IPM Farmer Field Schools:

A synthesis of 25 impact evaluations

Henk van den Berg

Wageningen University, January 2004
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Summary

- Integrated Pest Management (IPM) programs based on the Farmer Field School approach are being implemented in many countries. Their benefits have been recognized by a broad range of stakeholders, including farming communities, local and national governments, NGOs and donors, who are now supporting such programs. Substantial investment in this approach calls for comprehensive documentation of its impact and sustainability.
- This study reviews twenty-five impact studies and discusses the overall results. Most of the ongoing programs have conducted impact evaluations of a kind. These varied in focus, approach, methodology and robustness. Results, however, commonly remained buried in project reports.
- Impact evaluation of the IPM Farmer Field School has proven to be complex because of methodological obstacles, because of the range of immediate and developmental impacts, and because of different perspectives of stakeholders. Consequently, there is no agreed conceptual framework for measuring impact.
- Studies were designed to be either statistically rigorous (but with a restricted scope) or comprehensive (but with limited coverage), but never both. Nevertheless, by converging the results of diverse sources, the comprehensiveness of the overall evaluation was enhanced and the benefits were substantiated through patterns obtained from different perspectives.
- The majority of studies measured the immediate impact of training through aggregated data, and reported substantial and consistent reductions in pesticide use attributable to the effect of training. In a number of cases, there was also a convincing increase in yield due to training. Most studies focused on rice. Pesticide reduction and farm-level returns were higher in non-rice crops (vegetables and cotton) than in rice.
- A number of studies described broader, developmental impacts of training often using qualitative methods, and in some cases involving farmers in identifying and describing the impacts. Results demonstrated remarkable, widespread and lasting developmental impacts, which have been best documented for Indonesia. It was found that the FFS stimulated continued learning, and that it strengthened social and political skills, which apparently prompted a range of local activities, relationships and policies related to improved agro-ecosystem management.
- It is recommended that future studies combine diverse perspectives to evaluation, and pay more emphasis to participatory approaches to evaluation. Further, it is proposed that the IPM Farmer Field School is placed in a broader sectoral perspective, because benefits also accrue to sectors such as education, environmental protection and public health.

1. Introduction

The Farmer Field School is a form of adult education, which evolved from the concept that farmers learn optimally from field observation and experimentation. It was developed to help farmers tailor their Integrated Pest Management (IPM) practices to diverse and dynamic ecological conditions.

In regular sessions from planting till harvest, groups of neighboring farmers observe and discuss dynamics of the crop's ecosystem. Simple experimentation helps farmers further improve their understanding of functional relationships (e.g. pests-natural enemy population dynamics and crop damage-yield relationships). In this cyclical learning process, farmers develop the expertise that enables them to make their own crop management decisions. Special group activities encourage learning from peers, and strengthen communicative skills and group building. A detailed description of the Farmer Field School approach is given by Pontius *et al.* [1]

IPM Farmer Field Schools were started in 1989 in Indonesia to reduce farmer reliance on pesticides in rice. Policy-makers and donors were impressed with the results and the program rapidly expanded. Follow-up training activities were added to enhance community-based activities and local program ownership. Eventually, IPM Farmer Field School programs for rice were carried out in twelve Asian countries and gradually branched out to vegetables, cotton and other crops. From the mid-nineties onwards, the experience generated in Asia was used to help initiate IPM Farmer Field School programs in other parts of the world. New commodities were added and local adaptation and institutionalization of these programs was encouraged. At present, IPM Farmer Field School programs, at various levels of development, are being conducted in over 30 countries worldwide.

These diverse programs have generated a variety of data on the impact of the IPM Farmer Field School. Such data generally are presented in project reports that have a limited circulation. Impact studies that are published in official literature tend to focus on specific aspects of impact. Impact studies varied in focus, approach, methodology and robustness. Some lack description of methods. The nature of impact studies typically varies with the developmental stages of programs. Pilot projects often compared pesticide use and yields or profits of field plots grown with IPM practices and those under regular farmer practice, to demonstrate the merit of the approach. More advanced projects evaluated the adoption of IPM practices, studied expertise or recorded the developmental impacts resulting from farmer empowerment.

