workers in 1996. From 1996-1998, 1,394 cotton farmers from the provinces of Dong Nai, Binh Thuan, Ninh Thuan, and Dak Lak participated in 48 IPM FFS. Fourteen cotton IPM clubs have been organized and 369 farmers participate in regular meetings. Implementation of IPM in four provinces is reducing pesticide use by cotton farmers in Vietnam by about 66%. IPM farmers obtain increased yields of 16% and are able to increase net profits per hectare by about 30%.

Community IPM
The National IPM Programme is now supporting farmers' groups in sixteen pilot provinces in taking IPM beyond rice and beyond FFS to develop community-based IPM programmes. Graduates of quality FFS provide the foundation for this endeavor. They emerge from field schools ready to engage in further discovery processes to find solutions to crop protection and production challenges, as well as to address a broader set of problems which confront their communities. Driven by the desire to learn more, and given the opportunity to promote and

share new experiences in forums such as planning meetings, IPM farmers acquire a more holistic understanding of agriculture. A chain of changes follow, all leading to sustaining and strengthening farmers' groups and the development of local IPM movements to improve agriculture in the village. Activities of the groups include Training

- Training of farmer trainers to strengthen capabilities of FFS graduates in organizing and facilitating farmer training
- Farmer-to-farmer FFS
- Refresher courses in which farmer trainers share new technical information and experiences for the improvement of farmer-led I PM

Research

- Field studies in the village to understand more about factors that affect the plant, and to initiate IPM in other crops
- Impact evaluation of IPM activities in the sixteen pilot Community IPM provinces, to determine long-term plans for country-wide Community IPM as a framework for agricultural development

Forums

- Planning meetings for IPM activities in the village, and generating budgets for these activities; fund raising for these plans from village, district, and provincial governments
- Farmer trainers meetings to share experiences and strengthen skills in conducting farmer-to-farmer field schools
- Field days for sharing and learning new information
- Farmer technical meetings to share experiences and exchange ideas on IPM activities, discuss constraints to agricultural production, and identify possible solutions
- IPM theater/folk media groups to make more farmers aware of IPM

As local programmes evolve and farmer groups embark on a more proactive IPM implementation process, they are taking on a larger role in programme organization and management. To support this movement, the National Programme has organized *"cum tinh"* or sub-regional teams. These teams:

- participate in national workshops on planning, management, and evaluation as well as on technical topics like agronomy, ecology, environment, and health;
- make field visits to monitor training quality;
- organize workshops for trainers at local level-, and
- backstop community IPM activities

The organization of *"cum tinhs"* is a National Programme strategy to achieve decentralization and local programme development and support. With experience gained from the pilot exercise, the *"cum tinhs"* are expected to take the lead in assisting other provinces to develop their local programmes.

Non-governmental Organizations in Vietnam

Many NGOs in Vietnam are active in IPM, following the same approach as the National IPM Programme. Among them are International Cooperation for Development and Solidarity (CIDSE), Action Aid Vietnam (AAV), Canadian Center for International Studies and Cooperation (CECI), Save the Children Foundation UK (SCF-UK), Plan International, Nordic Assistance for Vietnam (NAV), CARE, Helvetas, World Vision, Bread for the World, Netherlands Development Organization (SNV), Japan International Volunteer Center (JIVC), Flemish Organization for Assistance in Development (FADO), Vietnam-Finland Friendship, Vietnam-German Food Security, Mennonite Central Committee (MCC), Agricultural Development Denmark Asia (ADDA) and a consortium of SCF-US/World Education/World Learning Inc. The main activity of the NGOs is training of farmers in rice IPM through FFSs facilitated by trainers who have attended TOTSs.

Besides FFSs on rice, NGO IPM activities include studies and FFS in other crops such as vegetables and fruit (e.g. plum by Bread for the World), rice-fish studies, rice-duck studies (JIVC), training and refresher courses for trainers, experience exchange tours (CIDSE), and the introduction of IPM into schools (SCF-UK). NGO activities are managed in close collaboration and coordination with the National IPM Programme.

