Since Farmer Field Schools (FFS) were first originated in Yogyakarta, Indonesia in 1989, many innovations have occurred and changes to the basic theme have been developed. FFS started out as a way to facilitate learning of integrated pest management (IPM) concepts and techniques by Indonesian farmers. The Indonesian National IPM Program first applied the FFS approach on a broad scale for rice farmers, and technical assistance provided by the United Nations Food and Agriculture Organization (FAO) and funding from the US Agency for International Development (USAID) among others were key to the success of this program. FFS were subsequently adapted for other crops such as legumes, fruits, vegetables, and tuber crops, and other technical and social themes such as integrated crop management, community forestry, livestock, water conservation, HIV/AIDS, literacy, advocacy and democracy (CIP-UPWARD 2003).

Central to the success of FFS programs is appropriate IPM and methodological training of the people who organize and facilitate the field schools. To be a successful FFS trainer/facilitator, one must have skills in managing participatory, discovery-based learning as well as technical knowledge of agro-ecology to guide the group’s learning and action process. Without an adequate Training of Trainers (ToT) program, the subsequent FFS program will fall far short of its potential.

This chapter focuses on a range of developments and innovations in FFS in recent years, with particular attention to IPM FFS and ToT. Promising innovations and new directions in other types of FFS will also be highlighted.

The Farmer Field School Process

IPM FFS are first initiated by introductory meetings with a community to determine if it is interested in establishing a FFS. Usually, a FFS concentrates on a particular crop in order to focus learning and deepen understanding of principles (e.g., on insect ecology, soil fertility, and production economics) that subsequently can be applied to other crops and the farm production system. If the community indeed decides to implement a FFS, the group establishes selection criteria and identifies a group of 15-30 participants. The facilitator and participants draw up a “learning contract” or “moral contract” that includes the commitments of both the facilitator and the group regarding attendance, materials, the management of resources, the investment of the FFS harvest, and other key issues. Ideally, the farmers contribute the majority of labor and crop input resources, with the facilitator contributing his or her time, transportation costs, and the basic learning materials needed for the FFS. Once norms are established, the FFS facilitator and
participating farmers conduct a participatory rural diagnostic on the crop of interest and identify priority learning themes, as per the different plant growth and production stages. Often the diagnostic focuses on knowledge gaps: i.e., what farmers don't know, but need to know to improve their agriculture. The results of the participatory diagnostic become the learning curriculum. Next, in synchrony with the upcoming cropping season in their area, the farmers and facilitator plant an “IPM plot” and “farmers’ practice plot” (variations occur, e.g., in Latin America these are called the “learning plot” and the “conventional plot”) of the crop to be studied. For perennial crops, existing fields are similarly designated for these two comparative treatments. The conventional plot is managed according to the farming norms of the community, while the IPM plot is managed according to the results of careful agroecosystem analysis in order to achieve common objectives -- usually the increase of production by area, the decrease of expenditures on external inputs, and the reduction of use of toxic materials. Often the group identifies priority research themes, such as new varieties, the management of a particular pest, or fertilization regimes, and a series of small research plots are planted near the FFS practice plots.

The core activities of the FFS are weekly/biweekly meetings that run the entire length of the crop season for annual crops. For perennial crops, such as trees, the learning is likewise organized around phenological cycles, with the FFS meeting at different locations where distinct growth stages can be found for learning experiments and management practice. These meetings begin with an "Agroecosystem Analysis", which commences with the farmers going into the field to observe the crop, pests, natural enemies, diseases, weeds, soil, effects of weather – in essence, the entire agroecosystem. Random locations are sampled and counts are made of pest, beneficial and unknown organisms, plant growth and health are assessed, and data are noted on these and many other aspects of the agroecosystem. This observation is often done in small groups of 3-5 farmers, and each small group subsequently returns to the meeting area (optimally in or adjacent to the field) and produces a systematic report of what they observed in the field. This involves drawing images on a large sheet of paper of the crop, pests, natural enemies, diseases, weeds and other visual components of the ecosystem relevant to understanding and managing crop health. Data on these components are listed in tables to enable other farmers to understand the results. The small group may write some brief comments, particularly on their conclusions regarding immediate action that is needed to maintain crop health.

Each small group then reports their findings to the large group of approximately 25 farmers. Participants are given the opportunity to ask questions and freely discuss each small group’s analysis. This often involves challenging the findings of other groups to encourage both accuracy and appropriate decisions. These exchanges can become quite lively with various farmers expressing their opinions vehemently. Optimally, the group as a whole reaches a consensus about needed actions to maintain crop health.

Often a group dynamics activity will follow the Agroecosystem Analysis. These activities usually reinforce technical learning and they help the participants (and facilitator) to become more familiar with one another. Many of these group dynamics exercises have an additional purpose in connection with either the process of analysis or the importance of cooperating with other farmers in applying IPM in their fields. Role plays and theater activities have been developed that lead to participants portraying, for example, the behavior of beneficial arthropods or disease-causing pathogens. Such activities help farmers to understand the important and often complex roles of organisms in the ecosystem. The resulting learning experiences, whether technical or of a group dynamics nature, mutually support important aspects of implementing IPM practice in the community.
A ‘special topic’ exercise is usually the last activity in a weekly FFS session. These topics are optimally identified during the participatory diagnostic and represent an opportunity for the facilitator to introduce material to the group that the farmers are not likely to encounter through their self-directed experiential learning process. These exercises are used to introduce or demonstrate a number of IPM and plant health-related issues, such as toxicity of pesticides to predators and parasitoids, the existence of microscopic pathogens, or the ability of the plant to compensate for damage done by herbivores.

The facilitator and participants work together throughout the FFS process to achieve the learning objectives. An adept facilitator is able to guide the FFS in productive directions while enabling the participants to shape it in ways that meet their needs and interests. Learning is acquired through directed discovery-based experiments that respond to the principal knowledge gaps identified early on. Because of this, the facilitator does not have to explain everything; the results speak for themselves. Due to the practical orientation of the teaching method, farmers can become very accomplished FFS facilitators. The chief skills required are the ability to lead others in carrying out and analyzing field activities. The field, not the facilitator, becomes the teacher.

Many variations on the main theme exist for the process of conducting an FFS. Pontius et al. (2002) provide details on what makes up a standard model FFS and the components of a typical rice IPM FFS. One point is important here. The format and process of the FFS make it possible to address many community issues which influence IPM. These can include anything from gender equity to land tenure to diverse marketing concerns. Since farming practice is largely a social construction, the FFS process of engaging in inquiry invariably triggers exploration into social issues that affect IPM, crop health and overall family and community well-being (Figure 1).