This synthesis presents a review of twenty-five available impact studies on the IPM Farmer Field School. To be included in this review, the study was required to describe the methods used and to present sufficient results to support its conclusions. The characteristics and findings of each study are presented in a standard format summary sheet. The summary sheets are annexed.

The report starts with a general discussion of methodological aspects of impact assessment. It then provides a summary overview of the results of the twenty-five data sources, from FAO and other agencies and organizations, followed by a discussion of these results.

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[1] Pontius, J.C., R. Dilts & A. Bartlett (2002) From farmer field school to community IPM: Ten years of IPM training in Asia. RAP/2002/15, FAO Regional Office for Asia and the Pacific, Bangkok. 106 pp.

2. Methodological aspects of impact evaluation

2.1 Efforts to develop a conceptual framework

The methodology for impact evaluation of the IPM Farmer Field School is still under development. At present, there is no agreed framework for IPM impact assessment. The complex nature of farmer decision-making processes together with the diversity of results has posed a major challenge to capturing impact. As explained further on, there is a variety of possible parameters for study, a range of agro-ecological and socio-economic settings, and a dilemma between being statistically rigorous and being comprehensive.

A contribution towards developing methodology on impact assessment of IPM is being made by the System-wide Program on IPM of the Consultative Group on International Agricultural Research. The System-wide Program recognized that conventional methods to assess the impact of IPM tend to underestimate the true costs of pesticide use on the one hand, and the various benefits that can accrue from adoption of effective IPM strategies on the other. This is because conventional methods focused narrowly on inputs, yields and productivity. In 2001, the System-wide Program made a start in developing a new conceptual framework and methodological approach to evaluating the impact of IPM programs. A workshop identified different phases in the development of an IPM program and defined indicators of impact at levels of farm household, community, and institutional policy-making, in the economic, social and ecological domains. The program is planning to undertake case studies to further develop this new framework.

In addition, the Global IPM Facility is supporting an ongoing series of workshops organized by the University of Hanover and committed to the development of guidelines on good practices for IPM impact assessment and evaluation, including the IPM Farmer Field School. A first workshop was held in March 1998 and a second in May 1999. These focused on concepts and methodologies for the evaluation of IPM programs. Combining economic and social science approaches was seen as a major challenge. Within the economist approach there is a need to make cost-benefit analysis more comprehensive e.g. by adding economic evaluations of environment and health impacts. The sociologist approach calls for an increased involvement of project stakeholders (including farmers) in the design and implementation of impact evaluation. A third workshop is planned for early 2004 with a focus on reviewing longer term impact.

Concentrating on the IPM Farmer Field School, some of the key issues appearing in discussions on impact assessment are briefly discussed below.

2.2 Defining impact

What is seen as impact of IPM depends on a project's objective. What do IPM initiatives attempt to achieve? Is the purpose to reduce insecticide use, to enhance sustainable pest management, or to enhance adaptive crop management? Is it to increase yields, to increase profits, or to improve livelihoods?

Although initially, pest resurgence was the problem that triggered the emergence of the IPM Farmer Field School, the objective has been to enable farmers to become better managers of their fields. Crop health – not pest control – was the central theme in most training. Later still, an objective was added to help farmers become better trainers, organizers and experimenters within their own locally developed programs. The training often went further than increasing farmers' technical capabilities and also helped enhance their educational, social and political capabilities. This raises the question of what should be considered impact: the immediate impacts such as farmer knowledge, decision capabilities, pesticide use or yield, or the indirect developmental impacts such as reduced poisoning, improved biodiversity, community agenda setting or policy change (Table 1).

Table 1. Examples of immediate and developmental impacts of the IPM Farmer Field School, arranged according to the technical, social and political domain.

Domain	*Immediate impact*	*Developmental impact*
Technical	Knowledge about ecology	More sustainable production
	Experimentation skills	Improved livelihoods
	Improved crop management	Ability to deal with risks, opportunities
	Pesticide reduction	Innovation
	Yield increase	More cost-effective production
	Profit increase	Reduced water contamination
	Risk reduction	Reduced frequency of farmer poisoning
		Reduced public health risks
		Improved biodiversity
		Improved marketability of produce
		Poverty reduction
Social	Group building	Collaboration between farmers
	Communication skills	Farmer associations
	Problem solving skills	Community agenda setting
		Farmer study groups
		Formation of networks
		Farmer-to-farmer extension
		Area-wide action
Political	Farmer-extension linkage	Stronger access to service providers
	Negotiating skills	Improved leverage position
	Educational skills	Awareness campaigns
		Protests
		Policy change

The IPM Farmer Field School combines an approach to pest management and an approach to farmer education. This combination compounds the difficulties in assessing and measuring impacts. Although impacts in terms of efficiency and effectiveness of pest control are most quoted, assessing the returns to the Farmer Field School as an educational investment is equally important.

