IPM in ASIA - A review of existing projects in the Philippines and Indonesia

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I. INTRODUCTION

Definition of Integrated Pest Management (IPM)

There are many different definitions of Integrated Pest Management (IPM). We reproduce here a standard definition formulated by the Food and Agriculture Organization of the United Nations.

> Integrated Pest Management means a pest management system that, in the context of the associated environment and the population dynamics of the pest species, utilizes all suitable techniques and methods in as compatible a manner as possible and maintains the pest populations at levels below those causing economically unacceptable damage or loss.
>
> *FAO Code of Conduct 1984.*

Study rationale

The IPHYTROP Consortium has worked for many years in the field of crop protection in tropical and sub-tropical regions in the context of sustainable development. It has been particularly active in South-East Asia, working in close collaboration with ESCAP to develop the Database on Pesticides and the Environment, which provides readily accessible information on the uses and effects of pesticides. The database covers over 900 pesticide active ingredients and over 6,000 pesticides products.

IPHYTROP strongly adheres to the principles of IPM and is making every effort to incorporate useful[1] information on IPM into the database. This initiative is fully in accord with the expressed wishes of the national agencies participating in the database project.

Major donor agencies too are increasingly supporting the IPM approach to agricultural problems, as exemplified by the Asian Development Bank in a recent publication entitled "Handbook for Incorporation of Integrated Pest Management in Agricultural Projects" and by the European Commission in a recent "Workshop on A New Approach to Pest Management : Pesticide Management and IPM in Developing Countries". The major donors have also invested large sums in IPM infrastructure, research, development and extension programmes. Donations represent approximately 24 per cent of recent IPM funding in Asia, the remainder being in the form of loans (29 per cent) or national government investment (47 per cent) (FAO personal communication).

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IPM is not a new approach, and substantial work has been undertaken the world over on IPM systems. However, because of the varied, extensive and haphazard nature of the IPM information currently available, it has become difficult to provide a meaningful analysis that could facilitate the full implementation of the system.

Keeping this in mind, IPHYTROP decided to initiate a pilot study of IPM at farmer level in two countries – Indonesia and the Philippines, covering two major crops - rice and vegetables. The choice of these countries and crops for the pilot study was made on the basis of the presence of an established national IPM programme in the general context of large-scale use of pesticides.

The first objective of the study was to undertake a systematic registration of IPM projects and to monitor the progress of their implementation in these two countries, as well as to produce an up-to-date catalogue of IPM activity in the region. This information is expected to serve as an important reference tool and would be incorporated into the Database on Pesticides and the Environment.

The second objective of the study was to analyze the current situation with a view to ascertaining the real extent to which IPM has been adopted and to identify the key factors of adoption at farmer level as a guide to future investment.

A large number of documents were collected through various library facilities in Europe, written requests to different projects and, more importantly, through visits to many of the European and Asian institutions involved in IPM projects.

The analyses was based on the documents collected, and information obtained through interviews with several key personnel.

II. IPM ACTIVITIES AT REGIONAL LEVEL

The major IPM initiatives currently in operation in Asia are being monitored and implemented by the Food and Agriculture Organization of the United Nations (FAO), and the Farmer-centred Agricultural Resource Management Programme (FARM) of the United Nations Development Programme (UNDP). The Regional Network on Pesticides for Asia and the Pacific (RENPAP) an intercountry network which until 1996 fell under the aegis of the FARM programme, is now financed independently and provides information on safe pesticides production and use.

Two major IPM research networks in existence are the IPMNet, based at the International Rice Research Institute (IRRI), in Los Banos, Philippines (Rice), and AVNET (AVRDC/ADB), based in Taiwan Province of China (Vegetables). Both these IPM research networks have no direct involvement in farmer training.

IPM training activities were begun in the region in 1980 with the launch of the FAO Intercountry Programme for the Development of Integrated Pest Control in Rice in South and South-East Asia covering seven countries. Currently in the third phase of operation, this intercountry programme covers thirteen countries, namely : Bangladesh, Cambodia, China, India, Indonesia, Lao People's Democratic Republic, Malaysia, Nepal, Philippines, Republic of Korea, Sri Lanka, Thailand and Viet Nam.

In 1995, FAO launched a similar programme covering vegetables called the FAO Intercountry Programme for the Development and Application of Integrated Pest Management in Vegetable Growing in South and South-East Asia. The project is operative in the four countries of Bangladesh, Lao People's Democratic Republic, Philippines and Viet Nam.

