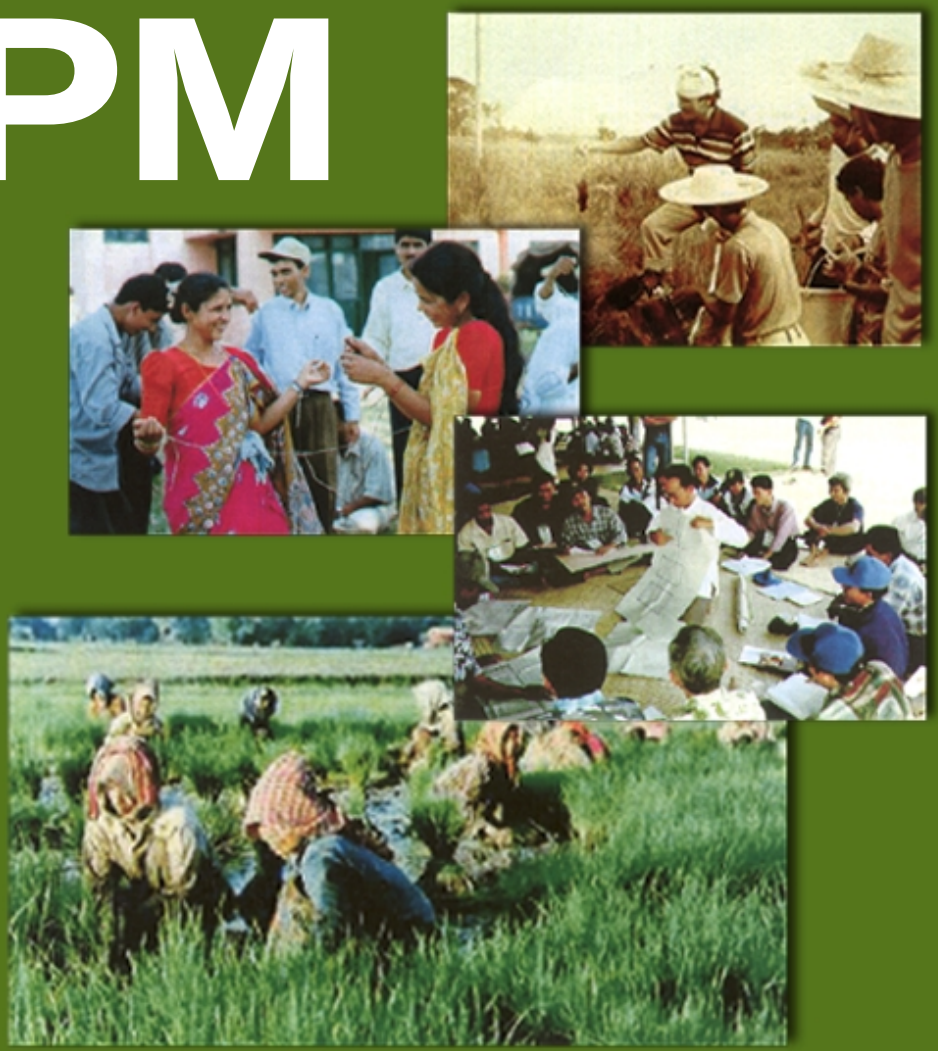
Ten years of IPM training in Asia

From farmer field school to community IPM



Food and Agriculture Organization of the United Nations
Regional Office for Asia and the Pacific

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From farmer field school to community IPM
Ten years of IPM training in Asia

Editors: John Pontius, Russell Dilts, Andrew Bartlett

Bangkok, July 2002



FAO Community IPM Programme



Food and Agriculture Organization of the United Nations
Regional Office for Asia and the Pacific

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PREFACE

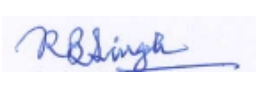
Twenty years ago, integrated pest management (IPM) was known only to a few plantation cash crop managers and academics as a new pest control technology. At present, it is a household word in the vocabulary of millions of smallholder farmers of staple foods, mainly in Asia, and a very basic concept in understanding their environment and in better managing their crops.

How could such a turnabout happen? The answer to this question is to be found in an effective combination of new ecological insights and innovative approaches, whose combined strategy has been adopted into farmers' perceptions and cropping practices. The cutting edge for this development was provided by participatory IPM training according to the farmer field school model. This model, now applied worldwide, was conceived and brought to fruition in the paddy fields of Southeast Asia in the context of the FAO intercountry IPM programme for rice in Asia.

Although the farsighted pioneers of the IPM programme wrote history, the actual account of their achievements still remained to be put on paper. The issuance of this FAO publication fills this gap. The farmer field schools and ensuing community IPM strategies have now come of age and express themselves by ramifications into new, sometimes unexpected, directions, like the recent emergence in Cambodia of 'farmer life schools', which focus on mobilizing and empowering rural communities in their struggle against HIV/AIDS. This innovative approach was inspired by the IPM farmer field schools. For such efforts to be successful, a solid grasp of community-based rural development and the role of farmer field schools is needed. Careful reading of this publication will provide the required knowledge.

Thanks to substantial financial contributions during the last two decades by the governments of Australia, Norway and the Netherlands, it has been possible to achieve the successful development of the IPM programme in Asia.

The active and long engagement of the three editors of this publication in the evolution of the IPM programme in Asia is reflected in the accuracy and great detail of the text and will, it is hoped, inspire a large readership ranging from field workers to policymakers. The FAO regional office in Bangkok is all the more proud to have been associated with this publication. I take this opportunity to express my most sincere appreciation to all FAO staff, from headquarters, the regional office and the field, who contributed to the production of this important publication. I am confident that it will be widely consulted for the benefit of present and future generations of farmers and the environment at large.



R.B. Singh
Assistant Director-General
and FAO Regional Representative for Asia and the Pacific

ACKNOWLEDGEMENTS

This publication is an attempt to capture a part of the story of IPM in Asia. No single volume can cover the entire length and breadth of this movement as it has progressed over the last two decades. We hope that others will continue to document and write in order to expand our knowledge and understanding of this important work while filling the many gaps left by this brief piece.

This volume was put together with the help of many. We are indebted to them all. In particular we owe the debt of inspiration to:

- Lou Setti, who set standards for love, dedication and leadership to which we all aspire. He continues to guide us.
- Niels Roling, who helped us to understand what we are doing and why we should continue to do it.

A mere list of the key persons and organizations involved in IPM in Asia over the last 10 years would comprise a book much longer than the current offering. Let us state that we have all benefited greatly from the steady long-term support of member governments and partner agencies across the region, and in particular the Food and Agriculture Organization of the United Nations for making it possible to bring people-centred, ecologically informed educational programmes to millions of farmers in the Asian region.

Among the direct contributors to this monograph were Agus Susianto, Alifah Sri Lestari, Jonathan Pincus, Kuat Van Khanh, Nguyen Tuan Loc, Le Minh Dung, Bachriandi, Rizalihadi, Udin Muslim, Haji Fatchurrohman, Peter Ooi, Muhamad Atek Zambani, Abdul Rohman, Triyanto Purnama Adi, Didik Purwadi, William Settle, Soedijanto Padmodiharjo, Paiman, Nugroho Wienarto, Mansour Fakih, Sunani, Sri Yuliantiningsih, and Romini.

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1. TEN YEARS OF IPM FIELD SCHOOLS

"Before IPM field schools we planted our rice and prayed that we might have a good harvest. Now we know that we can actually control many of the factors which influence our harvests."

An IPM farmer from Thai Binh province, Viet Nam

Over two million rice farmers in Asia and Southeast Asia participated in rice integrated pest management (IPM) farmer field schools (FFS) between early 1990, when the first FFS was conducted in Indonesia, and the end of 1999. During those 10 years, farmers, agriculture extension field workers, plant protection field workers and NGO field workers learned how to facilitate the FFS approach and conducted over 75 000 FFSs. Farmers who have participated in field schools have reduced their use of pesticides, improved their use of inputs such as water and fertilizer, realized enhanced yields and obtained increased incomes. From this beginning they moved into other crops and wider ranging activities related to their agro-ecosystems. IPM alumni are in the forefront of establishing sustainable agricultural systems in their villages and promoting food security for themselves, their children, and generations to come.

The IPM farmer field school has become a model approach for farmer education in Asia and many parts of Africa and Latin America. The approach has been used with a wide range of crops including cotton, tea, coffee, cacao, pepper, vegetables, small grains, and legumes. The FFS has proven effective at involving a wide range of people in the learning process, from school kids to the handicapped. The goal of this book is to set forth the educational and ecological principles underlying the IPM FFS, explore the strategy known as community IPM and discuss issues related to the community IPM project or programme implementation. The book ends with a brief look at future possible directions and how community IPM can address sustainable livelihood issues.

1.1 Empowerment of farmers



IPM field schools do not focus on insects alone, they provide farmers an opportunity to learn and achieve greater control over the conditions that they face every day in their fields. Farmers are thus empowered by field schools. Empowerment is a fundamental element in a civil society and it is the principle that has influenced the design and implementation of farmer field schools.

Why empowerment? Farmers live and work in a world where they face a variety of contending forces including those related to technology, politics, markets and society. These forces can marginalize farmers if they are not proactive. Farmers need to be able to make their voice heard now as sustainable ecological agriculture approaches a critical crossroads. Contending technologies are presented to farmers. Most of these technologies are not developed with the goal of improved farmer welfare; the goal is increased aggregate national production and profits for those who promulgate the technologies. Farmers need to be able to select technologies that benefit them and contribute to overall food production. They must also be able to transform and evolve any

chosen technology to fit the specific ecological and economic conditions confronted by them. Agriculture is often the focus of political activity. Whether at the national or village level there is frequent debate over issues that affect the livelihood of farmers. The rights of farmers, access to land and water, decisions on cropping patterns, subsidies, and price supports are a few examples of the myriad issues that affect farmers. Those who would make decisions regarding these issues, although they might claim otherwise, do not always recognize or understand the interests of farmers. Farmers need to be able to understand the issues affecting their livelihood and contend in the debates these issues generate to guarantee that their interests are served.

Farmers, in many societies, are at the lowest rung of the food production ladder. Marketing systems generally do not operate in their favour. Farmers are placed in the position of being price takers. There are strategies that farmers can use to change this situation. Farmers need to be able to analyse, understand and maximize their leverage regarding market factors.



These Farmer have organized a cooperative seedling bed. The narrow plots allow farmers to collect stemborer egg messes.

Besides being at the lowest rung of the production ladder, farmers, while often romanticized, are just as often referred to pejoratively. Commonly used terms include "peasants", "villagers" or "farming community". These terms tend to objectify and deny the individuality of farmers. The Green Revolution reinforced this by creating extension systems based on social engineering that regarded farmers as another production factor, much like fertilizer. Farmers were often deprived of the right to make decisions regarding their livelihood by heavily centralized production-oriented command systems serving national production targets, not farmers' interests. These systems frequently made mistakes that endangered food production. Educated farmers can make more effective decisions regarding food production at the field level than can centralized bureaucracies, while also proposing and promoting policies that reflect local reality.

The IPM movement, a programme strategy based on empowerment, has helped farmers to move from the margin into a more powerful position vis-à-vis these technical, political, market and social forces. FFS participants:

- Learn and can apply ecological principles to better manage their crops within their own specific agro-ecosystem;
- Master and apply critical thinking skills at both farm and community levels;
- Acquire leadership skills that they apply in organizing collaborative approaches to local ecosystem management;
- Master applied discovery approaches that allow them to gather, systematize and expand local knowledge.

The FFS approach fosters this learning with the intention that graduates will increase their control over technologies, markets, relevant agricultural policies and their agro-ecosystems. IPM activities assure that more farmers are making better decisions at the field level. At the inception of IPM training activities in Indonesia in 1989 there was a frank discussion about the values inherent in the design of the IPM farmer field school. The idea that FFS farmers can and should empower themselves because of their

IPM FFS experience became the acknowledged motivating force among programme developers and field staff. Across Asia, ten years later, farmer empowerment continues to be the foundation of IPM activities.

1.2 Farmers and what they have to say

The following are two brief cases involving IPM alumni from Indonesia and Viet Nam. The farmers present their comments on what they learned in field schools, what they are doing because of what they learned, and how their lives have changed. The first case is an interview of two women who farm small plots in Indonesia (Agus Susianto et al. 1998, p. 82)

Box 1.1 A tale of two farmers



Romini

This is the story of two women who are neighbours in the village of Sempor Lor, Probalinggo district, Central Java, Indonesia. One of the women, Romini, participated in a field school, the other, Sunani, did not. Romini, 45 years old with four children, farms her family's rice fields. Her husband works as a trishaw driver; his farming activities are limited to field preparation and harvesting. She takes care of all of the other farming activities. She has been growing rice since she was a child.

"My husband's income is not enough for us to live on. The area I farm is only 750 m^2. I have been interested in finding a way to farm effectively so that my yields might be as high as possible. I was happy when I was asked to be one of ten women to participate in a field school in the rainy season of 1995-96.

"Before I took part in the field school I farmed the way my parents had taught me. I used urea and TSP and applied the insecticide Diazinon three times a season. I usually made applications just after transplanting to control brown planthoppers. Later, when rice seed bugs would appear, I sprayed again. Finally, at the point just before harvest, I would put on a final application to ensure against damage before harvest. I averaged between 200 and 300 kg of rice per season on my small plot.

"After attending the field school I changed my approach to farming. I learned that by applying insecticides I was increasing my costs as well as increasing my risks. Insecticides kill both pests and natural enemies. If I don't spray, the natural enemies do my pest control work for me. The field school also helped me to learn about balanced fertilization and planting distances. I first started to apply IPM principles without telling anybody. My yield for the first season went up to 350 kg. Since then I have averaged around 400 kg.

"I now meet with women's groups and tell them about IPM principles and the dangers of insecticides. I tell the farmers in the fields around me to watch what I am doing and learn from me and not to stick with outmoded ways. No one near me is applying any insecticides."

Sunani and her husband, Sumarto, have two children. They live next door to Romini. Sumarto works as labourer in construction and is available for farm work only during field preparation and harvesting activities. Sunani takes care of all of the rest of the fieldwork.



Sunani

"My rice field is about 1000 m^2. My yields in the past averaged from 400 to 500 kg per season. What I know about farming I have learned from my parents, the extension worker and my neighbours. Many of my neighbours are well educated and have learned a lot about farming. I had a chance to follow a field school, but my mother was sick and I couldn't. Romini has told me much about IPM.

"For example, I am now using urea tablets, SP 36 and KCL. KCL is something I never used in the past. I am planting at a distance of 25 cm x 25 cm so that I can get more productive tillers. I learned that insecticides are dangerous and a waste of money and I no longer use them. I am also planting the same varieties as my neighbours and not using pesticides. Romini has taught me how to do field observations to look for pests and natural enemies.

"Since I have begun applying IPM principles my yields have gone up. I am now averaging between 600 and 700 kg from my plot. I am very happy because of this."

The following is an interview with a group of women farmers from Dong Phi village in Ha Tay province in Viet Nam (Pontius 1999). The respondents, a group of six women, have all completed IPM field schools. These alumnae discussed what they were doing differently because of their participation in IPM field schools.

Box 1.2 Changes



Why did you attend field schools rather than your husbands?

"Our husbands work in construction and as day labourers outside of the village; this brings in cash to our households and is important. Because they are often away from home we take on the responsibility for farming. Our husbands usually are present for land preparation and harvesting, but we make the day-to-day decisions regarding the management of our fields."

Did you teach them about IPM? And if yes, how?

"Our husbands needed to know about IPM. This was all new information and we learned new ways of doing things. If we were to change our ways, our husbands had to know what we were doing and why."

"I would take my husband out to the field and show him different insects and talk to him about their functions."

"I tried out different fertilizer practices and showed my husband what I was doing and then we weighed the results from each of our different trials."

"Yes, I had to make sure my husband wouldn't be afraid because I wasn't applying pesticides. This meant I had to take him into the field and show him how the ecosystem worked."

"Because I was buying more fertilizer my husband wanted to know what I was doing. So I talked to him about fertilizer and balanced fertilization. Then after harvest, the first season after I attended the field school, my husband could see the results of better fertilization. Our yield was fifty percent higher than before."

In general how have your yields been since attending field schools? Why do you think that this is true?

"I think all of our yields have gone up." (All the women nod in agreement.) "Perhaps each of us has experienced different levels of increase in our harvests, but we have all seen better harvests since attending field schools."

What are you doing differently? Why have your yields gone up?

"I am doing things that I learned about in the field school. I use a different variety of rice. I am planting fewer plants per hill and the hills are farther apart. This allows each plant to produce more productive tillers with more rice grains. I am using less urea but more phosphorus and potassium."

"I think that we are also paying more attention to using water effectively."

Tell me about other ways in which having attended a field school has changed how you live.

"I think we women work better together as a group. Our discussions are more open and we make sure everyone of us gets to say what she is seeing in the field and gives her opinion about her observations."

"I think my husband and I are a little more careful in our decision making, more analytical. For example, my husband thinks we need a motorcycle. I agree that it would be useful. But rather than buying the motorcycle right away, we have analysed how we would benefit because of a motorcycle and what we would have to give up because of buying a motorcycle. Also we are examining how to purchase the motorcycle, credit or cash."

"I go to sleep easier at night. Before my husband and I didn't know much about what was going on in our field. Now we make better, more informed decisions. We know about different factors in the field such as pests, natural enemies, fertilization, and we know how to care for our crop. We can actually take control of many things to ensure better yields. This makes me sleep easier."

1.3 Outsiders' views on IPM field schools

Writers and researchers with backgrounds in non-formal, adult or extension education have observed and written about the field school approach. The following is a brief collection of their comments on field schools.

Box 1.3 The basis of training

"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. Group dynamic exercises are an important part of this approach.

"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."

Roling and van de Fliert in *Facilitating sustainable agriculture*

Box 1.4 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. *Cooperative 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 characterized 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. Pretty, *Regenerating agriculture*

Box 1.5 Economic benefit and enhanced decision-making capacity

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 [the Indonesian national IPM programme which was responsible for the IPM training project employing field schools]. Over and above, FFSs have two main results: farmers regain the competence to make rational 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 public.

Farmers are owners of the programme

The enthusiasm of FFS graduates in general and of farmer trainers in particular indicates that they have become the driving force and the owners of the programme. This is for example expressed in the steps to found a farmer trainers' association or in the remark of a senior trainer: it's their - the farmers' - programme, not ours.'

Increased local funding

The emergence of stable interest groups as a consequence of FFSs and the increasing readiness of local authorities to contribute to the funding of FFSs are indicators that the introduction of IPM has become sustainable and will continue even after the termination of foreign funding.

Peter Schmidt, Jan Stiefel, Maja Hurlimann, *Extension of complex issues*

1.4 Community IPM and the future

The central lesson emerging from IPM farmer field school implementation over the past decade is that the complex ecological and social context of IPM argues for a sustained effort combining elements of technological development, adult education, local organization, alliance building, and advocacy. Scientific excellence and adherence to ecological principles provide a strong technical entry point for IPM development. The application of participatory, non-formal adult education methods represents a real advance over models based on information dissemination and the delivery of simple messages. But this is not enough. The long-term development of a sustainable small-scale agriculture also requires strong farmer groups with linkages among them and with the wider community.

From this perspective, IPM farmer field schools are not an end in themselves; they are a starting point for the development of a sustainable agricultural system in a given locality. The FFS provides farmers with an initial experience in experimentation based on ecological principles, participatory training and non-formal education methods. Once this foundation has been laid, farmers are better able to act on their own and to sharpen their observation, research and communication skills. The FFS sets in motion a longer-term process, in which opportunities are created for local leadership to emerge and for new, locally devised strategies to be tested. This longer-term process has been identified as community IPM.

Community IPM is a strategic approach whose goal is to institutionalize IPM at the community level. Like the sustainable livelihood approaches that have been gaining attention, community IPM assumes that all rural people, even the poor, have assets. In this analysis assets can be described in terms of five categories of capital: natural, human, social, physical and financial. Community IPM activities are intended to:

- Create and strengthen social capital in rural communities by supporting farmers' own efforts to build associations and networks that give them a voice and an improved means of helping each other.
- Create and strengthen human capital in rural communities by supporting farmers' own efforts to train other farmers using content and methods that promote critical thinking and improved decision-making.
- Preserve and restore natural capital in rural communities by supporting farmers' efforts to carry out studies and implement farming practices (as individuals and as groups) that take account of ecological processes.
- Lay a foundation for future improvement in the financial and physical capital of rural communities by creating and strengthening structures and processes which will expedite the provision and management of credit and the construction and management of facilities such as village laboratories and training centres.

Strategies based on this analysis are helping farmers across Asia to create their own approaches to the further development and institutionalization of IPM in their villages.

2. A BRIEF LOOK AT THE HISTORICAL CONTEXT OF THE FFS

The historical context out of which the FFS approach emerged was dominated by the agricultural projects of the Green Revolution. The approaches to agricultural development that were used in these projects were heavily centralized. At their best, the social engineering techniques of the Green Revolution were dehumanizing. The final scenes of the Green Revolution were played out to the accompaniment of a warning note sounded in the Philippines. Researchers found that the projected demand for rice from increasing regional populations would eventually overtake surpluses generated through Green Revolution projects in Asia. They also found that a significant number of farmers were outperforming research stations. This flew in the face of the opinions of many experts who viewed farmers as the main problem in agriculture production instead of recognizing them as potential problem solvers.

If extension was having problems, plant protection experts were able to create their own problems through the 1970s and 1980s by advocating the increased use of subsidized, broad-spectrum insecticides. Massive insect outbreaks were occurring that demanded a rethinking of crop protection approaches. The IPM FFS was developed in response to these conditions. The following is a brief review of the historical backdrop to the early development and spread of the FFS.

2.1 Small farmers in Asia and the Green Revolution



Almost one third of the world's population consists of Asian farming households. Across the region, hundreds of millions of families make at least part of their living by tilling the soil. Among the developing countries in the region, the proportion of the population engaged in agriculture is estimated to range between 42 percent in Indonesia to 96 percent in Nepal. Most of the households involved in agriculture own or have access to small parcels of land. Observers have estimated that, in Viet Nam for example, these small-scale farmers represent about 60 percent of the population. Small-scale farmers are the bedrock of Asian economic development. Because of the importance of small farmers as producers of each nation's food and industrial raw materials, as consumers of goods and services, as managers of national resources and as citizens, success in economic development largely hinges on the viability of smallholder agriculture and the vibrancy of social, economic and cultural life in rural areas. The economic crisis that recently swept the region made this point painfully clear.

Three decades ago, an immense social and economic experiment was launched in Asia. The experiment, which subsequently came to be known as the Green Revolution, was largely based on an engineering approach to smallholder agriculture. The main assumption of the approach was that small-scale farmers' productivity could be raised if they had better access to certain inputs and used them according to a set of prescribed instructions. This approach was most successful when farmers had access to:

- improved irrigation systems,
- improved varieties of rice, wheat and corn, and
- increased availability of inorganic fertilizers for the nitrogen-responsive, improved high-yielding varieties.

Small farmers, particularly those located in well-irrigated areas with good soils, responded positively

to the opportunities that easier access to these inputs presented. Farm productivity increased substantially. The average rice yields in the region doubled between the 1960s and the 1990s.

However, helping small farmers to build sustainable, productive agricultural systems proved more difficult than was originally supposed. Green Revolution programmes were designed to disseminate new technologies as quickly as possible. Because of the great number of small farmers in most Asian developing countries, the dissemination process was greatly simplified to facilitate rapid adoption of new inputs and methods. In some cases the push for rapid adoption led to open coercion. Agricultural development programmes came to rely on highly centralized systems designed to deliver input packages and information to small farmers. Although this approach succeeded in introducing small farmers to the new inputs, new problems quickly emerged.

The centralized systems were unable to take into account the reality of pronounced agro-ecological diversity within countries, regions and even within villages. The inclusion of routine pesticide applications within the input packages often caused severe ecological disruptions, most notably the rise of pest resurgence and resistance. Rather than reducing production risks for small farmers, the input packages frequently generated new, more serious threats to the sustainability and profitability of small-scale cultivation. Together with the disruption of the ecosystem came new threats to farmers' health and the introduction of millions of tons of poisonous substances to the fields, waterways, food and homes of rural people.

The inability of Green Revolution programmes to tailor input use to local conditions extended beyond pesticides to inorganic fertilizers and seeds. Centrally designed nutrient packages, in fact, required adjustment to local-specific soil conditions. The top-down extension of these packages did not give farmers the knowledge they needed to make these adjustments. Improved varieties were also introduced uniformly without assessment of local needs and conditions. In many regions production risks were often actually increased while local biological diversity was dangerously reduced. As a result, variation in yields increased in step with average yields and the marginal productivity of physical inputs began a long downward trend. More and more inputs were needed to achieve ever smaller incremental increases in production per unit area. (Kenmore 1991)

Of equal, if not greater importance, were the social implications of the engineering approach to farming systems. The government agencies that sprang up to disseminate Green Revolution technologies were target-oriented and often rigid in their interpretation of their mission. The pressure that these agencies put on small farmers to use inputs in accordance with centrally determined recommendations contributed to a deskilling of rural communities. Farmers were expected to be progressive and adopt new technologies rather than be active innovators.

2.2 The importance of being expert



Asian farmers were producing enough rice for the populations of countries in tropical and sub-tropical Asia by the 1980s. Yields forged ahead of population growth. These yield increases owed much to the above-mentioned access of farmers to improved varieties, inorganic fertilizers and improved irrigation systems. Then, in the late 1980s the work of a group of researchers from the International Rice Research

Institute (IRRI) in the Philippines produced some disturbing news. It showed that rice production increases in Asia had hit a plateau. Rates of increases in yields fell from 4 percent per year to 2.4 percent per year. This was close to regional rates of population growth and the estimated growth in demand for rice for the 1990s of between 2.1 and 2.6 percent (Rosegrant and Pingali 1991). The research also indicated that the yields on research stations had hit a ceiling established nearly 20 years before (Pingali et al. 1990) and that the highest yields obtained at the research stations were actually declining (Pingali 1991). The main cause of these declining yields was found to be environmental degradation caused by intensive rice monoculture. The degradation of the rice agro-ecosystem - and there were many possible causes, including micronutrient depletion, atmospheric pollution, pest pressure and accumulative toxic changes in soil chemistry - was found to be greater than the capacity for genetic improvements in yield potential. The negative impact of intensified rice production increased the speed of the depreciation of investment in the development of high-yielding rice varieties (Kenmore 1991).

The IRRI researchers identified one robust source of potential yield increase: expert farmers. A survey of farmers in the provinces surrounding IRRI had been carried out at intervals from 1966 to the late 1980s. The survey showed that during those two decades farmers' yields had not plateaued out. Surveyed farmers whose rates of yield were in the top third of yields in 1966 (their average yield was more than two tons below the highest yield at IRRI) had, by the late 1980s, increased their yield rates, on average, to more than one ton over those achieved at IRRI. The remaining farmers in the survey who in 1966 had an average yield of about four tons below that of IRRI were able to increase that average to less than two tons below that of IRRI. The IRRI trials made use of a standard set of management approaches, whereas the farmers innovated and improved. The gap between the average of the top third of yields and the average of the rest of the yields was actually wider than that between IRRI and all farmers (Pingali et al. 1990). The researchers suggested that the main reasons for this gap were differences in farmers' abilities and differences in access to irrigation. The researchers further suggested that training of farmers would be increasingly important.

"Training programmes become particularly important as the incremental gains in productivity are achieved by adopting ... 'second-generation technologies' (such as better fertilizer incorporation technologies, integrated pest management, etc) ... more knowledge-intensive and location-specific than the modern seed-fertilizer technology that was characteristic of the Green Revolution." (Pingali et al. 1990)

Furthermore, the IRRI researchers found that "Farmers who have the ability to learn about the new technologies discriminate among technologies offered to them by the research system, adapt the technologies to their particular environmental conditions and provide supervision of inputs to ensure the appropriate application of the technology." (Pingali et al. 1990)

This assessment of the capacity of farmers to learn and apply what they learned was drastically at odds with the assumptions of Green Revolution extension education systems. These systems assumed that "traditional" farmers required a complete refitting of their practices to become "modern". The time for a new approach to farmer education had arrived.

2.3 Getting the bugs out

The problems faced by Indonesia in dealing with brown planthoppers (BPH) were typical of those faced in all countries in the region. Indonesia's BPH woes began to be noticed in 1970 and 1971.

Surveys of stemborer damage in selected subdistricts of West Java determined that where farmers were applying insecticides, not only was there increased stemborer pressure but also BPH densities were ten times higher than in fields where insecticides were not used (Soehardjan 1972). Before the seventies, BPH was not considered a pest. This situation soon changed. As part of the BIMAS Gotong Royong programme of the late 1960s and early 1970s, hundreds of thousands of hectares of rice were treated with aerial applications of broad-spectrum organophosphate insecticide. The programme also provided production packages of in-kind credit that included chemical fertilizers and pesticides. As production went up so did BPH infestations. In 1975, as the government began to directly subsidize insecticides, losses to BPH equalled 44 percent of the country's annual rice imports (Kenmore 1991). This led the government to initiate aerial applications in 1976 of ultra low volume formulations of insecticide. These applications allowed huge areas to be treated. The result was that in 1976/1977, the brown planthopper caused severe damage to over 450 000 hectares of rice fields. The estimated yield loss was 364 500 tons of milled rice, enough rice to feed three million people for an entire year. (Oka 1991)



This was not an isolated occurrence. Indonesian crop protection policies that promoted the use of pesticides led to two other major outbreaks in 1979 and 1986. Thailand, Viet Nam, Cambodia and Malaysia also experienced similar outbreaks. Population ecologists were able to document the process (Kenmore et al. 1984; Ooi 1988; Settle et al. 1996). The brown planthopper was found to remain at insignificant population levels in intensified rice production under complete control by natural enemy populations when fields were not treated with insecticides. Even with immigration of large numbers of reproducing adults to a field, natural enemy populations were found to be able to respond and exact massive mortality on the intruders leaving rice yield unaffected. Insecticide applications were determined to cause disruptions in natural control. Survival rates of BPH in an insecticide-disrupted system were found to increase more than tenfold. With compounded rates of expansion this led to densities of BPH that were hundreds of times higher within one cropping season. Trying to control this kind of outbreak with insecticides was like pouring petrol on a fire.