So far, most impact studies concentrated on measuring immediate impacts, most notably, the effects on pesticide use and yield. This may have partly been due to difficulties in quantifying and measuring other parameters, due to the lack of methodologies that are accepted by the broader scientific community, or due to the short time-line for many evaluation studies. A number of studies, however, have attempted to capture a broad range of developmental impacts, including changes in the social and political domain.

2.3 Who defines impact

Every project stakeholder has a role in impact evaluation, each from a different perspective. Farmers, as primary stakeholders, are perhaps in the most appropriate position to describe the impact they experienced or valued in their livelihood situation. Program staff, as secondary stakeholders, need to determine whether their training effort has the desired effect, to suggest ways of improvement. External stakeholders, such as governments and donor agencies, generally want to know whether targets are met, whether the approach is cost-effective, whether it compares favorably to alternative approaches, whether the project contributes to rural development, or whether it contributes to solving environmental and health problems or impediments to export of crops.

In this paper, three levels of evaluation are differentiated: Self-evaluation by farmers (reported in 2 case studies), self-evaluation by a project (16 case studies) and external evaluation (7 case studies). Each has its own merits and disadvantages. Anyone's direct or indirect stake in a program can cause results (e.g. benefits, disadvantages, costs) to be overstated or understated. Self-evaluation is potentially relevant and comprehensive, especially when primary stakeholders are involved in designing the evaluation. External evaluations, aimed to provide an independent perspective, are costly, while their lack of association with a program can hamper sample selection, the choice of parameters and the interpretation of results. There is a tendency among development agencies towards a greater appreciation of self-evaluation.

Future impact evaluations of IPM Farmer Field Schools need to emphasize participatory evaluation involving farmers. After all, a project's objective to increase farmer expertise implies that control over implementation shifts from project staff to farmers. Hence, farmers determine what is best practice (in the broad sense), based on their values and on their local conditions. Participatory evaluation furthermore stimulates learning and enhances the engagement of stakeholders in a program's course. Local processes and structural changes are best described in open-ended qualitative studies (e.g. case studies, photo reportage, non-structured interviews, and participant observation). Hence, reasons for, and meaning of changes become apparent. The shift from external to local control over a project, however, will inevitably increase the variation and scope of project impacts, especially with regard to developmental impacts.

2.4 Measuring impact

The measurement of impact is complicated for several reasons. First, IPM involves more than one field variable and context-specific decision-making. Thus, practicing IPM is not merely a matter of adoption or non-adoption of a technology, but field-level decisions are made at various levels of advancement based on someone's understanding. The Farmer Field School is often seen as an extension method, which it is not. Extension sets out to deliver, and its effects are measurable by the level of adoption of specific practices or technologies. Conversely, the Farmer Field School sets out to educate local people to enhance their capability for informed decision-making in response to what are always context-dependent pest problems, and thus also for adaptive management. The former is easy to evaluate, the latter not.

Second, it has proven difficult to establish good comparisons. The selection of participants or locations for Farmer Field Schools is potentially biased towards farmers who are motivated, or towards locations with favorable conditions. This bias can influence the results of a latitudinal comparison in which the contrast between trained and untrained farmers is determined, unless caution is taken to ensure that the treatment groups are comparable (e.g. by collecting background data on the comparison groups). In case comparison groups are dissimilar (e.g. the literacy rate or access to irrigation was higher for trained than for untrained farmers), statistical modeling can be attempted to correct for a particular factor (e.g. by adding literacy rate into the regression), although in practice, it is difficult to contain the sources of variation involved in a flawed comparison. Further, diffusion effects may blur the contrast between comparison groups, causing an underestimation of impact. Longitudinal comparisons (e.g. a comparison before and after training) avoid these problems of comparison groups but introduce temporal variation, such as variable yearly rainfall or fluctuating market prices. A combination of a latitudinal and a longitudinal comparison is generally considered most robust (although it could pose restrictions to sample size), and is currently being encouraged in FAO-supported IPM programs.