**Goals of IPM FFS**

The goals of a FFS may vary, based on the needs and priorities of a community. Most immediately, IPM FFS strive to enable farmers to respond to practical needs, usually pest control, crop production and productivity. Nevertheless, FFS aspire to farther reaching individual and collective matters that are commonly behind social marginalization and poverty (Pontius et al. 2002). People development or human resource development is an often-stated goal (CIP-UPWARD 2003). Strengthening farmers’ critical awareness, in particular their knowledge base and capacity to analyze problem contexts, experiment, and negotiate mutually beneficial outcomes, is also a commonly held goal. Social empowerment, that is, the capacity to protect economic and cultural interests, is a frequently stated goal in well thought out FFS programs, and it was a fundamental principle which influenced the original design and implementation of FFS. Decades of rural development experience have shown that effectively managing interactive learning processes is central to enabling farmers to escape poverty (Pontius et al. 2002). Experiential, self-directed learning around technical concerns, such as IPM, can contribute to increased creativity, self-reliance, and confidence. For this reason, FFS concerns itself with both technical content and socially effective learning processes.
Overall Trends and Global Scope of FFS

Farmer Field Schools are now active in Asia (including East, South-East, South, Central and Middle East), Africa (Western, Southern, Eastern and Central), Latin America (South and Central America) and Eastern Europe. It should not be surprising that FFS-type activities are conducted in Australia through RiceCheck programmes and in the USA on fruit trees (OrchardCheck); the basic idea of aligning training with the crop phenology or livestock management and undertaking hands-on practical training has always been a “normal” practice in western country organizations such as Future Farmers of America (FFA) and 4-H. The
geographic spread has been accompanied by local cultural and socio-economic adaptations by local facilitators. In the case of moving from Asia to Africa, the focus moved from IPM to Integrated Production and Pest Management (IPPM) due to an emphasis on production and already low levels of pesticide use in most crops since structural adjustments took place. Further spread has taken place with focus of the FFS moving from primarily rice IPM in Asia to vegetable and cotton IPM in Asia to potato IPM in Latin America, cotton, rice and vegetable IPPM in Africa, vegetable and fruit IPPM in the Middle East and now towards mixed systems in East Africa with crops, poultry and dairy cows (LEISA Magazine on Low External Input and Sustainable Agriculture 2003; LEISA Revista de Agroecología 2003; CIP-UPWARD 2003; van den Berg 2004).

**FFS in Africa**

FFS are presently being conducted by a wide range of institutions in Africa, including the IPM Collaborative Research Support Program (IPM CRSP), FAO, many national governments, and numerous non-governmental organizations (NGOs). Unique challenges have arisen while attempting to apply in Africa this approach first developed in Asia. For example, efforts to implement FFS in Egypt have found that group dynamics activities developed in Asia do not work in the Arabic-Egyptian culture (van de Pol 2003). Reorienting FFS facilitators from a top-down technology transfer approach to a participatory approach has been especially challenging in Egypt, and has required intensive training in the latter over a prolonged period. Overall, adapting the FFS process to local circumstances must be a collaborative activity among farmers, facilitators and project staff (van de Pol 2003).

**FAO FFS**

As mentioned above, the FFS in Africa focus on production and pest management (IPPM) because of the relatively low levels of production and pesticide usage. Cotton, vegetables and tobacco are the largest recipients of pesticide treatments. For example, in cotton IPPM, most farmers conclude that they are over-using pesticides and under-using quality seed, irrigation and fertilizers. In rice IPPM as well, farmers learn to improve yields without increasing use of (or beginning to use) costly pesticides.

In Africa however, several innovations have taken place since FFS were introduced from Asia. First is the inclusion of more health and nutrition “special topics” due to the low level of awareness by farmers about the dynamics of diseases such as HIV/AIDS and malaria that are crippling many rural communities. Basic nutrition, water boiling, intestinal parasites and women’s reproductive health are included in FFS by non-IPPM extension officers or NGO guest facilitators. Perhaps the most exciting innovation which women’s groups in Western Kenya developed are “commercial plots” which are group production plots adjacent to the FFS learning plots. Such commercial plots allow the groups to raise funds and become self-financing in their activities. Efforts are underway to institutionalize these commercial plots in the FFS so that they will be largely self-financed from the outset of programs. The International Fund for Agricultural Development (IFAD) is funding a four country effort to develop the methodology by working with these innovative FFS groups.
The water and soil services of FAO, in collaboration with ICRISAT and national extension, have been especially active in Eastern and Southern Africa developing FFS for soil husbandry, minimum tillage conservation agriculture, soil conservation, water harvesting and water moisture management in rain-fed systems. These new field schools combine both educational and participatory technology development (PTD) methods. Further developments for youth (Junior Farmer Field Schools) are also taking place. There are excellent linkages with other FFS developers in the region, especially with IITA in cassava and banana, GTZ in Ghana on banana and vegetables and GTZ in Tanzania on various topics, and with Wageningen University PTD development methods in Zanzibar. A large number of non-FAO programs across Africa have been active in contributions to FFS developments.

Also in Africa, FFS are becoming the foundation of field-based food security programs and taking on a new role. Under IPM, farmers learn to better manage their crop for efficient use of resources (time, inputs, etc.). After the FFS, which is typically one to two seasons, farmers graduate with new skills. In fact, many groups of farmers in FFS decide to continue their group as some type of informal or formal association as they have built trust and confidence together. This is a natural occurrence not unlike the emergence of alumni associations or the continuity of Lions or Rotary Clubs. The new trend that is emerging is marketing networks in FFS that cooperate as a larger unit. FFS networks in Western Kenya consist of about 3000 farmers per district and have won supermarket contracts for IPM tomatoes. The skills required for shipping the right quality and quantity at the right time are new to these farmer-owned networks and therefore the FFS curriculum is moving towards management topics as well.

A critical role of FFS is the ability to up-scale by spreading out. A program for 250,000 farmers over 5 years is planned in Sierra Leone, another for over a million farmers in Kenya and larger programs in Tanzania. The up-scaling is possible because farmers can lead the largely hands-on activities of a well-designed FFS. In these programs, the FFS complement other methodologies including farmer-to-farmer methods that have been found to be best for straightforward see-and-do methods such as water harvesting and storage as well as PTD methods for production systems where new solutions must emerge from collaboration between farmers and researcher experts – the successful Agricultural Technology and Information Response Initiative (ATIRI) activities by the Kenya Agricultural Research Institute (KARI) are the model system. Radio and other mass media play a role for motivation and information exchange especially where farmer interviews are used.

The IPM CRSP in Mali

The IPM CRSP has prime sites in both West and East Africa, based in Mali and Uganda, respectively. The program in Mali is coordinated by Site Chair Keith M. Moore of Virginia Tech’s Office of International Research, Education, and Development, and Site Coordinator Kadiatou Gamby of the Institut d’Economie Rurale (IER), who was responsible for initiating FFS in the IPM CRSP Mali site. Considerable research has been conducted on green beans, an important export crop in the Bamako area and on which exporters are imposing on the farmers the use of large quantities of pesticides. Agrochemicals are ineffective and often unnecessary in the Sahelian climate, which is appropriate for organic production of green beans. The IPM CRSP scientists have developed a number of IPM technologies to deal with pests and diseases of green beans that exist in Mali, without recourse to pesticides. The main form of transmission of the
research results to the farmers is by way of FFS run in collaboration with the *Opération Haute Vallée du Niger* (OHVN), the local extension service.

IPM CRSP/Mali has been running FFS for men since the mid 1990s. In 2001 separate women’s schools were added in some villages. In spring 2003 a survey of the impact of these schools was carried out by Issa Sidibe (OHVN) and Haoua Sissoko (IER) in three of the villages – Dialakoroba, Sanambélé, and Tamala – where there are FFS for both sexes. 28 female and 24 male FFS members and 30 women and 29 men non-members from these three villages were asked about their opinions of the FFS, what they had learned from it, what they had passed on to others, and which of the practices taught there they had adopted.