With the massive BPH outbreaks, plant breeders set to work to develop varieties that would be resistant to BPH. The strategy was to displace insecticide use with the planting of BPH-resistant varieties. In the field, however, there continued to be intensive use of insecticides. Intensive application of insecticides actually encouraged a rapid selection among BPH for those who were able to overcome the resistance that had been bred into the new varieties. (Gallagher 1984) The rapid breakdown of these varieties meant that the money and time invested in their development was lost.

Thus what had been standard government methods for crop protection in the 1970s and 1980s actually increased the risk of pest outbreak. The BPH example is illustrative of the process that, in general, precedes insect pest outbreaks in tropical rice. Insecticides degrade a system so that it no longer contains the natural enemy populations that can provide protection to that system. Government policy also failed to take into account another buffer to further enable a rice agro-ecosystem to avoid loss of yield. This buffer is the ability of a plant to compensate for the loss of leaves and productive tillers during the first 30 to 40 days after transplanting. Some high-yielding varieties can withstand a loss of up to 30 percent of leaves and tillers during vegetative stage without a loss in yield. The compensation capacity of some of the widely grown high-yielding varieties enables plants to withstand damage from pests such as stemborers, leaffolders and others. (Way, Heong 1994) Way and Heong in their 1994 paper conclude that "IPM in tropical rice should be based on the contention that insecticides are not needed rather than that they are, and that "pests" should now be critically reassessed and proven guilty before insecticide use is contemplated."

2.4 IPM and sustainable agriculture

The above sections provide an outline of the set of problems that the FAO regional IPM programme faced in the late 1980s.

1. Pest resurgence and resistance caused by the indiscriminate use of insecticides posed an immediate threat to the gains of the Green Revolution.
2. Research demonstrated the viability of biological control of major rice pests, but such an approach required a broader understanding on the part of farmers (not to mention governments) of the ecological principles underlying the rice field agro-ecosystem.
3. Green Revolution extension approaches were actually deskilling farmers, not expanding their expertise. New approaches needed to be found for educating farmers.

While IRRI researchers found that the demand for rice was rapidly catching up to current levels of production, they also found that farmers had the capacity to learn, innovate and even outperform research stations in terms of average yield. That farmers could become expert in farming had become a working assumption of FAO regional programme training activities by the mid 1980s. Based on that assumption, the FAO regional programme developed a new departure in Southeast Asia related to IPM and farmer education. This departure posited that the methods that were being used for the dissemination of technological packages among farm communities were fundamentally flawed. These methods were technologically driven, not farmer-driven; centrally uniform, not locally adaptive. Given appropriate training methods that would empower farmers through learning, farmers could:

- master the ecological principles needed to implement IPM in their fields;
- become expert in IPM; and
- apply what they had learned to develop new initiatives and gain greater control over local conditions.

2.4.1 Developments in the Philippines

The first steps towards the creation of the IPM farmer field school approach were taken in the Philippines with a farmer training programme lasting for five consecutive planting seasons from 1978 through 1980. (This section is largely based on a chapter by Matteson, Gallagher and Kenmore in Ecology and management of planthoppers, 1994.) Philippine rural sociology and community organizing experts, extension officers, and an anthropologist and entomologists from IRRI made up the team that conducted

this training programme. In many ways this was a research effort into how farmers could be trained in IPM. The training tried new methods that were found to be important in helping farmers learn IPM.

- Farmers were trained in small groups and were encouraged to be active in the discussions that arose during each training session.
- The training tried out an extended schedule of over three months with weekly two-hour sessions.
- Hands-on field practice was favoured rather than expensive materials, theory or lectures.
- Follow-up sessions by extension workers in farmers' fields were encouraged.

This initial farmer training programme was followed by a cadre of officers from the Crop Protection Division of the Bureau of Plant Industry. After 1982, the FAO Inter-Country Programme for Integrated Pest Control in Rice in South and Southeast Asia provided technical and financial support for the training effort. By 1984 about 200 master trainers, 4 500 extension agents and 55 000 farmers had been trained in IPM.

The Philippine farmer training effort made important innovations that were eventually incorporated in the IPM farmer field school in Indonesia.

- The rice field was used as a classroom.
- The "ballot box" pre-test was developed as a field-based diagnostic test to determine learners' needs.
- Live samples were used for learning rather than photographs or drawings.
- Methodology shifted from lectures to structured experiences and analysis of field conditions.
- Experiments in season-long training found that IPM training needed to be of longer duration.
- The approach posited that the most interesting and determinant element in the rice field was the farmer, not the insects.

2.4.2 Indonesia and farmer field schools



The approach to farmer education that has been named the rice IPM farmer field school incorporated the lessons from the Philippines' experience in farmer IPM training and was implemented first in Indonesia. The first FFSs were conducted in the rainy season of 1989-90. In a few years the approach was being used throughout the region (see Table 1.1 below for data regarding implementation of FFSs in FAO community IPM programme countries). Field schools give small farmers practical experience in ecology and agro-ecosystem analysis, providing the tools they need to practise IPM in their own fields. The FFS also provides a natural starting point for farmer innovation covering the whole range of issues relating to crop and agro-ecosystem management.

The FFS approach is based upon four IPM principles. The principles provide a guide to what farmers should be able to do when they participate in an FFS. They form the working definition of IPM for the FAO community IPM programme. They are:

- Grow a healthy crop;
- Conserve natural enemies;
- Conduct regular field observations; and
- Become IPM experts.

The first principle means that FFS participants will need to be able to apply good agronomic practices and understand plant biology. This should help alumni to optimize their yields as well as grow plants that can withstand disease and pest infestations. The second principle implies that FFS alumni will reduce their use of insecticides. To do this, FFS participants will need to understand insect population dynamics and rice field ecology. The third principle asserts that IPM requires of farmers the ability to regularly observe, analyse and take informed decisions based on the conditions of their agro-ecosystems. The fourth principle posits that because of local specificity, farmers are better positioned to take the decisions relevant to their fields than agriculture specialists in a distant city. Hence, FFS alumni should be able to apply IPM in their fields and also help others to do so.

The FFS approach featured several new departures from earlier IPM farmer education models. Included among these innovations were season-long training for farmers, field experiments, a focus on plant biology and agronomic issues, a new method for agro-ecosystem analysis, the inclusion of human dynamics activities and a learning approach that stressed participatory discovery learning. (Training for IPM field trainers who facilitated these FFSs were intensive multi-season residential trainings. This approach to trainers' training was in itself an important innovation.) By the mid 1990, over 50 000 farmers had participated in the first set of field schools in Indonesia. The IPM farmer field school was on its way to becoming the single most effective new approach to farmer education in Asia. At the 1999 regional meeting of countries who make up the membership of the FAO community IPM programme, extension education expert Niels Roling stated that "IPM FFS is the model for farmer education across the world. Other extension methods have been exposed as lacking the capacity to provide the education that farmers require in the increasingly complex agricultural systems that they manage" (FAO Community IPM Programme 1999)

Policy support: IPM and FFS implementation were supported by a fairly comprehensive policy promulgated in 1986 by then president Suharto. The new policy departure resulted from concern over:

- another major BPH outbreak that had occurred in 1986;
- the threat that the outbreak would result in large imports of rice;
- the impact of imports on dwindling foreign currency reserves; and
- the potential embarrassment these imports would cause for a nation that had declared itself self-sufficient in rice production and was not able to maintain this position.

Scientists were able to persuade several ministers of the ineffectiveness of intensive insecticide use (notably, the Department of Agriculture remained unconvinced). The scientists proposed an IPM programme based on a farm-level IPM strategy, IPM training for technical personnel who would train farmers, and limiting the availability of broad-spectrum insecticides. The inter-ministerial coalition supported the proposal and took it to the president. The result was Presidential Decree No. 3, 1986. The decree called for farmer and field worker IPM training, the banning of 57 broad-spectrum insecticides from use in rice production and the eventual elimination of subsidies for insecticides (Oka 1991). The decree created a policy environment at all levels of government that ensured support for rice IPM FFS implementation.

2.5 The spread of FFS implementation

Farmers throughout the region have responded enthusiastically to IPM FFSs, wherever they have been organized. Some farmers are primarily motivated by the reduced costs and reduced production risk obtained through application of ecological principles to crop management. Some are intellectually

stimulated by the subject matter and excited by the experience of designing and carrying out their own experiments. For others, the main attraction is the group interaction, discussions and debates that are an important part of every FFS. The most striking confirmation of this enthusiasm has been the spontaneous appearance of farmer-to-farmer FFSs, in which field school graduates began to organize season-long FFSs for other local farmers.

Indicative numbers from member countries of the FAO community IPM programme in Asia implementing IPM field schools (through 2000):

Table 2.1 Country data

Country	Year FFS began	Rice FFS	Farmers trained	Other FFS*	Farmers trained	Farmer IPM trainers trained
Bangladesh	1994	5 490	141 470	373	9 410	679
Cambodia	1996	670	20 000	85	2 500	254
China	1993	1 306	37 877	13	390	1 817
Indonesia	1989	37 429	935 152	6 388	159 600	29 522
India	1994	6 302	189 683	-	-	-
Laos	1997	280	7 767	45	1 350	-
Nepal	1998	209	5 415	-	-	156
Philippines	1993	6 000	180 000	1 200	336 000	-
Sri Lanka	1995	510	9 700	34	610	240
Thailand	1998	525	12 027	-	-	-
Viet Nam	1992	19 876	515 927	1 993	55 098	6 178

* Primarily vegetable FFS, but also includes soybean and mung bean FFS

Table 2.1 provides some indicative numbers concerning the implementation of FFS in Asia through 2000. The IPM FFS has become the approach for IPM training in the countries listed in the table. Most of these countries have also adopted national policies supporting IPM and limiting the use of insecticides.

The success of IPM FFSs has opened up a new approach to the development of sustainable, small-scale agricultural systems. Farmers, having demonstrated their enthusiasm for learning and applying ecological principles, have pointed the way forward to a future when they will no longer be viewed as passive recipients of recommendations generated in far-off research laboratories or central government offices. Farmers have displayed an intellectual curiosity to understand rice agro-ecosystem ecological processes and an eagerness to formulate community-wide approaches to increase the impact of IPM in their villages. They are not only taking part in IPM activities; they are taking over IPM activities.

3. THE IPM FARMER FIELD SCHOOL

There is a standard model FFS. This standard model establishes a norm for the implementation of an FFS. There is plenty of room for variation as long as the resulting process is learner-centred, participatory and relies on an experiential learning approach. There have been variations in the standard rice IPM FFS model; different situations call for adaptations. When an FFS is conducted in a crop other than rice, there are necessarily changes based on factors such as the key growth stages of the crop, local cropping patterns and specific local problems. Any FFS should rely on the same process; it is the content that changes as the FFS is conducted with different crops. The four IPM principles, of course, underpin any IPM FFS.

This chapter begins with a general description of the FFS approach followed by more detailed discussion of relevant implementation issues.

3.1 The typical rice IPM field school

The following is a list of rice IPM farmer field school basics.

- The IPM school is field-based and lasts for a full cropping season.
- A rice FFS meets once a week with a total number of meetings that range from at least 10 up to 16.
- The primary learning material at a farmer field school is the rice field.
- The field school meeting place is close to the farming plots, often in a farmer's home and sometimes beneath a convenient tree.
- FFS educational methods are experiential, participatory and learner-centred.
- Each FFS meeting includes at least three activities: the agro-ecosystem analysis, a special topic and a group dynamics activity.
- In every FFS participants conduct a study comparing IPM with non-IPM treated plots.
- An FFS often includes several additional field studies depending on local field problems.
- Between 25 and 30 farmers participate in an FFS. Participants learn together in small groups of five to maximize participation.
- All FFSs include a field day in which farmers make presentations about IPM and the results of their studies.
- A pre- and post-test are conducted as part of every field school for diagnostic purposes and for determining follow-up activities.
- The facilitators of FFSs undergo intensive season-long residential training to prepare them for organizing and conducting field schools.
- Preparation meetings precede an FFS to determine needs, recruit participants and develop a learning contract.
- Final meetings of the FFS often include planning for follow-up activities.

3.1.1 To the field

The following boxes contain observation notes of FFSs that were made by members of the FAO technical assistance team while conducting FFS quality monitoring in Indonesia. A visitor to a rice IPM field school would see the things described in these notes. This section is organized around the schedule of an FFS meeting. Box 3.1 concerns the meeting place of an FFS. Experience has shown that FFSs that meet near the field in less formal situations, for example a participant's house, result in more effective meetings than those held in more formal settings, such as village offices, where the process is more likely to be interrupted by outsiders.

Box 3.1 The meeting place



Srijaya Farmers Group FFS
Orimalang village, Cirebon district, West Java

The Srijaya FFS meets next to the rice field in a shelter used by farmers when they rest from their field chores. Being next to the field makes it easy to get to the field for field school activities. The relaxed atmosphere in the shelter helps participants to concentrate on what they are trying to learn. The atmosphere is much better for the farmers here than in a more formal situation such as a school or village meeting centre. In those places the farmers would either disturb others or be disturbed by them.

The FFS does not depend on outside materials, but it does depend on having access to fields where observations can be made and studies organized. The materials that can be found in an FFS are those that learners use to construct experiments or in making analyses and presentations. Box 3.2 presents a discussion about the materials available to the farmers of Uma Bun FFS.

Box 3.2 Field and materials



Uma Bun FFS
Angantakan village, Badung district, Bali

The field school began one week after the rice was transplanted into the field. The practice fields of the field school are 20 m from the FFS meeting place. The IPM and non-IPM plots have been planted with IR-64 and on the third day after transplanting the non-IPM plot was treated with carbofuran. Applications of fertilizer have been the same for both plots, both in terms of kind of fertilizer and of time of application. In the non-IPM field a plant compensation supporting study was established this week and it will be monitored beginning next week.

Materials on hand included: newsprint, crayons, felt-tipped pens, masking tape, plywood sheets, small plastic bags, lengths of wood for measuring the height of plants, and pens and notebooks for farmers. There were also enough snacks and drinks for the participants.

07.30 hours: agro-ecosystem observation, analysis and presentation

Working in five member teams, participants enter the FFS learning fields to observe general field conditions, sample plants, collect insects, make notes and gather live specimens. The field provides all of the basic learning materials and subject matter for the FFS. Each team analyses its field samples and notes by creating a visual analytical tool known as the agro-ecosystem drawing. This tool is made up of key ecosystem factors such as pest/predator densities, plant health, field conditions, weather, and current management treatment. The output of the analysis is a field management decision. Following the analytical session, a member of each small group presents his or her group's analysis and decisions to the rest of the members of the FFS. The presenter and his or her group then defend their analysis in this open discussion. "What if ...?" problem-posing questions further hone analytical skills during the discussion among groups. Box 3.3 provides a description of the agro-ecosystem process.

Box 3.3 Agro-ecosystem observation, analysis, and presentation







Tani Gabah FFS
Balai Panjang Bawah village,
Lima Puluh Koto district, West Sumatra

The 25 participants were divided into five groups of five people each and they all went into the field accompanied by the facilitator to conduct the agro-ecosystem observation. Three groups made observations in IPM plots and two groups observed the non-IPM plots. Each group sampled 10 hills of rice that have been staked to mark out sampling sites. The stakes run in a diagonal across the plots.

After the observation the small groups returned to the meeting site to draw the agro-ecosystem and complete their analysis. The members of each group were all involved in the activity and the discussions generated by the analysis of the data they collected from the field. The facilitator went from group to group helping them to answer questions about their data. The completed drawings contained all the elements that should be included in a good agro-ecosystem drawing: pests and natural enemies, weather conditions, plant condition, field conditions such as weeds and water, and action decisions.

The facilitator helped with the presentations that were made by a representative of each small group. The presentations were smooth and each group's drawing was carefully explained. After each presentation the presenter was asked questions such as: "A spider will eat how many pests?" "How long does a spider live?" "What is the name of the weed that you have drawn there?" The action decisions of the groups included:

- There is a balance in the relationship of natural enemies to pests so there is no need to spray pesticides.
- We need to make insect zoos to study spiders and their feeding capacities.
- The water is enough for plants in their seventh week of growth.
- We will continue our field observations.

10.30 hours: special topic

This activity is linked to the stage of growth of the crop and specific local issues. This part of the curriculum should be tailored for each FFS. The topic is selected from a large menu of potential topics that are mastered by FFS facilitators during their training. Special topic activities cover such issues as community rat control, crop physiology, health and safety, food webs, field ecology, economic analysis, water management and fertilizer use. Most but not all of these exercises require that participants again enter the field. The process involved in a typical special topic is described in Box 3.4

Box 3.4 Special topic: natural enemies



Rejomulyo Farmers Group FFS
Rejomulyo village, Magetan district, East Java

The facilitator, Suwito, begins by stating that the topic today will be natural enemies. The facilitator follows up his opening by asking: "What are natural enemies? What's their role in the field?" *Pak* Karmo answers with: "Basically, natural enemies are those insects that prey upon pests in the rice field."

Next Suwito asks the group to list the natural enemies that they found in the field during their observation. The participants name the natural enemies they found and Suwito writes the names down on a piece of newsprint. Then Suwito asks the participants to describe the characteristics and habits of each of these insects and where they can be found. The descriptions are developed with the facilitator asking questions and the group answering. The questioning gets to be very interesting when the participants don't have any data upon which to base their decisions. For example, "How long does an ant live?" "How do dragonflies attack pests?" Then the group discusses other possible natural enemies in the rice field that weren't encountered during their observations. Several animals, for example snakes, are mentioned.

The discussion is not limited by the data collected during the field observations. Although discussion begins regarding what was seen in the field, the facilitator goes on to other probing questions: "Why do lots of natural enemies disappear? Who or what is the cause of this disappearance?"

These questions are interesting as they draw the group into a discussion of practices encouraged by the rice intensification package. The farmers point out that as part of the intensification package pesticides are applied as a preventive measure without paying attention to field conditions. "This results in natural enemies being killed." The group also notes that a common practice in the village is the collection of snake skins. "This also lowers the population of snakes in the rice field."

Suwito asks: "What do we need to do to maintain a balanced population among pests and their natural enemies?" This question generates a long discussion until one participant responds with: "How about if we talk to farmers here using the intensification package about its impact on natural enemies?" Again there is much discussion until, at last, the facilitator says: "Well, we need to talk more about this matter. I think each group should think of a way to spread the idea of a balanced ecosystem among farmers here."

11.30 hours: group dynamics

The goal of group dynamics exercises is to strengthen group cohesion, maintain motivation and help participants develop organizational skills. There is a large menu of group dynamics activities that facilitators learn during their training. Often facilitators will help farmers process the activity by asking them how the activity is relevant to the special topic of the day or to some local farming problem. The group dynamics activity described in Box 3.5 concerns communications.

Box 3.5 Group dynamics: the chain message



Tulus Tani Farmer Group FFS
Karang Talok village, Pemalang district, Central Java

The chain message is the group dynamics activity. The point of the activity is to sensitize participants to the importance of listening to good communication. The participants were divided into three groups. The first member of each group was given the same message by the facilitator. Then that person was asked to whisper the message to the next person in line. This process was repeated until the last person in each group had heard the message. The facilitator then asked the final members in each chain to announce the message he received. Not one group was able to get the correct message to the last member in the chain. The facilitator helped the participants to analyse and learn from the activity by asking the following and other questions:

- Why do you think the final message was incorrect?
- How can we improve our listening skills?
- What happens when we tell someone what we think a message means instead of repeating the message as it was told to us?
- What kinds of problems can occur when messages are incorrect?

12.00 hours: review and planning

The FFS meeting ends with a summary of developments in the field in which results of the agro-ecosystem analysis are reviewed. Other long-term activities such as field studies in plant nutrition or plant compensation are also reviewed at this time. Plans for future field school activities (for example determining the topic for "insect zoo" studies) are usually discussed at this point.

3.1.2 Further notes on the FFS

There remain a few details on FFS activities to provide a picture of the FFS. The following notes add some details to the field visits.

Activity matrices: The following tables describe discreet steps and behaviours that an observer should be able to see when the agro-ecosystem analysis process, a special topic or a group dynamics exercise is being conducted. While these are primarily outlines, the "indicators" column presents the observable steps that are fundamental to the process. Note that for any of the activities the role of the facilitator is to help participants learn, not to teach them.

Table 3.1 Agro-ecosystem 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 summarize observation, focus of analysis.	1. Before activity participants are 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 summarize observations.
	Presentation & analysis	Results of analysis presented to large group by one member of each small group. Problems posed, questions asked. Purpose: to discuss 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 small group 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 (eg. plant stage, natural enemies) 9. Facilitator uses leading questions to help participants analyse what was learned during activity.

Special topics activities are discovery learning activities. They depend upon the facilitator's ability to pose questions that will help participants to critically analyse what they have observed during the activity.

Table 3.2 Special topics activity matrix

Activity	Critical steps	Notes	Indicators
Special topics such as ecology, rats, biology	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 questions 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 summarizing 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".

Many of the group dynamics exercises are physical and active; others are more like brain teasers. 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 situations.

Table 3.3 Group dynamics activity matrix

Activity	Critical points	Notes	Indicators
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.	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 issues arising during activity; help participants to make conclusions based on their experience during 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 insect zoo: The insect zoo and cage studies should be conducted as part of any FFS. The insect zoo can be considered to be either a special topic or an additional study. This activity can focus on locally identified pest problems, but it is often used in any of several possible general topics such as pest and predator relationships, insect life cycles and plant and insect relationships.



Often the insect zoo is used to help participants discover the predatory capacities of natural enemies. In general, the insect zoo helps FFS participants to increase their understanding of ecological principles in their agro-ecosystems.

The insect zoo consists of a rice plant placed in a pot and enclosed either with clear plastic or very fine netting. The point of the enclosure is that nothing can get in or out. The photograph above shows the physical structure of the insect zoo. Several stakes keep the enclosing plastic or netting off the plant.

A fairly simple insect zoo study would be to examine the capacity of a wolf spider to consume BPH. The spider and a number of BPH - the number of BPH should be sufficient to provide the spider a couple of days of hunting, maybe 40 adults - are placed together in the zoo and the zoo is sealed. FFS participants are then asked to observe the insect zoo over the week between FFS meetings and take note of what happens. The following week at the FFS, they would be expected to report on what happened. The goal of insect zoo studies is to help increase the participants' understanding of relationships among insects found in the rice field agro-ecosystem.

Field studies: In contrast to special topics, which are usually short exercises or experiments, a field study usually continues for the entire season of the FFS. One example of an FFS field study is the comparison study of IPM-treated and non-IPM-treated field plots that is conducted as part of every FFS (see Box 3.2). These plots could be further divided into subplots to conduct additional studies, often known as supporting studies. In general the supporting studies focus on local issues identified in the needs assessment conducted as part of the preparation meetings for the FFS. Almost any study done as a part of the season-long training of IPM field trainers could be designed as a supporting study for an FFS. Participants begin to learn the process of doing applied field research from these field studies. Farmers who had gone on to conduct their own research pointed out that the exposure to various studies in the FFS provided them with the motivation to continue applied research in their own fields.



An example of a common supporting field study at an FFS is the simulation of stemborer damage by the cutting of rice plant tillers. In this study, plants in study blocks within one of the comparison study fields would have their tillers cut (see photo above). The study could be as simple as cutting 20 percent of the tillers in 1 m^2 blocks at 14, 30 and 55 DAT. During the FFS, participants would make weekly observations of the growth of the treated plants and take note of the numbers of tillers in these plants. At harvest, the participants would compare the number of tillers and grains, grain weight, and yield of the study blocks with samples from the larger field in which the supporting study was conducted. The study is a good demonstration of the capacity of a plant to compensate for damage due to stemborers.

Preparation meetings: Preparation meetings have become an important part of organizing FFSs in many countries. In general these meetings are used to:

- brief local leaders about the FFS process and goals;
- brief potential participants about the FFS process, conduct a gender analysis and a needs assessment, and select participants.

Local leaders will want to know about administrative issues such as the general timing of the FFS. The purpose for meeting with local leaders is to help them understand the FFS process and how they can contribute to making the FFS successful. The meeting with potential participants should be relatively structured and scheduled so that most of the farmers in the area, cooperative or neighbourhood can attend. This meeting can affect the make-up of the FFS in terms of the curriculum of the FFS, the number of women who will participate in the FFS and the understanding of participants about the FFS (this understanding will in turn affect their commitment to the FFS). Community mapping is a technique that can be used in these meetings to help participants analyse field realities.

The gender analysis activity is meant to raise the awareness of the group regarding the role of women in agriculture. The goal of the analysis is to recruit women for the FFS or to increase the number of women participating in it. Women play an important role in agriculture throughout Asia. A policy of actively recruiting women is almost the only way to guarantee that significant numbers of women participate in FFSs.

Materials: Some of the materials required to support FFS activities include plywood sheets (as bases

to draw on), large pieces of newsprint or poster paper, crayons, large felt-tipped pens, and notebooks and pens for farmers. Farmers generate their own learning materials, from drawings of insects to analytical tools. These materials are more consistent with local conditions, are less expensive to develop and are controlled by the learners themselves.



Balt box "polling station"

The ballot box: Usually an FFS has a pre- and post-test. The ballot box is a diagnostic test developed in the 1980s for IPM training in the Philippines. This is a field-based test in which 20 to 25 "balloting" stations (bamboo stakes with three small boxes and a multiple-choice question attached) are placed around the edge of a rice plot. The boxes have small slots in their tops through which ballots are entered. The ballots are usually cardboard paper "coins" that are numbered. Each participant is given an identifying number from one to twenty-five. Participants are given a set of 25 paper "coins" with their number inscribed. They then go from station to station and place their coins in the boxes that are lettered according to the choices associated with each question. The questions might include:

- identification of the roles of various insects (the insects should be in clear plastic bags or bottles attached to the question);
- damage on rice plants (a string should run from the question and be attached to the damaged area on a nearby plant); and
- other relevant field questions that can be readily seen and identified with live samples.

No drawings or pictures are used and no abstract questions are asked that cannot be based on a live sample. The pre- and post-tests should cover the same material and be of the same relative difficulty.

The tests are usually conducted as part of the first and last meetings of an FFS.

The results should point out weak areas of knowledge (in the case of the pre-test) or the learning needs of participants. The post-test, when compared to the pre-test, can be used to indicate improvements in knowledge among FFS participants and to determine needs for follow-up activities.

3.1.3 The role of the facilitator

The role of the facilitator is crucial in an FFS. In general the facilitator:

- organizes the field school;
- facilitates the activities associated with the 12 to 16 meetings of the field school;
- takes care of basic administrative issues; and
- maintains constructive communications with local government officials, NGOs and other agencies in the area where the FFS is located.

Organizing an FFS requires a facilitator to:

- determine the site for the FFS and identify study fields (see the section below, "Implementation issues");
- identify potential participants, usually via a local agriculture group;
- determine local endemic problems to be treated by the FFS; and
- conduct preparation meetings.

Leading an FFS appears easy in the hands of an experienced facilitator. The key is confidence and this only comes with experience. The above matrices detail what the role of a facilitator is in the various FFS activities. In general, the facilitator introduces an activity, clarifies the process, sets participants to work, asks open-ended and "what if" questions as groups make their presentations, and summarizes presentations underlining the important points that were learned during the exercise. This summary can also be done via questioning. An additional role that is important is the procurement of materials. Facilitators can best do this at the local level.

Administrative activities vary from country to country; they depend in many cases upon the needs of the organization taking responsibility for the implementation of the FFS. A few basic administrative activities would greatly help a "system" to know about how well FFS implementation is going as well as help the facilitator to improve his or her skills. These activities could include:

- Collect and report basic bio data such as name age, gender, education, access to land (form of ownership or rental contract);
- Report results of pre- and post-tests;
- Save weekly results of agro-ecosystem analyses;
- Prepare activity plans for each FFS meeting with ensuing reports per meeting containing comments about implementation (a useful analysis would be to have the facilitator describe positive aspects of each activity or what went well, then the facilitator could identify needed improvements and how those improvements could be made), data on attendance, and relevant notes on field conditions; and
- Interview a number of participants before the start-up or the FFS about their pre-FFS farming practices; this data could be used as baseline data to determine changed practices.

Bio data helps the facilitator to keep track of who has participated in FFSs in a particular village. Pre- and post-test data can help docment increased knowledge on the part of participants and provide a record for reference. Activity plans and reports help the facilitator and his or her supervisor to prepare for and review FFS meetings. Baseline data are useful if a programme wants to determine whether farmers changed their practices because of attending an FFS. Those participants who provided baseline data can be re-interviewed to determine what changes they have made based on their FFS experience.

Constructive communications with local leaders and supporting agency staff essentially means that the facilitator needs to keep these persons informed about what is happening in the FFS. Simple steps to good communications with local leaders include inviting them to FFSs, visiting their offices and perhaps taking them to see the FFS study fields. The field day, an activity late in the FFS schedule, is meant, in part, to let these leaders see the results of an FFS.

3.2 Implementation issues

This section examines some of the problems related to FFS implementation. Problems can arise concerning the conduct of FFSs regardless of the scale of FFS implementation. In general, the problems fall into two categories, facilitation and logistics.

3.2.1 Facilitation

Facilitation problems arise because of a few simple issues. Sometimes facilitators feel they lack technical

knowledge (this may really be the case). This condition often leads to a lack of self-confidence which may lead in turn to an erosion of the participatory nature envisioned for FFS activities. For example, the facilitator may decide to lecture and/or limit discussion regarding topics that he or she is unsure of.