FARM is a wide-ranging programme covering eight countries in Asia, namely : China, India, Indonesia, Nepal, Philippines, Sri Lanka, Thailand and Viet Nam. The IPM component of this programme currently operates in only four countries : India, Indonesia, Philippines and Viet Nam.

RENPAP, covers pesticides use in fifteen countries, namely : Afghanistan, Bangladesh, China, India, Indonesia, Islamic Republic of Iran, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Republic of Korea, Sri Lanka, Thailand and Viet Nam.

IPMNet covers seven countries, namely : China, India, Indonesia, Malaysia, Philippines, Thailand and Viet Nam. A small component of the work is geared to extension (farmer-participatory field trials, surveys).

Details of the regional programmes involving Indonesia and the Philippines are provided in Annex 1.

Table 1 provides a summary of all regional programmes identified.

Table 1. Regional projects identified

Project	Donor	Executing Agency	Location	Crops	Duration	Annual budget (million US$)
FAO Intercountry Programme for the Development of Integrated Pest Control in Rice in South and South-East Asia	Netherlands Arab Gulf Fund Switzerland	FAO	South & South-East ASIA 11 Countries	Rice	1980-1997	2.38
FAO Intercountry Programme for the Development and Application of Integrated Pest Management in Vegetable Growing in South and South-East Asia	Netherlands	FAO	South & South-East ASIA 4 Countries	Vegetables	1995-1998	1.0
Farmer-centred Agricultural Resource Management Programme (FARM) - IPM Component	UNDP	FAO (CABI-IIBC)	South & South-East ASIA 4 Countries	Rice, Cotton, Vegetables	1993-2001	0.135

Source: IPHYTROP from project document data

Note: Total regional investment 1993-[1]1997 approximately US$19 million.

III. IPM ACTIVITIES AT NATIONAL LEVEL

Philippines

Projects identified

Seven principal IPM projects were identified in the Philippines. The largest is the national IPM programme, KASAKALIKASAN, which serves as an umbrella to most but not all IPM activities in the country. Considerable cooperation was evident among the various projects, and contractual linkages among the different institutions for the execution of particular tasks further strengthened this cooperation.

Details of the projects are given in Annex 1.

Table 2. Projects identified in the Philippines

Project	Location	Duration	Annual budget (million US$)
NATIONAL IPM PROGRAMME	Nationwide	1993-1998	3.0
IPM for Highland Vegetables (ADB-IIBC)	CAR region	1994-1996	0.34
Barangay IPM Project	Nueva Ecija	1992-1996	N/A
IPM Collaborative Research Support Programme (IPM - CRSP)	Central Luzon	1993-2000	1.2
Integrated Pest Management (GTZ)	Nationwide	1987-1996	0.88
Sustainable Agriculture Participatory Research and Extension Model (SAPREM)	4 regions	1993-1996	0.02
Rice Specialists Training Courses PHILRICE	Nationwide	1993-1998	N/A

Source: IPHYTROP from project document data.
Note: Total investment 1993-1998 approximately US$22 million.

Table 3. Project documents collected from the Philippines			
Project	Document type	no.	Frequency
NATIONAL IPM PROGRAMME	presentation	1	1993
	report	3	ND, 1995, 1996
	manual	2	ND, 1994
	newsletter	2	quarterly 1995/6
IPM for Highland Vegetables (ADB-IIBC)	report	1	annual 1996
Barangay IPM Project	article	3	1993, 1996, 1996
	field notes	1	1992
IPM Collaborative Research Support Programme (IPM - CRSP)	report	3	annual 1994, 1995, 1996
Integrated Pest Management (GTZ)	report	1	1996
Sustainable Agriculture Participatory Research and Extension Model (SAPREM)	report (NCPC)	1	1995
Rice Specialists Training Courses (PHILRICE)	report	2	1994, 1995
	field guide	2	1995, 1996
	article	1	1996

The objectives and achievements of the identified projects in the Philippines are presented in a tabulated form for ease of reading in table 4.