Organization and Management of the National Programme

In May 1994, the Ministry of Agriculture and Rural Development (MARD), with the approval of the Government, decided to organize an IPM Steering Committee. Members of the Steering Committee include representatives of the following agencies: Ministry of Agriculture and Rural Development, Ministry of Planning and Investment; Ministry of Science, Technology and Environment; Ministry of Health; Ministry of Finance; Ministry of Training and Education; Farmers' Union of Vietnam; Vietnam Women's Union; and Vietnam Youth Union. The Vice-Minister of Agriculture and Rural Development chairs the Steering Committee. The Committee advises the Programme on creating favourable conditions for the national development and implementation of IPM. Provincial Steering Committees were set up in many provinces and have the same function as at national level.

The Plant Protection Department (PPD) of MARD is responsible for implementing the National IPM Programme. The FAO lntercountry Programmes for IPM in Rice and Vegetables in South and Southeast Asia work closely with an IPM Group of specialist officers in the Plant Protection Division of PPD. The IPM Group takes care of daily programme management and coordination, and reports to the Director General of PPD.

At the provincial level, Plant Protection Sub Departments (PPSD) are in charge of managing the IPM programme and implementing FFSs and follow-up activities. In each province, there is a nucleus of IPM trainers that plays a central role.

Funding of the National IPM Programme

Through the FAO lntercountry Programmes for IPM in Rice and Vegetables in South and Southeast Asia, the Governments of Australia (the major donor), the Netherlands, and Switzerland provided support to the National IPM Programme until 1998. The Government of Norway is the major donor for the Vietnam component of the 1998 - 2002 Phase IV of the regional programme, now known as the FAO Programme for Community IPM in Asia.

The amount of local government (provincial, district and village) support for training and follow-up activities at the community level increased from 30% to about 45% of total expenditures for IPM activities in Vietnam between 1996 and 1998.

In 1996, the Government of Vietnam used part of an agricultural rehabilitation loan from the World Bank to fund 1,841 FFS. In addition, several NGOs fund IPM activities in their project areas. Together, these sources supply 13% of the total funds for IPM implementation.

Policy Development in Support of IPM

Favorable changes in Vietnamese agricultural policy have improved the environment for the National IPM Programme. Since 1991, bans and restrictions have been imposed on the most toxic pesticides. From 1995 to 1997, a total of 45 pesticides were banned for use in Vietnam, and 30 have been restricted. In 1993, new plant protection and quarantine legislation came into effect. As a result, a professional inspection system was set up to enforce pesticide regulations. For example, restricted pesticides can not exceed 10% of the total quantity of pesticides sold in Vietnam. Since 1994 -95, Plant Protection Sub Departments are no longer responsible for pesticide sales and distribution, which has been transferred to other departments within MARD. This allows PPSDs to expand IPM programmes more effectively. IPM trainers are assigned full-time to training activities. In 1998, Vietnam stopped the registration of new insecticides for leaffolder by all Vietnamese and foreign companies, since IPM activities had shown that insecticide use against leaffolder is unnecessary.

MALARIA AND ITS CONTROL IN VIET NAM

Dr. Nguyen Van Hien
Ministry of Health in Viet Nam

1. Malaria situation:

With about 2/3 of territory belong to the mountainous and forested areas, 40 million out of 76 million in Viet Nam are exposed to malaria. About 15 million live in areas where malaria is hyperendemic. Malaria is one of the most important infectious diseases in Viet Nam and results in serious morbidity and mortality.

1.1. Malaria vectors: There are 4 principal vectors:

- *An. minimus*
- *An. dirus*
- *An. subpictus*
- *An. sundaicus*

An. minimus and *An. dirus* are two dangerous vectors in mountainous and forested areas, *An.subpictus* is main vector in the northern coastal, while *An. sundaicus* is the important vector in brackish water of southern coastal provinces (see annex)

1.2. Malaria parasite:

Two main species of plasmodium: *Plasmodium falciparum* (P.f) and *Plasmodium vivax* (P.v). Statistic data from Ministry of Health in 1995, P.f were 55,79% in northern provinces. 71,69% in central provinces and 81,52% - 85,62% in southern and high plateau (see annex).