A second possible cause of facilitation problems arises when a training-of-trainer (TOT) session does not provide enough opportunities for participants to master the FFS process. This can occur when participants are conducting FFSs in parallel with their own training. Usually a group of TOT participants jointly conduct an FFS. The planned FFS activities may not be practised enough prior to the FFS meeting, or the shyer TOT participants may allow others to take charge of activities and "hide" in the group. In either case the result is that TOT participants complete their training lacking enough experience to confidently facilitate an FFS.

A third reason for poor facilitation skills results from inadequate support and supervision by TOT trainers of the FFSs conducted as part of the TOT. FFS activities conducted as part of a TOT need to be processed by trainers and participants to determine what went well, what needs to be improved and how to make those improvements. Supervising trainers need to spend time working on the facilitation skills of FFS facilitators.

A fourth reason why participants may complete their TOT without having achieved mastery of the facilitation skills needed to conduct an FFS is that those skills simply were not stressed. A common tendency is to focus on technical issues in a TOT and allow facilitation skills to take care of themselves. The point is that all activities in a TOT, as in an FFS, should follow an experiential learning process.

The steps to correct facilitation problems are obvious. First, the TOT needs to provide both practice in conducting FFS activities and time for participants to analyse these processes. Second, the TOT needs to include adult non-formal education topics in its curriculum. Third, trainers in TOTs need to be more than just technically sound from the IPM perspective. The best TOT trainers have experience in conducting FFSs.

Fourth, currently in most countries, participants conduct FFSs in parallel with their TOT. Participants need to master ecological principles or facilitation skills before beginning an FFS. When the TOT and laboratory season are conducted together, several measures can be taken to improve the quality of both the TOT and the FFS that are being conducted.

- The first FFS meeting should start about a month after the TOT so that participants have been introduced to the IPM principles, have experienced the first steps in learning about IPM and have begun to master activities such as the agro-ecosystem exercise.
- TOT participants should be involved in the preparation of the FFS.
- The FFS should not be distant from the TOT.
- Schedule the FFS meetings for the end of the training week. Use a significant part of the day before the meeting preparing participants to conduct the meeting. The day following the meeting should include time to analyse what took place during the FFS meeting.

There is no real dilemma between technical skills and facilitation skills training. TOT processes for learning technical knowledge are much the same as those activities in an FFS. They are based on discovery learning via structured participatory exercises. If these exercises are well analysed as part of the TOT, participants will master the facilitation skills needed to conduct an FFS. We learn how to help others learn by observing how we learn. Facilitators set an example at the FFS; TOT participants will follow that example in the field.

3.2.2 Logistics

Logistic issues greatly affect the quality of an FFS. They include:

- Location of the FFS;
- Synchronization of the FFS with the planting season;
- Maintenance of a full schedule for each FFS meeting;
- Location of study fields relative to the FFS meeting place;
- Control over study fields;
- Relationship of the FFS to local needs;
- Inadequate materials and/or late arrival of funds.

Location of the FFS: Often the decision criteria for distribution of FFSs are based on administrative boundaries. The more a farmer is dependent on farming, the more likely he or she will be interested in an FFS and the more he or she will participate in it. Conversely, part-time farmers may well turn out to be part-time participants in an FFS. Thus, it makes sense to locate FFSs in areas where farmers are more likely to be full-time farmers and full-time participants.

Synchronisation of the FFS with the planting season: There is often pressure to get field schools implemented. The FFS is designed to run parallel with the growing season so that farmers can observe field ecology issues through all stages of plant growth. If start-up of the FFS does not mesh with the planting season, two things happen. First, as the season wears on it becomes more difficult to establish field study plots for the FFS, since the farmers owning the fields may have already applied pesticides. Second, starting late in the season means that participants are not given an opportunity to study the rice agro-ecosystem at all of the important stages of plant growth. Therefore, many of the important lessons to be learned about early-season ecosystem balance, plant compensation and the emergence and development of herbivore and predator populations are missed. A rice IPM FFS should begin between the first and third week after transplanting. Figure 1 shows a timeline for a 12-week FFS that is synchronized with a planting season to start a week after transplanting.

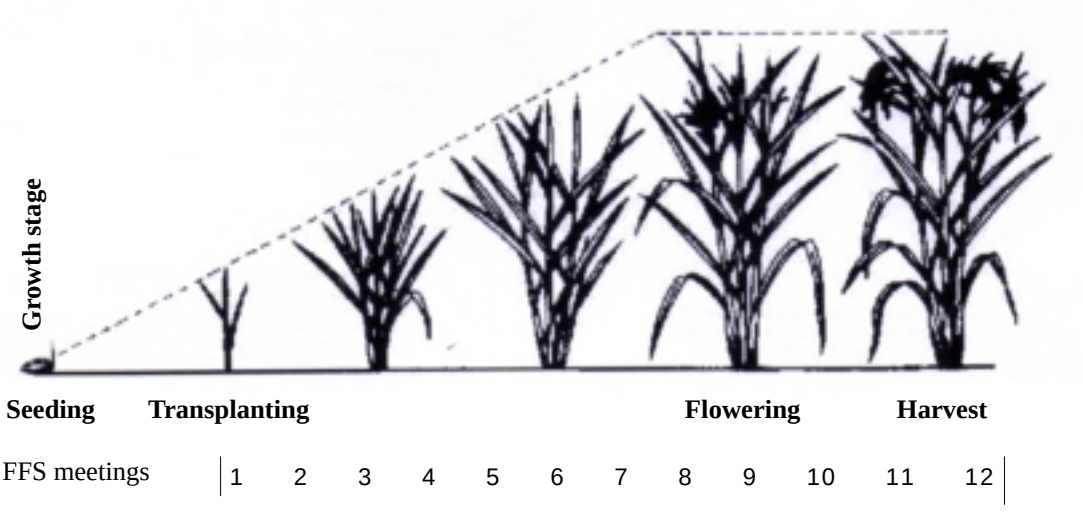


Figure 1 FFS meetings and the rice planting season

Maintenance of a full meeting schedule: An FFS meeting should consist of the agro-ecosystem analysis

activity, a special topic and a group dynamics activity. Not doing so has been shown to lead to low attendance and low interest by participants. Farmers demand quality as they make continual cost-benefit evaluations of their time investment in an FFS. If they feel the activity is not worth their while they will choose not to participate. If five or six participants make this decision the FFS will be on a downward spin. The issue is not one of cutting off discussion or short-changing an activity so that a daily schedule is maintained. Farmers will willingly allow an FFS meeting to overrun its closing time if they feel that they are getting something out of it.

The causes of activities dropping off the agenda or meetings being shortened include:

- an unbending approach to scheduling meetings that places the FFS in conflict with village events;
- poor meeting logistics;
- poor logistic support that causes materials not to be on hand when needed.

The first issue can be negotiated with participants and another day in the same week be found for the meeting. Both facilitators and farmers should learn how to negotiate these issues. Poor meeting logistics refers to time wasted because of poor planning, poor facilitation and/or poor preparation. Too much time taken in walking between study fields and meeting place can seriously eat into a daily schedule. Keeping the learning fields close to the meeting place is very important. Lack of clarity in providing instruction regarding the process of an activity can lead to false starts and poor implementation and take time away from other activities. Materials needed for FFS activities may be on hand, but they have to be used effectively. This means that the facilitator needs to know what he or she wants to do, how materials can be used, and to have them available when they are needed.

Control over study fields: Study fields are the heart of the FFS. Besides the need for synchronicity and propinquity, there must be an agreement with the owner of the fields to abide by FFS decisions regarding management of the plots used by the FFS. This means that insecticides should not be used in the IPM treatment fields unless the FFS takes that decision. FFS participants need to feel at liberty to walk in the study fields. If they or the owner feel that doing so would cause a loss to the owner of the field, they are less likely to go into the field during certain stages of plant growth. Some form of compensation or "rent" may be needed for the owner to be agreeable to the above two conditions. The facilitator will have to negotiate with field owners in preparation for the FFS and the FFS budget should include compensation for owners.

Relationship of FFS to local needs: The push to get an FFS organized and under way may lead to overlooking the locally important farming problems that need to be addressed by the FFS, especially if they concern pests, diseases or growing a healthy crop. Good preparation meetings should turn up these problems. There are many ways to do needs assessments. The Indonesian programme has used a variety of mapping techniques allowing farmers to identify hot spots and hot issues. If farmers feel that they are getting a national curriculum they may avoid the FFS.

Inadequate materials and/or late arrival of funds: Taking for granted that materials and budget will flow on time can be a mistake. Financial systems have their own schedules that often do not mesh with planting schedules. This problem influences the synchronization of FFS meetings with planting time, the quality of activities, the number of activities conducted at a particular meeting, the compensation of study field owners, preparation meetings and the number of FFS meetings. If funds are inadequate to begin with or erode before they arrive in the field, all FFS activities will suffer. While mass-produced learning materials are not an issue for FFS implementation, materials that participants use for their own learning are an issue (see the section on materials under "Activities", above). They must be on hand

when needed and their quality must guarantee that they can be used as planned.

These issues should be addressed from the beginning. Project design documents can ensure that there is sufficient budget available for FFS activities. The design can also detail a process for delivering funds to the field that will guarantee that adequate funds arrive in the field on time (i.e. so that the FFS is synchronized with the planting season). Purchasing materials is most effective when done locally. There are often mistakes when materials are purchased at the national level. Also the delivery of materials on time to trainers across the many scattered locations where FFSs are conducted can be difficult. IPM field trainers know the materials that they need and they can get them locally avoiding cross-country transport.

A final note on logistics: In successful programmes, the locus of decision making has been moved as close to the field as possible. This means that FFS facilitators have a chance to contribute to decision making and controlling logistical support. They are the people in a given system who are most involved with FFSs and the needs of farmers. They have an active interest in guaranteeing that what they do is useful to farmers. FFS facilitators care; they should have a voice in decisions regarding what they are doing.

4. COMMUNITY IPM

Community IPM is a strategy for sustainable agriculture development where farmers:

- act upon their own initiative and analysis;
- identify and resolve relevant problems;
- conduct their own local IPM programmes that include research and educational activities;
- elicit the support of local institutions;
- establish or adapt local organizations that enhance the influence of farmers in local decision making;
- employ problem-solving and decision-making processes that are open and egalitarian;
- create opportunities for all farmers in their communities to develop themselves and benefit from their IPM activities; and
- promote a sustainable agricultural system.

Community IPM is the conceptual framework in which field schools are now being conducted by national IPM programmes in the member countries of the FAO regional programme. In fact, the name of the regional programme has been changed to FAO community IPM programme to reflect this. Community IPM is a strategy in which the field school is a first step in the development of the sustainable management by a community of its shared agricultural and ecological resources. The goal of this strategy is to institutionalize IPM at the local level. This chapter will discuss the community IPM strategy and present case material from Indonesia to help demonstrate the strategy.

4.1 Community IPM basics

The three basic elements of community IPM are learning, knowledge-generating and organizing (Figure 2). The three overlap in practice, but community IPM begins with education at the farmer field school. The next step is the follow-up of the FFS with additional opportunities for farmers to build their skills. These activities further farmers' learning so that they are able to create their own knowledge through research and to organize groups and activities. The goal of post-FFS activities is to enhance the capacities of farmers to create their own mechanisms to manage their shared resources. Community IPM leads to farmer empowerment. It seeks to institutionalize IPM at the local level by putting farmers in control of the process of planning and implementing their own IPM programmes.

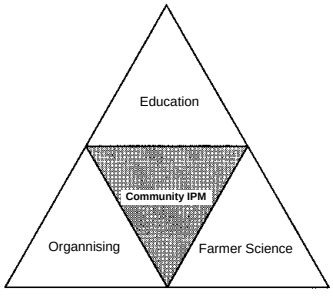


Figure 2 Community IPM

4.1.1 Building community IPM

Laying a foundation upon which FFS alumni can establish a farmer-led IPM programme in a given village requires several key activities:

- Building a cadre of experienced farmer IPM trainers.
- Implementing several FFSs plus other follow-up activities.
- Creating opportunities for IPM alumni/farmer IPM trainers to interact.

Experienced farmer IPM trainers provide village-level leadership for the establishment of community IPM. This local leadership will be on call 24 hours a day, seven days a week. When there are several farmer IPM trainers in a village they can share the leadership load and provide the critical mass of motivation required to get a community approach moving. Farmer IPM trainers are FFS alumni who, in essence, emerge during their FFS by displaying good facilitation skills and high commitment to IPM. These potential IPM leaders then attend training-of-trainer courses where they learn to facilitate farmer field schools. The status and confidence of a farmer IPM trainer is proportional to the number of IPM activities that he or she has organized.

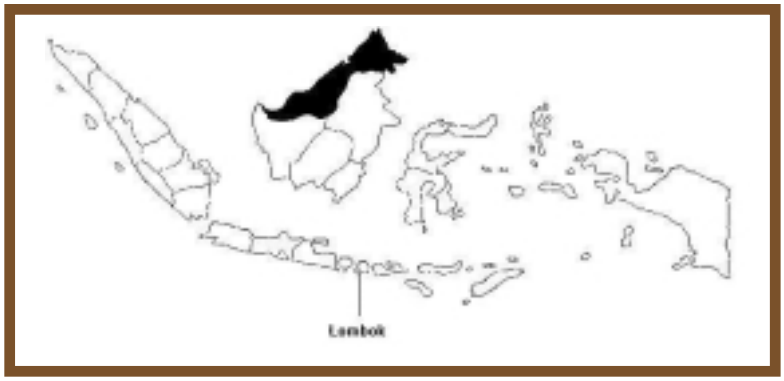
Without post-FFS educational opportunities there will be no community movement. At the outset, these activities will most likely have to be externally funded. Experience has shown that over time farmers can generate the funds needed to support their activities and to implement them. These activities should include FFSs that are conducted by the farmer IPM trainers and farmer-led field studies. The farmer-led field studies should help alumni to first identify a field problem to study and then design a research study to address the problem. The goal of these studies is to increase farmers' understanding of ecological and agricultural principles as well as to search for solutions to field problems.

Alumni forums held at the village and supra-village levels enable farmers to interact and discuss various issues related to IPM. If farmers are conducting field studies, they can share results. If farmers are conducting FFSs, they can share experiences. If farmers are organizing IPM groups and activities, they can share plans and ideas. Initially forums might be organized by IPM trainers with some help from IPM alumni. Over time alumni and trainers will exchange these roles.

Helping farmers to initiate and establish their own local IPM programmes will result in increasing the assets of rural communities and contributing to the promotion of sustainable rural livelihoods.

4.2 Community IPM in Gerung subdistrict

The following is excerpted from a case study prepared by an IPM field leader, Paiman, from Central Java, Indonesia (Paiman 1998, pp. 138-189). The case describes community IPM activities conducted by farmers in Gerung subdistrict in late 1997. Gerung is located in West Lombok district on the island of Lombok in West Nusa Tenggara province, Indonesia.



Map 1 Indonesia and the island of Lombok

4.2.1 Gerung subdistrict

Gerung subdistrict is located about 20 kilometres south of Mataram, the main city on the island of Lombok. There are eight villages in the subdistrict: Gerung, Banyu Urip, Dasan Geres, Beleka, Gapuk, Kebun Ayu, Jembatan Kembar and Lembar. The primary source of income for people in Gerung is agriculture. The city of Mataram has had little influence on people's incomes, as employment opportunities for villagers in the city are few. A result of this is that young people are involved in farming and hence there are many young farmers involved in IPM activities.

Map 2 The villages of Gerung subdistrict



1. Gapuk
2. Kebun Ayu
3. Beleka
4. Dasan Geres
5. Gerung
6. Jembatan Kembar
7. Banyu Urip
8. Lembar

There are 2 688 hectares of irrigated rice fields in Gerung. There is a continuous supply of water in the subdistrict, which allows for two seasons of rice production, and farming is the primary occupation of farmers in the subdistrict. The cropping cycle in the area is rice-rice-soybeans/vegetables. Commonly the cycle begins in December with the planting of the main rice-season crop. In April the second rice crop is planted. In August crops such as soybeans, corn, chillies, cabbage, cucumbers and watermelons are planted. Gerung subdistrict ranked second in 1996 in West Lombok district in rice and soybean production with respective yields of 27 568 tons and 2 423 tons.

Islam is a major factor in people's lives in Gerung. People who have made the trip to Mecca are proud of their accomplishment and respected by others. The homes of the people of Gerung may be simple, but most households have members who have gone on the Haj to Mecca. There are many IPM alumni who, though they might own as little as 0.33 ha, have earned the title of *Haji*. Given the importance of religion in these people's lives, it is not surprising that religious activities have become one method used by IPM alumni to spread IPM among the villagers of Gerung. Religious schools, religious discussions, Friday sermons at the mosque have all been used as venues for spreading information about IPM. Farmer IPM trainers who teach religious training classes have used these classes to promote IPM.



A Lombok tradition that has been taken advantage of by IPM alumni is the gathering of small groups of people to discuss issues or just relax together in a structure

known as the *bruga* (see photograph). This simple open structure is common to every house in Lombok. A *bruga* may have an area of up to 3 m x 6 m. There are four to six posts that support a platform for sitting at about 50 cm from the ground, a roof and often a second enclosed level that serves as a storage area. Members of a household use the *bruga* for relaxing. When guests come they are invited to the *bruga*, not the house. People say that the *bruga* was originally connected with sacred ceremonies and as an area for the storage of rice. IPM farmers use the *bruga* as an informal meeting area. In the *bruga* IPM alumni will discuss IPM among themselves or they will invite non-alumni to a *bruga* to talk about IPM.

> *"When we gather in the* bruga *we usually end up discussing social issues or problems concerning farming including IPM issues."*
>
> Rusdi Aminullah, farmer IPM trainer, Lembar village

4.2.2 National IPM programme field activities in Gerung subdistrict

A total of 40 FFSs had been conducted in Gerung by October 1997. The national IPM programme funded 35 of them (Table 4.1), which were conducted by the local IPM field trainer (a field worker from the Directorate of Crop Protection). The national programme also funded four farmer planning meetings and three farmer technical meetings for alumni in the subdistrict. The IPM field trainer and farmer IPM trainers shared managing and facilitating these meetings.

Farmers from 35 of the 52 farmers groups in Gerung have participated in the 40 farmer field schools conducted in Gerung. The field schools were reasonably spread among the villages. Table 4.1 summarizes FFS sites and the types of FFS that were conducted between 1992 and mid 1997.

Table 4.1 IPM FFSs held in Gerung between 1992 and mid 1997

Village	Rice FFS	Rice FFS (by farmers)	Soybean FFS	Shallots FFS	Follow-up FFS	Farmer IPM trainers
Gerung	4					1
Dasan Geres	7	1			1	
Beleka	4	1	1			2
Gapuk	2					2
Banyu Urip	1					
Kebun Ayu	6		1			
Jembatan Kembar	4		1	1	2	
Lembar	1	3	1			2
Total	29	5	4	1	1	9

Five of the rice IPM field schools received funding support from the local government. By mid 1997 850 farmers had participated in an FFS and nine alumni had been trained as farmer IPM trainers. The names of the farmer IPM trainers and the villages in which they live are listed below.

I Nengah Sukma Widarta	Gerung village
H. Burhanuddin	Beleka village
Rizaliadi	Belaka village
Zakub	Gapuk village
Nasrudin	Gapuk village
Bachriandi	Jembatan Kembar village
Jumahir	Jembatan Kembar village
Rusdi Aminullah	Lembar village
Nurudin Romli	Lembar village

4.2.3 IPM farmer activities

IPM national programme efforts established a critical mass of IPM alumni in Gerung. Since 1996, IPM alumni have been organizing several types of activities that, for the most part, they have funded themselves. Among the alumni-conducted activities, field studies have been most prominent. FFS alumni have been very creative in making use of available forums for informing others about IPM and in establishing their own organizations and forums as venues for communication. This section presents a description of alumni field studies, the informal approaches that have been used to disseminate IPM, and alumni organizing efforts. While the presentation of these activities may make them appear to be discreet efforts, in reality the activities were related one to the other and occurred concurrently.

Farmer-conducted field studies. Field studies in Gerung have been conducted to increase farmer understanding of ecological issues, to adapt or test out recommendations in local conditions and to increase alumni confidence regarding their understanding of specific practices.

> *"Experience in Gerung has shown that IPM farmer alumni are inclined to conduct field studies. For example IPM-trained farmers studied the effectiveness of SP 36, conducted variety trials, analysed the effects of defoliation and tested various planting distances and their influence on yields. Alumni conducted demonstrations for themselves and others on the ability of plants to compensate for damage caused by pests. There are other things that you can see regarding IPM alumni. They are creative, dynamic, and have taken on the leadership for developing a sustainable approach to agriculture."*
>
> Ir. L.L. Noverdi Bross, Head, Provincial Agriculture Service

By October 1997 alumni had conducted many kinds of field studies including:

- The influence of planting distances on yields in soybeans;
- The influence of plant loss due to bean seedling flies on yields in soybeans;
- The effects of inter-planting tomatoes and chillies;
- The effects of varying planting distances in rice;
- The use of alternative control measures for rice seed bugs; and
- The comparison of Membramo and IR 66 in resisting Tungro Virus.

Alumni originally learned about research procedures via their rice FFS experience. Post-rice FFSs in alternative crops also made use of studies. By 1996, alumni were conducting their own field studies. All of the above studies were based on alumni-identified field problems. The IPM field trainer served as a consultant on some of the earlier studies helping with study design and analysis. Later studies were all alumni designed and implemented.

Box 4.1 Planting distances for soybean

This study was conducted in Kebun Ayu by IPM alumni from the Mustika Sari farmers' group. The farmers who conducted the study were Udin Muslim and *Haji* Abdurrahman. In Gerung subdistrict, there is a tendency among farmers to not pay much attention to planting distances in soybeans. They will set out seeds according to how many they have and how large the area is that they are planting.

"The planting of soybeans with regular distances between plants is rare here. The common practice of farmers is to broadcast the seeds and let them fall where they will. So with this study we wanted to determine optimal planting distances in soybeans and demonstrate to others the effect of regular and optimal planting distances on yields. We will present the results of our studies to other farmers."

Udin Muslim, IPM farmer researcher

The basic study design was:

- Variety - Willis
- Treatment - 4 treatments with 3 replications each
  - T1. Broadcast sowing of seeds
  - T2. Seeds planted at 40 cm. x 10 cm.
  - T3. Seeds planted at 40 cm. x 20 cm.
  - T4. Seeds planted at 20 cm. x 20 cm.
- Date of planting: 23 July 1997
- Area planted: 1000 m^2
- Plot layout:



T 1.1	T 2.1	T 3.1	T 4.1
T 4.3	T 1.2	T 2.2	T 3.2
T 4.2	T 2.3	T 1.3	T 3.3

At the time of the field visit the soybeans had not yet been harvested so there was no way to determine which treatment was optimal. However, Udin Muslim did have some interim observations regarding the soybean plants:

"Physically, plants with a distance of 40 cm x 10 cm look the healthiest. The plants in treatment three, 40 cm x 20 cm look the worst off. These plants are the smallest of the four treatments. Perhaps their leaves are too exposed."

Box 4.2 The effect of reduction of plant populations due to bean seedling flies

Hadji Fatchurrohman along with 25 farmers from the Berkat Batuh farmers' group of Gapuk village conducted this study. Bean seedling flies often attack soybeans in the first or second week after planting with a maximum loss of five percent of the plants. This early infestation scares farmers. When they see that plants are dying, they turn to pesticides to protect their remaining plants.

"Farmers get worried during the first couple of weeks of soybean growth because of the appearance of bean seedling flies. Although only five percent of the plants may be lost, farmers begin spraying at this time. So that we would know when and at what levels damage could be sustained without



significant loss in yields my friends and I set up this study. Planting distances are also important to this issue so we have worked with the farmers of Kebun Ayu village who are conducting a planting distance study. We will use this study to establish a set of basic practices among the farmers in our farmers' group in the planting of soybeans."

Haji Fatchurrohman, IPM farmer researcher

This study was selected based on what members of the farmers' group felt was an important issue. The full group was involved in the decision, as these were the people who would be responsible for the study and who would eventually make use of the results of the study. Every time that a field observation was held during the study, there were at least 25 farmers involved in the collection, analysis and discussion of field data.

The design of the study was as follows:

- Planting date: 16 July 1997
- Treatment: Three treatments with three replications
  - T1. Control, no plants were pulled
  - T2. Ten percent of the plants were pulled after two weeks
  - T3. Ten percent of the plants were pulled after four weeks
- Variety: Willis
- Planting distance: 40 cm x 20 cm
- Seeding rate: two seeds per hole

Cultural practices were the same for all three treatments. Each treatment received the same amount of fertilizer and water, hoeing was the same for each treatment and the planting distance was the same in each treatment. T2 was conducted on 30 July 1997 and T3 was conducted two weeks later. Field cuts were taken at harvest time to determine yield rates that were converted to reflect yield per hectare. Yield rates per repetition per treatment were as follows:

Treatment	Repetition	Yield (T)/ Ha	Average
T 1 (control)	1 2 3	1.809 1.670 1.630	1.703
T 2 (10% at 4 weeks)	1 2 3	1.710 1.640 1.510	1.620
T 3 (10% at 4 weeks)	1 2 3	1.260 1.640 1.620	1.506

The farmer research team that conducted the study had the following to say about their results:

"Looking only at average yield rates per treatment would lead to the selection of the first treatment (T1) where there was no deliberate reduction of plant population as the optimal treatment. In other words, we should try to protect all of our plants so that none are lost to pests.

"If we look a little closer, we see that there was no consistency among repetitions of increased yields. For example the first repetition of T2 was higher than repetitions two and three of T1. The second repetition of T3 was also higher than the third repetition of both T2 and T3. Thus while there seems to be differences in yields, there is in fact no difference.

"A simple analysis of the data shows that the ranges between the maximum and minimum yields of each treatment overlap. Look at this drawing. (One of the farmers drew the following diagram on a piece of paper.)

T1 .....
1.630 1.809
T2 .....
1.510 1.710
T3 .....
1.260 1.640

"The drawing shows how much overlap there is among the treatments. The treatment with the lowest average yield (T3) has one replication with a higher yield than the lowest yielding replication of the highest yielding treatment (T1). This overlap means that it's hard to tell if there is or isn't any difference among the yields of the various treatments."

The following is part of a discussion held with Haji Fatchurrohman about the results of this study.

So what do you make of these results?

"There is no difference in yields as a result of the various treatments in our study. We will try this study again next year. However, my take on these results is that loss of plants due to bean seedling fly does not imply that there will be lower overall yields."

If that's true then what do you think about crop protection in the early stages of plant growth?

"Come again?"

There are those that spray pesticides at the beginning of the season. Are they solving or creating a problem?

"Losses of plants at the beginning of the season due to bean seedling fly are not important, they are insignificant: less than five percent of plants die due to the fly. Whether we pulled out ten percent of the plants at two or four weeks had no measurable effect on yields. So there is no reason to spray early in the season, especially when you consider the effect of pesticides on the natural enemy population which is just beginning to develop at that point in the season."

Alumni help others to learn about IPM: IPM alumni in Gerung subdistrict have taken advantage of every means available, formal or informal, to help educate other farmers in their villages about IPM. The approaches they have used have made optimal use of existing opportunities in their villages.

Dissemination via religious activities: The majority of Gerung residents are Muslim. Farmer IPM trainers and IPM alumni have often made use of religious activities as forums for talking about IPM. This approach has been especially effective when farmer IPM trainers and IPM alumni played a major role in a particular activity, for example as an imam, the presenter of the Friday sermon, or as the leader of a religious study group. Nurudin Romli, village secretary of Lembar village, officiates at marriages and has used that role to provide information about IPM.

> *"I always take the chance of incorporating IPM into every sermon I deliver during a marriage ceremony. I urge newlyweds to not endanger the environment by going wild with the use of pesticides as these poisons endanger both the environment and our health. I impress upon them the importance of passing on to our children and grandchildren an environment that is clean, free of dangerous poisons. I usually use an appropriate phrase from the Koran; for example one of the sayings of Allah expresses the thought: "You should not do damage to this earth as Allah will not befriend the person who does this."*
>
> Nurudin Romli, IPM farmer alumnus

Religious training as a vehicle for IPM *dissemination*: Twenty-nine-year-old Rusdi Aminullah, a farmer IPM trainer from Lembar village, serves as a religious teacher at the Madrasah Nujumul Huda in his village. In the classes that he conducts he usually finds a way to incorporate IPM into his lessons. His goal is to help his students acquire an understanding of the environment and its management. He hopes that this will influence their approach to life in the future and help them to remind their parents of alternatives to the use of pesticides.

> *"I don't necessarily rely on the curriculum or the school's schedule. Every time a topic arises that is connected to the environment, nature in general or health, I discuss the basic principles of IPM with my students. I hope to plant the seed of love for the environment that was created by God for the enjoyment of humanity, not for humanity to destroy. If I can plant this seed now, they will grow to appreciate the importance of nature. I would be thankful if at the very least they were able to influence their parents."*
>
> Rusdi Aminullah, farmer IPM trainer

Dissemination of IPM by women through informal groups: Women often take advantage of informal situations to discuss household issues with one another. Women in Gerung who are IPM alumna are actively helping their friends by telling them of IPM. The following is an interview with Syifa'iyah of Lembar village.



So what do you think of IPM?

"IPM has been very profitable to me. We no longer have the problem of buying pesticides which are expensive and which we can't say have been of any benefit. Our rice is safe, there are no dangerous residues and, more importantly, we are protecting our environment."

If you feel that IPM has profited you, how have you told other farmers about this?

"I often gather with other women in the bruga and talk about IPM. I also teach at the Madrasah and every time we hold religious instruction for women I slip in information about IPM."

What do you talk about?