Table 4. Objectives and achievements of identified projects – Philippines

Project	Objectives to 1996	Achievements reported up to 1996
NATIONAL IPM PROGRAMME	Training of : 53 000 irrigated rice farmers 740 rice trainers 6 000 vegetable farmers 95 vegetable trainers 300 specialists (by 1998)	Trained : 36 024 irrigated rice farmers (68%) 1 143 rice trainers (154%) 3 459 vegetable farmers (58%) 0 vegetable trainers 261 rice/vegetables
IPM for Highland Vegetables (ADB-IIBC)	N/A	DBM populations to 3.33% Insecticide use down 75% Yields maintained
Barangay IPM Project	Evaluation of 40 day rule versus IPM and conventional practice.	Results in December 1996 Reduced pesticides use and increased incomes reported for 40-day and IPM groups.
IPM Collaborative Research Support Programme (IPM - CRSP)	Identify constraints to pest management; Develop, test, and evaluate IPM strategies; Promote training, information exchange, participatory decision-making in pest management, particularly for women, and promote policy and institutional reform.	Participatory appraisal (PA) of IPM issues. Selection of key issues, plants, and pests for programme focus. Initiation of biological studies. Analysis of pesticide/IPM practice. Baseline socio-economic survey. Assessment of pesticide subsidy and taxation levels.
Integrated Pest Management (GTZ)	Establish breeding methods for 2 parasitoids. Conduct training for extension workers and farmers to promote implementation of further alternative control methods.	N/A
Sustainable Agriculture Participatory Research and Extension Model (SAPREM)	Create awareness and impact IPM knowledge on sustainable agricultural development through participatory research activities. Develop farmers', LGU's/NGO's IPM experimental capabilities.	Pesticides use reduced, natural methods introduced. New varieties in use. Incomes improved.
Rice Specialists Training Courses (PHILRICE)	Training of rice specialists and farmers	60 specialists and 263 farmers trained. Technical briefing for 1 575 trainers, technicians and farmers.

Indonesia

IPM in Indonesia is conducted almost exclusively under the national IPM programme. "Externally-funded" programmes are in operation but are closely associated with the national effort.

Projects Identified

Details of the projects are given in Annex 1.

Table 5. Projects identified in Indonesia

Project	Location	Duration	Annual budget (million US$)
NATIONAL IPM PROGRAMME	12 provinces	1993-1998	10.6
Clemson Palawija Project	6 Provinces in East-West-Central Java., West-North-South Sumatra and South Sulawesi	1992 -	N/A
Improved Environmental Management (IEMA)	Provinces of North Sumatra, Lampung and Central Java	1990 - 1996	N/A

Source : IPHYTROP from project document data.
Note: Total investment 1993-1998 approximately US$53 million.

Table 6. Project documents collected from Indonesia

Project	Document type	n□.	frequency
NATIONAL IPM PROGRAMME	presentation	8	1991 (2), 1993, ND (5)
	report	8	1988, 1991, 1993 (5), 1996, ND
	manual	4	1989, ND (3)
Clemson Palawija Project	report	1	1995
Improved Environmental Management (IEMA)	report	3	1994, 1995, 1996

Objectives and Achievements of Identified Projects.

Table 7. Objectives and achievements of identified projects - Indonesia		
Project	Objectives to 1996	Achievements reported to 1996
NATIONAL IPM PROGRAMME	Since 1993, Training of : 468 pest observers 12 000 trainers 490 066 farmers (30 % women trainees). To promote a bottom-up concept of extension service and farmer-participatory approach for implementing the IPM programme. supporting studies and field investigations. Strengthening the regulatory and environmental management of pesticides.	Since 1993, Trained : ? pest observers 6 940 trainers (94/95 only) 345 050 farmers (average 10 % women trainees).
Clemson Palawija Project	Determine the major insect pests of palawija crops, levels of crop losses and impact and role of natural enemies in IPM systems. Develop research programmes, field studies and training activities. Evaluate the economic impact of IPM strategies.	Development and/or improvement of training exercises and field keys. Occasional participation in FFS and TOT programmes. Evaluation of the economic impact of IPM strategies. Survey of natural enemies. Field studies.
Improved Environmental Management (IEMA)	To begin a group learning process among farmers through IPM field schools with a local-specific curriculum. To link these field school groups together in active local networks. To enable local organizations to develop and use participatory learning approaches.	Group learning process among farmers established. FFS groups linked together in active local networks of IPM sites. Project has reached 2 500 farm families (1993-1994), with 69 IPM FFS on 40 project sites. Reduction/elimination of pesticide use in irrigated rice crops. Stable/increased yields. New IPM techniques and IPM for other crops tested and developed.