The main issues for the production of green beans in this area of Mali are: (1) thrips, podborer, and whitefly infestations; (2) weeds, particularly where there is no crop rotation. Weed control practices include: well-decomposed compost and cabbage inoculated with a biocontrol fungus incorporated into the soil, plastic mulch applied prior to planting for solarization, once-a-day watering, the addition of the *Lonchocarpus* plant to the compost, the use of powdered tobacco, and burning plant residues from the previous season in the plots. Insect pest control practices include: red Vaseline covered traps at crop emergence, blue traps at the vegetative stage, yellow traps at flowering, and up to three applications of neem leaf extract (with soap added) if necessary during vegetative growth, at the flower bud stage, and during flowering and pod formation (Gamby *et al.* 2003). Some integrated crop management (ICM) techniques, such as planting in rows, were also taught in the FFS.

The aim of the survey was to assess the efficacy of the FFS and the effect they have on participants’ and non-participants’ farming practices as well as to evaluate gender differences in issues and responses. Questions considered include whether the FFS can influence thinking on pesticides and their health and environmental effects, and especially, whether farmers will adopt FFS technologies when the export operators provide pesticides and even someone to apply them along with the seeds.

**Results.** Perhaps the most important result of the FFS is that large numbers of both participants and non-participants have realized the dangers of applying agrochemicals, both pesticides and chemical fertilizer, and have therefore decided to do their best to eliminate these from their practices. All but seven of the respondents indicated that they had learned about pesticides and the associated dangers during the course of the FFS. The economic benefits of using neem, which grows in quantity in the village and therefore costs nothing, clearly also played an important role. The one person who said he would not be changing his practices said this was because he works with the exporters and so must follow their rules, despite understanding the dangers.

Most participants and non-participants had adopted several of the technologies taught and were planning to apply others. Everyone who had practiced any of the technologies claimed to have benefited from them, especially economically. Comments included: “The greatest benefit of all is having received training and therefore being equipped with new knowledge and skills”; “The production is better and the quality and yield have improved”; “There is less danger without pesticide usage”; “The women in Dialakoroba have formed a group to cultivate cereals together in addition to their green-bean farming”; “Now that we know these principles we cannot be easily deceived in the matter of production techniques”; “I can now distinguish between pests and beneficial insects.” A majority of women said the chief benefit for them was being able to farm without having to wait for help so they could work to their own rhythms. Some women who had never previously had their own plots said their new skills had given them the courage to
farm independently of their husbands. Many people commented that the FFS had given them the strength to go on with green-bean cultivation and to cope with the problems.

Some perhaps unexpected benefits from the FFS are that when women are able to raise their incomes through use of these techniques, they no longer depend on selling firewood for cash. This both reduces their workload, since fetching wood is both time-consuming and physically demanding, and helps the environment. Multiplying this effect over a larger number of women would be very beneficial and might even positively influence the most serious problem raised during this survey, that of access to water. Many people complained about wells drying up and asked for help in dealing with this situation. Preserving trees might help prevent even worse desertification in this extremely arid region.

All participants praised the FFS and said the techniques they had learned were truly useful, not only as regards IPM but also for their general farming. In general the FFS had more than met expectations. However, there were a number of suggestions for improvements, such as more effort should be made to include youth, the farmers of tomorrow, and to encourage more women to attend. Attendance would be easier in the dry season when people had more time and more people could benefit if participants taught those unable to attend. They would like to learn additional technologies and work on other crops.

Most people found the information supplied easily digestible. However, the more educated, mainly younger men, felt the lessons could have contained more, while the less educated, such as the older men and particularly the older women, found the amount of material somewhat daunting. Notably, the difference lay in literacy levels. Those able to write notes were in a greatly advantageous position, while illiterate participants struggled to understand and remember everything.

The women had clearly learned less than the men, being acquainted with and applying fewer techniques. This can in part be attributed to sessions missed because of domestic duties. Moreover, their lack of resources meant that they were not always able to apply technologies. This was especially notable in the case of the insect traps, which are the most expensive to implement.

The main problems that emerged were not FFS-related but involved village conditions, particularly the water problem noted above, which had prevented many people from farming vegetables at all. This impacted women the most since the men always ensured sufficient water for their own crops before giving their wives a plot to farm.

Many FFS participants had received visits from other farmers or discussed the FFS with family members or neighbors and given detailed descriptions of the IPM practices they had learned (Table 1). These varied from showing how to use neem leaves and/or apply organic fertilizer to discussing the entire package of IPM techniques. Non-participants appeared very interested in learning the techniques and some specifically asked for help so they could apply them in their own plots. Many participants went over the lessons in detail with spouses and/or neighbors and even showed them practically how to apply the techniques. In cases where several family members participated they would even hold discussions at home on potential applications of these to other crops. Many participants were eager for all their fellow villagers to learn about IPM to improve their economic levels and reduce agrochemical usage in the village as a whole.

One comment made was that some men started by mocking the participants for wasting their time but after hearing about what they were learning and seeing the improvements, the men changed their opinions and became eager to learn more so they also could adopt the new practices.
### Table 1: Communication of FFS participants with non-participants

<table>
<thead>
<tr>
<th>Issues</th>
<th>Totals of FFS participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>female</td>
</tr>
<tr>
<td>Received visits from other villagers</td>
<td>24 (86%)</td>
</tr>
<tr>
<td>Discussed the FFS lessons with spouse</td>
<td>14 (50%)</td>
</tr>
<tr>
<td>Discussed the FFS with neighbors</td>
<td>20 (71%)</td>
</tr>
</tbody>
</table>

All but one of the non-participants had heard of the FFS in their village and could name at least one, most of them two to three, IPM practices. It was especially interesting to see the extent of knowledge of non-participants. In July 2001, before the addition of women’s FFS, women interviewed in these villages had either not heard of the school, or only vaguely knew what it did. Two years later, with the addition of women’s schools, non-participant women are not only aware of the schools but also know a great deal about their content.

Almost all interviewees explicitly mentioned the use of neem leaves as an insecticide and of organic manure as a fertilizer, and 37% and 42% of non-participants, respectively, had already adopted them (Table 2). 17 others intended to use neem in the near future.

Table 2 shows high adoption rates of IPM/ICM practices by the 52 FFS participants surveyed; also apparent is a surprisingly high rate of adoption by the 59 non-participants surveyed.

### Table 2: Adoption of IPM/ICM practices by FFS participants (total of 52 surveyed) and by non-participants (59 surveyed)

<table>
<thead>
<tr>
<th>IPM practice</th>
<th>FFS participants</th>
<th>Non-participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Totals</td>
<td>Women</td>
</tr>
<tr>
<td>mulching</td>
<td>31 (60%)</td>
<td>17</td>
</tr>
<tr>
<td>applications of neem</td>
<td>39 (75%)</td>
<td>19</td>
</tr>
<tr>
<td>well-decomposed organic fertilizer</td>
<td>43 (83%)</td>
<td>21</td>
</tr>
<tr>
<td>colored sticky traps</td>
<td>15 (29%)</td>
<td>5</td>
</tr>
<tr>
<td>tobacco powder</td>
<td>9 (17%)</td>
<td>3</td>
</tr>
<tr>
<td>addition of cabbage residues to fertilizer</td>
<td>12 (23%)</td>
<td>5</td>
</tr>
<tr>
<td>solarization of mulch</td>
<td>10 (19%)</td>
<td>3</td>
</tr>
<tr>
<td>addition of Lonchocarpus to fertilizer</td>
<td>3 (6%)</td>
<td>1</td>
</tr>
<tr>
<td>sowing in rows</td>
<td>19 (37%)</td>
<td>7</td>
</tr>
<tr>
<td>burning plant residues</td>
<td>39 (75%)</td>
<td>20</td>
</tr>
</tbody>
</table>

Fifty-seven out of the 59 non-participant respondents said they thought the IPM techniques were excellent; they clearly kept off pests and diseases, and the beans looked better. Three respondents hoped to join an FFS in the future. Eight people liked the techniques because
they enabled them to farm without the use of dangerous pesticides and 14 commented on the economic advantages of IPM.