1.3. Malaria morbidity and mortality in Viet Nam 1991 - 1999:

Viet Nam's malaria situation worsened since 1985 with the number of deaths reaching 4646, the highest figure ever recorded in 1991 (see annex).

- Mortality drastically reduced in 1999 up to 95,9% in comparison to 1991.
- From 144 outbreaks in 1991 to nil in 1999
- Annual morbidity reducing average 20% from year to year.

2. Malaria control policy in Viet Nam:

From 1986, the malaria eradication programme has changed its strategies and was converted to the national malaria control programme in 1991 with the following objectives.

- To reduce mortality
- To reduce morbidity
- To reduce epidemic outbreaks

3. Strategies:

3.1. More investment of funds to malaria control programme

3.2. Promotion of production of ART

3.3. To socialize the malaria control activities under direction of the government and various level local authorities, to invest in the programme and mobilize the participation of the community and of various branches.

3.4. To develop the PHC system, to mobilize the heath services network for malaria control activities.

3.5. Health education on malaria control. The activities is done through 3 channels:

- Health service system
- Primary schools
- Mass media
- Launching the campaign of "all the people participate in the malaria control programme.

3.6. To improve the early detection/treatment of malaria m order to reduce the mortality

3.7. Vector control

4. Vector control in public health:

There are not IVM programme in Viet Nam.

The use of chemicals is important measure in controlling Malaria vector as well as other vectors such as Dengue fever, Plague etc.

At present in Vietnam, Malaria and Dengue fever control are the two important national programs which has been considerably invested from state budget for controlling vectors. In malaria control, there are two main methods: bed net impregnation once or twice as year and residual spraying once a year with effectiveness in 9 months. Chemicals use in malaria control are including Permethrin 50 EC for bed net treatment with dosage of 0.2gram per square metre and ICON 10WP for residual spraying with dosage of 30mg per square metre. Every year state budget uses in purchasing chemicals for malaria control is about US$2 million. Apart from the above mentioned chemicals, Vietnam has been conducting trials on other chemicals such as Peripel 55EC, Fendona 10SC, K.othrin 1 SC, ICON 2.5CS etc and hopefully to have more new, effective chemicals for controlling malaria vector in country. Trials have to be carried-out in North, Central and South regions. Chemical, which is proved good efficacy in 3 regions will be granted certificate from Ministry of Health for malaria control in Vietnam. Vietnam encourages the use of bed net treatment for infectious regions while residual spraying method only uses in case of malaria out break, in high risk area, remote areas and border line.

Chemicals have been using for Malaria control in Vietnam.

Year	Quantity (T)	Chemical	Origin
1957- 1979	14,847	DDT 30%	Former Soviet Union
1976- 1980	1,800	DDT 75%	WHO
1977- 1983	4,000	DDT 75%	The Netherlands
1981 - 1985	600	DDT 75%	Former Soviet Union
1984- 1985	1,733	DDT 75%	The Netherlands
1986	262	DDT 75%	WHO
1986-1990	800	DDT 75%	Former Soviet Union
1992	237,748	DDT 75%	Former Soviet Union

1993	33,935	DDT 75%	Former Soviet Union
1994	151,675	DDT 75%	Former Soviet Union
1995	23,697	ICON, Deltamethrin, Vectron	
1996	17,836	ICON	Zeneca
1997	1,261	ICON	Zeneca
1998	50,000 Ltrs 20 T	Permethrin ICON	Zeneca
1999	50,000 20 T	Permethrin ICON	Zeneca

The above imported DDT has been used since 1957 and up to 1994, it was stopped in Vietnam due to its high toxic and long time residue in environment. At present, only chemicals belong to Pyrethroid group are in use for malaria control in Vietnam.

Registration of chemicals used in public health: In the past, permission was issued by Ministry of Agriculture and Rural Development (Plant Protection Department). To date, Ministry of Health (Dept) has been ordered by Prime Minister on issuing this permission (Decision No. 197-1998 QDTTG dated 10/10/1998). The Ministry of Health has issued the list of chemicals, insecticides, anti-bacterium substances that are permitted to register for use, permitted to register for restricted and prohibited in hygiene and house hold fields. (see annexes). Also the Ministry of health already issued regulations on registration of chemical and substances used in hygiene and house hold fields.