IV. DISCUSSION

The various IPM training projects in the two countries surveyed could be considered successful on one particular aspect, in that the countries have met the training requirements with regard to the numbers of farmers trained. In view of the scale of the project, this is commendable.

It is however, difficult to ascertain the real impact of the training on the farmers.

Impact of IPM programmes at the local level.

Results published by the national programmes are largely restricted to announcements of the number of farmers trained and the publication of case studies where applicable. As far as it is known, no comprehensive evaluations of the impact of national programmes at farmer level have yet been published.

The IPMNet, based at IRRI in the Philippines, was expected to publish the results of its recent surveys in both Indonesia and the Philippines, (as well as eight other countries) in December 1997.

Project documents from both Indonesia and the Philippines carry the same message : **IPM training encourages reduced use of pesticide, sustained and/or increased crop yields, and higher farmer incomes**. While there is no reason to doubt the authenticity of the claims made for the cases in question, there is a tendency to imply that all IPM initiatives have led to these results. Given the public-relations nature of most of these publications, this is not surprising, but it throws little light on the overall effect of the training.

In the case of the Philippines, articles collected comparing IPM practice on **rice** to conventional practice, support these results, typically reporting a reduction in insecticide applications from around three spray rounds to one to two, an increase in yields from an average 4.9 tons/ha to an average 5.6 tons/ha, a reduction in input costs by an average 35 per cent (excluding monitoring costs) and an increase in incomes by an average 15 per cent for IPM farmers (FAO, 1996; Heong and Escalada, 1995, EDRC-UPLE, 1990; Teng, 1990). The same pattern is reported in the case of **vegetables**. EDRC-UPLB (1990) report that pesticides treatments were reduced but remained numerous with IPM practices. IIBC (1996) report a 75 per cent reduction in pesticides use on cabbages.

Programme surveys conducted after Farmer Field School initiatives in Indonesia report a clear improvement in **rice** farmer practices, yields and incomes (FAO, 1996; Untung, 1996; Sudorwahadi, 1995). Pesticides applications dropped from around two to three to around one to two applications, considerably less banned pesticides were employed (up to 80 per cent less), crop yields remained stable or showed slight improvement, and incomes increased (8 per cent, FAO 1996). Even better results were reported for **vegetable** IPM on cabbages and potatoes (Untung 1996).

Other recent surveys on **rice** farmers, however, failed to reveal significant differences between IPM-trained and untrained farmers except for a reduction in the number of pesticides applications made, and a better identification of pests in trained farmers (Kartaatmadja *et al.*, 1996; Suyanto *et al.*, 1994).

It has been demonstrated that under certain conditions IPM training leads to considerable improvements, but the extent to which IPM can be successfully implemented under the different agronomic, economic and social conditions is still unclear. It is also uncertain to what extent these improvements are due to the application of IPM practices, or simply to the correct application of normal agricultural practices, for example the use of fertilizers or improved varieties. Clarification of these factors would require further field surveys.

Impact of IPM programmes at national level.

In the absence of comprehensive surveys, conclusions about the general impact of the IPM programmes are, at best, approximate. In the surveys reported for Indonesia, for example, the impact of IPM training appears to vary considerably depending on the site chosen and the survey undertaken. No clear picture emerges.

The fact that only a small percentage of rice farmers have been trained, leads to the conclusion that the national pictures are largely those of baseline studies.

Projects view.

The impression conveyed by national publications, however, is that there has been significant changes in farmers practice at the national level, in line with those reported for specific local cases.

In most cases, however, the results are presented in the form of "public-relations" documents that are difficult to analyze objectively. It is regrettable that more-precise scientific assessments are not freely available. Occasionally, conclusions are drawn without apparent justification. For example, the significant drop in pesticide use on rice in Indonesia and the sustained level of crop yields is attributed to the Presidential ban, and the national IPM policy and was interpreted as rice production having been "decoupled" from pesticides use.

While it may well be true that rice production does not require pesticides, the presentation of this idea is not entirely valid, attempting as it does to link simply two parameters (pesticides production and rice production) of a very complex system.