Table 3 shows a considerable level of adoption of IPM practices by non-participants. The levels would have been even higher, they said, if they had more detailed information about them. It is notable that men’s adoption rates were higher than women’s. The high adoption rates in Tamala may be due to the significant involvement of the FFS trainer with non-participants; this trainer helped them with the applications in their plots. Women non-participants had mainly learned the techniques from observing their neighbors, while the men had learned them from similar observations, discussions with IER/OHVN agents, and participation in the original trials. One man even said he believed he knew the techniques well enough to teach them to others. The reasons they gave for adopting IPM practices included: “They are clearly economically beneficial”; “They are safer than pesticides”; “They are obviously superior to the old practices”. They came to these conclusions from observing the trial plots and seeing the improvements in the IPM ones and in the fields of their participant neighbors.

Table 3. Adoption of IPM techniques by non-participants

<table>
<thead>
<tr>
<th>Sex</th>
<th>Non-participants</th>
<th>Village</th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dialakoroba</td>
<td>Sanambélé</td>
<td>Tamala</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Have adopted</td>
<td>No</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>at least one IPM</td>
<td>Yes</td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>technique</td>
<td>Total</td>
<td>9</td>
<td>11</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Male</td>
<td>Have adopted</td>
<td>No</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>at least one IPM</td>
<td>Yes</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>technique</td>
<td>Total</td>
<td>11</td>
<td>10</td>
<td>8</td>
<td>29</td>
</tr>
</tbody>
</table>

**Lessons Learned.** This survey has provided some important lessons that could usefully be taken into consideration when organizing FFS in the future:

- To encourage wider participation there should be good explanations of the goals and the types of practices to be learned. The program should clearly incorporate general farming (or ICM) practices as well as IPM ones. This will reduce skepticism on the part of villagers about the FFS being a waste of time.
- Gender issues are very important. Women play a far larger role in farming in most rural societies than is usually admitted. Even where women do not work in the fields they are often exposed to pesticides from washing impregnated clothes or reusing empty pesticide cans. It is therefore crucial to include women in some sort of training. Where women do carry out farm labor it is crucial to include them in all technology transfer programs. Increasing the numbers of female extension agents would help in this regard.
- The following lessons emerged from this survey in regard to FFS in particular:
  - Women and men have different interests and these need to be taken into consideration.
  - Women and men often have different times when they are free.
  - There may be real obstacles to mixed-sex schools in some settings. The farmers themselves should decide in each place. Such issues as lesson times, cultural acceptance of mixing men and women, women’s ability to talk freely in front of men, women’s issues in learning which may be different from men’s especially where they are largely illiterate, all need to be taken into consideration. For instance, stricter husbands may
refuse to allow their wives to attend a mixed school. If the men are impatient with the women for learning more slowly or asking too many questions then a mixed school may also not work. Specific cultural obstacles, such as cooking days allotted to African women, need to be circumvented to enable women to attend all the classes.

- Extension methodologies:
  - Although most interviewees said they were satisfied with the teaching methodology used in the FFS it is the understanding of C. Harris that this largely consisted of the trainer talking, the participants listening and some discussion, occasionally using drawing to clarify points and repeating things several times. The result was that those who learn very quickly felt underutilized and those who learn very slowly found it difficult to catch up. Moreover, the illiterate felt themselves to be at a significant disadvantage as they could not write down what the trainer was saying.
  - These problems could have been overcome by the use of graphic materials, rather than written ones, and small group work in the theoretical sessions. This means providing FFS trainers with tools that give participants a much more active role in the theoretical lessons. Using small groups, separated by sex, educational levels, and so on, can also eliminate some of the problems of mixed-sex schools. Alternatively, those who learn faster can be assigned to support the others and made to feel useful as adjunct trainers. Graphics can not only serve in exercises for teaching specific techniques but also act as mementos for the illiterate. Such tools can also be used to enhance the FFS principles of empowering participants and encouraging them to develop reasoning processes around understanding the agroecosystem as a whole.

FFS in Asia

As noted above, IPM FFS originated in Indonesia, and they have subsequently spread to many institutions in Asia, including the governmental extension programs of various countries and national and international NGOs across the continent. Application of the FFS approach beyond IPM has perhaps diversified most in Asia, with it being applied to community forest management in Nepal (Singh 2003), gender issues in Indonesia (Fakih 2003), HIV/AIDS in Cambodia (Yech 2003), women’s self-help groups in India (Tripathi and Wajih 2003), and a variety of other areas.

Evolution of FFS in Asian FAO Programs and Community IPM

The FAO South and South-East Asian Rice IPM Project coordinated by Peter Kenmore from 1982 to 1997 worked to bring IPM to rice farmers during a period when massive pesticide subsidies encouraged over-spraying and release of a secondary pest, rice brown planthopper, which in fact caused widespread production losses across Asia. This project focused on removing subsidies for the un-needed rice pesticides as well as promoting farmer education on a large scale. Field training was widely tested and successful in Sri Lanka and the Philippines for farmers and policy makers to understand the role of natural enemies and the disruption caused by pesticides. This training was linked to policy change and – combined with data from national researchers and farmer IPM studies – had a large impact. The Presidential Instruction by President Suharto in 1986 was perhaps the best known of these changes; it entailed banning 57
pesticides and subsequently removing annual subsidies of US$150 million for rice pesticides. However, policy changes in India, Bangladesh, the Philippines and other Asian countries also helped to reduce the threat of secondary pest outbreaks.

Large scale FFS programs emerged first in the case of the Indonesia National IPM Program on Rice which was later expanded to vegetables and estate crops under various national programs. FFS were originally designed to fit into the predominant training and visitation system with a few improvements including a hands-on practical field-based curriculum, extension staff as facilitators (rather than being expected to be experts in all fields), and farmer-managed learning plots instead of demonstrations. The learning activities were built on solid adult education principles and led to successful large scale implementation of rice IPM. The FFS process has subsequently been adapted to numerous crops and study areas in Indonesia.

The Indonesian success was followed by expansion and innovations in Vietnam, the Philippines, Thailand, Bangladesh, India and China. Malaysia’s own practical and hands-on programs informed the overall process with each participating country contributing their own experiences and improvements. Eventually, the FFS was no longer only for learning about IPM. Driven by farmer and donor demand for greater sustainability and wider impact, FFS evolved under the leadership of Russ Dilts and the FAO Inter-Country IPM Programme towards “community IPM” under which the wider livelihood issues of IPM were explicitly developed around FFS for education but also farmers’ forums and community associations for focusing on social capital development and dealing with environmental, health and local policy issues related to pesticides and IPM (Pontius et al. 2002). Although many of the “national” projects have not continued after the end of this project, national and local farmers’ associations are still active, being testament of the sustainable nature of community IPM. Institutionally, NGOs have taken the place of the FAO programs in many of the countries (e.g. FIELD Indonesia, Srer Khmer in Cambodia).

**The IPM for Smallholder Estate Crops Project in Indonesia**

The IPM SECP commenced in 1997 and is slated to finish in 2004. During this time, the thousands of FFS conducted on this project followed the basic format outlined above. However, there were a few notable differences. Five of the six main crops in the project are perennials, i.e., cocoa, coffee, black pepper, cashew and tea, which required adjustments of the traditional annual crop FFS format. These adjustments are detailed in Mangan and Mangan (2003).