Third, as explained above, there are numerous possible parameters for impact assessment, and some of these are difficult to measure. Simple measurements of success are, for example, pesticide use (volume, spray frequency, chemical compounds), yield, input costs and profit, but also, the variation in yield or profit. Other, less tangible, but not less important, parameters are the quality of produce, marketability, ground water contamination, pesticide-related health symptoms, agricultural biodiversity, agricultural sustainability, policy change, gender roles, farmer-to-farmer diffusion, education and empowerment indicators.

An inevitable dilemma in impact assessment is the need to be rigorous and the need to be comprehensive. Here, ‘rigorous’ is meant in the narrow sense – in the way of obtaining representative and convincing statistical data – implying a restricted scope. Comprehensiveness is meant in terms of a broad range of technical, educational, social and political impacts. Studies have been designed to be either rigorous or comprehensive but never both. This suggests there is a need to combine the methods or results of different data sources to evaluate benefits from more than one perspective.

Long-term impact is particularly difficult to capture, because of the progression from immediate impacts to developmental impacts. Moreover, in the course of time, the contrast between comparison groups may fade due to two-way influences: (i) a diffusion of training impacts, causing bias in control farmers, and (ii) an influence of the prevailing (socio-economic, political, natural) environment, causing bias in isolated groups of trained farmers. These influences may be direct (e.g. through farmer-to-farmer contact), or indirect (e.g. through cooperatives phasing out the general supply of certain chemicals as a result of farmer lobbying, or through established, non-supportive policies inhibiting IPM). Studies aiming to look at long-term impacts should take account of these influences. Particularly, in vegetable farming, there is the additional risk that farmers change to new crops after some years.

As pointed out earlier, the interface between economic and social assessment requires special attention. The two sciences, by having different objects of study, often have different requirements with respect to experimental design. This is described in the following example. The parameter yield can show a high degree of variation (is highly context-dependent). Conversely, the way people learn will be less dependent on context (i.e. learning capability is rather universal). Hence, a study to compare knowledge or concepts between IPM farmers and control farmers can suffice with a small sample size, even in a so-called pseudo-replicated design, where individual measurements are part of the same experimental unit (for example 30 FFS farmers from one village compared with 30 control farmers from another village). However, a problem arises when knowledge is subsequently related to yield, e.g. if the two villages had different access to irrigation water. A study on yield thus requires a different experimental set-up, with a sufficient number of true replications. One possible solution is to design the study for the most demanding parameter (e.g. yield), and then accommodate other parameters (e.g. knowledge) accordingly. Another approach is through cross-verification with qualitative studies, as will be discussed later.

3. Results of the case studies

Twenty-five case studies presented in the Annex are further summarized in this section in order to provide a brief overview.

3.1 Indonesia

Because the Indonesian IPM program was the first, the longest and largest Farmer Field School effort, it has attracted a variety of impact studies.

Case 1: Evaluation began in 1993 with a large-scale effort to examine the change in pest management behavior of farmers graduated from IPM Farmer Field Schools. It was shown that training caused a change from preventative spraying to observation-based pest management, resulting in an overall 61% reduction in the use of insecticides.

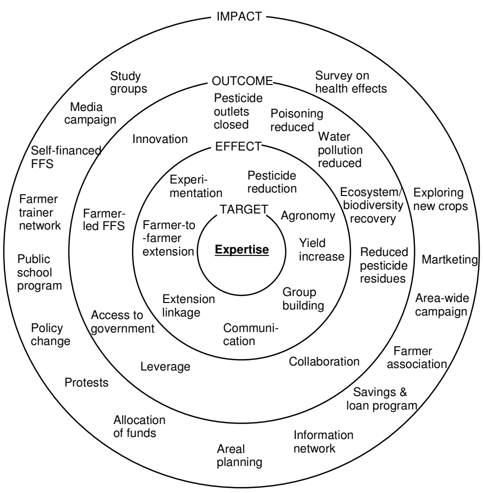
Case 2: As the program changed gear from 1996 to encourage development of community-based IPM programs, six detailed case studies were conducted to describe local developments in different parts of Indonesia. Farmers reported strengthened relationships and more group cohesion after their training. Also, their technical and social skills improved and their awareness about their position and rights increased, causing Farmer Field School alumni to question government recommendations or counter pesticide promotions.