"Well, I have told them that in this world, if you have rice plants you surely are going to have pests. But if there are pests, there will also be natural enemies that prey upon them. These natural enemies are there to help farmers. I have also talked about the danger of pesticides to the environment and to people."

Organizing IPM farmers: At their own initiative IPM alumni have created a multi-tiered structure of semi-formal and formal groups. They have established an IPM alumni association. In each group are individuals who serve as nodes of a communication network that keeps each group in contact with the other groups. The goal of the organizing activities is to develop a system that will sustain an IPM movement in Gerung and be responsive to the needs of farmers throughout the subdistrict. Alumni efforts have been independent of outside agencies. The following describes the different levels of organizational activity of the IPM alumni in Gerung subdistrict.

The bruga *as the foundation for an IPM movement:* The custom of people gathering in the *bruga* of a household has been taken advantage of by IPM alumni to create a foundation for a semi-formal IPM network. The *bruga* of 46 households in the subdistrict are being used as meeting places for IPM discussion groups. These groups meet on a regular basis to share information regarding IPM and farming. The alumni association plans to establish IPM discussion groups in every neighbourhood in every village of the subdistrict. The *bruga* discussion groups are the foundation of a farmer-controlled IPM network.

Bachriandi, farmer IPM trainer

"Spreading information about IPM via the bruga is appropriate; we farmers don't much care for formal meetings. At the bruga we can talk about IPM in a relaxed and informal manner without worrying about protocol. Farmers usually gather in the bruga for a cup of coffee in the afternoon as it starts to cool. While families have always had bruga, the role of the bruga has expanded in village life. The bruga serves a greater social purpose. With the advent of IPM an additional role has arisen for the bruga: they now serve as neighbourhood forums to support the spread of information about IPM and to strengthen the understanding of farmers regarding IPM principles. The bruga has given birth to farmers who embody the spirit of IPM. The farmers are changing how they farm."



Farmers' groups reorganized: Farmers' groups were organized by extension field workers as part of the modified training-and-visit system used by Extension in Indonesia. Farmers were meant to meet on a regular basis to receive recommendations and instructions and establish seasonal plans for input

requirements. Over time the basic weaknesses in the organizational structures of farmers' groups led to the erosion of their vitality. The farmers of Gerung say that their farmers' groups were inactive because they were poorly organized, failed to be relevant and had poor leadership.

The farmer IPM trainers and other alumni in Gerung subdistrict have provided the leadership to breathe life back into these groups. The revivification of farmers' groups got an initial boost from the first round of farmer planning meetings where alumni identified the reactivation of farmers' groups as one of their objectives. Alumni note that their FFS experience provided them with new ideas and a new perspective on how to work effectively as a group. Alumni determined that the farmers' groups provided the appropriate formal organizational context for their IPM activities. Once the groups had planned activities and began to implement them, there was good reason to continue to meet to learn about the results of those activities. As alumni brought new energy to their farmers' groups, farmers in general learned that alumni had something new to offer in terms of both knowledge and motivation. The members of farmers' groups lost little time in electing FFS alumni to leadership positions.

IPM alumni have thus been recognized by their villages because of their new knowledge and leadership. They have helped members of their farmers' groups to improve their farming practices. Field studies have been important, as they have served to actively involve all farmers' group members in learning. Gerung farmers are no longer the passive targets of messages brought to them by the extension system. Rather, FFS alumni are becoming recognized as the key to the development of sustainable agriculture in Gerung, as evidenced by the following statement.

> *"IPM alumni, including farmer IPM trainers, have become the heads of their farmers' groups and as such the nodes of an IPM movement. Among their roles as heads of farmers' groups, the farmer IPM trainers have worked to connect one group with another via the IPM network that has grown up. Farmers' groups have become the second tier in the organization of an IPM movement in Gerung subdistrict. The farmers' groups provide bruga discussion group members with a forum for discussing IPM issues among a larger group of farmers. Farmers' groups provide a context in which farmers can plan and effectively manage a variety of activities that respond to their needs."*
>
> L.L. Noverdi Bross, Head, Provincial Agriculture Service

At the subdistrict level: The next tier of alumni organizations is at the subdistrict level. At this level an organization has been established by IPM alumni for IPM alumni. The following is a conversation with Rizalihadi, a farmer IPM trainer from Beleka village, about the beginnings of the subdistrict-level IPM alumni association.

What are you doing to pursue the establishment of an IPM programme led by farmers?

"Along with other farmer IPM trainers and IPM alumni we are in the process of creating an IPM alumni association at the subdistrict level. We feel that the primary activity of the association will be to expand the application of IPM by farmers via the implementation of field studies in response to field problems identified by farmers."

When do you expect the association to be on its feet?

"We've already begun. We began the process over a year ago when there was a farmer technical



meeting for 30 IPM alumni from six farmers' groups in five villages. Our farmers' group, Dasan Tapen of Beleka village, was the host for the meeting and I was in the team charged with organizing the meeting. Several of us had already floated the idea of forming a subdistrict-level association and I had spoken with Bachriandi from Jembatan Kembar village about it. There were several key leaders in attendance at the technical meeting, including: I Ngh. Sukma Widarta, a farmer IPM trainer from Gerung village; I Wayan Galang from Banyu Urip village; Bachriandi, a farmer IPM trainer and Haji Haeruddin from Jembatan Kembar village; Haji Mustofa Syafii and Rusdi Aminullah, a farmer IPM trainer, from Lembar village; and from Beleka there was Haji Burhanudin, the head of a farmers' group, and Haji Mujiburahman. We discussed the issue of forming an association for IPM alumni and all 30 participants were in support.

"What we agreed to as a programme at that time was:

- *A common vision: Gerung subdistrict would become an IPM subdistrict and the site of a farmer-led IPM programme at the field level;*
- *Informal activities: to promote IPM through every means available; and*
- *Formal activities: to conduct field studies on a rotational basis among farmers' groups based on the needs of and problems faced by farmers of those groups."*

A mega-tier: The creation of an IPM alumni association, the revitalization of farmers' groups and the development of *bruga* discussion groups led to an initiative for which Bachriandi and Rizalihadi have provided the leadership. Bachriandi came to Rizalihadi with the idea of promoting IPM through the water users' association to all farmers in the subdistrict. The subdistrict is divided into water users' associations. One association is located in each watershed of the subdistrict. All farmers belong to one of these associations. In general, rice farmers are more active as members of the water users' associations than they are in farmers' groups. As water is of primary importance in growing rice, all farmers are interested in participating in decisions regarding the use of water.

This strategy takes advantage of the strengths and positions of leadership that IPM alumni and farmer IPM trainers have come to hold in their farmers' groups. There are usually several farmers' groups represented in one water users' association. The heads of these associations are drawn from the leadership of farmers' groups. This has resulted in most of the farmer IPM trainers who are heads of farmers' groups also becoming heads of water users' associations.

Each water users' association is part of a larger collective of water users' associations. The subdistrict has two of these collectives. Meetings of the collective are attended by the head of each association in the area under the oversight of the particular collective. Each collective meets once every 40 days. Bachriandi is the head of the collective of farmers' water users' associations for Pengga Kanan and Rizalihadi is the head of the collective of farmers' water users' associations for Pengga Kiri; between them they coordinate the activities of all water users' associations in Gerung subdistrict.

"Rizalihadi and I agreed to try to expand our organizing to truly cover the entire subdistrict. Fortunately I am still trusted by farmers to coordinate the collective of water users' associations for Pengga Kanan and Rizalihadi holds the same position for Pengga Kiri. We will use this

opportunity to spread field schools throughout the watershed areas of the subdistrict. Wherever the watershed includes another subdistrict, we will be active there as well. I get really nervous whenever I see farmers using poisons. Many farmers still don't realize that they are playing with fire. If they are unlucky they could die. We need to stop this. We, all of us farmer IPM trainers, are now actively pursuing this."

Bachriandi, farmer IPM trainer

The inclusion of water users' groups forms a network that is more inclusive and more extensive than an IPM alumni association, a collective of farmers' groups or neighbourhood *bruga*. The same key individuals, IPM alumni and farmer IPM trainers are in both, but there is a potentially larger audience for IPM by including water users' groups. The regular meetings of the collectives provide a forum that allows for communication among all affiliated groups. Each collective meeting brings together the nodes of the IPM network. The *bruga* discussion groups, farmers' groups, the IPM alumni association, and water users' associations are all connected via the IPM alumni and others that participate in the collectives of Pengga Kanan and Pengga Kiri.

The network has helped farmers' groups to take a coordinated approach to their activities. The IPM network has also helped farmers' groups to plan and organize activities such as field studies across the subdistrict, ensuring that the studies are of use to all farmers in the area; share results of field studies among farmers across the subdistrict; and inform other groups of innovations developed by members of any one group.

The role of leadership in the network is to coordinate the basic planning and decision making that takes place at the farmers' group level. The network circulates information internally and to groups outside the subdistrict. There exists a common vision among the farmers connected by the network. Bachriandi, who, as a leader of one of the water users' collectives, is a key figure in the network, had this to say:

"The trust placed in me by the farmers is not something that I intend to use to expand my power. I work with farmers so that we are working towards a common goal. I have not pushed an agenda upon others. The farmers are the ones with the right to determine the direction we take, not me. If I have an idea I will express it, but the group, not me, takes decisions. They have the power. Thus we work together with the same rights and responsibilities to struggle to realize our shared vision."

In Gerung, alumni initiated their own organizing efforts. IPM alumni, who began by using the bruga as a meeting place, reactivated their farmers' groups and ended up forming a subdistrict IPM alumni association, have found that their ability to communicate at all levels has been enhanced by the IPM network. Farmers can communicate among groups via the network, as the leaders of their farmers' groups are part of the network. Farmers in Beleka have access to farmers throughout the subdistrict. The various levels of organization serve to ease implementation of activities while the IPM network enhances communications.

4.3 A change in roles

IPM field trainers play a key role in initiating community IPM activities. This was the case in Gerung subdistrict and throughout Indonesia as well as in all countries where community IPM programmes have been established. Over time, IPM alumni take on the roles of trainers and leaders of local IPM programmes and IPM trainers are free to play a more consultative role. The Gerung case study provides some insight into the roles that IPM field trainers and IPM alumni have played in establishing a community IPM programme in the subdistrict.

The Gerung case began by identifying IPM field activities that were conducted in the subdistrict. An IPM field trainer, a plant-and-disease observer from the Directorate of Crop Protection, facilitated the first FFS in 1994. By the time the case study was conducted in 1997 there were nine farmer IPM trainers in the subdistrict and they had conducted a total of five FFSs. At this point the implementation of FFS was turned over to farmer IPM trainers. Thus the FFS implementation, initially an IPM field trainer role, became a farmer IPM trainer role. IPM field trainers picked up additional training activities, for example the soybean, shallot and follow-up FFS. The follow-up FFS was primarily a field study and reinforced research methods initially learned in the rice IPM FFS. The case presents a variety of examples of field studies being conducted by farmers. Gerung farmers, who initially looked to outside resources (the IPM field trainer) for knowledge, were, by 1997, creating their own knowledge base.

The IPM field trainers organized two types of forums for IPM alumni, the farmer technical meeting and the farmer planning meeting. These forums:

- Further enhanced the role of farmers while lowering the profile of IPM field trainers in activity planning and implementation.
- Reemphasized the role of farmers as legitimate sources of knowledge for other farmers.
- Put farmers in the driver's seat of programme development by giving them a planning role in the development of a local community IPM programme.

The beginning sections of the case show the importance of the IPM field trainer in organizing IPM field activities and the final sections show how IPM alumni replaced outsiders as the organizers of the Gerung subdistrict community IPM programme. This replacement process is described in Figure 3.



Figure 3 Farmers replace IPM field trainers in community IPM

IPM field trainers in Gerung in 1994 played the most prominent role in terms of providing training, information and leadership related to IPM. By 1997, the roles of IPM field trainers and alumni had been reversed. FFS alumni had taken on providing training, information and leadership. The case also indicates that local sources were being tapped for funding. In a sense, the high-profile national IPM programme was phased out over a period of several years in Gerung and replaced by a locally driven community IPM programme.

4.4 The farmer planning meeting and the farmer technical meeting

At the beginning of the chapter, meetings or forums for alumni at the village or inter-village level were identified as a key activity in laying the foundation for community IPM. Two types of meetings, the farmer technical meeting and the farmer planning meeting, were mentioned in the Gerung case. These forums were designed to set in motion the development of community IPM activities within subdistricts in Indonesia. While these forums might go by different names in different countries and there might be some difference in agendas, their primary goal would be the same: to provide an opportunity for IPM alumni to share information related to IPM and start establishing a network among alumni as a foundation for a local community IPM programme. Perhaps a key difference between community IPM and other community development approaches is that these meetings occur after a season-long training process, the FFS. The FFS helps to establish a common vision, group norms, and problem-solving skills. These are important to the efforts of alumni in institutionalizing IPM at the village level.

4.4.1 Farmer planning meetings

The farmer planning meeting in Indonesia was designed with the goal of laying the foundation for a network among IPM farmers at the subdistrict level. Creating a network among alumni is an initial step in establishing community IPM activities. Rice farmers tend to maintain friendships at a very local level, among neighbours and those who farm near them. Rarely do they have acquaintances among farmers from other villages. These meetings, while focusing on IPM issues, helped farmers from across a subdistrict to get acquainted. The process of preparation for and implementation of the meeting required that farmers identify local issues, plan activities to resolve those issues and share those plans with other farmers at a subdistrict level.

Box 4.3 Farmer planning meeting, Kaligondang, Central Java

The IPM field trainer and the IPM district leader established a committee of IPM alumni to organize and facilitate the meeting. The committee was made up of representatives from six of the 'rice bowl' villages of the subdistrict (two IPM-trained farmers per village, usually farmer IPM trainers). The committee met to determine the nature of plans to be developed, the format for the plans and how each group might conduct village-level planning meetings. The representatives returned to their villages and met with other IPM alumni to formulate the plans that they would present at the planning meeting.

Field school alumni from five villages (Tejasari, Arenan, Penolih, Kembaran Wetan, Sempor Lor and Kaligondang), six per village including two farmer IPM trainers, attended the farmer planning meeting. Other attendees included not only the IPM field trainer and field leader but also extension workers from the subdistrict, the subdistrict extension officer and the heads of

each village. The meeting was conducted in the house of the head of the village of Kaligondang on 19 December 1995. The meeting started at 9:00 a.m. and closed at 1:30 p.m. The agenda of the meeting included an opening, a presentation on the purpose of the meeting, presentations of plans, the editing of plans by the groups based on comments from participants and the determination of a schedule for implementation and where funds would come from. Each group had written out its plans on newsprint and these were attached to the walls of the meeting room. A member of each village group presented the group's plans. Members of the organizing committee facilitated the meeting.

Pak Eko Sugiyanto, an IPM field trainer , said: *"This is a meeting that will strengthen the network among IPM-trained farmers, help farmers to share their experience and contribute to the continuation of IPM activities at the village level. This is a meeting for and by farmers."*

Pak Hadi Suwito, a farmer from Tejasari village, said: *"Our group came up with the idea to study the use of urea tablets and super phosphate 36% because we want to test new extension recommendations. We aren't rejecting the urea tablets and SP 36. We want to determine the proper approach to using them in our village. The results of our study will be useful to all farmers in the village."*

Examples of activities planned by farmers

Farmers' group	Activity	Source of funds	Schedule
Sri Mukti Kaligondang	Rat control study; urea tablet study; IPM promotion	Farmers and local government	95-96 main season
Sri Rejeki Arenan	FFS by farmer IPM trainers; urea tablet study	Farmers and local government	95-96 main season
Kencana Tejasari	FFS by farmer IPM trainers; urea tablet & SP 36 study	Farmers and local government	95-96 main season
Sri Lestari Penolih	IPM promotion; rat control; urea tablet & SP 36 study	Farmers and local government	95-96 main season
Rukun Tani Sempor Lor	Urea tablet & SP 36 study; rat control	Farmers and local government	95-96 main season
Karang Blimbing Kembaran Wetan	Produce improved weeding tools; repair irrigation	Farmers and local government	95-96 main season

After the presentation of their plans, the groups did further work on the technical aspects of implementing them. There was much discussion among and between groups.

"Funds for our study will come from our farmers' group. Each member will contribute Rp1000."

Pak Atmo, Sempor Lor village

"Our activities are based on issues we thought were important, including the testing of what Extension has been promoting. The activities that involve just our group will be supported by the farmers in our group. As the rat control activity involves the whole village, we will seek support from the village."

Pak Hani, Penolih village

"The meeting was very appropriate for us. We were able to share news among farmers from throughout the subdistrict about the progress of our groups."

Farmer from Kembaran Wetan village

"*We should be able to bring back to life farmers' groups throughout the subdistrict that are now dormant by means of the activities that we have planned."*

Farmer from Arenan village

4.4.2 Farmer technical meetings

The agenda of the following technical meeting included the review of the results of activity plans that had been presented at a planning meeting during the 1994/95 rainy season. The purpose of the farmers' technical meeting is to provide an opportunity for IPM farmers to share their experience, knowledge and skills through the discussion and analysis of field-based problems and of the activities that have been implemented to resolve those problems. Like the farmer planning meeting the technical meeting is designed to help create and support a network among IPM farmers.

Box 4.4 Farmer technical meeting, Kaligondang, Central Java

Prior to the meeting the IPM field trainer and IPM district leader formed an organizing committee of IPM alumni from Tejasari, Arenan, Sempor Lor, Kaligondang, Penaruban and Penolih. The committee determined the agenda of the technical meeting, designed a format for presentation of activity results and inventoried activities previously planned that were conducted in their villages. Members of the committee returned to their villages to meet with their groups to write up presentations on those activities that their groups thought were most important. The technical meeting was held at the house of the head of Kaligondang village. Thirty farmers participated in the meeting, five from each village, including farmer IPM trainers. Extension workers from the subdistrict, the subdistrict agriculture officer and village heads also attended. The agenda included an opening, a presentation and discussion of field activities, and closing comments from farmers. The organizing committee facilitated the meeting.

Farmers' group	Title of presentation	Year implemented
Tirta Kencana Tejasari	Planting distance study	1995
Rukun Tani Kaligondang	Analysis of farmers' activities	1995
Sri Rejeki Sempor Lor	Planting study	1995
Sri Murni Penaruban	Turning waste metal into farm tools	1995
Sri Lestari, Penolih	Rat control study	1995
Sri Mukti Arenan	Fertilization study	1995

After the presentation of reports on field trials and other activities, a general discussion was held. Among the points made during the discussion were the following:

"There is a wide disparity among planting distances used by farmers in our village. We wanted to know what was most appropriate. We did the study for two seasons. What seemed to be the best planting distance was 25 cm x 25 cm. The results of this study were provided to the farmers in Tejasari during meetings that took place there. Now there are many farmers using this planting distance."

Pak Hadi Suwito, Tejasari village

"We wanted to know the advantage of planting rice in straight rows. It turns out that straight rows

yielded more and were easier to weed than crooked rows. We also tried out different planting distances to determine appropriate spacing."

Pak Riswoyo, Sempor Lor village

"What we found, like those in Tejasari, was that a planting distance of 25 cm x 25 cm was best for us."

Pak Muntako, Sempor Lor village

"Because of our study we have succeeded in involving all local farmers in controlling rats."

Pak Hani, Penolih village

4.5 IPM, institutionalization and civil society at the community level

The goal of community IPM is the institutionalization of IPM and sustainable agriculture at the village level. Most external donors insist upon a project being 'institutionalized. From their perspective this means that the project becomes, in some way, an ongoing programme of the national government with its own budget. These donors rarely give thought to the possibility of sustainable institutionalization at the village level thereby ensuring the continued flow of benefits at the village level.

Uphoff (1986) suggests that institutions may or may not be organizations (money is an institution but not an organization). Institutions are, in fact, a set of norms and behaviours that persist over time because they serve collectively valued purposes. On the other hand, organizations, whether or not they are institutions, are structures of acknowledged and accepted roles (a cooperative is, generally, an organization). Organizations can become institutions. Institutionalization occurs when there is a growing acceptance of a structure of roles or set of norms and beliefs capable of channelling and patterning behaviours so that they become more sustained and beneficial (ibid).

Uphoff (1999) holds that membership organizations like those in Gerung can can effectively be institutionalized through a process that begins with self-help projects. That process includes:

- Implementation of self-help projects to solve acknowledged local problems;
- Mobilization of resources on behalf of those projects;
- Acknowledgement that those projects are contributing to the efficiency and effectiveness of local development by local institutions.

The Gerung case provides a look at how alumni in one subdistrict in Indonesia are working to institutionalize IPM in their villages. Specific organizing activities include reactivating farmers' groups, organizing a subdistrict alumni association and taking advantage of water users' associations. The farmers' groups are planning and conducting a variety of activities to help farmers overcome specific field problems. The alumni association and water users' associations serve to spread the results from field studies to all farmers in the subdistrict. Apparently the leadership skills of farmer IPM trainers and their ability to facilitate open processes and group decision-making have been recognized by local farmers. The farmer IPM trainers have been elected to leadership positions of farmers' groups and maintain prominent positions in the water users' associations. Local governments have provided funds to support field schools conducted by farmer IPM trainers. The provincial agricultural service believes that the activities of IPM alumni will lead to a sustainable agricultural system in Gerung. Thus, Gerung

alumni have generally followed Uphoff's outline concerning a path to institutionalization: implementation of self-help projects, mobilization of resources and acknowledgement by others of the value of those projects. And having put themselves on the local institutional/organizational map, alumni organizations are becoming institutionalized through the legitimacy accorded to them.

4.5.1 Building a civil society

An important outcome of community IPM activities is the strengthening of civil society in a village. Civil society arises when:

- the interests of members in a community, especially those who do not belong to the "official" class of the community, gain voice and are taken seriously as part of the decision-making process of that community;
- the decisions affecting a community are reached via a process that is open and inclusive; and
- benefits of community decisions flow in many directions; they are not the exclusive property of one segment of the community.

The approaches used to establish community IPM enhance the analytical, decision-making and leadership skills of alumni. Alumni are able to conduct decision-making processes based on open and democratic deliberations that lead to consensus. Community IPM is a collaborative effort among farmers to strengthen the overall agro-ecosystem management skills of the community in a specific locality. This collaborative effort as shown in the Gerung case can increase the credibility that is given to farmers by official society. In the Gerung case, alumni were working to achieve broad common consent regarding decisions related to the village "commons", i.e. the agro-ecosystem or watershed shared by the farmers of a village. Additionally, Gerung FFS alumni were determined that decisions arising from their communicative action processes should be of benefit to their community.

Government, non-alumni and other local organizations are legitimizing IPM and the IPM organizations being established in Gerung. This institutionalization will influence behaviour patterns for all local organizations in Gerung. Hence, the conditions common to a strong civil society are being established. The civil society taking root in Gerung will enable the community of farmers to better manage the ecological and social conditions in which they live, which will in turn ensure greater stability in food production in their villages.

4.6 Pitfalls

Applying a prescriptive formulaic approach to community IPM will not necessarily result in farmers establishing their own village-based IPM programmes. Laying a foundation upon which farmers can build their own local IPM programmes requires flexibility. Two common pitfalls related to community IPM are presented below.

4.6.1 The task-at-hand trap

The first pitfall that can limit a community IPM programme is the tendency for facilitators to become absorbed in the immediate job to be done, the activity that must be conducted now, the meeting that must be run today. IPM field trainers are task oriented; they get the job done. They may be good facilitators of FFSs and meetings, yet fail to see beyond the task at hand. The systems or organizational

cultures in which IPM field trainers work usually reinforce this approach. The job of community IPM programme leadership is to help IPM field trainers to see beyond the FFS. The FFS opens the door on a vast landscape of potential. The job of leadership is to help alumni and field trainers to enter into that landscape.

Leadership needs to create activities that will help alumni realize their potential. These activities should lead to alumni being in control of IPM activities at the local level. In order for IPM field trainers to be able to effectively make use of and integrate new IPM activities, there needs to be regular training meetings or forums for field trainers. In general, these meetings should focus on how to implement new field activities and help field trainers to broaden their vision regarding the potential of post-FFS IPM activities.

4.6.2 The template trap

Programmes should avoid the trap of trying to develop a formulaic approach to community IPM. Creating a template that would generate village IPM programmes across a country is a snare and a delusion. A national IPM programme needs to create a menu of activities that can be used creatively by field trainers to help alumni establish their own IPM programmes. Every effort needs to be made to capture evolving ideas for activities that emerge from field trainers and farmers. In Indonesia, project offices served as coffee shops. They were places where trainers and farmers felt comfortable visiting and talking with staff about field issues and possibilities. Many ideas for field activities were generated by these discussions.

When programme leaders employ a template approach, it suggests that they lack confidence in both alumni and field trainers. A possible reason this trap might arise is that a programme wants to get village IPM programmes up and running as fast as possible. Speed is not of the essence in developing community IPM. Building local institutions is more important, and this takes time. National plans also tend to generate constraints on flexibility because of the importance that they put on targets, log frames, and budgets in the planning process. National plans describe reality in terms of activity units, cost per unit, units per province and total cost. Templates are convenient for those who are charged with planning and managing large projects. However, they are a constraint for field workers. Field workers are in the position of actually being able to develop activities that are relevant, feasible and effective.

The template trap reinforces the task-at-hand trap. Templates produce a formulaic approach with a set of fixed activities that facilitators will be expected to perform, usually within prescribed guidelines. Facilitators will focus on the task at hand and getting it right. Should they feel that they need to conform to a set of fixed expectations regarding activities, the facilitators will tend to be more controlling. The more top-down and controlling the system that puts the template into play the more controlling will the facilitators be. As we have seen, Green Revolution systems tend to have centralized management structures. Community IPM, on the other hand, requires a decentralized approach that not only allows local initiative and innovation but also encourages it. Dynamic field-based decision making needs to be applied not only by farmers but also by facilitators and programme managers. The Gerung case shows that this is feasible in farmer-led village or subdistrict IPM programmes. The Indonesian national IPM programme has seen several hundred subdistricts evolve in ways similar to Gerung. It has demonstrated that a decentralized field-based management system is feasible on a large scale. Chapter 8 further explores the issue of establishing a decentralized field-based management system to support farmer-led village IPM programmes.

5. EDUCATIONAL FOUNDATIONS OF THE FIELD SCHOOL

FFS alumni are able to not only apply IPM principles in their fields but also to:

- master a process enabling them to help others learn and apply IPM principles and
- organize collaborative activities in their communities to institutionalize IPM principles.

A good field school process ensures these outcomes. The educational concepts underpinning the FFS are drawn from adult non-formal education. These concepts have been found to be relevant across the many countries and cultures in which the FFS approach has been used. In the context of the FFS these concepts have proven to be empowering for farmers.

This chapter presents a review of the concepts that underlie the learning activities found in a field school. In addition, there is an analysis of the field school approach using a framework based on critical theory. This analysis demonstrates why the FFS has a broader impact than simply changed practices among farmer alumni.

5.1 The principles of education and the IPM farmer field school

The following are some of the concepts and theories that have contributed to forming the methodological basis of the IPM farmer field school.

5.1.1 A definition of learning and the learning cycle

There are many definitions of learning. D.A. Kolb, in his book *Experiential Learning*, proposed a definition of learning that is relevant to the FFS approach.

"Learning is the process whereby knowledge is created through the transformation of experience."

Kolb proposed the "learning cycle", a concept of the learning process that is well known among practitioners of adult non-formal education. For Kolb, the learning process can be boiled down to four elements or stages, which constitute a learning cycle (Kolb 1984):

- Concrete experience;
- Observation and reflection;
- Generalization and conceptualization; and
- Experimentation.

All FFS learning activities apply the learning cycle. For example, in a rice IPM FFS, the agro-ecosystem observation and analysis activity begins with the observation of a rice-field agro-ecosystem. Participants collect data in the field (experience) and return to the meeting place to analyse the data (reflection). The participants make use of their data to prepare a presentation regarding field conditions and propose decisions for actions regarding the rice field such as apply fertilizer or don't apply insecticides (generalization and conceptualization leading to a hypothesis). The decision is then implemented over the following week (experimentation) and the cycle begins again.

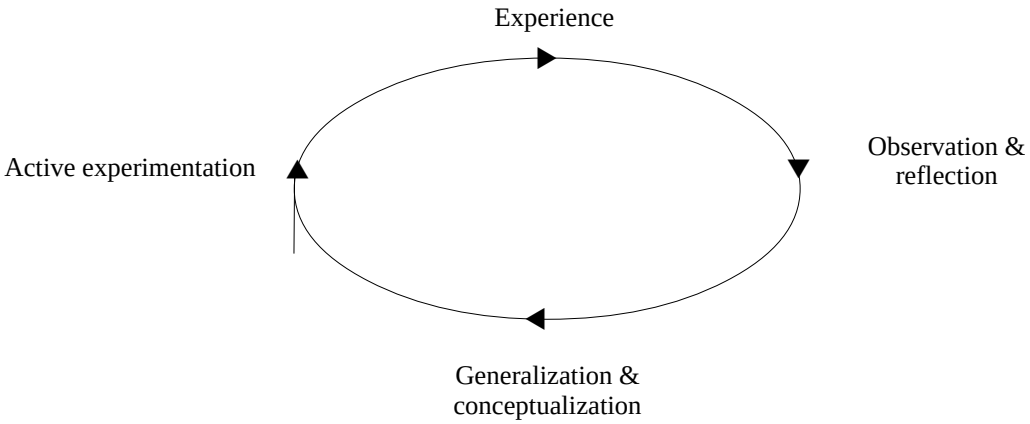


Figure 4 The learning cycle

5.1.2 "Andragogy"

Malcolm Knowles thought and wrote about the education of adults. He distinguished pedagogy from something he termed "andragogy". For Knowles, pedagogy was the art of teaching children and andragogy the art of teaching adults (Knowles 1968). The FFS is an approach that exemplifies andragogy. Table 5.1 compares pedagogy and andragogy based on four main assumptions that can be found within each approach (Jarvis 1987).