(i), it is not a valid exercise to extrapolate pesticide production figures to pesticides use - factors such as production, imports, exports, buffer stocks, need to be taken into consideration to evaluate availability. Pesticide sales do not indicate pesticides use by crop. Figures by weight do not reflect the number of applications, as the dose can vary by a factor of 100.

There was undoubtedly a fall in pesticide use following the ban, or more precisely following the withdrawal of pesticides subsidies, when there was a dramatic increase in retail prices (RENPAP data, personal communication).

(ii), yield (production) does not depend simply on the degree of pest damage and the choice of crop protection measures. It depends on a number of factors including seed variety, fertilizer use (which has risen in line with production increases -Kenmore, 1991), water management, etc. In addition, the areas planted to crops have increased from nine million hectares in 1980 to 10.5 million hectares in 1990 (FAO data - internet).

Baseline Studies.

In Indonesia, the most striking aspect of the baseline studies was the revelation that the most popular insecticides used by farmers were those officially banned or not recommended for use on rice.

A total of 57 pesticide formulations had been banned in 1986 (Republik Indonesia, 1986) for use on rice, in response to persistent pest problems notably Brown Planthopper :

Nilaparvata lugens, Stal. Hemiptera: Delphacidae. The decree, however, allowed the banned pesticides to be used on secondary crops, which has meant their continued availability, and use by the farmers.

In Java, the most popular pesticides among surveyed farmers, for example (SUYANTO *et al.*, 1994), were Dursban (chlorpyriphos), Thiodan (endosulfan), Azodrin (monocrotophos), Diazinon (diazinon) and Elsan (phenthoate). Surveys conducted by the National Programme (Indonesian National IPM Programme, 1992) confirm that 40 per cent of the insecticides used on rice were banned broad spectrum organophosphates.

The Minister of Agriculture of Indonesia, in addressing the GIFAP conference held at Jakarta in October 1995, admitted that, nearly ten years after the announcement of the Presidential Decree No. 3/1986, perhaps as much as 50 per cent of the chemicals being applied to rice, comprised banned formulations under the Decree, and that a similar situation was apparent on other crops such as vegetables and plantation crops. Excessive amounts of chemicals were also being applied by untrained and unprotected farmers (FAO, 1996).

Additionally, the general practice of spraying was often undertaken with scant respect for agronomic and health guidelines (non-rational spraying, uncontrolled doses, cocktails of chemicals, absence of protective clothing, etc.)(Heong, 1996 ; FAO, 1995 Ref.57; Rola and Pingali, 1993).

Suyanto *et al.* (1994) report that most farmers surveyed had never heard of the pesticides ban (including 53 per cent of FFS alumni!) and of those that had 66 (FFS) to 68 (non-FFS) per cent of farmers could not identify a single banned product. Furthermore, those that were aware of the ban still prefered to use the banned products because they perceived these as being more potent.

The farmers surveyed sprayed two to three times per crop on average and a majority sprayed during the early stages (60-65 per cent within 30 days after transplanting).

A similar situation was found in the Philippines :

Various surveys (Heong, Escalada and Vo Mai, 1994 ; Rola and Widawsky, 1996 ; Lazaro, Escalada and Heong (nd), Heong, 1993) indicated that of the pesticides used on rice, 90 per cent were insecticides (herbicides and fungicides about 4 per cent each). The most popular insecticides were endosulfan, methyl parathion, cypermethrin, monocrotophos and chlorpyrifos. Of the insecticides used, 35-55 per cent were organophosphorus, 20-25 per cent organochlorines, 20-35 per cent pyrethrins and five per cent carbamates, with approximately 15 per cent WHO Class Ia (Extremely Hazardous), 20 per cent Class Ib (Highly Hazardous) and 60 per cent Class II (Moderately Hazardous).

The farmers surveyed sprayed three times per crop on average (most between two and five) and a majority sprayed during the early stages (70 per cent within 30 days after transplanting).

The baseline data were collected by the authors from a small number of regions. Although regional differences in conditions were noted, the general practices were remarkably similar, which may indicate the influence of previous generalized recommendations.

Observations

During the analysis of documents and field visits, several areas of interest concerning the implementation of IPM were highlighted. It is beyond the scope of this report to consider the wider implications or to evaluate all possible factors that may influence implementation of IPM. A brief summary of some of the points raised are presented here.

a. Farmer practice :

Very often farmers do not treat their fields according to a rational assessment of pest populations/damage. They may treat their fields in response to their feelings of security in the face of a perceived threat, because they feel they need to treat the field to preserve the crop yield and consequently their livelihood (Beguin, 1996 ; Kartaatmadja *et al.*, 1996 ; Heong, 1996 ; Escalada and Heong, 1993).