The initial attempt to adapt the method of Agro-ecosystem Analysis to tree crops had been undertaken by plant pathologists without input from entomologists. As a consequence, the method taught was one of returning to the same sample tree/plant week after week (based on seeing if diseases had progressed). One result was a loss of much observational information. J. Mangan and G. Luther therefore recommended that the procedure be modified so that participants changed sampled plants every session, and selected them randomly. Another modification occurred when the Curriculum Development Specialists (G. Luther and M. Sianturi) noticed during FFS that many farmers were focusing quite strictly on the limited number of plants they had sampled. There was little flexibility in terms of drawing conclusions based on the status of non-sampled plants and other components of the agroecosystem which could be gained by glancing around as one walked through the plot. For this reason, we asked all FFS to explicitly add a new component, Pandangan Umum (General Overview), to their Agroecosystem Analysis, to emphasize that farmers need to quickly look over the plot as a
whole, and integrate this observation into their conclusions so that they are truly analyzing the agroecosystem and not just a small number of sampled plants.

Yet another problem which resulted from the above tendency to limit sampling to the same spots was that flying insects were largely overlooked, which can be very important in the tree crop ecosystem. Dragonflies and robber flies are important predators and often one must catch a view of them on the wing. Therefore, J. Mangan and G. Luther adapted the Agroecosystem Analysis by advising farmers and facilitators to start by standing quietly in one spot and watch every flying insect that comes through the space of the tree. This was done for several minutes, and the insects thus observed were entered into the final tally for the group’s observation.

Early on in the IPM SECP the use of economic thresholds (ETs) was instituted to help guide farmers towards making better decisions about when pest control measures were needed. However, when G. Luther started working with the project in 2000, he found these ETs were being used in a very rigid and absolute manner in the FFS, without taking into account that ETs can change on a daily basis due to fluctuations in pesticide prices and other factors. The farmers’ and trainers’ focus on the ET levels often crowded out any consideration of other factors they had observed. Due to this we asked them to consider a wide range of factors in the agroecosystem when making a pest management decision, and keep the ET in mind as a minor factor, remembering its fluctuating nature.

**NGOs in Asia**

Numerous international and national NGOs in Asia have been conducting FFS since the 1990s. World Education coordinated and funded a network of Indonesian NGOs to conduct FFS projects beginning in the early 1990s. This network included such NGOs as Gema Desa in Lampung, and Gita Pertiwi and the Institute for Rural Technology Development (LPTP) in Central Java. With small budgets, these NGOs have been able to conduct FFS projects that have produced substantial impacts among local farmers.

LPTP built its program by hiring farmers who were FFS alumni to become full-time FFS facilitators. Besides training them in participatory methods and technical aspects of IPM, the NGO also facilitated their learning of other new skills, such as how to use computers. LPTP has done an admirable job of responding to village needs; in one village where almost all the younger and middle-aged men migrate to the city to work about 10 months of the year and the women therefore do a large share of the farming, LPTP facilitated an all-womens’ soybean FFS. Participants ranged from teens to 60s in age, and the older women showed as much enthusiasm for learning as the younger ones. Another valuable practice of LPTP’s is to transport FFS alumni to other villages and facilitate discussions among farmers so useful technologies can spread more quickly.

CARE – Bangladesh has conducted large FFS projects which have trained hundreds of thousands of Bangladeshi farmers. CARE integrated fish culture and rice IPM in the FFS curriculum for its INTERFISH project. NO PEST has also been a large IPM FFS project which focuses on rice and vegetable crops.

**FFS in Latin America: The challenges of modernization**
“Modernization” policies and structural adjustments throughout Latin America have dismembered classical agricultural extension and research services. This is transforming the roles of researchers and extensionists and placing greater responsibility on rural communities. While tremendously challenging for present professionals and their institutions, improving present-day agricultural research and development has demanded approaches that are more responsive and better-suited to local agroecological and socioeconomic conditions. The efforts to introduce FFS have led us to re-think how to organize ourselves for greater and more effective agricultural innovation.

**Responding to public sector collapse through collaboration**

The International Potato Center (CIP), the FAO, and a diverse group of governmental and non-governmental organizations have been working with Andean communities in Ecuador, Peru and Bolivia to respond to pressing potato-farming demands. Partners are striving to enhance farmer understanding of agro-ecosystems and to strengthen local decision-making and technology development capacities for more productive and sustainable agriculture. Faced with tremendous pest problems and pesticide abuse, they have emphasized management-intensive approaches that require strong understanding of biology and ecology.

Beginning in the early 1990s national and regional research institutes began to work more closely with communities to strengthen potato IPM. Presently, they are building on this experience through a range of participatory extension and research models, in particular FFS methodology, Local Agricultural Research Committees (CIALs) developed by CIAT, and Farmer-to-Farmer extension developed by World Neighbors and others in Central America.

Researchers engage with communities in collaboration with NGOs and municipal governments. Such collaborative arrangements can yield diverse benefits. For example, communities gain new access to information and institutional resources, rural development agencies gain increased technical support, and research organizations gain brokers to mediate between their relatively narrow interests and the broader needs of communities.

**Strengthening research and community-based agricultural development through FFS**

In 1997, CIP and its institutional partners in Bolivia and Peru started to experiment with more participatory approaches to training (Torrez et al. 1999a, b), incorporating some elements of the FFS approach, but not the Agroecosystem Analysis, which many consider to be its distinguishing feature. CIP has promoted the FFS approach through a project financed by IFAD (International Fund for Agricultural Development) in six different countries, including Bolivia and Peru. In each country a national research institute and a NGO, or other extension organization, has been included. In 1999, to support this project, the Global IPM Facility organized a course of three months to train FFS facilitators in Ecuador, Bolivia and Peru. These facilitators then returned to their work places and implemented the FFS, incorporating other important elements of the Asian model, such as the Agroecosystem Analysis. Although many of the fundamental principles have been the same, each country has had its own strategy of implementation, depending on the demands of the farmers and the unique institutional and organizational setting of each context.

In Bolivia, the PROINPA Foundation and the NGO ASAR have taken the lead in the design of the training curriculum. Both institutions, in close coordination, have promoted FFS in
different communities. PROINPA has usually taken the responsibility for the research activities and provision of genetic material, and ASAR for the multiplication of seeds of resistant cultivars and the replication of the experience in other places. The main emphasis of these FFS has been on participatory training. In the learning fields, previously validated strategies of chemical control for late blight with resistant cultivars have been tried out (Navia et al. 1995; Navia & Fernández-Northcote 1996; Fernández-Northcote et al. 1999). Training has concentrated on the use of the strategy and related components. Participatory research activities have been limited to evaluation of new cultivars and advanced clones. PROINPA also supports other related research activities with cultivars resistant to late blight with groups of farmer evaluators, and CIALs composed of farmers (Braun et al. 2000a, b).

In Peru, the NGO CARE has been responsible for the implementation of the FFS. CIP has taken the leadership in the development of the training curriculum, in delivering clones and cultivars, and in monitoring the data generated by the participatory research. In these FFS, participatory research has almost the same weight as training (Nelson et al 2001). The concept of PR-FFS (Participatory Research - Farmer Field Schools) has also been used to give the idea of a hybrid of the FFS with participatory research. The farmers have carried out research into the use of cultivars or advanced clones with different degrees of resistance and high, middle and low intensity of fungicide use, assessing the clones and cultivars by late blight resistance and other qualities. In Peru, the FFS have also been useful in promoting IPM, in evaluating and disseminating cultivars with resistance, and in generating new information about the efficiency of resistance under different agro-ecological conditions. Here, each FFS lasts for two or three years, with emphasis on research during the first cycle and with a successive transference of responsibility to the farmer group subsequently.