Table 5.1 Pedagogy and andragogy compared

Key assumption	Pedagogy	Andragogy
Concept of the learner	The role of the learner is by nature a dependent one. The teacher is expected to take full responsibility for determining what is to be learned, when it is to be learned, how it is to be learned and if it has to be learned.	Because of the process of maturation a person moves from dependency towards increasing self-directedness, but at different rates for different people and in different dimensions of life. Adults have a psychological need to be self-directing.
Role of learners' experience	The experience learners bring to a learning situation is of little worth. It may be used as a starting point. The experience from which learners learn is that of the teacher, the textbook writer, etc. The primary techniques of teaching, accordingly, are transmitted techniques - lectures, reading, etc.	As people mature they acquire an increasing reservoir of experience that is a rich source for learning, for themselves and others. Adults attach more meaning to learning they gain from experience than what they gain from passive methods. The primary methods for adult learning are experiential.
Readiness to learn	People are ready to learn what society says they should learn, provided the pressure put on them (i.e. fear of failure) is great enough. Most people of the same age are ready to learn the same things. Thus, learning is to follow a standard curriculum with a uniform progression.	People become ready to learn something when they experience a need to learn it in order to cope more satisfyingly with real-life tasks or problems. The educator has a responsibility to help them discover their "need to know".

Orientation to learning	Learners see education as a process of acquiring subject-matter content, most of which they understand will be useful only at a later time in life. Thus the curriculum should be organized into subject-matter units which follow the logic of the subject. People are subject-centred in their approach to learning.	Learners see education as a process of developing increased competence to achieve their full potential in life. They want to be able to apply what they learn today to living more effectively tomorrow. Thus learning experience should be organized around capacity development categories.

(From Jarvis 1987)

5.1.3 Learner-centred approach



The FFS has been described as a learner-centred approach. Learner-centred approaches emphasize self-directed learning and are commonly used with adults. These approaches put the trainer in the role of a facilitator. Carl Rogers' work forms a theoretical basis for learner-centred approaches. The fundamental principle of this approach is that adult learning can be optimized when the learner is put in control of his or her learning. Rogers' work suggests that adult learners require:

- learning to be relevant to their needs;
- activities that encourage self-direction;
- processes that foster independence, creativity, self-reliance, self-criticism and self-evaluation; and
- facilitators not teachers.

The FFS builds on Rogers' work from a methodological perspective. The following is what Rogers had to say about facilitation. (Rogers 1969)

Box 5.1 Rogers' guidelines for facilitators

- The facilitator has much to do with setting the initial mood or climate of the group or class experience.
- The facilitator helps to elicit and clarify the purpose of the individuals in the class as well as the more general purposes of the group.
- He/she relies upon the desire of each student to implement those purposes that have meaning for him or her as the motivational force behind significant learning.
- He/she endeavours to organize and make easily available the widest possible range of resources for learning.
- He/she regards himself or herself as a flexible resource to be utilized by the group.
- In responding to expressions in the classroom group, he/she accepts both the intellectual content and the emotionalized attitudes, endeavouring to give each aspect the approximate degree of emphasis that it has for the individual or the group.
- As the acceptant classroom climate becomes established, the facilitator is able increasingly to become a participant learner, a member of the group, expressing his or her views as those of one individual only.
- He/she takes the initiative in sharing himself or herself with the group - feelings as well as

thoughts - in ways that do not demand or impose but represent simply a personal sharing which students may take or leave.
- Throughout the classroom experience, he/she remains alert to expressions indicative of deep or strong feelings.
- In his or her functioning as a facilitator of learning, the leader endeavours to recognize and accept his or her own limitations.

5.1.4 Learning theory and the FFS

Ideas from three different theoretical branches of psychology contribute to the basic learning theory upon which the FFS is based: stimulus-response theory, cognitive theory and motivation and personality theory. (The following is drawn from a summary by Dilts 1986)

Box 5.2 Psychological principles

Stimulus-response theory
- The learner should be active, rather than a passive listener or viewer.
- Frequency of repetition is important in acquiring skills and for retention through learning.
- Reinforcement is important. In repetition desirable or correct responses should be rewarded.
- Generalization and discrimination suggest the importance of practice in varied contexts, so that learning will become important to a wider range of stimuli.
- Novelty in behaviour can be enhanced through imitation of models, through cueing and through behaviour shaping.

Cognitive theory
- The organization of knowledge to be presented is not arbitrary. Information to be presented should go not just from simple to complex, but from simple wholes to more complex wholes.
- Cognitive feedback confirms correct knowledge and corrects faulty learning. The learner tries something provisionally and then accepts or rejects what he does on the basis of its consequences. This is similar to stimulus-response reinforcement, but places more emphasis on the testing of hypotheses.
- Goal setting by the learner is important as motivation for learning and his or her success or failure determines how he/she sets future goals.
- Divergent thinking that leads to multiple paths and answers is to be encouraged alongside convergent thinking which has a sole logical path to a single answer.

Motivational and personality theory
- The learner's abilities are important. Rates of learning vary from individual to individual and must be accommodated in training design.
- Anxiety levels affect learning differently in each individual and vary in their effect with the type of learning task undertaken.
- A similar situation may evoke different levels of motivation from different individuals depending on whether they are oriented to affiliation needs or achievement needs.
- The organization of motives and values within the individual is relevant to his learning. People tend to learn what they perceive as relevant to their specific needs and interests.
- The group atmosphere of learning (competition, collaboration, isolation, etc) will affect satisfaction in learning as well as the product of learning.

5.2 A critical theoretical framework and the FFS approach

Humans approach knowledge with an "orientation towards technical control, towards mutual understanding in the conduct of life and towards emancipation from seemingly 'natural' constraint" (Habermas 1971). With this statement Habermas presents the three cognitive interests all humans share which form the basis for their interest in learning: the technical, the practical and the emancipating. These three cognitive interests grow out of three distinct areas of human social existence: work, interaction with others and power (Ingram 1987). As cognitive interests, they govern the interest of humans in gaining knowledge and hence underlie human conduct. The following presents the characteristics of the learning domains associated with each cognitive interest. Box 5.2 provides a summary of these characteristics.

5.2.1 The technical domain





The technical-interest learning domain grows out of the need to control the physical and social environment. As such, the interest makes use of instrumental action. Its prototype is the natural sciences. The type of knowledge developed consistent with this interest (i.e. technical knowledge) derives its power from being able to offer explanatory theories. These theories are based on causal relationships. Technological knowledge is exploitable only as processes that can be objectified. The problem is that not all processes can be objectified.

5.2.2 The practical domain

In order to live with other human beings we must interact with them and come to know them. Thus practical knowledge is dominated by communication and is typified by communicative action. This knowledge interest is based on coming to understand human actions. Communicative action in society is founded on norms that make clear the consensual agreement regarding behaviour shared by at least two actors. Social norms are valid only where there is shared and mutual understanding of intentions and recognition that there are obligations inherent in the social act of communication (Mezirow 1980). In this practical domain, the concern is with understanding and meaning, not with causality, prediction or control. While technical knowledge depends upon separateness and externalization, practical knowledge depends upon connectedness and inclusion. Thus at the core of practical knowledge is the act of speech (Park 1994).

While technical knowledge relies on empirical science to reveal knowledge, practical knowledge is based on the historical hermeneutic sciences where knowledge is created in the interpretation process. Hermeneutics concerns itself with interactions and patterns and focuses on determining meaning rather than causality (Dilts 1985, p. 81).

Table 5.2 Critical theory framework

Area of social existence	Domain of learning	Characteristics
Work	Technical	1. Technical control of environment 2. Characterized by instrumental action 3. Goal: effective prediction and control of reality 4. Use of empirical sciences
Interaction	Practical	1. Understanding and meaning of social processes with others 2. Characterized by communicative action 3. Goal: the meaning of interactions and patterns 4. Use of historical hermeneutic sciences
Power	Empowerment	1. Internal and environmental factors that inhibit our control over our own lives 2. Characterized by self-reflective action 3. Goal: able to differentiate between factors that are beyond our control and those assumed to be beyond our control to expand our area of action 4. Self-reflection, critical thinking

5.2.3 The empowerment domain



Knowledge associated with empowerment, based on action and reflection, deals with individual self-knowledge. Self-reflection releases the subject from dependence on hypostatized powers (Habermas 1971, p. 311). Self-reflection, critical thinking which examines both the internal factors and the environmental limits that together inhibit our control over our own lives, produces a knowledge that leads to empowerment. In investigations concerned with empowerment, people, knowing what they wish to achieve, examine the structural issues of the world they live in. Knowledge associated with empowerment is concerned not with causality or meaning but with structure. Because progress in technological and practical knowledge requires unconstrained discourse, there is a sense in which all knowledge is related to an empowerment interest (Ingram 1987, p. 13).

5.2.4 The FFS learning approach

The critical theory framework presented above provides a basis for thinking about the FFS approach. As Ingram pointed out, all knowledge is related to an emancipating interest: we learn so that we have more control over our world. Learning also frees us from dependence on others. Habermas points out that the first two domains combine through the use of self-reflection to become emancipating (Habermas 1971, p. 314).

Although the original purpose of learning might come from the technical domain, the learner will not necessarily be able to apply that learning if the practical and empowerment domains have been ignored. What is learned about a technical interest remains to be applied in a social context and this demands interaction. The learner needs to know how to explain and talk about - how to take communicative

action concerning - what has been learned relating to a technical interest. In many cases, learning concerning a technical interest cannot be applied before the learner has been freed from factors once assumed to be out of his or her control. The learner assumes a problem is external in nature only to discover that it is internal - one the learner can take action to remedy. Having discovered this, the learner becomes free to employ technical knowledge. Thus learning interests, while they can be discussed separately, cannot be contained in separate categories. The FFS approach unifies these interests and domains in an integrated and integrative educational process.

The general purpose of FFS learning associated with the technical domain concerns the management decisions that have to be made by a farmer applying IPM principles. These decisions are related to agronomic and ecological factors. FFS alumni live in a world where non-IPM alumni may not only not understand IPM but also be openly antagonistic to alumni who would refuse to apply pesticides. Thus learning in the FFS connected to the interaction domain must serve several purposes focused on helping other farmers understand and apply IPM principles while organizing and collaboratively managing local IPM programmes. Empowerment domain concerns reflect the developmental process whereby farmers become able to identify factors that inhibit their control over their lives and the means to resolve those issues.

Table 5.3 The learning domains and the FFS approach.

Learning domain	Purpose
Technical	1. Alumni manage the use of agricultural inputs based on their analysis of field conditions and knowledge of plant requirements. 2. Alumni able to analyse ecological conditions based on their understanding of field ecology. 3. Alumni design and implement field studies that will help them increase knowledge of ecological and agronomic issues.
Practical	1. Alumni are able to effectively collaborate among themselves and with others. 2. Alumni facilitate/participate in group processes aimed at identifying, analysing and solving problems. These processes are characterized by communicative action. 3. Alumni facilitate learning among others so that IPM becomes the accepted approach to rice growing in their village. 4. Alumni organize community action to solve agriculture problems.
Empowerment	1. Alumni have developed skills that support critical thinking. They are able to identify and analyse field problems and take action to solve them in common with others. 2. Analytical skills of alumni result in expanded area of action. They are able to organize community action, information networks, village IPM programmes.

Table 5.3 links the critical theory framework presented earlier to the FFS approach. The column "Purposes of the FFS approach" identifies the general purposes addressed by an IPM FFS associated with each domain: technical, practical and empowerment.

The following paragraphs address each domain, its specific learning purposes and how the field school approach addresses these purposes. The discussion refers to the IPM principles: grow a healthy crop; conserve natural enemies; regular field observations; and farmers as IPM experts.

Technical: The purpose of the FFS approach in connection with this domain focuses on the management and decision-making skills of a farmer concerning agronomic and ecological factors. In order for farmers to be able to grow a healthy crop, emphasis is placed on agronomic management issues such as seed

selection, soil preparation, planting in nurseries and transplanting to the field, soil fertility management, water requirements of plants and the timing of irrigation, and cultivation issues. The decisions regarding the use of inputs are connected to plants' physiological development and needs at different stages of their development. The goal is to help farmers optimize their yields by fulfilling the potential inherent in the plants.

To be able to conserve natural enemies requires that farmers are able to recognize the different factors in the rice-field ecosystem and understand their interactions. Plant-eating insects, predators and parasites are studied in the context of how they relate to the rice plant and the stages of the plant's development. They learn how to conserve natural enemies on the basis of their own analysis of the factors existing in their fields and hence, avoid unnecessary pesticide applications.

Observe field regularly concerns learning how to see what is happening in the rice field over time. The observation is based on the collection and analysis of field data. In the learning situation, farmers use a formal process (the agro-ecosystem analysis) to gain these observational and analytical skills. Having learned about agronomic and ecological issues, the farmer, during the observation, sees what is happening in the field and is able to make decisions based on knowledge of cause and effect in the field.

Almost all FFS learning activities bear a direct relationship to the technical domain. In particular the agro-ecosystem analysis, special topic activities, the comparative studies and additional field studies conducted during an FFS all affect the technical skills of a farmer. All of these activities employ the experiential or discovery learning cycle: hypothesis formation, data collection, analysis, synthesis, formation of a new hypothesis and testing of the hypothesis. The agro-ecosystem analysis in particular helps farmers to master technical issues by experimentation and analysis. Weekly action decisions are taken and implemented as a result of the agro-ecosystem analysis. Each succeeding week allows the farmers to see and analyse the results of their previous decisions as they conduct additional agro-ecosystem analyses.

During their FFS, farmers master the experimental approaches used in special topic activities and in comparative field studies. They learn to employ the discovery learning cycle. As they gain increased understanding of their agro-ecosystem through experimentation, they increase their control over it. The FFS results not only in participants creating an IPM knowledge base, but also in learning how to learn and being enabled to continue to create their own knowledge related to this domain. In Gerung (see Chapter 4), FFS alumni were conducting studies concerning the agro-ecosystem ecology of not only rice but also soybeans and chillies.

Practical: While the principles of IPM suggest that the field school approach might be limited to a focus on the technical domain, the practical domain is crucial. There are practical domain purposes integrated into every FFS activity. The purpose of the practical domain in the FFS is to enhance a range of leadership skills that will essentially help alumni to facilitate learning activities and group problem-solving processes as they initiate collaborative activities to institutionalize IPM at the village level. Specific leadership skills related to this domain include discussion skills, questioning, analysis, problem-solving processes, and communication skills.

Farmers participating in an FFS learn the grammar of their agro-ecosystems and IPM. For example, they don't just learn to identify an insect but they learn about its lifecycle and function in the ecosystem. They are able to talk about one factor of the ecosystem as it interacts with other factors. Every FFS activity includes analysis, presentation and discussion sessions. During these sessions participants practise

their analytical skills, learn to present to groups and to handle difficult questions. They coach one another as they make presentations: the shy overcome their reluctance to talk, the imprecise achieve clarity, the weak argument is strengthened, and they gain voice.

Again, the Gerung case of Chapter 4 provides many examples of the effects of FFS learning involving the practical domain.

- Alumni conduct FFSs for other farmers or teach children the basics of ecology.
- Practical field problems are identified and solved by means of various field studies.
- Alumni develop IPM organizations and institutionalize IPM in their subdistrict.

Empowerment: In all of our lives, there are factors that we tend to make larger than life and to treat as if they were beyond our control. To successfully take control of these factors, we need to demystify them through critical analysis. Critical analysis is a skill that farmers master as part of the FFS. Every FFS activity is designed to include an analytical step. All participants have an opportunity to enhance their critical analysis skills during the FFS. Group presentations and discussions develop analytical skills. A good FFS facilitator will help enhance analysis through the probing questions that he or she asks. A principle of empowerment, the possibility of and the need for the progressive replacement of more naive perceptions by more integrative and more discriminating perceptions (Freire 1968) is a direct result of the critical analyses that take place within an FFS.

In the Gerung case the description of the organizing activities of FFS alumni provides several examples of group decision-making, collaboration and analysis of opportunities to create IPM organizations. The decision to organize was in itself a clear example of alumnus empowerment. Farmers, pre-FFS, were organized by extension field workers into farmers' groups which became moribund. FFS alumni reactivated those groups and initiated their own alumni association. Typically, farmers have been organized by others to further the organizers' goals; FFS alumni organize themselves in response to their own needs and determine their own goals.

Empowerment plays out into everyday life for alumni. The Gerung case is just one example of what FFS alumni are doing. Many groups of alumni in Indonesia have noted the inconsistency between IPM and the demand of village credit programmes that farmers accept insecticides as part of the credit package. Hundreds of alumni groups have protested against such demands and have successfully changed local policy. Thousands of farmer IPM trainers in Indonesia have formed a national group for themselves and they have:

- investigated adulteration of fertilizer;
- campaigned on behalf of farmers' rights;
- spoken out against the inefficiencies of the extension system;
- changed government agriculture policies that were inimical to IPM; and
- confronted local governments as well as the national assembly to lobby for increased farmers' rights.

In countries across the region FFS alumni have been successful in taking greater control over their lives. Examples include:

- In Cambodia, alumni are being installed on local development councils, using the FFS to train handicapped farmers and studying health issues related to insecticides to raise the awareness of their neighbours about the hazards of pesticide use.
- In China, women who have gone through FFS are organizing FFS for other women to improve their IPM and farming skills in response to the increased farming-related responsibilities that

women have had to take on as their husbands seek higher income in urban areas.

- In Thailand, children who have gone through FFS in their schools are helping their parents to apply more sustainable approaches to farming.
- In the Philippines, alumni have held national and local congresses to try and solve their problems.
- In Viet Nam, IPM alumni are becoming active in gender rights, organizing action research to study agricultural problems relevant to their communities, and playing key roles in village decision-making.
- In Sri Lanka, alumni have helped to maintain local IPM programmes in spite of an absence of national funding and civil war.

Empowerment might begin in the FFS, but the FFS is just the first step along a road that is being built by alumni throughout Asia.

6. RICE IPM IN ASIA: ECOLOGICAL PRINCIPLES UNDERLYING THE FFS

The genesis of integrated pest management (IPM) was a response to the emergence of problems associated with the reliance on chemical controls for insect pests by governments, extension systems and farmers. The search for solutions to these problems led to the development of a more holistic view of what constituted an agro-ecosystem and how human intervention could either enhance or disrupt one. This chapter briefly looks at the development of IPM in general, its application in tropical irrigated rice and the evolution in the understanding of tropical irrigated rice-field ecology.

6.1 Early development of IPM

With the introduction of chemical insecticides following World War II, plant protection specialists were able, almost without restriction, to make use of powerful poisons. The goal of plant protection specialists in the early 1950s was 100-percent control (eradication). Entomologists such as Ray F. Smith and A. E. Michelbacher sounded warnings against such unrestricted use and proposed an approach that tolerated low levels of pest populations to allow natural enemy populations an opportunity to suppress pest populations. They proposed an approach to crop protection that was based on the analysis of the ecology of a given agro-ecosystem and included biological controls. Their work resulted in the development of what was known as integrated pest control. They proposed that the goal of pest control strategies was to tolerate pest populations that were below specified threshold levels. (J.A. Litsinger, Peter E. Kenmore and G. Aquino 1982)

Box 6.1 contains a summary of a presentation by R.F. Smith and H.T. Reynolds to an FAO symposium in 1966 concerning the ecological approach inherent in integrated pest control.

Box 6.1 Principles of integrated pest control

1. The use of chemical pesticides, without regard to the complexities of the agro-ecosystems in which they are used, has been a major cause of disruption and undesirable side effects. These include: target pest resistance and/or resurgence, secondary pest outbreaks, residue problems and environmental pollution.
2. The agro-ecosystem is a unit composed of the total complex of organisms in the crop area together with the overall conditioning environment. There must be an analysis of the agro-ecosystem to determine population dynamics and mortality factors operating on pest populations.
3. The kinds of crops, agronomic practices, patterns of land use, weather, total complexity, and self-sufficiency of the agro-ecosystem affect its stability. As complexity increases, particularly among trophic interactions, there is usually an increase in the stability of the agro-ecosystem. Integrated pest control should seek to preserve or improve this complexity.
4. Levels or limits of tolerable damage are more important than pest population levels. Tolerable levels of damage vary widely with market conditions, stage of the crop, local conditions or grower economics, and the personal values of the people concerned. The presence of pests is not an indication of a threat of economic damage to the crop.
5. In more sophisticated programmes, individual fields are surveyed for populations of pests, parasites, predators and pathogens. On the basis of this information and consideration of the time of the year, stage of growth of the crop and weather conditions, a prediction can be made of population trends and potential damage. This type of sampling and prediction requires a solid base of fundamental biological and ecological data.
6. All but the most sterile of man-made environments have some biotic agents influencing pest populations. Appropriate consideration must be given to biotic control agents. In some fortunate

situations, the biotic agents are all that is necessary to have satisfactory economic control. The failure of natural enemies to keep a given pest under control should not cause us to invoke control practices that disrupt the controlling action of natural enemies of other species in the same agro-ecosystem.

(R.F. Smith and H.T Reynolds 1966)

Integrated pest control eventually became integrated pest management. The stress on decision-making and integration of tactics and the allowance of tolerable thresholds were seen as a move away from control and towards management (J.A. Litsinger, P.E. Kenmore and G. Aquino 1982).

By the 1970s, according to Barfield and Swisher (1994), two schools of thought regarding IPM emerged:

1. The school of tactical IPM. For this group, IPM required the use of pesticides, but only when necessary. This school promoted the technological fix.
2. The school of strategic IPM. This group emphasized the importance of understanding the agro-ecosystem. They promoted the ecological approach to pest control.

The first school gave rise to crop scouting and economic thresholds as tools to decide when to spray. In essence, this school adopted a position of cooperating with the pesticide industry. They treated farmers as passive recipients of technology. The second school stressed ecological insight and the avoidance of the use of insecticides. This school embraced farmers as partners in agricultural development (ibid). By the late 1970s, the ecological foundation of IPM was overshadowed and the tactical school was ascendant. Crop protection systems were advocating multiple tactics, the timing of pesticide applications, government subsidies to lower pesticide costs for farmers, economic threshold levels, and national forecasting systems. By the early 1980s, IPM had become so closely associated with pesticide use that the term was interpreted by many to mean integrated pesticide management. (Monica Moore 1996)

6.2 Pest control and IPM in tropical rice systems

Asian rice farmers were to feel the impact of the ascendancy of the tactical school of thought in IPM with the coming of the Green Revolution. In the early 1960s the first high-yielding rice varieties were released by IRRI. International researchers urged the use of insecticides to control pests. Essentially this advice was accepted because it seemed an astute approach to protecting the investment that had been made in the international research and development of these new varieties. The new varieties were assumed to be irresistible to pests and the cost of pesticide was seen as an acceptable insurance premium. Because farmers were seen as being unable to deal with the complexities of pest control, prophylactic use of insecticides was promoted. This control tactic relied on calendar-based applications of pesticides. Farmers were told to apply insecticides based on the number of days after transplanting or the stage of plant development. In Indonesia, the calendar-based approach resulted in farmers applying broad-spectrum systemic insecticides to the nursery bed and at transplanting. Farmers then made additional applications of non-systemic broad-spectrum insecticides some forty days after transplanting and at or around the milky stage of seed development. The government, apparently not content with promoting calendar applications to farmers, contracted with companies to provide large-scale aerial applications of insecticides.

Tactical IPM arrived in tropical rice production systems with the introduction of economic threshold levels (ETLs). This tactic seemed to be a rational way to reduce the amount of insecticides that were

being applied under the calendar-based system. ETLs failed to take into account the role of natural enemies in suppressing pest populations. General ETLs were developed for insecticide use throughout a given country. Farmers were told to count the number of a pest, for example BPH, and spray when there were "x" many BPH per hill of rice. The ETLs were often set at artificially low levels to reduce risk. During the 1970s ETLs in different countries varied widely. In Japan ETLs for BPH were set at five per hill, in the Philippines 20 adults per hill at 40 days post-transplanting, in India the ETL was estimated at two to five nymphs or adults per hill (K. Sogawa and C. H. Cheng 1979). ETLs were developed for all insect pests and, given the steady increases of sales of insecticides across the region, appeared to encourage insecticide use rather than reduce it.

National forecasting systems were another approach taken to control pests. These systems took the onus for decision making off the farmer and allowed professionals to take charge. Forecasting systems based their control tactics on ETLs. The greater the fear of a particular pest the lower the ETL and the more pressure put on farmers to apply insecticides. Surveillance systems sometimes made recommendations to farmers regarding insecticide applications. The systems also included pest eradication brigades to handle outbreaks. Outbreak stocks of insecticides were purchased by the crop protection system and stored for distribution to locally organized pest eradication brigades when the forecasting system detected an outbreak.

Prophylactic spraying, the use of ETLs, and forecasting systems all placed limitations on the management role of rice farmers. Crop protection experts assumed that professionals could take better decisions than could farmers. It was not until 1990, when the Indonesian government instituted a farmer IPM education programme, that a truly farmer-based IPM system was promoted. The process of getting to this point required several discoveries on the part of researchers and the realization on the part of both scientists and government that it was appropriate for farmers to be the ultimate decision makers in an IPM crop protection system.

Box 6.2 Hunting spiders: predators of BPH



Predators are the most important natural enemies of BPH. Together with parasitoids and insect pathogens they keep populations of BPH down. An important group of predators commonly found in rice fields is the spiders. Of particular importance are the hunting spiders, especially *Lycosa pseudoannulata*, which is often found near the water level in the same area where BPH feed. A lycosid will eat as many as 20 BPH per day. The spider's voracious appetite makes it a very important natural enemy of BPH.

6.2.1 A broader ecological understanding

Scientists began working out some of the basics of rice-field ecology in the late 1970s and early 1980s. Their attention was generally focused on the brown planthopper, which at the time was ravaging rice fields across Southeast Asia. They discovered that BPH outbreaks were insecticide induced (P.E. Kenmore 1980) and that breeding rice varieties resistant to BPH under continued pressure of insecticide use was futile (K.D. Gallagher 1984). Researchers soon worked out an ecologically based means to BPH control (P.A.C. Ooi 1988). Yet it was to take some time before the broader ecological approach became part of mainstream extension. An example of the slowness of the ecological approach to catch

on is the *Illustrated Guide to Integrated Pest Management of Rice in Tropical Asia*, published by IRRI in 1986, six years after Kenmore demonstrated that BPH outbreaks were pesticide induced. This manual for extension workers and other agriculturalists used 211 pages to describe 35 specific pests, 19 pages discussed pesticides and their use and only 20 pages were devoted to pest parasites and predators.

Box 6.3 Cyrtorhinus lividipennis



An important predator of BPH is the mirid bug, *Cyrtorhinus lividipennis*. It feeds on eggs and very young nymphs of BPH. Ecological studies show that this mirid is very sensitive to build-ups of BPH populations and usually increases in population in response to increasing BPH populations.

A study in Sekinchan, Malaysia (Ooi 1986), showed that a build-up of BPH was followed by a similar build-up of *Cyrtorhinus*. Unlike spiders, *Cyrtorhinus* populations react to the presence of BPH. However, this tendency is disrupted when insecticides are applied. To understand this, two fields were selected. In one field, the farmer continued with his spraying while in another field, he was persuaded not to spray and to observe what happened. Weekly samples were taken of pests and predators in both fields. The field that was not sprayed regularly was the only field in the block that did not suffer from BPH-caused "hopperburn". This was attributed to the presence of predators, especially *C. lividipennis*.

Eventually most researchers came to accept that Asian rice farmers were gifted with what R.A Smith had called a "fortunate situation"; biotic agents in a rice agro-ecosystem were able to control pests within tolerable levels as long as insecticides were not allowed to disrupt that system (P.A.C. Ooi and B.M. Shepard 1994; M.J. Way and K.L. Heong 1994).

During the 1980s there was an increasing number of studies on the various predators and parasites of the main pests in tropical rice. Pests no longer occupied centre stage by themselves; they had to share it with their natural enemies. The following table, based on Ooi and Shepard (1994), presents the common predators and parasitoids that cause mortality among rice stemborers, leaffolders, brown planthoppers and green leafhoppers.

Table 6.1 Predators and parasitoids of common insect pests

	Stage attacked		
Yellow stemborer	**Egg**	**Larva**	**Pupa**
Parasitoids	*Tetrastichus schoenobii* Ferriere *Trichogramma japonicum* Ashmead *Telenomus rowani* (Gahan)	*Temelucha philippinensis* (Ashmead) *Stenobracon nicevillei* (Bingham) *Bracon chinensis* Szepligeti	*Tetrastichus ayyari* Rohwer
Predators	*Conocephalus longipennis* (de Haan)	*Lycosa pseudoannulata* << (Boesenberg and Strand) *Micraspis spp.*	*[also attacks adults]*

		Ophionea spp. Ants *Microvelia douglasi atronlinea* *Mesovelia vittigera* *Limnogonus fassarum (F.)*	
Leaffolders	**Egg**	**Larva**	**Pupa**
Parasitoids	*Copidosomopsis nacoleiae* (Eady) *Trichogramma japonicum* (Ashmead)	*Temelucha philippinensis* Cotesia augustibasis (Gahan) Trichomma enaphalocrosis Uchida	*Xanthopimpla* flavolineata Cameron *Tetrastichus ayyari* Rohwer
Predators	*Conocephalus longipennis* M. vittaticollis *Cyrtorhinus lividipennis* Reuter *Micraspis crocea* Mulsant	*Lycosa pseudoannulata* Micraspis spp. *Ophionea spp.* Ants Water bugs	
Brown planthopper	**Egg**	**Nymph**	**Adult**
Parasitoids	*Oligosita yasumatsui* (Viggiani and Subba Rao) *Anagrus spp.*		
Predators	*Cyrtorhinus lividipennis*	*Pseudogonatopus spp.* *Cyrtorhinus lividipennis* *Lycosa. pseudoannulata* *Migrovelia douglasi atrolineata Bergroth* *Synharmoni octomaculata* *(F.)* *Paederus fuscipes Curtis*	*Pseudogonatopus spp.* *Lycosa pseudoannulata* *Migrovelia douglasi atrolineata Bergroth* *Synharmoni octomaculata* *(F.)* *Paederus fuscipes Curtis*

Table 6.1 provides some indication of the myriad parasitoids and predators that exist in the tropical rice agro-ecosystem. In this table, the predators and parasitoids that attack yellow stemborers, brown planthoppers and green leaffolders are presented. The predator complex that feeds on eggs and larvae of leaffolders is nearly the same as for stemborers. A major exception is the cricket, *M. vittaticollis*, which is a voracious feeder on the eggs of leaffolders. Leaffolder egg predation averaged about 50 percent in both direct-seeded and transplanted rice in field experiments. Kamal (1981) reported 70-percent leaffolder mortality by predators. The parasitoid complex for leaffolder larva and pupa is richer than that for eggs. Rao et al. (1969) listed 32 species of larval and eight species of pupal parasitoids for rice fields in India (1969).