Chemicals such as Permethrin 50EC and ICON 2.5 EC are used for dengue fever control program with ULV treatment.

On the other side, Vietnam also encourages environment treatment like fish breeding to exterminate larvicides, hygiene works etc. for control vector.

<u>The outstanding difficulties:</u>

- Lack of information on chemicals that are permitted for use, restricted use and prohibited use in hygiene and house hold fields.
- Limit performance on chemical management due to untrained monitoring staffs.
- Lacking basic facilities and funds needed for chemical management.
- Limit co-ordination between ministries and functional authorities in chemical management when issue permission, registration, distribution and destroy.
- There are not coordination between IPM and IVM programme in Viet Nam. How to coordination, where to coordination, what to coordination and management structure for implementing of coordination etc are new problems to Ministry of health.

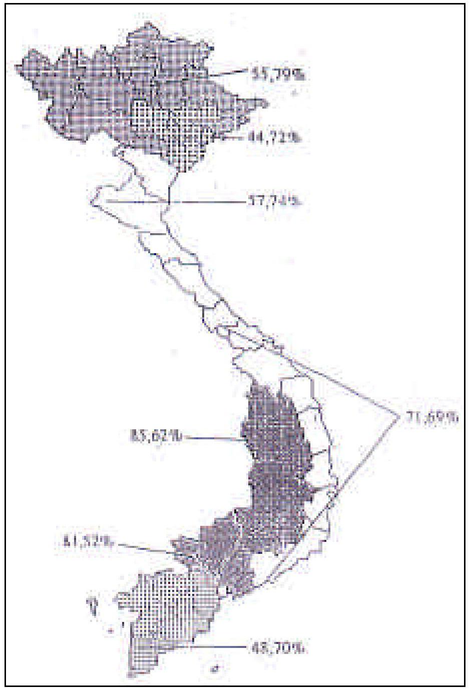
<u>Recommendation:</u>

- Strengthen information exchange in international scope on this field (Workshop, meeting m regions and international).
- Coordination between IPM and IVM programme are very necessary.
- Staffs training assistance (in Vietnam and overseas) in order to create high performance management system and work-out suitable regulations on chemical application and implementation for coordinating between IPM and IVM.
- Having good facilities to research the impacts of chemicals on environment and human.

- Strengthen the coordination between ministries and functional authorities on chemical management nation-wide.
- The need of international rule/agreement on management of chemicals use in agriculture, public health, environment and based on this issue, different nations can work out the most effective regulation system for them.

MALARIA STUATION IN VIET NAM 1991 - 1999

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Pop at risk of malaria	31,530,420	31,848,910	32,170,620	32,495,570	34,042,468	34,042,468	41,939,624	41,939,642	42,485,526
Pop protected by insecticides	4,305,786	5,560,562	7,829,045	10,457,880	11,050,340	12,138,439	13,189,076	13,412,100	13,892,249
Malaria cases	1,091,201	1,294,426	1,111,960	860,999	666,153	532,860	445,200	383,117	341,529
Positive cases	187,994	225,928	156,068	140,120	100,116	76,356	65,859	72,077	75,534
P.f	144,595	172,515	111,295	99,630	71,902	55,607	48,721	55,070	58670
Number of deaths	4,646	2,658	1,061	604	348	198	152	183	190
SPR(%)	7.55	7.94	6.2	5.29	4.04	3.02	2.72	2.6	2.87
Number of outbreaks	144	115	19	8	3	0	11	4	8



Annex : The distribution of P. falciparum in Viet Nam 1995

MINSTRY OF HEALTH

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

LIST OF CHEMICALS, INSECTICIDES, ANTI-BACTERIUM SUBSTANCES PERMITTED TO REGISTER FOR USE, PERMITTED TO REGISTER FOR RESTRICTED USE AND PROHIBITED USE IN PUBLIC HEALTH AND FAMILY FIELDS

(Pursuant to Decision No. 65/2000/QD-BYT dated 13 January 2000 of the Minister of Health)