Furthermore, certain alumni had increased their status (e.g. to become consultants to other farmers), and had gained better access to public decision-making, including more leverage to negotiate or to protest. As a consequence, increased local support was given to IPM in a number of instances, and several local policies were changed due to the efforts of Farmer Field School alumni.

In addition to the above study that was organized along geographical lines, specific thematic sub-studies were conducted on the incidence of spontaneous activities, on pesticide sales and on farm-level economic benefits of the Farmer Field School. These sub-studies are presented in separate summary sheets in the Annex (Cases 3-5).

Box 1.

As appears from the material in Case 2 and 3, increased expertise achieved through the program resulted in impact at various levels. The illustration below is an attempt to organize these effects, outcomes and impacts in concentric circles of cause-effect relationships.



Case 3: A related study recorded the incidence of spontaneous (i.e. non-project) activities in each of 182 designated IPM sub-districts; spontaneous activities are considered impact of the Farmer Field School when they were triggered by the training. Sixty-two types of activities were recorded, related to innovations, dissemination, social gains, marketing, sources of funding, policy changes, etc. These impacts are indicative not only of farmers' technical expertise, but also of their acquired capability to organize, lobby, educate and experiment. The diversity of activities implies a widespread creativity and local variability.

Case 4: Consistent reductions in insecticide sales and the number of pesticide shops operating in IPM sub-districts were reported during the 1990s, amid an increasing national trend. This suggests a broad impact of local programs on pesticide use.

Case 5: Furthermore, partial budget analysis indicated substantial benefits due to training, resulting from a reported 21% yield increase and a decline in insecticide use from 2.8 to 0.02 applications per season in the selected IPM sub-districts.

Case 6: In a participatory evaluation in West Java, farmers made photographs and descriptions of the impact of training on poverty alleviation in their situation. It is worth mentioning that this is an example of "listening to the voices of the poor", a concept promoted by the World Bank. Farmers concluded that program activities, including the Farmer Field School and additional follow-up activities, increased their opportunities for learning, gave a more balanced diet through agricultural diversification, increased the scope for on-farm work, improved living conditions, and enhanced self-regard and reduced discrimination. Consequently, the community-based IPM program was found to address the causes of poverty.

Case 7: A SEARCA team conducted an independent study in six provinces and found a modest reduction in insecticide use and an increase in knowledge and improved practices attributable to the effect of training. Also, there were indications of important yield improvements due to training.

Case 8: A World Bank team examined long-term training effects on pesticide expenditure and yield. Data from 1991 served as the baseline. Data from the economic crisis season 1998/99 provided the reference point to measure impact of training that took place mainly during 1992-94. The results did not show a significant effect of training, which is inconsistent with findings of the studies mentioned above. Moreover, it claimed rising levels of pesticide use with declining yields for both groups of farmers. Comments on the methods used in this analysis are given in the Annex.

3.2 Elsewhere in Asia

Case 9: In Bangladesh, where pesticide use in rice was moderate (on average 1 spray and 1 granular application per season), training reduced pesticide use to negligible levels and was consistently associated with an increase in yield.

Case 10: Training caused a drastic reduction in pesticide applications in eggplant in Bangladesh, from 7.0 to 1.4 applications per season. Also, a consistent yield increase of eggplant was observed. Preliminary results suggested that comparable benefits were obtained in three other vegetables.

Case 11: Results from Cambodia, where use of hazardous class Ia and Ib insecticides is high, training caused farmers to reduce pesticide volume in rice by 64% and to select relatively less hazardous compounds. FFS farmers were better aware of pesticide-related health risks than non-FFS farmers.

Case 12: Recent results on cotton IPM in China showed a decline in insecticide use from 6.3 to 3.1 applications per season a year after training, whereas control farmers continued spraying around 6 times per season. Pesticide volume declined with 82% due to a combination of lower frequency, lower dosages and a shift towards less hazardous chemicals. The change in spraying practices was readily diffused among villagers.