Box 6.4 Conocephalus longipennis (de Haan)



C. longipennis feeding on stemborer eggs

Parasitoids and parasites cause mortality among all the various species of stemborers. *C. longipennis* has been reported to consume up to 65 percent of the eggs of yellow stemborers (Pantua and Litsinger 1984). This grasshopper will reportedly feed on rice panicles, but its role as a predator is far more important. *C. longipennis* can consume more than eight yellow stemborer egg masses in three days (Rubia et al. 1990).

The generalist nature of some predators is apparent in Table 6.1. The wolf spider, *L. pseudoannulata*, feeds on stemborer larvae and adults, leaffolder larvae and the nymphs and adults of BPH and green leafhoppers. The mirid, *C. lividipennis*, feeds on the eggs and nymphs of the BPH, the green leafhopper, and the eggs of leaffolders. The grasshopper, *C. longipennis*, feeds on the eggs of stemborers and leaffolders.



Tetrastichus schoenobil, a parasite attacking stemborer eggs

Parasitoids tend to be more specific in their tastes. The predators and parasites that appear in the table are but the tip of the iceberg. Settle et al., in four years of sampling irrigated rice fields on the island of Java, found 765 species of arthropods. Of that number, 40 percent or 306 species were predators and 24.4 percent, 187 species, were parasitoids. Herbivore species accounted for only 16.6 percent or 127 species.

6.3 A general theory of tropical rice agro-ecosystems

(To summarize the above: early pest control specialists looked only at pests and they tried to eradicate them. Smith and others promoted a broader ecological perspective in trying to control pests. They advocated an analysis that included pests, predators, pathogens and the plant. This perspective lost out to the simplification of counting pests and spraying based on economic thresholds. Researchers and crop protection specialists in tropical Asia fell in line with this perspective until they were jolted out of it by massive outbreaks of BPH. By the early 1990s a picture emerged of the ecology of the tropical ricefield agro-ecosystem that suggested that crop protection in rice could not be successful unless its analysis included the plant, pests, predators and parasitoids. Yet the picture was not complete. Most of the components of the rice-field agro-ecosystem were understood, but no one had offered an explanation of how the system worked as a whole. Settle and his group, working as part of the FAO technical assistance team to the Indonesian national IPM programme, put the puzzle together. They were able to develop a general explanation of how the tropical irrigated rice agro-ecosystem functioned. The following is an extract from a paper presented by Settle to a conference in China in 1998, in which the functioning of the tropical irrigated rice agro-ecosystem is explained.)

Whereas the specific conditions critical for management decisions regarding inputs vary over a small spatial scale, agro-ecosystems do have a general structure and dynamics that are reasonably consistent for the entire system. In essence, it is possible for us to think in terms of a general theory for the structure

and dynamics of specific agricultural ecosystems. IPM is not a theory in a strict scientific sense; rather, it is a set of practical guidelines for how to best manage a specific crop. The rice IPM FFS learning approach, however, is based on well-established scientific theories, supported by good field data.

The fact that all ecological systems, even highly complex ones like tropical irrigated rice, are structured by a very few key variables allows us to propose a general theory for any ecological system. Research over the past 20 years in applied ecology of managed systems shows that ecosystem dynamics, regardless of the system, are organized around a small number of nested cycles, each driven by a few dominant variables (Gunderson et al. 1995, Holling 1992).

> *"A small number of plant, animal and a-biotic processes structure biomes over scales from days and centimetres to millennia and thousands of kilometres. Individual plant and biogeochemical processes dominate at fine, fast scales; animal and a-biotic processes of mesoscale disturbance dominate at intermediate scales; and geomorphological ones dominate at coarse, slow scales. The physical architecture and the speed of variables are organized into distinct clusters, each of which is controlled by one small set of structuring processes. These processes organize behaviour as a nested hierarchy of cycles of slow production and growth alternating with fast disturbance and renewal."* (Gunderson et al. 1995, p. 27)

The basic outline of how a few key variables and processes determine the dynamics of an entire ecosystem in irrigated tropical rice are as follows (see Settle et al. 1996 for details).

6.3.1 Key processes

Key process #1: energy is stored as organic matter in the soil and brought into the system by micro-organisms and detritivorous insects (Figures 5 and 6). From the time that water first floods a farmer's field in preparation for planting, **organic matter** - derived from residues from the previous crop cycle, organic waste in irrigation water and algal growth - provides the energy for an array of micro-organisms. The energy flow begins with **bacteria** being eaten by **protozoans** and rotifers and continues upwards to larger **zooplankton**. In a parallel flow, **detritivorous insects**, such as the larvae of flies and beetles and especially the minute but abundant Collembola, feed directly on decaying organic matter, including material floating on the surface of the water. This process is fundamental to aquatic systems and will be found in all irrigated rice systems.

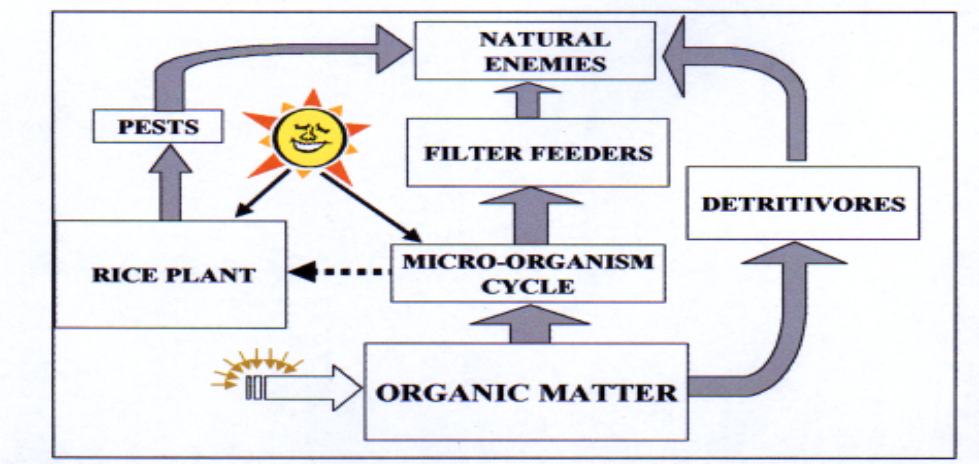


Figure 5 Trophic-level energy flow diagram for tropical irrigated rice

Consistently low pest populations in tropical rice result from the fact that natural enemies - especially generalist predators - are not directly dependent on pest populations. Rather, there are three separate avenues for energy flows to natural enemy populations:

1. from organic matter via micro-organism cycles and filter-feeding insects,
2. from organic matter via detritivorous insects and
3. from the rice plant via herbivores.

A more detailed elucidation of the energy-flow diagram for tropical irrigated rice at the functional group level is shown in Figure 6.

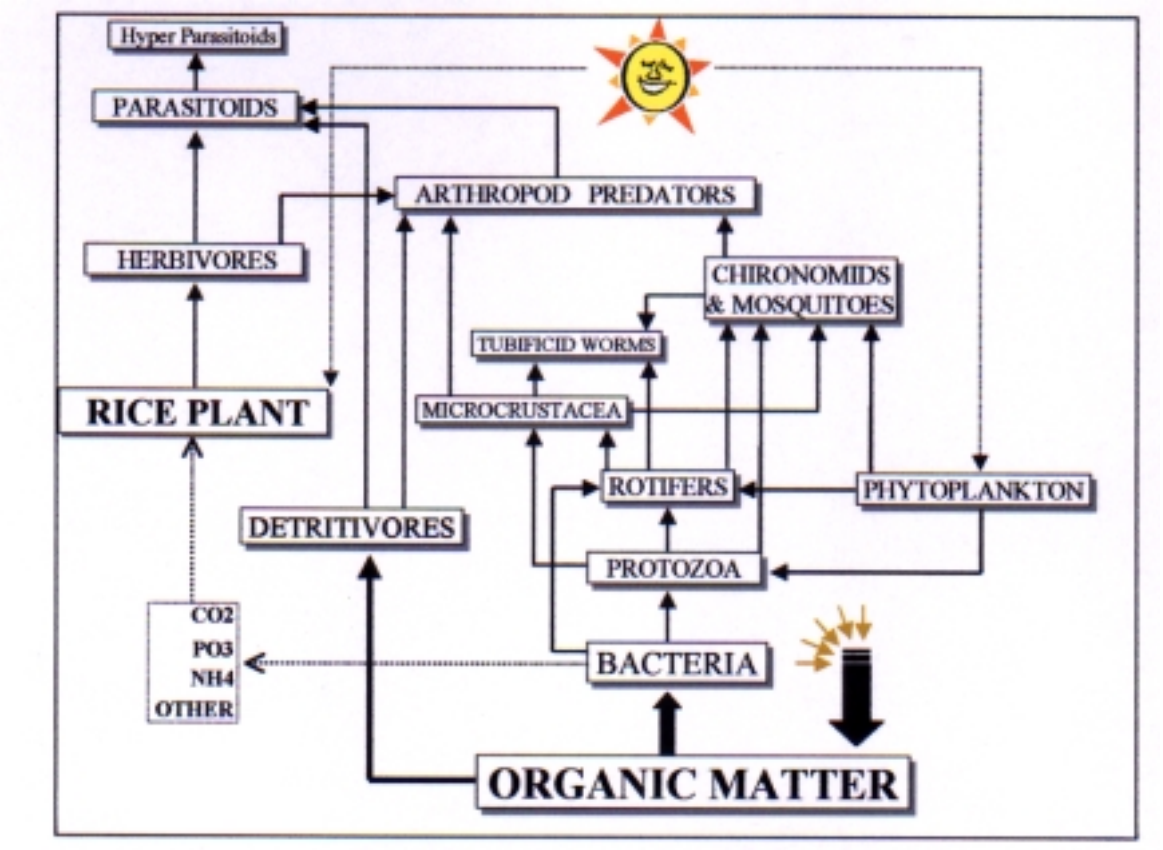


Figure 6 Functional-group-level energy flow diagram for tropical irrigated rice

Key process #2: aquatic plankton provides food for filter-feeding insects. The small to medium-sized zooplankton and the phytoplankton found in all flooded rice fields provide food for **filter feeders** (midges and mosquitoes). Densities of chironomid midge larvae have been observed in irrigated rice fields in the thousands/m^2 range. Again, abundant midges and mosquito populations are a general characteristic of rice systems.

Key process #3: Larvae and adult plankton feeders and detritus feeders provide a consistent and abundant source of alternative food for generalist predators from early in the season until after harvest. Figure 7 shows the results of observations in two plots in a field in West Java. One plot, "a", was not treated with insecticides; the other, "b", received early-season applications of carbofuran and azodrin. Alternative prey for predators, in the form of filter feeders and detritivores (or neutrals), show

a consistent peak at about 30 days after transplanting (Figure 7a). The existence of abundant alternative prey effectively frees predator populations from a dependence on the pest populations, giving predators the opportunity to develop well in advance of the normal pest populations. As a result, mortality of pest populations due to predation is high -beginning with early-season pest migrants and carrying on throughout the season. This process minimizes the likelihood that pest populations can escape control by natural enemies and reach outbreak levels. Furthermore, high populations of detritivores found in harvested stubble fields assure a continued food source for generalist predators for some time after harvest.

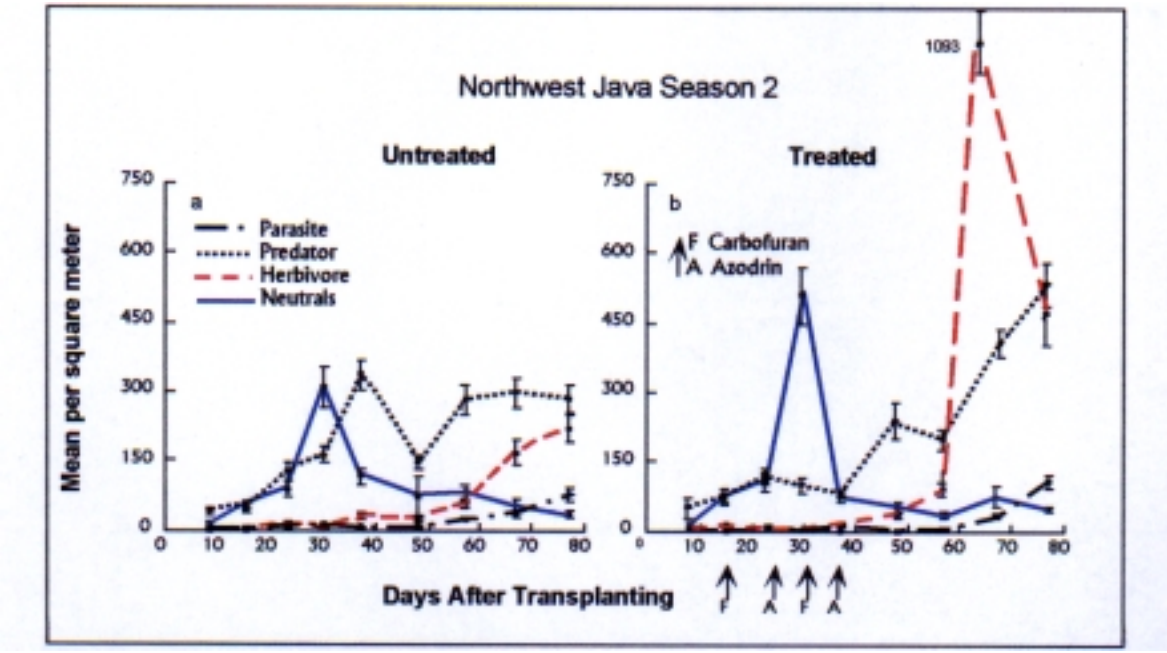


Figure 7 Trophic-level population dynamics in a field in West Java, 1992

In plot "b", early-season applications of insecticides by farmers lead to a suppression of early-season predator populations and a subsequent resurgence of pest populations (mostly BPH). This is a classic example of pesticide-induced pest resurgence, the phenomenon that is responsible for the problems with BPH over the past 30 years.



In order to test the hypothesis of whether energy flows from organic matter to predators in tropical rice systems (Figures 5 and 6), plots were set up with low and high organic matter and examined during the first 40 days. High organic matter resulted in significantly more neutrals and predators below the water, on the water surface and in the plant (Figure 8). A somewhat different experimental approach conducted in China reached the same conclusion (Wu et al. 1994). Wu et al. eliminated midge and mosquito larvae by using highly selective *Bacillus sphaericus* insecticide. In response, predator populations in early-season irrigated rice were diminished for lack of food and pest populations were subsequently higher compared with controls.

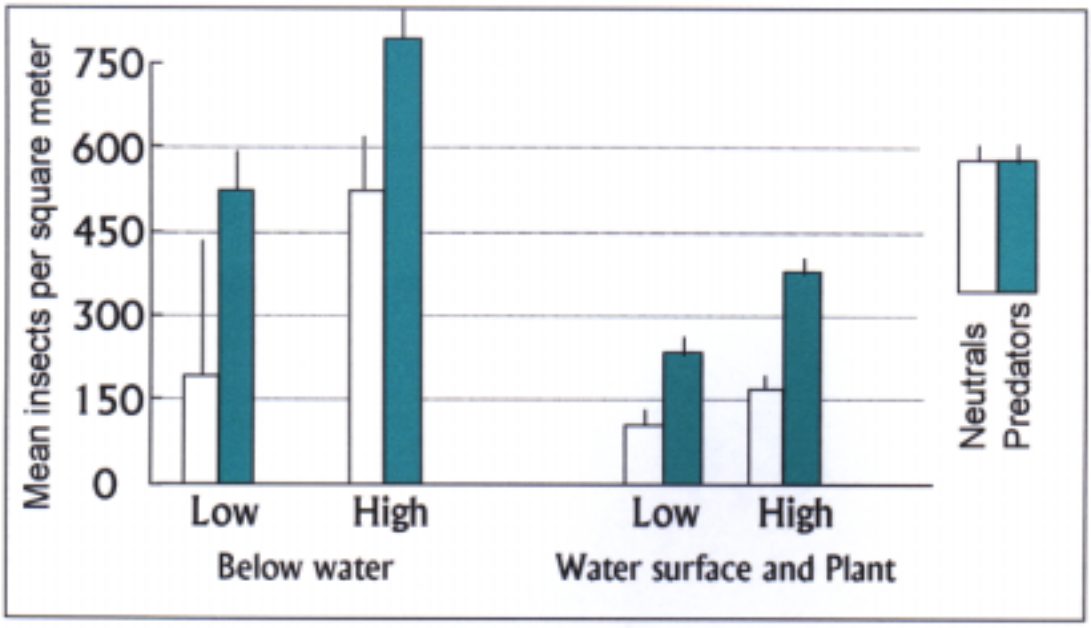


Figure 8 Soil organic matter experiment

Results of six Indonesian surveys show that some 19 percent of the arthropod species are detritivores or plankton feeders (Figure 9). Except for pioneering work done in China (e.g. Wu et al. 1994) previous recognition of these functional groups has been largely ignored or misunderstood. For example, chironomids were all considered to be root feeders (phytophagous) and therefore thought to be harmful, but this is not generally true (see Settle et al. 1996 for details). Recent studies in southern China using ELISA techniques have shown that chironomids represent up to 80 percent of the diet of spiders early in the season (Zhang Wenqing, Institute of Entomology and State Key Laboratory for Biological Control, Zhongshan University, Guangzhou, pers. comm. to W.H. Settle).

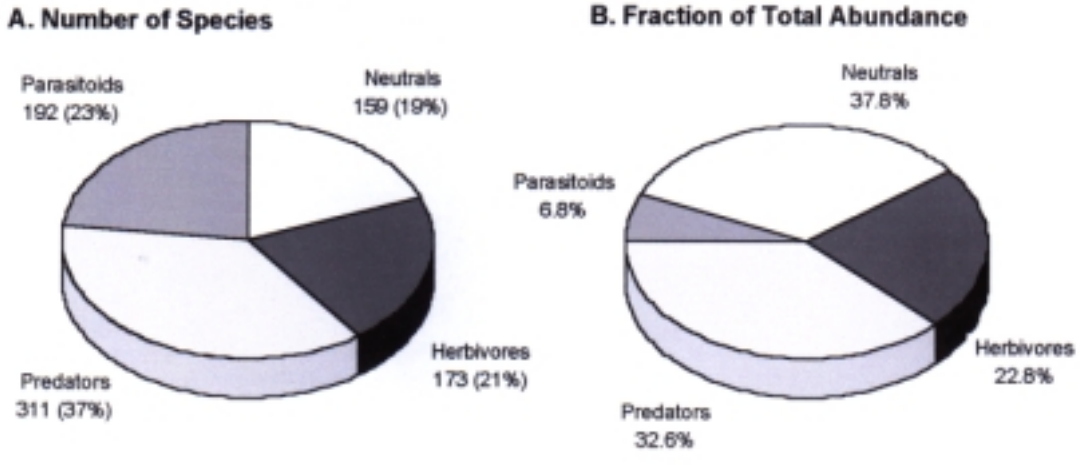


Figure 9 Trophic level distributions from vacuum samples over six sites in West and Central Java

6.3.2 Some conclusions

The existence of diverse populations of natural enemies, supported by abundant alternative food species, assures that populations of pests are consistently maintained at low levels. In effect, the structured biodiversity of arthropods in tropical irrigated rice functions to consistently suppress pest populations by **denying them refuge in time or space**. All the key variables can be found in any rice ecosystem - only when the process is disrupted do pest populations explode, causing serious damage. From this, a set of implications for rice IPM practice can be determined.

The use of insecticides disrupts and destabilizes natural enemy populations. The use of insecticides is by far the most common cause of pest outbreak, especially for pests such as the rice brown planthopper. These kinds of pest outbreaks are generally referred to as **pesticide-induced resurgence** (Figure 7). Several factors combine to enable resurgence to occur.

- Eggs of many pests, such as BPH, are not susceptible to chemical sprays.
- Insecticides create a refuge for the development of pest populations by reducing the abundance of natural enemies.
- Migratory abilities of pests are generally better and their generation is many times faster than those of natural enemies.

Certain landscape designs can cause delays in the arrival of natural enemies after long dry fallow periods. In many tropical areas, the potential exists for year-round cultivation of rice. However, some areas, either from natural constraints or by government design, are planted synchronously over thousands of hectares and have long (3-4 month) dry fallow periods. These are the areas in which natural enemy populations are weakest and where pest outbreaks are most frequent (Settle et al. 1996). Take, for example, a typical area in North West Java: in the middle of a 3 000 ha area, dry and devoid of refuge for 3-4 months, there simply is not enough food and shelter to support significant natural enemy populations and some species are absent altogether. After such a long dry spell, when the next season of rice is planted, it takes up to half a season to build up predator populations that would otherwise have been there from the beginning. Again, as pests are better re-colonizers than natural enemies, the potential for outbreak is much higher in these synchronous, large-scale areas.

Much attention has been given to the ideas of synchronous planting and breaking the pest cycle with long dry fallow periods, to the point that these ideas have become ingrained almost as fundamental principles of IPM. However, a close look at the empirical data and experiments that purport to demonstrate these principles will show that the support is very weak. Finally, our developing theory of irrigated rice ecosystems allows us to question the logical foundations of such principles.

Healthy soils, high in organic matter, are the foundation for a healthy ecosystem. Soil organic matter is not emphasized as much for irrigated rice as for dry-land cropping systems because of the lesser need for good soil texture. However, as we have seen, soil organic matter is the foundation for energy cycles that ultimately support high populations of natural enemies. We also know that high levels of soil organic matter help prevent leaching of nutrients in sandy and degraded soil conditions. Areas that entirely remove or burn their rice stubble, putting no soil organic matter back into the system, may suffer from lower natural enemy populations and more frequent pest outbreaks (we have some supporting evidence for this, but this is a hypothesis that needs to be examined more generally).

6.4 IPM and the FFS

One of the biggest problems with many of the developments in IPM over the years has been the tendency to generalize and make recommendations for farmers across large and highly heterogeneous areas. This has been true for all manner of input recommendations including fertilizers, pesticides and rice varieties. This problem, ecological heterogeneity, has also severely limited the effectiveness of government monitoring and forecasting systems. All of these practical issues vary on a small spatial scale. This local specificity requires that farmers become IPM experts. The main crop protection approaches since the late 1960s, from the perspective of donor support, are presented in Table 6.2. The recommendations or decision criteria of each approach reveal a steady progression in the accommodation of ecological heterogeneity and farmer control of agro-ecosystem management.

Table 6.2 Pest control approaches in tropical irrigated rice

Calendar-based applications	Surveillance systems	ETL-based decisions by farmers	Farmers as IPM experts
Farmers, in this approach, apply insecticides based on number of days post-sowing or transplanting. Goal: prophylactic control of pest populations. Relies on broad recommendations and assumes homogeneity among planting conditions. Developed in 1960s.	Usually an activity of agriculture departments. Based on ETLs developed at national level to be applied in widely differing conditions. Goal: insure national yield targets achieved by using professional pest control agents. Emerged in 1970s as response to massive pest outbreaks.	The count-and-spray approach relies on use of criteria that assumes homogeneity across all local agro-ecosystems. Goal: employ control tactics at predetermined pest population levels to avoid economic loss. ETLs appeared with advent of surveillance systems, promoted to farmers in 1980s.	Farmers as decision Makers; decisions based on analysis of agro-ecosystem. Goal: farmers as IPM experts taking action based on analysis of their agro-ecosystem; Pesticide-free rice production. FFS, introduced in 1990, has led to rapid growth in number of farmer IPM experts.

Governments across Asia have enacted policy in support of one or more of the four approaches presented above. Some countries have supported each of the approaches over the last four decades, often using more than one approach at the same time. Countries have often adopted new approaches without abandoning old approaches, despite glaring contradictions. Presented in roughly chronological order of emergence from left to right, these four approaches place an increasingly larger burden on the user in terms of ecological knowledge, observation and analysis. Each successive approach requires more data for decision making and the decisions made cover increasingly smaller units of area and time. This increased precision in decision making, not surprisingly, has led to better control of insect pests and reduced use of pesticides. The FFS was designed to address the problem of ecological heterogeneity and local specificity by placing the control of small-scale agro-ecosystems in the hands of the people who manage them.

7. PARTICIPATORY MANAGEMENT AND EVALUATION IN COMMUNITY IPM

Community IPM requires an approach to management and evaluation that encourages congruence between ideas and approaches throughout the programme. The community IPM model encourages an adaptive management approach by farmers to engage with the complex systems in which they live and work in a sustainable way. The model is based on incremental, experiential learning and decision making at the community level. To support this model, continuous monitoring and feedback processes are required at the community level (Jiggins and Roling 1999). The model encourages multi-stakeholder participation and is focused on developing more sustainable relations between people and their environment. The community IPM model needs a management and evaluation system that encourages and supports the adaptive management approach. Farmers and facilitators must be part of the decision-making and evaluation activities that make up the management system supporting a community IPM programme. This chapter presents a discussion of participatory management and evaluation in the context of community IPM programmes.

7.1 Management

FFS alumni are developing their own village IPM programmes across Asia, from Nepal to Cambodia. The management context for community IPM needs to not only be flexible and responsive, but also ensure that decisions are made as close to the field level as possible. Alumni must have the opportunity to participate in the management system.



Alumni designing their local IPM programme

Michel Pimbert's analysis of agriculture biodiversity management paradigms provided the inspiration for the following matrix (Pimbert 1999). The matrix (Table 7.1) compares two management models based on a set of key institutional attitudes or patterns of behaviour. The first model is the conventional approach to management generally found among or aspired to by the centralized agriculture services developed during the Green Revolution. The second model describes a management system that can effectively support farmer-led community IPM field activities. This second model has been termed the community IPM model.

Table 7.1 Agro-ecological management models

	Conventional	Community IPM
Starting point	Resources valued extrinsically based on the market place	Recognition of the inherent value in the diversity of resources and people
Key word	Development	Empowerment

	Conventional	Community IPM
Locus of decision making	Centralized, ideas originate in capital city, professional/ expert-based	Decentralized, ideas originate at village level, people-based
First step	Data collection and plan	Awareness, knowledge creation, and action
Design	Static, professional-based	Evolutionary, people-based
Main resources	Central funds, professionals and technicians	Diverse, includes villages, their people and assets
Analytical assumptions	Reductionism (natural science bias)	Systems, holistic
Management focus	Budgetary, projects meet deadlines, targets	Sustainable improvement and performance
Communication	Vertical: orders go down, reports come up	Lateral: mutual learning, sharing of learning and experience
Evaluation	External, intermittent	Internal, continuous, interactive and participatory
Error	Covered up, explained away	A basis of learning
Relationship with people	Controlling, policing, inducing, motivating, creating dependency. People as objects	Enabling, supporting, Empowering People as acting subjects
Output	The empowerment of professionals A uniform reactive agricultural system	The empowerment of rural people A diverse and interactive local approach to agro-ecological management

A look at a few of the key attitudes and behaviours that constitute the comparison is revealing.

Starting point describes the philosophical perspective of a management system regarding the resources, natural or human, involved in an agro-ecological system. The conventional model takes an extractive perspective; resources are valued in terms of what they will yield or can be processed to yield on the market, national or international. Humans that are involved in the system are important only in so far as they can get product, in sufficient volume, to market. The community IPM model values natural resources and the humans involved in working with those resources. Rice has a culturally based value; people are not machines but impart value to all that they come in contact with. Thus, for example in Cambodia, community IPM activities are designed to provide opportunities for all in a village who are engaged in agriculture, including the children, disabled, illiterate and landless, to achieve their potential as human beings.

Key word describes the intention of the management model concerning the people and resources connected to an agro-ecological system. The conventional system intends to develop humans as objects to be manipulated so that resources can be extracted or processed for the market. The human factor in this system is neither intelligent nor endowed with the right to control what he or she does or owns. The community IPM model takes the position of empowering humans to control and decide about the

processes and resources that they own. The community IPM approach includes regular forums for farmers to set strategies and plan activities which are then used as the basis for planning inter-regional and national programme activities as well as proposals for leveraging local support.

Locus of decision making refers to who is making the decisions and where they are located. Conventional systems are heavily centralized. Relatively few people are involved in taking decisions. These people are the senior professionals/bureaucrats who often have the added cachet of being expert. The community IPM model employs a decentralized approach to decision making. Consistent with a basic principle of community IPM, "farmers as experts", farmers are involved in the management process. In the countries involved in community IPM many opportunities are open to alumni and facilitators to engage in management activities. Farmers conduct participatory strategic planning exercises to develop goals, strategies and plans and take decisions regarding activities that they want to conduct to achieve their goals. Facilitators and farmer IPM trainers regularly hold management meetings together to decide about resource allocations to support field activities. In Viet Nam, farmer IPM trainers have participated in national-level community IPM planning sessions as well as in the designing of evaluation systems. In Indonesia the National IPM Farmers' Association and the community IPM team regularly meet to decide about allocation priorities, programme duration and specific activities.