Pest control may be seen as a small part of a farmer's concern, representing a small percentage of costs, and therefore not a priority. Unwillingness or inability to spend the time (or money) needed for monitoring activities was often given as a reason for treating "blindly".

Improper practices can be the result of simple logic - for example, some Filipino farmers reported using a non-resistant strain of rice, which they were obliged to treat, instead of using an available resistant strain, because they considered the flavour better. Mixing cocktails of pesticides in a single application can save time and labour. Cocktails are also often perceived as being more potent in their effects. It is perhaps important to consider the considerable reassurance that can result from observation of the dramatic effectiveness of the more toxic insecticides.

Vegetable growing differs from rice in this respect. The insect threat is greater since many vegetables are introduced species and there is less natural control. Input costs are high (up to 50 per cent of overall costs), but there is a large market price differential between blemished and unblemished vegetables, and the risk of not treating these vegetables is consequently much greater. Farmers tend to treat vegetables often, even after the IPM training (EDRC-UPLB, 1990). Indeed, some IPM farmers report (personal communication Barangay farmers, Philippines) that they reduce their treatments on rice to keep their pesticides for the more profitable vegetable crop.

IPM has been applied successfully to cabbage (IIBC, 1996) using biological control, but for other vegetables no parasitoids are available and the IPM approach relies on bacterial insecticides (Bt), resistant varieties and agronomic techniques.

Farmer crop protection practice is not necessarily rational

b. Training :

The aspect of continued training is important. The time spent at the field school is around 50 hours for a season-long training, a very short space of time to appreciate complex ecosystem management and to change long-standing habits and perceptions. Moreover, improved knowledge does not automatically imply improved practice. Left to themselves, trained farmers can quickly revert to their old practices, particularly in the face of a new outbreak of a known pest (White stemborer, Untung, 1996) or appearance of a new pest, *Liriomyza*, (Sudarwohadi personal communication). The role of farmers cooperatives, alumni groups and indeed the community is crucial to stimulating a permanent learning situation. Follow-up FFS are a feature of the Indonesian National Programme (FAO, 1996).

Continuing professional training would also seem important to the IPM specialists who are expected to advise experienced farmers after only a year's training.

Post-field activities are being developed by FAO and the Indonesian national programme to ensure continuing education for all trained personnel, observers, farmers and extension workers (personal communication FAO E. Java). There is increased involvement of extension workers in IPM, which implies retraining to a certain extent since the priority in Indonesia has been to maintain production levels and not necessarily to introduce IPM. With this aim, the Agricultural Extension Academics are being developed.

Reinforcement of training is important

c. Selection for training :

Selection of farmers is made on the basis of certain criteria (owner/tenant, willingness to undergo full training and willingness to teach others) designed to optimize the results of the training. Selection may also tend to favour certain groups, such as the better educated or younger farmers (van de Fliert, 1993), who would be expected to be more receptive to training and more likely to adopt and promote the lessons learned. There will come a point, however, where the training must be extended to the farmers who do not meet these criteria. This will have implications on the expected rate of diffusion of IPM concepts which, particularly for Indonesia, is largely reliant on farmer-to-farmer extension. This year, for example, 40 per cent of farmers trained in Indonesia will be trained by FFS alumni (FAO, 1996). It must be assumed that the extension of the training programme will slow down as these farmers are introduced into the system.

Farmer-to-farmer training is likely to slow down with time

d. Curriculum development :

The training curricula are being developed continuously as new information and experience is acquired. A particular trend is the change towards learning fields (real situation learning) and farmer participatory research. The Philippine National Programme is introducing training modules in nutrient, water and variety management, and post-harvest treatment (FAO, 1996).

The present curricula place particular emphasis on insect management with less attention paid to other major threats (for example, rats, tungro, blights). Insecticides are not adequately considered. (KARTAATMADJA *et al.*, 1996). In an attempt to dispel the (linguistic) links with medicines, they are presented as poisons that should be avoided whenever possible. Whilst it is important that the farmers are fully aware of the hazards of these products, the fact remains that farmers, even after IPM training, continue to use them. In the absence of proper directions from their training they are likely to continue using them badly.