In Ecuador, CIP and INIAP, the national agricultural research institute, have promoted the FFS in the most important potato producing provinces through a network of local institutions. As a result of the recent decentralization of the state, much of the agenda of agricultural development has been placed in the hands of local governments, the NGOs and the communities themselves. CIP, INIAP and the Ministry of Agriculture are trying to develop and institutionalize an extension approach based on the farmers and on participatory research methodologies, establishing an effective mechanism of communication between the local institutional actors and the scientists. Here the strategy has been to first increase the local agricultural knowledge through the FFS and subsequently support the local process of technological development with participatory research groups such as CIALs, including FFS graduates, research institutions and universities.

More recently, the FAO established a national FFS program in Peru that has effectively scaled-up IPM throughout the country. Furthermore, FFS has spread to Colombia, with the leadership of CORPOICA and FEDEPAPA, and to Central America (El Salvador, Honduras and Nicaragua) and Mexico, with the leadership of Zamorano/PROMIPAC and the Rockefeller Foundation, respectively. CABI has introduced FFS to Trinidad and Tobago and others are testing the methodology in Cuba and Haiti. Within five years of its introduction, FFS has become well established throughout Latin America.

Similar to the African experience, the practice of FFS in Latin America brought a number of innovations to the methodology as a result of lessons learned in Asia and the unique farming systems and ecologies, institutions, and politics of the region. Thiele et al. (2001) identified ten specific lessons of the initial experience of introducing FFS to the Andes (Box 1). Introducing FFS to Latin America required more than just a re-writing of extension manuals. Partner
organizations were generally hesitant to blindly accept external ideas, but they were willing to explore common principles among successful IPM work and to adapt local methods. For example, after agreeing on the benefits of ‘discovery learning’, local extensionists took to heart the re-design of their activities to create a new extension guide (see Pumisacho and Sherwood, 2000). The result was both a reification of and improvement on existing experience in the region.

**Box 1. Ten lessons learned from adapting FFS to potato farming in the Andes (Thiele et al. 2001).**

1. The FFS help farmers to learn principles of integrated disease management of late blight (a major concern to Andean potato farmers), deploy cultivars and improve fungicide use.
2. The economic return to training in managing late blight is very high.
3. Various methodological aspects of the FFS need to be adapted to the potato crop.
4. The content of the FFS should be adapted to the needs and interests of the community.
5. It is not recommendable to carry out an FFS without properly trained facilitators.
6. Special care is needed to avoid turning the learning field into a competition between farmers and facilitators or into a demonstration of the superiority of a new technology.
7. The FFS may play an important role in participatory research but other mechanisms and platforms also exist.
8. NGOs are valuable partners.
9. Farmers are enthusiastic evaluators of new genotypes, and they do it well.
10. Ideally, farmers should take part in trial design; where this is not possible it is essential that the design facilitates their active participation in trial establishment and data collection.

Presently, the chief challenge is political and institutional in nature. Impact studies conducted by CIP, INIAP, and the FAO have shown important contributions to farmer knowledge and a relationship between knowledge and increased productivity (van den Berg 2004). Other studies in market and input intensive areas have shown that FFS has enabled farmers to significantly decrease dependence on pesticides without negatively harming production per area and in many cases improving overall productivity (Barrera et al. 2001). Despite such impressive results, without public investment in agriculture, it has been difficult for FFS to reach more than a small group of farmers.

Consequently, the present challenge for the diverse FFS movements in Latin America is to establish collaborative structures and finance and technical support mechanisms to sustain a FFS movement. The diversity of experience has brought a number of opportunities for the future. For example, in Central America PROMIPAC has tested an IPM labeling system to certify the clean production emerging from FFS and to link groups to higher value urban markets. Similarly, groups in Ecuador have established production contracts with the agrifood industry, such as FritoLay and Kentucky Fried Chicken, which provide fairer prices and help farmers to avoid the variability of national markets. More work is needed to further develop such market opportunities for FFS and to coordinate production among groups in order to meet volume demands throughout the year.

Rather than rely on NGOs and professional extensionists that are highly reliant on external funding sources, programs are beginning to work more directly through community-based organizations and are training and supporting local farmers as FFS facilitators. This has led to the exploration of self-financing mechanisms, where the very production of the FFS covers
the costs of facilitation. Presently in Ecuador, this modality is beginning to dominate the FFS movement, with the FAO and local governments contributing financial resources to support a small team of technicians and researchers that provides informational and continued training support to farmer facilitators.

**Training of Trainers/Facilitators to Prepare Them for FFS**

The facilitator is the most important tool in the FFS. The success of the entire enterprise depends on having facilitators capable of and willing to position themselves in such a way as to encourage participants to direct their own learning processes. Proper training is therefore essential to equip the facilitator to enable participants to carry out independent discovery-based learning. This last requirement is crucial if the FFS is to be truly effective, since those who discover knowledge for themselves tend to make use of it, while those who are merely provided with information very often do not. Good knowledge of the technical side (in relation to pests and beneficial organisms, agronomic requirements for plant health, IPM techniques, etc.) is of course equally essential to guide the group in productive directions and ensure a maximally rewarding learning experience. If the facilitator does not have command of the technical issues, the farmers sense that he/she does not know the material and they become frustrated.

Optimally, the farmers will actively lead the learning process in the directions they find useful and interesting. However, facilitators should be ready to stimulate those who are unused to the freedom of self-direction, prevent domineering individuals taking over and sabotaging the process, and find ways to support the less forceful to develop autonomously. Facilitators also need to know how to work in small groups in order to allow all to express themselves; this is particularly important to allow women a voice in mixed-sex schools. Therefore, ToTs need to equip facilitators to tackle a wide range of eventualities.

**Training of Trainers and Challenges to Sustaining FFS in Latin America**

While diverse organizations, such as the International Potato Center (CIP) and CARE in Peru, had begun to apply aspects of FFS methodology in the late 1990s, it was not until 1999 that the FAO's Global IPM Facility (GIF) conducted the first comprehensive Training of Trainers in Latin America (Sherwood et al. 2000). This was an intensive three-month activity that was funded by the FAO and involved 33 extensionists from rural development agencies and research organizations in Ecuador, Peru and Bolivia. The thematic platform was the potato, which generally is a priority food security crop in Andean rural highlands, and has major soil fertility demands and pest problems. Since there was no FFS training expertise in Latin America at that time, the GIF brought in a Master Trainer from Cambodia's National IPM Program, who had previously studied in Cuba and spoke Spanish. CIP and the participants supported technical potato IPM needs. The training content included soil and plant health needs of potato growing in the Andes.

Since 1999, FAO support enabled INIAP's National Potato Program and CIP in Ecuador and the MAG in Peru to conduct a dozen ToTs in FFS methodology, at first in potato and subsequently in a diversity of crops, such as tomato, cotton and agroforestry. These have trained some 500 professional extensionists from NGOs and farmer promoters from communities.
Depending on individual participant needs, these have included attention to pasture improvement and animal health concerns. In 2001, a group of Master Trainers from the Andes were sent to support the first ToT in Central America for the Swiss Funded IPM Program for Central America (PROMIPAC) that took place in El Salvador. This included participants from Honduras, Nicaragua, and El Salvador and centered on field bean, maize and tomato. Since then, some 200 FFS Facilitators have been trained in Central America. The Rockefeller Foundation has supported similar activity in Mexico. This experience was generally presented in a Spanish LEISA Magazine dedicated to FFS in Latin America (see LEISA, 2003).