Management focus describes the concerns of the system. The main concerns of the conventional approach are budgetary, deadlines and targets (e.g. numbers of farmers contacted, tons of rice harvested). The community IPM model is concerned about the quality of its activities. The model seeks to enhance the capacities of people, both those involved in the system and those touched by the activities conducted by facilitators and alumni. The community IPM model seeks sustainability. A concern of management within the community IPM model is that participants in the model continue to learn. Training is regularly available for FFS facilitators and farmer IPM trainers. Regular technical meetings are held for alumni to exchange information regarding field studies, village IPM programme development strategies and successful alumni-created farming innovations.

Error in the conventional model is either covered up, explained away or avoided by risk-averse decisions. The model shifts responsibility for mistaken decisions from the professionals who made them to the farmers who were the victims of the mistakes. In the community IPM model, mistakes are used as a basis for learning. If activities fail to achieve hoped-for results, the implementation of the activities is examined to determine whether changes can be made to improve a given situation or whether something entirely different needs to be done. Farmer and facilitator technical meetings often contain sessions that analyse farmer strategy or tactical problems in terms of: "What worked?" "What didn't work?" "Why?" "What can be improved?" "How can it be improved?" This analytical approach allows alumni and facilitators to openly examine shortcomings and discuss ways of overcoming them.

Outputs describes what the management system hopes to achieve. In the case of the conventional model, it is obvious that it hopes to be recognized for its professionalism, that targets are met. The model empowers the professionals within the system. As the system is risk averse, it becomes reactive rather than dynamic. The community IPM model seeks to empower rural populations by putting them in control of the resources that they own or jointly utilize and establish a system that is interactive or adapted to the existing ecological conditions.

In putting management systems together to support community IPM the key has been to build from the bottom up, starting at the local level. FFS facilitators, IPM field leaders and farmers have developed and managed complex community IPM programmes around the region. Planning and budgeting must

become locally specific. For this, various strategies have been employed. In Indonesia, district IPM leaders, FFS facilitators and alumni developed activity plans and budgets based on local strategies that were aggregated into sub-regional plans. In Viet Nam, community IPM farmers and facilitators designed locally specific plans that were aggregated into provincial plans. In both countries the main management tasks were implemented locally: evaluation, administration, planning, budgeting, FFS implementation, building networks and human capital development were placed in the hands of farmers, facilitators and IPM field leaders. The result has been not only successful farmer-led village IPM programmes but also the development of highly skilled management teams.

7.2 Participatory evaluation

The purpose of evaluation in community IPM is to provide the leaders of these activities with the information that they need for their management decisions. The goals of evaluation within the context of FAO community IPM activities include:

- Providing alumni and IPM trainers with the opportunity to develop their evaluation skills so that they become better leaders/managers of community IPM activities at the local level.
- Providing the leadership of community IPM activities at all levels with the information they need to take effective decisions to enhance the impact of those activities.
- Providing alumni and others with information concerning the progress achieved by alumni in institutionalizing IPM at the local level.

Evaluation activities must be useful to farmers. The best way to ensure this is to give farmers a role and a share of control in each stage of any evaluation activity. As community IPM develops at the village level and farmers are conducting their own IPM activities, they need to have the tools to evaluate those activities to determine whether they are achieving their goals. Farmers need to be able to review what they have done in the context of their local conditions and take decisions regarding future activities.



Mapping farm and village conditions

If IPM field trainers have relevant evaluation skills, they can train farmers so that farmers can effectively evaluate their own local programmes. Community IPM programmes have depended upon both IPM field trainers and farmers for the implementation of evaluation studies. To successfully conduct any evaluation study both farmers and IPM trainers need to be able to:

- design an evaluation study;
- conduct direct field observations of IPM farmers' activities, fields and studies;
- lead focus group discussions with IPM alumni and others;
- lead open-ended interviews of farmers, officials, IPM field staff and pesticide dealers;
- collect secondary/corroborating data relating to activities, pesticide sales, health issues, etc;
- map farm and village conditions;
- apply the analytical frameworks discussed later in this chapter; and
- prepare appropriate reports based on the evaluation results.

Using a participatory approach that puts alumni in a position where they share control over the activity ensures that they learn about conducting evaluation studies and increases the likelihood that they will benefit and use the results from the exercise. Involving them in design decisions, study implementation, data analysis and report is essential.

Beside interviews with individuals, a wide variety of group participatory activities can be used to collect data. Group activities might include:

- Mapping the history of the development and spread of IPM activities in a community. A time line of critical events, activities, individuals, organizations, etc, can be identified through this activity. The activity can point out where and with whom follow-up interviews are needed.
- Mapping sites of FFSs, IPM groups, farmer IPM trainers, local leaders, field problems, sites of studies by alumni, etc, can also help to determine who might be able to provide further information other than the immediate group of alumni.
- Conducting extended field observations to determine the state of health of the agro-ecosystems in alumni fields can help to determine the benefits of IPM at the field level (this could be a comparative study) and provide a crosscheck on alumni-reported insecticide use.
- Studying the incidence of pesticide poisoning among alumni and non-alumni would help to determine the impact of IPM on people's health.

The following participatory evaluation activities are taken from a field guide for participatory evaluation activities. The field guide was developed and used in participatory evaluation studies in Indonesia in 1998 and 1999. The two activities are intended to help farmers and trainers identify IPM activities conducted in a community and farmers' perceptions of results and benefits from the activities. The goals of these activities are to: a) raise alumni's awareness of the history of local IPM-related activities and the outcomes of these activities; b) identify potential issues, people, activities, etc, for follow-up interviews by farmers and trainers. Participants in the activities included alumni and trainers.

Box 7.1 Identifying IPM activities



Alumni analysing results of IPM activities

Background: As this is a village where a local community IPM programme has been active, both the national IPM programme and farmers will have conducted IPM activities in the village. We want to identify these activities. These may be FFSs, farmer IPM field studies, alumni organizing activities, meetings, etc. Each of these activities will have immediate results and longer term results. During the session, ask participants to identify all of these activities and their immediate results. Start with a discussion of what is meant by immediate results. If it is easier, make it two steps: identify FFSs implemented, where, when and by whom; then identify post-FFS activities including what, where, when and by whom, then ask about the immediate results of each activity.

Goal: Participants develop the history of IPM activities in the community and their results for follow-up study
Time: Three hours
Materials: Newsprint, felt-tipped pens
Process:

1. Have the group define "immediate results". A brainstorming activity would be useful to do this.
2. Divide the group into small groups. Each group should prepare a matrix with columns headed: "FFS activities", "FFS results", "Post-FFS activities", "Results", etc. Ask each group to first identify these activities and for each try to determine where, when and by whom they were conducted. Then ask them to identify the results of those activities. Each group should report out the results of their small-group efforts.
3. In a full group discussion ask the participants to identify the general categories, for example "field ecology", "empowerment", etc, that the results of IPM activities tend to fall into.

Identifying the benefits of IPM activities

Background: We are now familiar with the IPM activities conducted in the village either by the national programme or by IPM alumni. As well, specific immediate results have been identified. We do not yet know the perceptions of participants regarding the long-term benefits or impact of IPM activities in a community. Generally, IPM activities can be seen to have a specific immediate result. For example, if we conduct a study on urea we can discover the benefit of using urea at certain rates of application. Thus the immediate result of the study can be said to have been what was learned from the study. Benefits then arise as a result of farmers applying what they have learned from the study. Examples of possible benefits or impact arising from this study would include:

- Other studies are conducted to sharpen farmers' understanding of the first study's results (benefit: other farmers learning to conduct studies);
- Information regarding improved urea use practices is spread to other farmers (benefit: more farmers know about good fertilization practices);
- Other farmers start using urea at more advantageous application rates (benefit: improved practice being implemented by x number of farmers);
- The yields of farmers using the improved practices that were a result of the study (benefit: an increased yield of x per hectare, improved income, improved welfare, etc).

In a sense each successive IPM activity is the result of earlier IPM activities. Initial activities should lead to a long chain of activities and benefits.
Besides identifying the benefits of IPM activities in the village, it is important to analyse why they came about. We want to know what caused these benefits. These causes are the strengths that are shared among IPM alumni, their groups or their community and that resulted from IPM training or IPM field activities. These strengths represent the potential for further development of the IPM movement in the village. They could include:

- Alumni knowledge of ecology;
- Alumni attitude changed from followers of traditional beliefs to creators of local knowledge by means of field studies;
- Local government funds available for well-reasoned agricultural development plans;
- Information network among alumni and other farmers;

- IPM knowledge spread to non-IPM-trained farmers;
- Critical thinking skills of IPM farmers;
- Organizations formed and their activities;
- Attitude of local leaders towards IPM, alumni, alumni organisations; etc.

Goal: Make participants aware of some of the benefits of the IPM activities conducted in their community and identify strengths to help in the planning of further IPM activities
Time: Two to three hours
Materials: 4" x 8" note cards, newsprint, felt-tipped pens
Process:

1. Divide the large group into small groups and ask each group to identify what they feel to be the main benefits of IPM activities. Ask each group to write on newsprint what they feel are specific examples of these benefits.
2. Have each group present its results. The results of each group's discussion, written on newsprint, should be attached to the wall and left there.
3. The facilitator should take several blank sheets of newsprint, attach them to the wall and begin to make a drawing with a farmer at the centre and drawings of the various benefits that have been identified displayed in a circle surrounding the central farmer. As the facilitator draws each benefit (use appropriate symbols for impact, for example, bags for rice yield), the participants should be asked to explain more about each benefit by identifying:
    - What: give an example of the benefit if one has not been presented;
    - Who, when, how and where should be included for clarification;
    - Why: have the group identify the strengths of IPM alumni and the community that were generated by IPM training and alumni-led activities that caused this benefit to arise.



Drawing of benefits identified by farmers



Farmers' analysis of strengths and causes

4. The strengths or causes should be written on note cards and placed next to the drawing of the benefit circle. Where strengths arise in the context of more than one benefit, draw lines that connect these benefits. Thus there should be lines connecting the farmer (a symbol of all IPM alumni and the central or basic reason for the rise of all benefits) and each benefit and lines connecting benefits that share similar strengths/causes.

5. The facilitator can summarise the session by pointing out how different strengths or causes were connected to various benefits. The strengths that are identified here can be used as the basis for planning future activities.

Indonesian farmer IPM trainers and IPM field trainers have developed several approaches to collecting data related to changes in farmers' practices. One approach seeks to improve recall by using a group activity. The first step is to conduct individual interviews with IPM alumni in the field to determine pre- and post-FFS practices. A drawing of the stages of plant development is often used to help with recall. The next step is to check the data through group analysis and discussion of interview results. The following is a participatory evaluation activity that was developed and used in West Java, Indonesia. Farmers wanted to know how they were benefiting by applying IPM principles, how they could improve their practices and influence others to apply IPM.

Box 7.2 A participatory financial analysis

An Indonesian IPM field leader working with a group of FFS alumni developed a participatory method for examining financial benefits from FFS training at the farm and group level. The field leader and the group wanted to follow up their FFS with an activity to determine the benefits of applying IPM. The activity that they designed consisted of the following steps:

- The group attached large sheets of newsprint to the wall of their meeting place at the beginning of the planting season.
- They then drew several columns on the newsprint.
- The names of the group of 25 farmer alumni were on the far left side of the newsprint. Other columns were then identified for relevant background data and farming practices that they thought would be changed because of their FFS experience. The following are the column headings developed by the group.

Name Plot	Fertilizer	Pesticide	Observation	Yield
	Area Type Vol.	Kind Vol. Why	Results	Tons

- Based on what the group decided and wrote on the newsprint, each member made their own worksheet to keep track of their data on a weekly basis.
- The group, using a large piece of painted plywood, set up a group worksheet for summarizing individual data. The data board was similar to individual worksheets.

Name Plot	Fertilizer (Kg)	Pesticide	Observations	Yield
	N P K	Kind Vol. Why	Total number	Tons

- Each week each member summarized the data in the appropriate columns after his or her name.
- At the end of the season yields and costs were determined and benefits were examined.
- The group then evaluated what changes they had made and compared them with their previous experience. Discussion focused on how individuals benefited from the changes, and what the average benefit was per individual in the group. (During discussion the group constructed a "baseline" for purposes of comparison).

7.3 Frameworks for analysis

Participatory evaluation of community IPM activities has generated a wide variety of data. The participatory activities presented above hint at some kinds of data that might be uncovered by an

evaluation activity. Data will typically concern:

- Alumni-organized IPM farmer networks, their organization and the processes they use for sharing information about IPM;
- Groups that alumni organized or reactivated, their activities and the results of their activities;
- Alumni-conducted research studies, the results, how results have been shared with other farmers and how they have been shared;
- Alumni leadership and the processes enacted as part of group problem analysis and decision making;
- Profiles of IPM alumni, local government officials and others;
- Events involving IPM alumni or organized by alumni, their goals, processes and results;
- Emerging behavioural norms among alumni and others; and
- Farming practice changes by alumni because of participation in an FFS.

Three different frameworks have proven to be useful in the analysis of data to look at the benefits of community IPM at the individual and collective levels. These frameworks help in describing the extent to which farmers are successful in achieving their goals. The frameworks overlap somewhat and, depending on the requirements of the evaluation study, some facets of the frameworks may be more relevant for a given study than others. The three frameworks look at:

- Farmers' relationships with the fundamental aspects of their world. Farmers are engaged with their world through many relationships that can be categorized and analysed by looking at the extent to which farmers have gained control over or improved their position within those relationships.
- The extent to which farmers have been able to achieve social gains. The extent to which farmers have been able to develop their potential can be labelled as social gains that farmers have made because of community IPM and FFS alumni activities. The analysis of social gains will consider several types of conditions which, taken together, provide the basis for farmers to make the best use of their skills, knowledge and resources.[1]
- The changes in economic returns to farmers because of their improved farm management. Alumni can be expected to have made changes in their farm management because of participation in an FFS. These changes might lead to changes in the returns that alumni receive from their farming activities. The analysis of changes in economic returns that accrue to farmers makes use of what is referred to as the partial budget.

7.3.1 Relationships

Farmers are part of a web of relationships that constitute their world. Key relationships related to the analysis of the benefits of community IPM at the village level include:

- Farmers and the agro-ecosystem;
- Farmers and farming;
- Farmers and money;
- Farmers and policy; and
- Farmers and other people.

Farmers and the agro-ecosystem: Farmers may take decisions to achieve a relationship in which they have greater control. They may be bound by myth into a relationship that places them in a position where they are mainly reactive to changing conditions. On the other hand, they may be free actors, aware of the range of

[1] See *They know how* for more background on both the analysis of changes in relationships and social benefits

options that exist or of their ability to create new options and the consequences of those options.

Farmers and farming: Farmers are in a relationship with their work. They may be passive recipients of technological packages, accepting what they are told regarding their farming practices. Or they may be farmers, because of their understanding of plant biology, agronomy and field ecology and of their ability to learn, test and adapt or reject inputs and ideas as they seek to employ economically and ecologically sustainable farming practices.

Farmers and money: Farmers tend to require credit assistance at specific times of the year. Their access to credit and the terms of that credit form the basis of this relationship. Farmers may be required to accept an in-kind credit package consisting of inputs that they don't need or they can act to change the shape of the credit package. The extent to which farmers can generate and manage resources to support their development would also be part of this relationship.

Farmers and policy: Local government policy, how officials implement policy and activities and whether farmers can act to influence policy are important elements in this relationship. Officials can follow policy, ignore it or use it to constrain farmers' freedom to make their own decisions as they manage their agro-ecosystems. Greater control over this relationship would include taking effective action against the misuse of policy or negotiating changes in inappropriate policy. Being able to change village policy regarding the use of village development funds to provide support to IPM activities would indicate a greater control over this relationship.

Farmers and other people: Farmers interact with a wide variety of people including other farmers, officials, their neighbours, and business people. Their attitudes toward these interactions are important. The changes in alumni attitudes as well as their changed status within these relationships form the basis for the analysis of this category of relationships.

An analysis of relationships should reveal whether and how these relationships have changed at the individual or at the collective level because of community IPM activities at the village level. Relevant issues to be considered are:

- Has there been a shift in control or power because of IPM activities?
- Have farmers changed their understanding of the terms of the relationship (hence a change in their ability to control the relationship)?
- If there has been a change, what has been the resulting benefit or loss to farmers?

7.3.2 Social gains

Another way of examining the benefits of community IPM would be to determine the social gains that have accrued to alumni and their villages because of it. These benefits indicate an increased level of empowerment that is shared among farmers. Farmers who are empowered can take or organize actions regarding their own, their families' and their communities' development. The conditions referred to here are several and grow out of the relationships that were discussed above.

- Access;
- Leverage;
- Choices;
- Status; and
- Critical reflection capacity.

Access: Access refers to the ability and capacity of farmers to obtain the resources they need on favourable terms. Access is gained when their ability to obtain access on favourable terms to the resources they need is either newly established or enhanced. Access implies that farmers are able to identify, analyse and design projects or actions to further enhance their opportunities. Further, farmers can sell these activities to those who control resources.

Leverage: This is farmers' bargaining strength to obtain the resources they need. Leverage is gained when farmers can successfully make claims on needed resources.

Choices: This concerns the ability of farmers to make decisions by choosing among available options. Positive benefits in this case would include both increased options and increased ability to take a critical decision regarding those options.

Status: Community IPM in a village should result in an improved self-image, increased self-confidence and a positive sense of identity. On the other hand, community IPM activities should result in local officials, non-members of IPM organizations and others conferring an enhanced status upon these organizations and their members. For example, FFS alumni are sought out as members for village development committees because of, among other reasons, their analytical and planning skills.

Critical thinking capacity: The ability to accurately assess competing options (perhaps recommendations regarding agronomic practices) based on experience and knowledge. This might be a planning activity where farmers identify a problem, set priorities, assess options and develop action plans

7.3.3 The partial budget analysis

Evaluation studies often try to determine what changes farmers have made in the farming practices because of participating in an FFS. Box 7.2 indicates that farmers are interested in knowing about these changes and their benefits. Farmers and trainers conducting participatory evaluation studies in Indonesia and Viet Nam collected data on practice change to examine the benefit of applying IPM in their fields. The IPM principles point to the changes in farming practices that alumni can be expected to make because of their participation in a field school. The IPM principles include:

- Grow a healthy crop. The application of good agronomic practices including the use of high-yielding varieties, appropriate planting distances and appropriate fertilization.
- The conservation of natural enemies. This suggests that there will be lowered rates of pesticide use.
- Conduct regular field observations. Alumni should regularly observe their fields to collect data regarding the agro-ecosystem for decisions that in turn influence the above two issues.
- Farmers become IPM experts. Alumni should be able to make informed decisions based on the results of their observations.

Data related to practice change can be assigned costs, and comparisons can be made between pre- and post-FFS practices related to economic benefits. The partial budget is a useful analytical tool in this context. Normally used as a planning tool, the partial budget examines changes made by farmers and the ensuing benefit of those changes on farmers' incomes. This is a straightforward analysis. The strength of the tool is that it provides a reliable indication of whether alumni benefit from the changes that they have made.

Box 7.3 A partial budget analysis

Note that data relate only to changes made in farming practices, in this case changes in fertilizer use and insecticide use. These are changes that have been made by IPM alumni because of training. Yields have also changed and it is assumed that the changes in yield relate directly to the changes made in farming practices. Because of changes in yield, returns to farmers have changed. Data are arrayed so that increases in costs or decreases in returns (negative benefits) due to changed practices can be compared with decreases in costs or increases in returns (positive benefits) due to changed practices.

Partial budget analysis: A pre-and post-training comparison of the financial status of 24 IPM alumni from Indramayu district, West Java, Indonesia.

	Urea (kg/ha)	TSP (kg/ha)	KCL (kg/ha)	ZA (kg/ha)	Insecticide applications	Change in cost	Yeild (kg/ha)
Before	156.6	60.1	2.4	0	4		5 450
After	198.5	87.2	61.5	5.7	0		6 200
	(Rp/ha)	(Rp/ha)	(Rp/ha)	(Rp/ha)	(Rp/ha)	(Rp/ha)	Returns
Before	65 772	39 065	1 560	0	104 000		2 452 500
After	83 370	56 680	39 975	3 705	0		2 790 000
	(17 598)	(17 615)	(38 415)	(3 705)	104 000	26 667	337 500
					Returns to alumni decisions		364 167

The above data indicate that there were changes in fertilizer use after training. The changes in rates of fertilizer application resulted in increased costs of Rp77 333. Reductions of insecticide use resulted in savings of Rp104 000. There was thus an increased saving of Rp26 667. Increased yields resulted in increased returns of Rp337 500. Savings plus increased returns reveal an average increased return to the management decisions of FFS alumni in Indramayu of Rp364 167.

7.4 A cautionary note on participatory evaluation

There are many effective participatory evaluation methods. There are those practitioners who hold that the use of a given set of methods guarantees that a study will be participatory. The point is not to what degree farmers are active in a given study; it is rather to what degree farmers control decisions and play a role in the different stages of an evaluation study, including control over the data collected in a study. The most participatory of methods can be used in an oppressive manner. The most formal of academic research methods can be used in an emancipating manner.

There is a wide range of categories of participation. In a farmer training project for example, types of participation may range from farmers sitting in a room during a training (farmers are participating in a training) to farmers managing and implementing the training (farmers own the training). In participatory evaluation, the important question to ask is: who will own the data? If farmers collect data as part of a study but outsiders take over the data for their own purposes, the study has not been very participatory.

In community IPM, participatory evaluation has not been simply a methodological issue. Instead of asking what is the best participatory method for collecting a given category of data, the question has been one of how to put farmers in control of a method that will help them to collect the data that they need to answer their questions. In the first case farmers would be assured of being involved in an evaluation activity, in the second case they would be assured of owning both the evaluation approach and the data that was collected.

8. THE BIG PICTURE

Farmers have been continually opening up new dimensions for community IPM. With their help new possibilities are being created for community IPM activities. Three questions that concern both the present and the future provide the focus for this chapter:

- What has community IPM achieved in the region?
- What are the important community IPM programme operational principles?
- What's next?

In the end we close where we started: farmers and empowerment.

8.1 Farmer-to-farmer activities in the region

What has community IPM achieved in the region? In a number of countries across the region farmer-led community IPM has emerged. A focus on farmer IPM trainers and their activities provides a snapshot of community IPM in the region in the year 2000. This snapshot reveals some of the achievements of farmer-led community IPM in the region.

8.1.1 Bangladesh

There are two organizations conducting IPM activities in Bangladesh, CARE and the Department of Agriculture Extension (DAE). DAE has two separate IPM projects, one supported by DANIDA and the other by UNDP/FAO. The community IPM programme has supported the activities of both organizations especially in the development of farmer IPM trainers and farmer-to-farmer programmes.

The **DAE UNDP/FAO** project has been in progress for several years and in 1999 began farmer-to-farmer activities. The project has trained 320 FFS alumni as farmer IPM trainers and will train 320 more during the present year. By the end of November 2000, farmer IPM trainers will have conducted a total of 926 FFSs. The UNDP/FAO project has established the following process for developing farmer IPM trainers:

- Project IPM field trainers identify potential farmer IPM trainers over the course of an FFS.
- Upon completion of their FFS, these alumni participate in a week-long training-of-trainer course.
- After the course, each farmer IPM trainer teams up with a DAE IPM field trainer to conduct an FFS. During this apprenticeship of sorts, the farmer IPM trainer does all the planning, preparation and running of an FFS with support and assistance from the IPM field trainer.
- Following the apprenticeship season, the farmer IPM trainer will establish and run his or her own FFS supported by his or her DAE IPM trainer team-mate who will attend a limited number of FFS meetings.
- Regional review and training meetings conducted by DAE trainers are held at the middle and end of this FFS season for farmer IPM trainers.

The **DAE/DANIDA** project has trained 40 farmer IPM trainers and will continue to train more. The project follows the same process as the DAE UNDP/FAO project in developing farmer IPM trainers. The following describes a farmers' IPM club. Clubs usually provide forums for farmer IPM trainers to extend IPM training and advice to other farmers. However, as the following brief case shows, the activities of IPM clubs are not limited to IPM or to adults.

Box 8.1 Laupara elementary school

In 1998, 25 rice farmers, including five women, participated in an FFS at Laupara in Bagmara Upazila in Rajshahi district. At the end of their FFS the 25 farmers established an IPM club and built a simple shed for meetings near their fields. The group assessed a membership fee of US$.60 per month. Their first activities included providing IPM management advice to their neighbours. Membership grew to 43. Members wanted a school for their children. The group built a second building. The building became a school for local children. There are now 37 pupils attending grades 1 through 6 at this school.

CARE Bangladesh has trained farmers to be farmer IPM trainers. For CARE, the main purpose of the farmer IPM trainers is to extend the benefits of their IPM activities beyond the project period. Farmer IPM trainers were encouraged to develop their own roles. CARE conducted an evaluation of their activities. The following is a summary of that review.

Money is not the most important motivational issue. CARE discovered that most of their farmer IPM trainers found social recognition to be more important than the potential of earning money as farmer IPM trainers. Farmer IPM trainers state that non-alumni have been coming to them to learn about IPM and that they are proud of the new recognition they get from their neighbours.

Farmer IPM trainers improve linkages with line agencies at the community level. Farmer IPM trainers were developing linkages and networking with different organizations and helping their communities to acquire new information and technology.

Farmer IPM trainers contribute to community cohesion. Farmer IPM trainers respond to community and alumni needs and take initiatives.

- Farmer IPM trainers have reorganized FFS alumni into groups that are similar to agricultural cooperatives. The groups are generating funds from their own contributions for use in IPM activities.
- Farmer IPM trainers design and implement with FFS alumni field trials based on local interests and problems. Results are shared with all farmers in their communities.
- Farmer IPM trainers are assisting schoolchildren to learn about ecology and crop production.

8.1.2 Cambodia

In Cambodia, there are over 6 000 FFS alumni and about 300 farmer IPM trainers. The farmer IPM trainers have conducted activities that have increased the scope and range of the national programme in Cambodia. Farmer IPM trainers are:

- working with alumni to conduct field research;
- conducting IPM field schools in schools for primary grade students; and
- conducting vegetable IPM field schools.

A relatively high percentage of rural people in Cambodia are physically disabled. Farmers with physical disabilities are often not included in agricultural training activities. The regional community IPM programme in Cambodia initiated a project in cooperation with Handicap International (HI) in 1999 so that disabled farmers could participate in FFSs. Not only have handicapped farmers been participating in FFS but disabled alumni have also joined the ranks of the several hundred other alumni who have been trained as farmer IPM trainers.

Box 8.2 Disabled farmers take a leading role



Two handicapped farmer IPM trainers conducting FFS

Tropaing Prech village, in the Bati district of Takeo province, now has four handicapped farmer IPM trainers. They have recently conducted their own field experiments on watermelon. The study was part of an alumni/farmer IPM trainer project focused on farm-level income generation related to IPM in vegetable and rice crops. They investigated the effects of fertilizer and pesticide on crop yield. The farmers found that increased rates of fertilization with no pesticide use achieved almost twice the yield of the usual practice of low fertilization and high pesticide use. The farmer researchers shared their results with other farmers in their village by holding an open meeting for all local farmers.

While this small study focused on crop yield, other studies have examined the economic returns to IPM and the viability of diversification. Farmer meetings have been helpful in improving these research activities, sharing ideas and strengthening relationships within the farmers' communities.

8.1.3 China

The China IPM programme has been training alumni to be farmer IPM trainers since 1998. By the end of 1999 there were almost 600 farmer IPM trainers in China. In the current season at least 30 farmer IPM trainer training sessions supported by FAO will be conducted for selected FFS alumni. There will be an almost equal number supported by local governments in six provinces. These training sessions will increase the total of farmer IPM trainers in China to about 2 400.

Women are playing an important role in IPM activities as farmer IPM trainers. The following case from Mianzhu County in Sichuan province indicates that this role will only get larger.

Box 8.3 Women leading the way for community IPM



Participants in an all-women FFS

Minanzhu County in Sichuan province is approximately 60 kilometres north of Chengdu, the capital of Sichuan. Sichuan, in southwest China, is one of the largest provinces in China, with a population of approximately 80 million people. Women have always played a critical role in rice production in the Xinshi Township of Mianzhu County. Recently women have become even more important to agriculture in the area as a growing number of men seek employment in nearby urban areas. Traditionally women have been responsible for seed preparation, crop fertilization, cultivation, pest and disease management, water management, and harvesting. Clearly, women need to be included in FFSs so that they can learn and apply the principles of IPM in their fields.

In 1999, Li Jirong from Jiannan village in Xinshi Township became the first female farmer IPM trainer in China to conduct an FFS. She participated in a farmer IPM trainers' training course in 1998 after having completed an FFS. She is 37 years old and is the chair of the women's union in her

village. The 25 participants in the FFS that she organized ranged in age from 25 to 50 - all women. But she was not the only woman leading an FFS in Mianzhu County in 1999. There were four other FFS conducted by women during the 1999 rice-growing season. Women will be playing an increasingly larger role in IPM in Mianzliu County. The county women's union leader is strongly behind IPM, as is the provincial women's union, which will be adding funds to help increase the number of FFS implemented by women for women. The leaders of the Mianzhu County women's union intend to have 20 FFS implemented by women for women during the summer of 2000.

8.1.4 Indonesia: the IPM Farmers' Association

Indonesian farmer IPM trainers have continued to expand their activities despite the completion of the Indonesian IPM training project in late 1999. The farmer IPM trainers organized a national congress of IPM farmers in 1999. One of the decisions of the congress was to establish a national FFS alumni organization. Several hundred farmer IPM trainers spread across Indonesia have provided the leadership in getting the organization up and running. The alumni organization, known as the Indonesian IPM Farmers' Association, has had a very busy start with thousands of alumni participating in its activities across the country. The following summarizes a few of their activities in 2000/2001.