It should also be said that the widespread introduction of rational pesticide use implies rational pesticide supply - the pesticide industry must also adopt a responsible attitude.

Training curricula requires continuous development

e. Technical back-up :

Important practical support to IPM implementation is not always available to the farmers : for example certified seeds, varieties, soil analyses, fertilizers, water supply.

Technical back-up is not always available

f. Evaluations / research orientation :

The need to go beyond the classical evaluation of yields, costs and incomes is now fully recognised and fuller analysis of the farmers' situation is demanded.

FAO, for example, has recently commissioned SEARCA in the Philippines to undertake a study of the socio-economic aspects of farmer decision-making among IPM FFS graduates (Source *Philrice newsletter* : results expected in December 1996).

The Philippines (NCPC, 1995) are pioneering community participatory research, with entire villages involved in the project.

In acknowledgement of the fact that isolated IPM will not work, if farmers all around continue usual practices, the Indonesian national programme is planning field school projects which will involve all farmers (about 1 000) over a 500 hectare site, to engender cooperation and common interest.

Socio-economic environment is important

g. Farmer to farmer communication :

This is perceived as an important factor in the diffusion of the IPM concept to the majority of farmers and field schools are perceived to engender a strong and lasting collaborative spirit among the participants. Individual farmers, however, tend to communicate within their immediate circle (Escalada and Heong, 1992), and spontaneous cooperation with other farmers is not always evident (Kartaatmadja *et al.*, 1996). Moreover, farmers, who, for whatever reason, decide not to continue their training or not to adopt what they have learned will oppose the "spill-over" effect of training to other farmers. No figures are published of the drop-out rates from FFS, but most unofficial estimates are around 20 per cent (personal communications : range quoted from 10 per cent to 75 per cent in one extreme case (Beguin 1996)). Not all these farmers will have abandoned IPM because of disaffection with the concept, but the influence of those who were disaffected may well be significant. Again, the community has an important role to play here.

Farmer-to-farmer communication can also be limited and/or counter-productive

h. Farmers' groups :

Alumni groups and farmers cooperatives (Philippines), as stated above, are important to the reinforcement and dissemination of IPM concepts. They are not, however, without their own problems. Alumni groups are, by definition, restricted in number to the number of FFS held, and they require considerable farmer investment and funding to survive. This will depend to a large extent on the support of the local authorities.

Farmers cooperatives are more independent, but so also are retailers of inputs, which could create conflict of interest over the use of pesticides.

The effect of farmers' groups can be variable

i. Women's participation :

Many more women attend FFS in the Philippines, (25 per cent or more) than in Indonesia (average of 10 per cent). There is a certain cultural impediment to women's participation in Indonesia, which the national programme is trying hard to overcome. In both countries, their important role in the farm and in any consequent adoption of IPM is officially recognized and their presence is encouraged. Besides having a direct interest in spraying and farm economics (particularly in the Philippines), women are seen as crucial to the spread of IPM concepts within their communities.

The role of women is important

j. NGOs :

Non-governmental organizations (NGOs) already play an important role in the implementation of IPM, usually as a component of their work to enable sustainable development. It is generally considered that their role in farmer training will increase in the future.

NGO participation will increase

k. Information :

Information to the farmers is lacking. A vast majority of farmers (95+per cent) have never undergone IPM training of any sort. Even those who have been trained can be sadly uninformed as is demonstrated by the case of 53 per cent of FFS alumni in one survey in Indonesia, being unaware of the then eight-year old ban on certain pesticides for rice (Suyanto *et al.*, 1994).

There is a certain rivalry among the different schools of thought over the dissemination of information. The classic "top-down" approach, whereby the fruits of research are passed down to the farmers has been abandoned by the FFS system, which prefers farmer-based research and communication. This is undoubtedly a more educational and ultimately sustainable approach, but has the disadvantage of being a long and expensive process. Against this, there is the heuristic approach, pioneered by IRRI, whereby a simple rule of thumb is broadly transmitted with the aim of introducing one simple practice, in IRRI's case, to not spray within the first 40 days of rice crops. This, as FFS advocates point out, is not IPM, but it is surely complementary. It has the advantage of being easily transmitted and rapidly assimilated by the farmers (MEDRANO personal communication). It is a technique much used in Europe for specific cases.