While ToTs, not unlike FFS, continue to structure themselves around cropping demands, ToT modality has shifted from intensive 12-week trainings to semi-present, distance educational designs, such as three-day meetings every other week over six months, followed by local implementation of pilot FFS. This has been in response to the lack of public support for agricultural extension programs and the difficulties that NGOs face freeing up staff under the pressure of time bound and objective driven projects. Funding for ToTs first came from the FAO in South America and COSUDE in Central America. Nevertheless, this support has proven tenuous and increasingly local governments and participants themselves have begun to fund ToTs and FFS in communities.

Most agree that ToTs in FFS deepen technical IPM competence of regional extension professionals and help to improve participatory methodologies, in particular the use of discovery learning approaches and group dynamics. In less than five years, FFS methodology was introduced to over 100 rural development agencies in seven Latin American countries that conducted over 2,000 FFS in communities. Nevertheless, on-going changes in the region based on neoliberal development models have increasingly marginalized rural development and decimated both public and private capacities to enable rural innovation under modalities such as FFS.

Government restructuring in the region during the 1980s and 1990s, driven by the World Bank, IMF, USAID and the IDB, first demanded that non-governmental organizations take over many rural development responsibilities (see for example, Barrios 1997; Font and Blanco 2001). The transition from GO programs to NGO projects was funded through bi- and multi-lateral funding. As a result, FFS initiatives in Latin America adopted a multi-institutional, collaborative approach to strengthening individual and collective capacities in IPM and engaged actors from local governments, action agencies, and knowledge generating organizations. In Ecuador and El Salvador, partners explored direct ties to markets and the food processing industry. Nevertheless, before alternative funding structures have been established, donor agencies have begun to sharply decrease financing for agricultural development, and NGOs are finding it increasingly difficult to respond to on-going rural development demands of communities.

While the Swiss Cooperation for Development continues to provide some financing for PROMIPAC in Central America, due to changing organizational priorities and decreasing government capability of supporting national programs, the FAO had by 2003 ended its financial support to FFS in South America. The public institutional crisis in Ecuador recently led INIAP to accept funding from CropLife, the pesticide industry consortium, creating a conflict between public and private interests and leading to a focus on the industry priority of "Safe Use of Pesticides". This situation has led farmer organizations and NGOs promoting agroecology in the country to call for INIAP to re-evaluate its collaboration with CropLife (CEA 2004).

Although municipalities and departmental or provincial governments have been able to fund a handful of ToTs, it has become increasingly clear that local governments are not capable
of maintaining the long-term technical, capacity-building, or coordination support needed to enable coherent IPM FFS programs. While the pesticide industry occasionally expressed interest in FFS methodology, not surprisingly, its interest in FFS has waned when IPM begins to emphasize pesticide use reduction and the elimination of problematic products, such as the highly toxics (see BBC 2004). In the absence of lasting public or private industry support, a number of examples of self-financing mechanisms to fund FFS at the community level exist. Volunteer farmer promoters usually run these. Nevertheless, devoid of continual attention to broader needs of facilitators, in particular social organization and conducive governmental policies, not unlike other very promising community-based approaches to rural development and natural resource management, the days of FFS in the region may be numbered.

ToT in Asia

China

FAO began to support FFS in China in 1992 and expanded to the first ToT there in Hunan Province in 1993. The Chinese extension system made several innovations necessary in carrying out Training of Trainers. First, county-level crop protection technicians had numerous responsibilities, and their work units were not willing to lend them to a training program for more than a single rice season, if that. This constraint required that the crop IPM training season, during which candidate facilitators learned IPM by doing experiments on a rice crop, had to be overlapped with the “extension season” where the trained facilitator organized his/her first real FFS in the field. In order to do both kinds of training at once, a system was devised in which several FFS were organized within the ToT. Candidate facilitators were put through all the activities to be carried out among farmers before FFS day. Each candidate facilitator was given charge of a small group of five farmers for activities like Agro-ecosystem Analysis or a defoliation trial. Larger group activities, like group dynamics, were done with all farmers together. Even though they did not know the outcome of the experiments or the condition of the ecosystem later in the season, the candidate facilitators knew enough before FFS day to get their small group to carry out their Agro-ecosystem Analysis, or set up their trials, on the scheduled day. Only as the season progressed did the candidate facilitators themselves become aware of the purpose of many of the FFS activities through which they guided their small group of farmers in a ToT environment.

Since everyone—candidate facilitators and farmers too—became fully aware before the end of the season why they carried out these activities, there was no loss in not being able to explain the purpose behind the activities before starting them. In fact, there might have been a gain. Discovery can be much more powerful than repeating someone else’s experiment, or being told beforehand why a field trial is to be carried out. It is much better to engage in a field experiment in a spirit of open inquiry, and find out afterward what the purpose of it was.

These innovations in scheduling, in which both field activities and FFS farmer training were compressed into a single season, were then used in other countries such as India and Pakistan. The more efficient use of time that this approach made possible did much to promote the process of FFS ToT for long season crops like cotton in countries which would otherwise have been unwilling to commit themselves to the long duration of training needed (using a multiple-season approach).
One study from China (Mangan and Mangan 1998) compared FFS IPM training with another model of multiple session IPM training concentrating not on the whole ecosystem but only on pests and diseases. Interviews were carried out with both groups of IPM trainees before, immediately after training, and one year later after two rice crops. The most significant finding was that the FFS farmers’ learning “took off”; the number of beneficial insects they identified after a year was higher than right after training. On the other hand, the identification skills of the pests and diseases IPM trainees degenerated after a year, and they became more reliant on using pesticides than on understanding the ecosystem. FFS farmers used significantly less pesticides, but crop yields for both groups were not statistically different.

**The IPM SECP in Indonesia**

In the IPM SECP, it was determined through observations and discussions with FFS facilitators that most were severely lacking in knowledge of the roles/functions of the wide range of insects and spiders in their crop ecosystems. While knowing the correct or established names of these organisms is not crucial to implementing IPM effectively, knowing their roles – pest, natural enemy (predator, parasitoid or pathogen), or neutral species – in the agroecosystem is very important. Elucidating their roles through observation in “insect zoos” is highly recommended; however, in many instances time is limited for conducting multiple observations on a wide variety of organisms, especially when a pest management decision must be made quickly. Also, certain insects do not lend themselves to easy observation of their behavior while in an insect zoo (e.g., both robber flies and dragonflies, which catch their prey while flying across a fairly expansive area, would require an extremely large insect zoo to exhibit their normal behavior).

To respond to the above needs of FFS facilitators to know the insects in their crop ecosystems, J. Mangan and G. Luther (who worked as IPM SECP consultants) designed a ToT program. Since facilitators in a large number of Indonesian provinces needed training over a short time period, the program had to be designed to meet serious time constraints. Participatory activities in the crop field were prioritized in the curriculum.