Provincial and district-level congresses have been held throughout the country. The congresses were organized by local branches of the national association to:

- strengthen the Indonesian IPM Farmers' Association at provincial, district and subdistrict levels;
- identify and agree upon issues that might serve as the basis for advocacy efforts; and
- discuss the issue of farmers' rights and lobby local and provincial officials concerning farmers' rights.

The association has used a grant of nearly US$40 000 (mediated by a local NGO) to further strengthen its membership base by means of a series of workshops held in selected districts across 11 provinces.

The association organized a countrywide training programme with technical support from the FAO community IPM programme. The goal of the training was to improve the effectiveness of farmer IPM trainers in responding to local needs. Three week-long workshops were held in each of the 11 provinces. Each workshop focused on one of three topics: advocacy, strengthening the quality of FFS implementation, and farmer-led science. In total, about a thousand farmer IPM trainers attended these workshops. Participants attended the workshops as two-person teams and during the workshops each team developed an action plan for follow up in their home districts.

8.1.5 Nepal

A relatively new community IPM programme, Nepal is moving quickly into the development of a cadre of farmer IPM trainers. During the year 2000, the programme conducted five farmer IPM trainer TOTs and farmer IPM trainers will organize 31 FFSs. The participants in farmer IPM trainer TOTs are FFS alumni. The goal of these courses in Nepal is to develop the facilitation and leadership skills of FFS alumni. The vision is that the participants will not only organize FFS but also provide leadership at the village level in the development of local IPM programmes. The following summarizes the curriculum of the TOT held in Birgani, Nepal. The summary is based on the report of two members of the FAO community IPM Asian trainers' team who helped in the design of the curricula for Nepal TOTs and participated in the Birgani session.

Box 8.4 Training farmer IPM trainers in Birgani, 1-10 May 2000



Alumni at the farmer IPM trainer TOT

The training approach used in the TOT was to have participants practise an activity then analyse the process of the activity. Facilitators asked a series of questions to help in the analysis of activity processes. Among the questions asked were:

- Why was the activity important to review in the TOT?
- Why is the activity important in an FFS?
- What took place during the activity?
- How can the FFS facilitator help the learning process in this activity?
- When should this activity be conducted in an FFS? Why?

The TOT curriculum covered four main categories of activities, the AESA, special topics, group dynamics, and FFS management. The AESA activity was done several times during the TOT. The participants practised and analysed all of the steps in the AESA process. The objective was that participants would master the facilitation of the AESA process.

Among the special topics that were practised during the TOT were: insect life cycles, the insect zoo, categorizing arthropods, drawing and identifying insects, major pests in rice, plant root and vascular system, pesticide poisoning, fertilizer management, soil and water management, weed management, plant morphology and growth, disease management, economic analysis and applied statistics.
The participants also practised 17 different group dynamics activities during the TOT. In this TOT group dynamics were used to improve the learning climate before a session or after lunch.

Management topics focused on three main issues, preparation for an FFS, conducting the FFS and post-FFS activities. Preparation topics focused on needs assessment, participant selection, budgeting, and curriculum development. Topics related to conducting the FFS included work plans and conducting the ballot box activities and the FFS field day. Post-FFS topics included evaluation and the planning of follow-up activities.

8.1.6 Sri Lanka

The first farmer-to-farmer training in Sri Lanka started spontaneously when farmers in three districts decided that they should begin to take responsibility for training farmers in the neighbourhood. In 1999, the community IPM programme supported a technical exchange with the IPM programme in Bangladesh. The exchange enabled experienced TOT trainers from Bangladesh to participate with Sri Lankan trainers in a farmer IPM trainers' TOT curriculum development workshop in Sri Lanka. The trainers designed a five-day curriculum. The curriculum was used in five TOTs in the Maha 1999/2000 season. Participants in these TOTs were FFS alumni from Galle, Puttalam, Anuradhapura, Kandy, Ratnapura and Hambantota districts. These new farmer IPM trainers conducted 26 FFS during the following season.

After the first season of farmer-to-farmer training, farmer IPM trainers and project field trainers participated in a workshop to evaluate the farmer-to-farmer FFS that had been conducted. One of the results of the workshop was lengthening TOTs from five days to ten days to allow for more training on facilitation and technical issues. This new model of farmer TOT is being implemented in new districts and irrigation systems.

The farmer IPM trainers have been successful both as trainers and as local IPM leaders in the districts where they have been active. For example, farmer IPM trainers in Galle district have worked with farmers to form IPM alumni groups. These groups produce seed paddy to meet local requirements. The deputy director (Extension) of Galle district, Mr Indrajee, is so convinced of the impact of farmer-to-farmer training that he has taken the decision to use it as a primary extension strategy.

Farmer-to-farmer FFS is an expanding activity in the programme in Sri Lanka. The number of farmer-to-farmer FFS has been increased for this season. There are now over 200 farmers who have participated in farmer IPM trainers TOTs. Present plans call for at least 50 percent of these farmer IPM trainers to conduct FFSs in the upcoming Maha season.

8.1.7 Viet Nam

Community IPM activities in Viet Nam have led to an increase in the number and activities of farmer IPM trainers. The following is a brief case from Yen Tan village in Nam Dinh province. The case is representative of the role of farmer IPM trainers in establishing sustainable village-level IPM programmes across Viet Nam.

IPM activities began in 1995 in Yen Tan village with the implementation of a single field school that was followed by two others, one in 1997 and another in 1998. At this point there were 90 FFS alumni spread among the 10 hamlets of the village. In the autumn of 1998, as community IPM activities started in earnest, a TOT was held in Yen Tan to train 20 alumni or two per hamlet (a total of 12.5 percent of FFS alumni in the village). Half of the alumni trained as farmer IPM trainers were women. This selection strategy meant that both the local farmers' union and the local women's union were represented in the TOT. These two organizations supported IPM and wanted members trained as farmer IPM trainers.

After their TOT the farmer IPM trainers conducted four field schools in 1998 and another four in 1999, raising the number of FFS alumni in the village to 330. The farmer IPM trainers also helped in the organization and implementation of 12 field studies over the two years.

Box 8.5 A farmer field study in Nguyet Trung hamlet, Yen Tan village



Farmer researcher at the field study site

After attending the village planning meeting before the spring planting season of 1999, Mr Tuyen, an FFS alumnus who is head of the crop production brigade for Nguyet Trung hamlet, along with Mrs Hoan and Mr Tong, farmer IPM trainers, organized a study on fertilizer use. (Mrs Hoan is a leader in the hamlet branch of the Yan Ten women's union and Mr Tong is the head of the hamlet's farmers' union branch.) Their goal was to conduct a study that might have a practical benefit for farmers. The study focused on the impact of phosphorus fertilizer.

The number of farmers involved in the study was limited to 20. They managed all of the fieldwork associated with the study. There were farmers from other hamlets involved in the study group to help ensure that results were shared with other IPM clubs. The local IPM field trainer played the role of a consultant helping mainly in design issues.

Participants in the study made weekly ecosystem observations and evaluated the impact of phosphorus on yields. The results of the study indicated that increased levels of phosphate led to higher yields in general. Lam Thao phosphate led to higher yields in all the plots in which it was tested. However, in low-lying fields, the study found that melted phosphate had better results than Lam Thao. Results were shared with other farmers in the hamlet IPM club, of about 80 farmers. The study group also conducted a field day for village and hamlet leaders.

Alumni and the farmers' and women's unions began organizing IPM clubs for all farmers in 1998. By early 2000 each of the 10 hamlets had an IPM club. In each of the clubs farmer IPM trainers were named as either the chair or vice-chair. These two positions alternate between a representative of the hamlet branch of the farmers' union and the women's union and a farmer IPM trainer is always either the chair or vice-chair. The clubs are conducting field studies organized by farmer IPM trainers. The leaders of each hamlet IPM club meet regularly to share results of studies that they then provide to hamlet club members. The total membership of the ten clubs is about 600 farmers. Clubs plan to continue organizing studies and FFS.

8.2 Operational principles

How did we get here? Across Asia, the process of getting community IPM institutionalized at the village level has usually taken place in the midst of large-scale IPM training projects. The challenge has been the opposite of that facing an NGO that wants to take a successful activity at the community level to a larger scale. Community IPM managers and leaders have had to ask not only how to provide large numbers of farmers with the opportunity to participate in FFSs, but also how to enable FFS alumni to establish sustainable IPM programmes in their own communities. Getting IPM institutionalized at the field level has also required working through complex government bureaucratic systems. Centralized bureaucracies tend not to be conducive to participatory IPM. Historically, agriculture departments have been the main input suppliers encouraging insecticide use. How then can participatory, ecologically informed programmes take root within and through such systems? The following have proven to be effective operational principles and have allowed managers and leaders to answer the above two questions.

8.2.1 Capturing systems

Attention needs to be given to the highest and lowest levels of the systems that provide the context for IPM field activities. Policy guidance from top levels can combine effectively with bottom-up pressure generated by farmers to transform systems. A classic example of cultivating the highest level in the system comes from Indonesia where an inter-ministerial coalition was established to oversee the development of IPM activities. Indeed, it was this coalition that was able to prevail upon the president of Indonesia to issue a policy that called for:

- the banning of the use of 57 wide-spectrum insecticides in rice;
- the elimination of subsidies for insecticides; and
- the implementation of IPM training for government agricultural field workers and for farmers.

This policy mandate provided the initial space for an IPM training programme to move at the lowest level in the system, in the field with farmers. To take advantage of this opportunity meant moving quickly to develop and implement an effective educational model for field workers and farmers. Once

such a model was in place, both policymakers and farmers were available to persuade the middle part of the system, from the minister of Agriculture down to village heads, of the importance of IPM, the effectiveness of the FFS approach and the ability of farmers to implement IPM. When you see endless pictures of IPM farmers talking in the field with heads of state, ministers, local government chiefs, etc, think of how top-bottom linkages are being formed.

8.2.2 Move quickly

Windows of opportunity, once opened, are usually not open for very long. In terms of IPM education for farmers this means getting activities going quickly at the field level after acquiring the mandate to work with farmers. This requires collapsing the layers in a training system so that it is essentially a one-step affair. In community IPM countries this has been done by organizing FFSs as part of the training for IPM field trainers. Further, elaborate hierarchical training systems have not been developed to train field workers or farmers. IPM field trainers are trained and they train farmers both during their training and afterwards. A human resource system is established at the field level, not a set of training facilities. When the training of field trainers is completed, the TOT trainers move on to the job of supporting farmers in their efforts to institutionalize IPM at the village level.

8.2.3 Let the farmers show them

Decision makers need evidence to support ecological IPM education for farmers. Written reports are not enough, decision makers should be able to visit an FFS and talk directly with farmers. There has yet to be large-scale implementation of FFSs in any country without decision makers having had a chance to see FFSs at first hand and talk with farmers. The FFS is a radical departure from farmer education as usual. Quick implementation, before a çfarmer training as usualé approach sets in, allows decision makers to see what farmers can do because of the FFS.

8.2.4 Actively engage local institutions

To engage local institutions means educating local government and non-governmental groups about IPM and advocating their support for IPM and farmer-led IPM activities. Alumni will need both policy and financial support to enable them to organize IPM activities and base groups. To achieve this support, both education and advocacy will be required. A wide variety of steps can be taken to accomplish this. Every FFS has a field day that is organized by FFS participants. The field day provides an opportunity for participants to begin the work of communicating with others about IPM and its benefits. In Viet Nam and in Indonesia, FFS facilitators have included farmers who also hold leadership positions in the village in their FFS. These leaders have helped to make village funds available to support FFSs. Alumni have also used forums such as farmer planning or technical meetings to inform local officials about the direction and benefits of alumni-organized activities. Advocacy can begin in these forums as alumni can initiate negotiations with local government for funds to support their activities. In Viet Nam and in China, local mass organizations such as the women's union have been recruited to support and organize FFS and IPM alumni associations.

8.2.5 Use TOT trainers as communicators

In many countries, the trainers who conduct TOTs have been effective in gaining support for IPM at the local level, especially during the early stages of field activities. In Indonesia, for example, the trainers

from the TOT centre supported TOT participants as they implemented field schools by helping the participants to solve logistic and facilitation problems and by working with local government at the district and subdistrict levels to acquire support for FFS implementation. In a sense the practical period of the course was also a learning opportunity for these trainers. They acquired valuable experience in effectively communicating with the middle levels of the system in support of farmer-led IPM.

8.2.6 Establish new systems through training

The training activities in support of the implementation of FFSs can be more than simply a TOT programme. This programme offers an opportunity to:

- lay the foundation for a field management system that can support the institutionalization of IPM at the village level and
- influence the context in which FFS implementation and IPM institutionalization is taking place.

TOT trainers have, in many countries, become the day-to-day managers of IPM field activity implementation. They have effectively counteracted the tendency of centralized bureaucracies to work in a top-down fashion. The development of trainers as managers within a field-based management system has come about by design, not by accident.

The TOT programme, when it is conducted as a season-long intensive residential training, provides an opportunity to change the values, skills and approaches of its participants. The TOT necessarily must provide a motivational force that will sustain IPM field trainers when they confront the obstacles that will arise as they organize and facilitate FFSs. Thus as TOT graduates go about their work, they represent, in effect, not only a moral force acting on behalf of IPM and farmers but also a skill base that can design and implement participatory approaches that sustain a bottom-up approach to the development of sustainable agriculture at the local level. Their potential for affecting the system in which they work can be great, especially at the subdistrict and village levels.

8.2.7 Create room for farmers to take action

An FFS provides farmers with an opportunity to develop their potential. Follow-up activities allow alumni to further develop their potential. Those that are focused on developing local IPM programmes provide alumni with the room to take action to institutionalize IPM at the village level. Activities that focus on problem analysis, planning, decision making and field research allow farmers, within the context of IPM, to identify local problems related to agriculture and plan actions that will lead to their solution. These activities build teams, enhance values and strengthen the motivation of alumni to move ahead with their own programmes.

In Indonesia and in Viet Nam the IPM programmes have developed approaches for follow-up to FFSs that integrate several activities, including participatory problem analysis, activity planning and activity implementation. These follow-up activities, while initiated by national programme trainers, have consistently provided a foundation for farmers to begin the development of their local IPM programmes.

8.2.8 Continuously build farmer capacities

While follow-up activities can build skills, it is important to have a cadre of alumni in as many villages as possible that can organize FFSs and have additional training in leadership. Farmer IPM trainers have

been the key element in all successful IPM movements in the region. Their TOTs provide them with more intensive technical and leadership training. This increased base of skills at the village level is enough to give an edge to alumni as they organize their IPM programmes. Farmers are the agricultural system. Departments of agriculture often fail to take note of this. Only farmers can institutionalize IPM at the community level.

8.2.9 Organize IPM nodes and networks

The level at which this takes place depends on the country. The concept of an IPM node suggests one point in a network that can extend across a whole country. Each node serves to support the work of alumni in institutionalizing IPM at the village level. In Indonesia, the subdistrict became the focus for the integration of IPM activities. Subdistricts were envisioned as nodes that could be linked up in a wider network as well as influencing the immediate area.

The subdistrict level became the focus for developing nodes because:

- The subdistrict is the highest level in the Indonesian governmental system where some homogeneity can be found in terms of culture, ecosystem and availability of resources.
- Most of the institutions that affect villagers exist at the subdistrict level.
- Farmers have easier access to governmental resources at the subdistrict level than at district or provincial level.
- A farmer can easily get to a bus, travel to a meeting and return home before nightfall within the borders of most subdistricts in the main rice growing areas of Indonesia.
- The subdistrict head can implement policies that affect the village easier than officials at higher levels can.
- The subdistrict can offer more immediate support to a community-organized IPM programme than any higher level of government would.

Organizing effective nodes requires forums that allow farmers to communicate, plan activities and share results of planned activities. Plans can be used to lobby officials for support. Reporting results helps alumni to evaluate their activities. These forums can help an IPM project develop activities that are responsive to the needs of alumni.

8.2.10 Scale up, down and out

Demands are placed on any large-scale national IPM training programme to increase coverage and accelerate training processes. The challenge is to accomplish this while setting the foundation for village IPM base groups. Thus, there are two facets to this issue: a) increasing the number of farmers participating in FFSs and their application of IPM principles and b) developing organizational capacity at the community level.

The Indonesian programme dealt with increasing the number of farmers participating in FFSs in two ways. The first was to locate at least one TOT centre in each province and have each PHP conduct four FFSs as part of their training. The second approach used to accelerate FFS implementation was the training of alumni as farmer IPM trainers. This strategy also helped to enhance the organizational capacity of alumni at the community level. TOTs for farmer IPM trainers stressed leadership skills, including planning and problem-solving skills. The FFS itself can enhance village-level organizational capacity. (Discussions of the FFS approach and what farmers can do because of their participation in an

FFS were presented in chapters 3 and 4.)

8.2.11 Maintain flexibility and organizational learning

Establishing community IPM means continually trying new ideas. The çcookie cutteré approach does not effectively support sustainable community IPM at the village level. In effective programmes there is usually a pilot activity being conducted somewhere. By experimenting, managers and trainers are able to add to their experience. Trying new activities has its ups and downs. Some field staff will find it to be a burden; some will take advantage of what the new activity can achieve. A total of 15 different field activities could be conducted in a given subdistrict in Indonesia in 1996. Field managers were encouraged to look at the list of activities as a menu and to use it creatively. For example, the farmer technical meeting was budgeted to be conducted three times a year in one subdistrict. Most field managers looked at the allocation as an opportunity to be flexible. Some conducted one technical meeting per year in three different subdistricts. Others conducted one in each of two subdistricts and used the remaining funds for a meeting that included the two subdistricts. In Viet Nam, a long list of activities has been developed. There is a budget limit per province, but community IPM provincial leaders are asked to develop their own local programmes from these lists (or perhaps add some new activities). Again, a community IPM programme cannot be established in cookie-cutter fashion. Field staff should be allowed to make these decisions, not central staff. The closer the locus of decision making is to the farmer, the better the chance of sustainability.

8.3 Looking ahead

What next? For the last ten years, IPM training programmes in Asia have pursued multiple objectives with considerable success. The explicit goals of the programmes have included farmer empowerment, the conservation of biodiversity, food security, community education, the protection of human health, and policy reform. These multiple objectives have arisen from a growing recognition - among governments, NGOs, donors and farmers themselves - of the interdependence of the various aspects of development and of the need to put people at the centre of the development process.

8.3.1 A sustainable livelihood framework

Although IPM training programmes were being implemented before the use of livelihood terminology became widespread, the current concept of sustainable livelihood accurately describes what is going on in these programmes. (See Chambers and Conway 1992 and Farrington et al. 1999 for more discussion of sustainable livelihood concepts and their development.) Within a community IPM programme, participatory approaches including farmer-to-farmer training, action research and policy dialogue transform natural, human and social capital into a number of livelihood outcomes. These livelihood outcomes include security of income, food supply and health and improvements in rural civil society.

Box 8.6 How community IPM programmes promote sustainable livelihood

- Learning about ecology, which leads to an understanding of natural balances and dynamics and to an appreciation of relationships and processes;
- Conducting field experiments, which leads to greater technical knowledge, the development of analytical skills, and scientific scepticism;
- Group decision-making, which involves assessment of assets and strategies;
- Collective action, which involves both practical and communicative action.

Structures

- Formation of farmer groups or revitalization of existing groups;
- Networking among farmer groups for knowledge sharing and support;
- New farmer-driven forums for interaction with local and national government agencies (regarding technical, funding and policy issues);
- Creation of new alliances between farmer groups, consumer groups, NGOs and other organizations with common interests.

Outcomes

- More efficient crop management, resulting in improved food security and income;
- Reduced use of pesticides, resulting in improved biodiversity and human health;
- Greater self-reliance, resulting in better response to adversity;
- Better bargaining position, resulting in improved support from government and reduced threats from corporate interests.

Current descriptions of the livelihood concept focus on five different types of capital or assets: social, human, natural, physical and financial. These are the resources people can use to improve their livelihood. As an example of how community IPM activities can enhance these assets, the following goals were recently established by the community IPM programme in Indonesia.

Box 8.7 Community IPM goals in Indonesia

1. Help create and strengthen social capital in rural communities by supporting farmers' efforts to build associations and networks, which will give them a voice and improved means of helping one another.
   - Formalize democratic processes for the management of existing IPM farmers' associations.
   - Register new associations and expand active membership, with an emphasis on the recruitment of women farmers.
   - Build the managerial capacity of local organizations (organizational development) and enhance leadership skills.
   - Support planning meetings among IPM farmers on a seasonal basis in at least 100 subdistricts.
   - Organize at least 40 district and provincial congresses and one national congress to be attended by representatives of local IPM farmers' associations.
   - Undertake policy studies in collaboration with at least three existing local NGOs, including a specific gender study.
   - Undertake collaborative advocacy and farmers' media activities.

2. Help create and strengthen human capital in rural communities by supporting farmers' efforts to train other farmers, using content and methods which promote critical thinking and improved decision-making.
   - Evaluate past training activities and develop curriculum for future training during local,

- Support season-long farmer field schools, follow-up activities, and cross-visits for at least 20000 farmers organized and managed by the Indonesian IPM Farmers' Association.
- Support specialized workshops and meetings as and when planned by local groups on issues such as marketing, agribusiness development, etc.

3. Help preserve and restore natural capital in rural communities by supporting farmers' efforts to carry out studies and implement farming practices (as individuals and as groups) which take account of ecological processes.
   - Share results of field studies that have been completed by farmers and plan future studies during local, provincial and national farmer technical meetings as mentioned above.
   - Support the implementation of field studies by farmers that create a better understanding of agro-ecology and develop or test environmentally friendly practices for crop production.
   - Organize at least one meeting per year at which representatives of farmers' associations can discuss the results of their studies with professional researchers.

4. Lay a foundation for future improvement in the financial and physical capital of rural communities by creating and strengthening structures and processes which will expedite the provision and management of credit/cooperatives and the creation and management of farmer-led facilities such as village laboratories and training centres (activities as above).

Community IPM activities have and will continue to evolve in a manner that is congruent with the sustainable livelihood framework. The commitment of community IPM to work at the village level with farmers means that activities will go beyond IPM, but not beyond what farmers identify as necessary.

8.3.2 Further developments

What further development can be expected in terms of projects and programmes? It will be clear from earlier sections of this document that farmers and trainers, having been empowered by IPM training, are organizing their own groups and pursuing their own programmatic objectives. This is creating an opportunity for the democratization of agricultural development. Farmers are able to negotiate with local government about the provision of services; they are able to contribute to national debates about policies affecting their livelihood; they are able to share research results with scientific organizations without being patronized - in short, farmers are acquiring a strong and credible voice. IPM projects and programmes, which in earlier days were designed and managed to do things for farmers, now need to undergo a paradigm shift so that they start to do things with farmers.

What might this mean in practice? We are still learning the answers to this question, but here are a few examples:

- Farmer representatives need to be involved in all stages of project design and appraisal, and in subsequent work planning and monitoring. Governments, NGOs and donors often talk about participation, but the practice often falls short of the promises. Hundreds of thousands of IPM farmers have acquired skills in critical thinking and planning and they may resent attempts to put a fence around their participation.
- Programmes need to be designed which can accommodate the integration of issues which affect rural livelihoods: not just the integration of pest management with other aspects of crop production (such as soils and water management), but also the integration of crop production with health, education, credit and other farmer-defined issues.

- Project funding mechanisms must be established which respond to proposals made by farmer groups. This is not as easy as it sounds; it may mean making a large number of small grants that are difficult to account for (documentation in local languages, expenditures which do not fit into financial years, disbursements in locations without adequate banking facilities).
- Projects and programmes will need managers who are not afraid to challenge the status quo. When farmers gain a voice, they start demanding their rights. This is likely to cause friction. Diplomatic skills will be required to put these demands on the government (and funding agencies') agenda. Project managers who do not take the side of the farmers who are supposed to benefit from projects will be identified by farmers as part of the problem rather than part of the solution. Fortunately a number of development organizations now have policies regarding governance, civil society and democratization.

This short list of issues indicates that, although existing institutions may continue to play an important role in supporting the development of IPM, new organizational arrangements may be needed. These are starting to emerge in countries like Indonesia where local foundations are being formed specifically to support the work of IPM farmers' groups. At the regional level, a group of independent experts who recently reviewed the FAO programme for community IPM have recommended the establishment of a foundation which will support the work of local and national groups. The purpose is not to compete with the efforts of organizations such as FAO, IRRI, DANIDA or CARE, but to complement their work by providing an independent structure for interaction among the many local and national groups which exist in Asia. The proposed regional foundation will support activities that are initiated and implemented at the field level by farmers.

8.4 A final note about empowerment

This programme draws upon the energy, caring, thoughtfulness and skills of everyone. Where the IPM programme has succeeded, success has been due to the efforts of the many rather than the few. In our view power, and hence empowerment, is not a zero-sum game. We strongly believe, and have been strongly reinforced in this belief, that power can be created. The more individuals, families and communities that generate this power - be it knowledge power, social power, voice power or scientific power - the stronger and more resilient and sustainable will a society be.

Surprisingly, such belief in people and communities is not universally held nor acted upon. We know because what we deem to be simple beliefs have often been seen as heresy to established political (and agricultural?) elites. Over the last ten years, a legion of local heroes has proven these heresies to be, in fact, solid principles upon which a programme can be based. These former heresies include:

- ***Farmers as experts.*** At the outset, few believed that farmers could even identify insects, let alone deal with something as abstract as field ecology. IPM farmer field schools in over 50 000 communities across the region have proven them wrong. Unfortunately, as all new programmes know, such doubts remain widespread.
- ***Farmers as IPM trainers.*** Currently in some countries more than 50 percent of IPM farmer field schools are managed by farmers themselves, a complex task which was daunting initially even to trained field workers and NGO organizers. Many still question quality, but from all we can gather farmer-led training is much the stronger vehicle.
- ***Farmers as researchers/scientists***. We have always promoted the view that the farmer-researcher linkage was not just about having farmers tolerate researchers on their farm or just be demo-plot watchers. Farmers are now regular presenters at national agricultural research and university forums; and they easily hold their own. At the local level, farmer-run science has had immediate

impact in real time over broad areas.

- ***Farmers as organizers, planners, advocates, activists.*** IPM farmer planning and organizing activities now extend from the neighbourhood to the national arena. Vignettes of IPM farmers holding dialogues with ministers and, in some places, prime ministers are not unusual. Farmer-generated media also are no longer limited to effective local bulletins, people's theatres, field days or field seminars. The Indonesian IPM Farmers' Association has just founded a new newspaper, *Farmer*, which has an initial print run of 10 000.
- ***Farmers as policymakers.*** Farmers, while representing over half of the population of many member countries, have traditionally had little voice concerning policies directly affecting their lives. While far from revolutionized, this is indeed changing. Organized IPM farmers are gaining increasing access and much greater leverage over local, regional and even national polices. " Who is the spokesman for this group?" asked a committee chair of the Indonesian national parliament recently. "We are representing ourselves and speaking for ourselves" was the answer from the IPM farmers who proceeded to lead a four-hour session with several major factions.

And empowerment within the community IPM programme is not just about farmers. Whereas early in the programme international experts were the movers and trainers, the current phase has highlighted the abilities of the A-team, a regional group of experienced field managers, organizers and trainers that have not only taken over the core duties of organizing training-of-trainer programmes but pushed their boundaries and provided the core expertise that has led to the spread of participatory planning/organizing, farmer-led action research and field ecology programmes across the region. This group represents one of the most solid resources ever developed for the promotion of sustainable agriculture in Asia and beyond. A-team members have also provided assistance to programmes as far afield as Ghana, Ivory Coast, Kenya, Tanzania, Peru and Iran. One Asian trainer from Indonesia with a degree from the field, not from a university, replaced an American international expert as an IPM project leader with a major international NGO in Bangladesh.

While we don't have the hubris to declare a sea change in changing extension into farmer education, the efforts of these Asian trainers testify to at least recognition of a powerful alternative model that has gained credibility across the region through their work.

Just as community IPM is about more than bugs, it has also proven to be an effective modality for empowerment beyond agriculture.

- ***IPM in schools.*** In several countries in Asia, IPM field school methods have found their way into primary, secondary and even college curricula; revamping teaching-learning processes while bringing school kids back into the community and the community back to schools. One of the IPM schools in Thailand received a national environmental award.
- ***IPM for disadvantaged groups.*** In Cambodia, with the help of Handicap International, disabled farmers not only have gained access to IPM farmer field schools, they have become community leaders and trainers of the non-handicapped. Programmes have also started for demobilized soldiers and even prisoners as part of their rehabilitation.
- ***IPM and health.*** IPM farmers and schoolchildren in several countries are learning to be community epidemiologists capable of tackling problems of pesticide poisoning. In one area of Cambodia, IPM field school methods have been applied within a farmer's life school to face the challenge of the burgeoning HIV problem.
- ***IPM and farmers' rights.*** In Indonesia the IPM farmers' association obtained independent funding to conduct a series of workshops for local parliaments and government agencies on local problems and local rights, from land and credit to water and fertilizers.

Throughout, IPM farmers and field trainers have often been the innovators and promulgators of new and broad-based activities and programmes. Our job has been to keep up with them and try to provide relevant and timely support for their activities.

Finally, we must also frankly admit that despite the emergence of thousands of local heroes and despite the success of many programmes across the region, we are still swimming upstream. The economic crisis in Asia proved the resilience of agricultural communities and the importance of this often-silent rural majority in holding together the economic and social fabric of nations. Still, the dominant paradigm of outside-controlled input-driven agricultural systems with their requisite technology packages, messages, target groups, target outputs, input subsidies, adoption strategies, coercive incentives, social engineering, and on and on, still looms large in most countries. We believe that it will be largely up to the farmers themselves to transform agricultural systems in such a way that farmers are no longer viewed as mere adopters of more schemes. We hope that in this struggle we will be one of the programmes counted as an ally by farmers, their families and their communities.

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