TABLE 1. LIST OF CHEMICALS, INSECTICIDES PERMITTED TO REGISTER FOR HYGIENE AND FAMILY USE

No.	Chemical name	Trade name
01.	Alpha-Cypermethrin	Fendona 10SC
02.	Bacillus thuringiensis Thurigiensis H 14 Bacillus thuringiensis var israelensis	Bactimos fc Bactimos B, Bactimos G Vecto Bac 12AS
03.	Belzyl benzoate	Belzyl benzoate 10% lotion
04.	Bifenthrin	Talstar 10WP, 10SC
05.	Cyfluthrin	Solfac 050EW, 10WP, Baythroid
06.	Cypermethrin	Visher 24EW
07.	D-allethrin (Pynamin Forte)	Fumakilla 0.3 coil; Mosfly coil 0.27; Thaibinh Mosquito coil 0.3; Zebra 0.24 coil; Sumi coil 0.2%; Raidcoil.
08.	Deltamethrin	Crackdown 10SC; K.Othrin Moustiquaire 1SC; K-Otab 0.4, 0.3; K-Othrin 2.5WP, 5WP, 10ULV; K-Obiol 25WP; Phan tru kien 0.7%, Kill pest 0.2 powder; K-Othrin 2.0 EW; Deltox; Housetox, Killpest.
09.	Diazinon	Diazinon D
10.	Diethyl toluamid	Deet; Micado 10 cream; Cosmetic cream; Autan 15 balm.
11.	Dimethyl phthalate	DMP
12.	D-phenothrin	Sumithrin, Jumbo Aerosol
13.	D-trans allerthrin	Bioallethrin; D-trans; Trad 0.1 coil; Beskill 0.1 Mosquito coil; Combatmat 0.15% 20mg, 25mg; Gold fish 0.1 coil; Jumbo 0.15 coil 23mg mat; Mosman 0. 1%; Moskill 0. 1 coil 20mnt. Sheltox 0.1 Mosquito coil; 3-trad 0.25 aerosol; Mostec 0.1 coil; Esbiol 0.3 aerosol.
14.	Ethylbuthylacetylamino- propionate	Insect Repellent 3535
15.	Etofenprox (Ethofenprox)	Vectron 10EC, 10EW, 20WP, 20EC, 30EC, 30ULV, 7.5ULV; ETF 1S; Vectron D 1cream, 2 cream, 3cream, 2 lotion, 3 lotion; Vitreb 10EW; Vectronet; Killpest.
16.	Lambda-Cyhalothrin	ICON 10WP, ICON 2.5CS, ICON 2.5EC
17.	Permethrin	Helmethrin 55EC; Imperator 10ULV, 50EC, 50PH; Map-perrnethrin 10EC, 50EC; Peripel 10EC, 50EC; Coopex Dust 0.5D; 3-Trad 0.25 aerosol; Aqua-Resigen 10-40EW; Rem Olyset, Viper 50EC.
18.	Prallethrin	Etox; Star mosquito coil 0.08% W/W; Jumbo aerosol.
19.	Propoxur	Propoxur 30%; Baygon, Blattanex EC
20.	Pyperonyl Butoxide	Pybuthrin
21.	Rotenon	Prentox, Noxfish, Chemfish, Fortenon
22.	S-bioallethrin	S-bioallethrin, Esbiol 0.3 AE
23.	Tetramethrin	Neo-pynamin, Mosfly 1.05 aerosol; Phtathrin
24.	Transfluthrin	Tranfluthrin, Baygon green aerosol 1.065: Baygon green with disinfectant 1.165 aerosol; Baygon oilspray 0.535 liquid; Baygon yellow aerosol 0,08%; Baygon blue aerosol 0.065