The main objective of the ToT was to enable FFS facilitators to quickly identify insects/spiders as pests, natural enemies, or neutral organisms. We took advantage of the fact that these roles often divide down the lines of Orders and Families within the insect world; for example, all mantids (Order Mantodea) are predators, so if a facilitator/farmer can identify an insect as being a mantid, then s/he would immediately know this is a natural enemy that could help control pests. Similarly, all spiders are predators. We moreover chose an insect classification system that lent itself to this learning need. For example, some systems place Mantodea as a Suborder together with grasshoppers and roaches, all under the Order Orthoptera. Rather than confuse matters for farmers by mixing carnivores with herbivores, we chose a classification system that recognizes mantids as a separate Order. We likewise used a system that recognizes Homoptera and Hemiptera as separate Orders. Homoptera (leafhoppers, aphids, psyllids, etc.) are all plant feeders and distinct enough from Hemiptera, which are mixed in their feeding habits but contain many predators. The classification system we chose augmented the knowledge of insect/spider behavior which the training was designed to convey.

Each ToT began with a Powerpoint presentation which introduced major insect Orders and spider Families to the trainees with many color photos to provide an overview. Separate presentations were prepared for each crop ecosystem, to make them more specific to trainers’
needs. Focus was given to specific natural enemy groups that would likely attack pests on that crop. Questions and discussion occurred during the presentation, which helped make it more participatory.

The trainees then conducted an agroecosystem census on their particular crop. They first spent several hours in the field in small groups collecting all arthropods they could find on or near that crop (they sometimes also caught bats). Then they returned to the work area to categorize these into pests, natural enemies or neutral organisms; this was done based on previous experience and knowledge, use of some written materials in Indonesian (e.g., Program Nasional P&PPHT 1991), and guidance from the consultants. These insects and spiders were identified to the Order level or—if that was not enough to determine which category they fit into—to the Family level. Each small group spent many hours assembling and examining their collected specimens and labeling them, and these were judged correct or not by two consultants who had knowledge in this area. Each small group reported their findings to the others, with discussion among the entire group of the results. Members of the winning small group were each awarded a plastic insect as a prize.

Another activity in the ToT was for each FFS facilitator to find a predator in the field and follow it for one to two hours. Each facilitator made a brief oral report of his/her observations, and much was learned through this process. For example, those who followed dragonflies and robber flies—the two most difficult predators to follow among trees—discovered by compiling their observations that these insects would return to the same branch after each attempt to catch prey. They discovered that these flying insects are territorial—that they do not simply roam randomly throughout the archipelago, but they have their own spot where they can be depended upon to be found.

An activity to help trainees understand the food web in their agroecosystem was also conducted. The trainees were each assigned a role as one of the pests or natural enemies on their crop, or the crop itself or the sun, and each drew their organism/role on paper. They then stood for that organism/role in the web. Together with the consultants they constructed a food web by tying colored string from one trainee to another to signify who ate whom. Yellow string was used from the sun to the crop to signify the plant obtaining its energy from sunlight. Green string was tied from the crop to the pests to signify these herbivores feeding on plant material, and natural enemies feeding on pests was signified with red string. By tying people together, everyone could physically “feel” the relationships in the agroecosystem, which was meant to enhance the learning process. It is hard to forget a food web which you have been tied up in.

The ToT usually wrapped up with a drama activity in which FFS facilitators divided up into pairs and received a natural enemy – prey combination from the consultants. Each pair then acted out their combination and the rest of the group guessed which natural enemy and prey species they represented. The “best actor” awards were, again, plastic insects.

**ToT in Africa**

Training of trainers in Africa has largely followed methods developed in Asia except that computer literacy, HIV/AIDS, nutrition and other issues have been added to the curriculum. There is an emerging emphasis on marketing networking among farmers and therefore ToTs also include network management and marketing methods. IPPM is still an excellent entry point for the FFS but wider issues must be incorporated to make them relevant to farmers and extension
services. New efforts in post-conflict situations in Uganda, Congo, Sierra Leone and Liberia also include non-government extension staff and bring in greater social awareness and peace building methods. FFS should play a major role in the recovery process of rural institutions, production and markets in these countries over the coming years, including further development of youth based field school methods.

Conclusions

Each location around the world has its specific obstacles or hurdles to overcome to successfully implement FFS, but one that appears to be common to all locations is the difficulty of reorienting facilitators from a top-down teaching approach to a participatory mode of operation that enables discovery-based learning. This may be especially true of government extension agents who have operated their entire careers in a top-down, “tell the farmer what they should do” mode. Even after training in the participatory approach, the tendency is to revert to top-down teaching as a default, especially when a challenging situation arises. Due to this, intensive training in the participatory approach over an extended period of time appears to be the key, because frequent reinforcement of this completely new mode of operation helps to reorient people so that they finally gain a new default mode. This reorientation is absolutely critical to successful FFS implementation.

The FFS experience reminds us that many of the solutions to agricultural development are not just technological in nature, but largely conceptual and social. FFS can respond to both knowledge needs of an individual farmer as well as the social needs of communities in ways that contribute to farming innovation that can increase production per area and overall farm productivity.

As a knowledge-intensive learning and action process that emphasizes the management of ecologies as a means to IPM, present professionals, institutions and organizations are not well positioned to promote FFS. This is particularly true under the priorities of neoliberal thinking about development: government decentralization and the privatization of public services. As a result, IPM practice as promoted by the methodology, continues to reach only a relatively small number of rural farmers and communities. There are several options that need to be explored in order to resolve this problem. First, improve the flow of information and technology from FFS participants to non-participants. Second, work with new partners, such as groups based in the communities and municipalities, in order to increase the number of FFS in various countries. Third, develop FFS for farmer promoters who can then organize and train other groups of farmers. Fourth, further develop self-financing opportunities in order to cover FFS’ cost. Fifth, complement the FFS, using mass media methods to reach a greater number of farmers.

A recent synthesis of 25 impact evaluations of FFS showed “substantial and consistent reductions in pesticide use attributable to the effect of training” (van den Berg 2004). In addition, a considerable increase in yield was demonstrated in many instances. Many developmental impacts were also documented, among them that FFS motivated continued learning. Clearly Farmer Field Schools have produced numerous successes and positive outcomes in many parts of the world; consequently, they deserve continued support in the future.
**Acronyms**

ASAR = *Asociación de Servicios Artesanales y Rurales* (Artisan and Rural Services Association)  
ATIRI = Agricultural Technology and Information Response Initiative  
CIAL = Local Agricultural Research Committee  
CIAT = *Centro Internacional de Agricultura Tropical*  
CIP = International Potato Center (*Centro Internacional de la Papa*)  
CORPOICA = *Corporacion Colombiana de Investigacion Agropecuaria*  
COSUDE = *Agencia Suiza para el Desarrollo y la Cooperación*  
FAO = United Nations Food and Agriculture Organization  
FEDEPAPA = *Federación Nacional de Productores de Papa*  
GIF = Global IPM Facility  
GTZ = *Deutsche Gesellschaft für Technische Zusammenarbeit*  
ICRISAT = International Crops Research Institute for the Semi-Arid Tropics  
IDB = Inter-American Development Bank  
IFAD = International Fund for Agricultural Development  
IITA = International Institute for Tropical Agriculture  
INIAP = *Instituto Nacional Autonomo de Investigaciones Agropecuarias*  
IPM CRSP = Integrated Pest Management Collaborative Research Support Program  
IPM SECP = Integrated Pest Management for Smallholder Estate Crops Project  
PROMIPAC = *Programa de Manejo Integrado de Plagas con Pequeños Agricultores en America Central*  
PTD = participatory technology development  
USAID = United States Agency for International Development

**References**


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