The regional research network, IPMNet, is dedicating the next phase of its operations to the investigation of how IPM ideas are best communicated. An information network is being planned within the Philippine national programme (FAO, 1996).

Dissemination of information is crucial

l. Decentralization :

In future, the national programmes plan to become more decentralized, with local authorities and organizations taking more financial and operational responsibility. For adequate extension of IPM practices, it is important that experience and information spread is not just within the communities but between different communities. To date, the information passes through the central programme structures, but as the programmes decentralize, this aspect will become more important. There is a danger here that political and/or community rivalry will hinder this process.

Decentralization will increase

m. Legislation :

The Indonesian Government has recently passed legislation that will completely outlaw 28 insecticide products (Republik Indonesia, 1996). This generally is considered a good initiative as it will end the use of some particularly toxic products, although there is concern that there are insufficient alternatives available, and hence the risk phenomena of pest resurgence and/or resistance.

New legislation is in force

n. Economics :

Ultimately, the best persuasion for the farmers to adopt IPM will be the assurance of financial reward. The lucrative export market for vegetables is, in particular, exerting pressure on farmers to reduce excessive pesticide use with stringent residues standards.

The introduction, with the support of agribusiness, of an official "IPM / less pesticides" label for vegetables is another initiative presently under consideration by the Government of Indonesia.

Economic incentives are important

V. CONCLUSION

Considerable progress has been made in Asia, since the launch of IPM initiatives. National programmes have steadily evolved, backed up by national and international research.

IPM has been shown to be a safe and positive factor in the attainment of sustainable agriculture. As rice-growing has become better understood, attention has turned to vegetables and other crops where, in general, IPM methods are less-developed.

IPM training has, in many cases, resulted in considerable improvement in farmers practice. It remains unclear, however, to what extent the improvement is due to the application of IPM or to the correct application of standard agricultural practices. Since IPM, as a holistic approach, would perhaps, be better incorporated into a global concept of integrated crop management, this is possibly a purely academic concern. It does, however, pose the question of whether the IPM training should abandon its pest-oriented approach for a more comprehensive approach. Indeed, the national programmes are already moving in this direction, with the broadening of their syllabuses and the consideration of farmers problems in their own fields. Historically, IPM has been the domain of the entomologists, but other disciplines are being progressively introduced into the field, which could only broaden the approach.

The various IPM programmes deserve considerable credit for their efforts so far, but the fact remains that, after 10 or more years' activity, only a small percentage of farmers have been trained and the expected "critical mass" of trained farmers is not yet in sight. The FFS system has made considerable inroads, but it is a relatively slow and expensive method and cannot be expected to reach sufficient numbers of farmers in a reasonable time. The requirement now is to build on the work done by spreading the message to as large a number as possible and as quickly as possible, using all available means.

In consideration of the factors influencing the implementation of IPM by the farmers, the following would appear to be of particular importance :

Farmer environment

The site-specificity of IPM solutions and the difficulties involved in taking a general approach, imply the need for a local focus. The farmer's environment has an important bearing on his attitude and practice. A community-based approach to training is important for the appreciation of local problems, the dissemination and reinforcement of IPM concepts, and, not least, the encouragement of the farmer.

Economics

Farmers' decisions are linked ultimately to protecting their livelihoods and they need to be convinced of a real benefit before risking fundamental changes in their practices. The uncertainty and complexity of market forces will not encourage the risk of change. There is need perhaps for more governmental (or international) economic intervention.

Information

Most farmers have not had access to training and basic information is lacking. Full use should be made of all media (FFS, extension services, TV, radio, press, communities, etc.) to disseminate and reinforce IPM/ICM concepts and to provide specific information for decision-making. The heuristic approach compensates its simplistic message with the ability to touch large numbers and should be given further consideration.

The situation is complex and full understanding is beyond the capacity of any single agency or concept. A concerted effort from all involved - donors, government, NGOs, researchers, extension services, pesticides industry, agribusiness - is a prerequisite to further progress.

The continuing use of pesticides, even within the IPM programmes, requires immediate attention from all concerned to ensure that, as far as possible, they are used correctly.

The industry should also be expected to evaluate the effects of its products (current and new) in the context of IPM practice, in order to quantify their "IPM-compatibility". Indeed, some companies already perform some such tests as part of registration trials. In parallel, donors and governments should be urged to develop corresponding new protocols for the testing and registration of products.