TABLE 2. LIST OF CHEMICALS, INSECTICIDES PERMITTED TO REGISTER FOR RESTRICTED USE IN HYGIENE AND FAMILY

No.	Chemical name	Trade name
01.	Agnique TM MMF	Not permitted of use to control insect in clean water
02.	Bromchlophos	Permitted of use for ULV treatment of housefly out-door only
03.	Fenitrothion	Permitted of use for ULV treatment of housefly and mosquito out-door only
04.	Malathion	Permitted of use for ULV treatment anopheles mosquito only
05.	Pirimiphos -methyl	Permitted of use for control insect and housefly out-door only
06.	Pyriproxyfen	Not permitted of use to control insect in clean water
07.	Temephos	Not permitted of use to control insect in clean water
08.	Trichlofon	Permitted of use for ULV treatment of housefly out-door and housefly bait only

TABLE 3. LIST OF CHEMICALS, INSECTICIDES PROHIBITED TO USE IN HYGIENE AND FAMILY.

No.	Chemical name	Trade name
01.	Aldrin	Aldrex; Aldrite; Aldripoudre; Aldrosol; Altox; Bangald; Drinox; Farmon aldrin; Hortag aldrin dust; Octalene; Rasayaldrin, Solodrine; Supradin
02.	BHC, Lindane	Gamana-BHC; Gamana-CHC; Gamatox; Lindafor; Carba
03.	Chlordane	Belt; Chor kill; Chlotox; Clordisol; Chloroson; Corodane; Fitachloro; Formimata; Formidane; Gold crest c-100; Grovex gx255 chlodane miscible; Kilex lindane; Kypchlor' Octa-klor; Ortane 50; Syndane granular; Syndane 25; Synklor; Temided; Topiclor 20; Veicicol 1068
04.	DDT	Neocid; Pentachlorin; Chlorophenothan
05.	Dieldrin	Diedrox; Dieldrite, Octalox
06.	Dichlovos	DDVP
07.	Heptachlor	Fennotox; Biarbinex; Cupineida
08.	Hexachlorobenzene	Hexachlorobenzene
09.	Isobenzan	Isobenzen
10.	Lead compound	Lead compound
11.	Mirex	Dechlorane
12.	Methamidofos	Dynamit 50SC; Filitox 70SC; master 50EC, 70SC; Monitor 50EC; Isometha 50DD, 60DD; Isosuper 70DD; Tamaron 50EC
13.	Monocrotophos	Apadrin 50SL; Magic 50SL; Nuvacron 40SCW/DD, 50SCW/DD; Thunder 5.5DD
14.	Parathion Ethyl	Alkexon; Othophos; Thiophos
15.	Phosphamidon	Dimecron 50SCW/DD
16.	Strobane	Strobane; 1,1,1 Trichloroethane; Triethane; Methylchlorofonn; Methyltrichloromethane; Chloroethene; Chlorothane; aerothene TT; Inhibistol; Chlorten; Solvent 111.
17.	Toxaphen	Polychlorocamphene, Camphechlor; Camphochlor, Chlorocamphene, Polychlorinated camphenes

TABLE 4. LIST OF CHEMICALS, ANTI-BACTERIUM SUBSTANCES PERMITTED TO REGISTER FOR USE IN HYGIENE AND FAMILY FIELDS.

No.	Chemical name	Trade name
01.	Amoni 4 grade	Ampholysine plus; Bactilysine plus
02.	Centrimide	Hibicet; Microshield A concentrate
03.	Cloramine B	Cloramine B
04.	Cloramine T	Cloramine T
05.	Chlorhexidine Gluconate	Microshield (4%, 2%, handrub; Hibisol; Hibiset; Hibistat; Hibistane; Hibiscurb
06.	Protease	Cidezyme
07.	Chlorine	Nuoc clo
08.	Sodium hypochlorite	Nuoc Javel
09.	Cresyl	Crezyl
10.	Sodium Dichloroisocyanurate	Presept 2.5g, 5g
11.	Calcium hypochlorite	Calcium hypochlorite, Clorua voi
12.	Ethanol	Ethyl alcohol 70-90%
13.	Formaldehyde	Formaldehyde, Formal, Formalin
14.	lode	Con iot 5%- 10%; Microshield PVP-S; Betadin; Povidine
15.	Isopropanol	Isopropyl alcohol 70-90%
16.	Glutaraldehyde	Cidex 145; Cidex 285
17.	Phenol	Phenol 1%