Case 13: A detailed study in China described how learning concepts evolved after field school education. During a period after training, farmers gradually increased their concepts about the agroecosystem. In comparison, a declining trend was found for message-based classroom-trained farmers. Hence, the experiential learning approach of the Farmer Field School was found to encourage continued learning in contrast to message-based training.

Case 14: A study in the Philippines showed that FFS graduates gained complex knowledge on agroecosystem management. The knowledge was retained over a period of at least five years. Even though the acquired knowledge was reportedly shared with non-FFS farmers, it did not readily diffuse.

Case 15: Studies in Sri Lanka found a similarly drastic reduction in insecticide use in rice due to FFS training, from 2.2 to 0.4 applications per season. Moreover, a substantially increased use of organic manure (through rice straw incorporation), a 23% yield increase and a 41% increase in profits were attributed to the effect of training. Consequently, the overall training costs (including costs for training-of-trainers), which were relatively low, could be recovered seven-fold within a single season. Impact was present six years after training.

Case 16: In a related study in Sri Lanka, farmers recorded the impact of Farmer Field School training in six villages, using methods similar to those of Case 6. A large number of impacts, ranging from crop diversification to new income-generating activities, were attributed to the effect of training. The number of impacts was highest in villages with the longest post-field school history, suggesting a gradual development process.

Case 17: Also in Sri Lanka, an independent study was conducted on pesticide-related health effects among FFS farmers, non-FFS farmers and non-farmers. Farming was associated with a high incidence of pesticide related symptoms, but FFS farmers spent considerably less time spraying pesticides than non-FFS farmers and accordingly exhibited lower cholinesterase inhibition level in blood samples. This indicates a positive effect of training on health.

Case 18: An ongoing evaluation of training effects in Thailand showed a 60% reduction in the use of insecticides and moluscicides in rice the season after training, and an increase in knowledge about pests and natural enemies.

Case 19: A study in Vietnam revealed reductions in pesticide use in rice more drastic than those initially reported from Indonesia. The decline was linked to improved farmer knowledge and to the development of innovative techniques. Insecticide use was reduced from 1.7 to 0.3 applications per season, but there were considerable differences between provinces. Fungicide use was reduced after training in the North but was increased in the South, probably due to a combination of factors (see Annex).

Case 20: An impact study on Farmer Field Schools for tea growers in Vietnam showed a 50-70% reduction in pesticide use and good prospects for improving crop management and to increase yield.

Case 21: Also in Vietnam, preliminary results on vegetable IPM demonstrated the potential of IPM to substantially reduce pesticide use in high-value vegetables while improved agronomic practices can help increase yield. However, more work is needed to study whether farmers adopt IPM.

3.3 Other Regions

Case 22: In Bolivia and Peru, the Farmer Field School model was adapted for potato. It was demonstrated that FFS graduates acquired knowledge necessary for the management of late blight, resulting in substantially increased income.

Case 23: Preliminary results from Burkina Faso showed that IPM methodology including the use of botanical insecticides had the potential to increase production of tomato, cabbage and onion.

Case 24: A global qualitative study compared the success factors between five approaches to IPM training. Success was defined in terms of acceptance by clients, efficiency, broad impact, sustainability and adaptability. It was concluded that the Farmer Field School contained the main ingredients necessary for successful extension on IPM. It was argued that, in contrast to the Farmer Field School, the No Early Spray approach (i.e. a rule-of-thumb for farmers not to spray rice the first 40 days after planting) did not support farmers responsiveness to local and dynamic conditions.

Case 25: A pilot project in Kenya showed through a simple and rapid test that respondents felt the Farmer Field School had increased their skills, profits and yields, and reduced risks.

4. Discussion

4.1 Immediate impact

The majority of case studies concentrated on measuring the immediate impact of training on pesticide use and yield. Three studies used a combination of a longitudinal and latitudinal comparison, while four studies used a longitudinal comparison, and another six studies a latitudinal comparison. Remarkably, the first-mentioned group of studies had small sample sizes, which may have been a consequence of the combination of methods.

Generally, the case studies reported reductions, sometimes drastic reductions, in pesticide use attributable to the effect of training (Table 2). There was also a general increase in yield due to the effect of training. The range of results in latitudinal studies did not obviously deviate from that in the longitudinal studies.

Table 2. Relative change in pesticide use frequency and yield attributable to the effect of training in individual case studies, arranged according to the type of study.

Nr	Country	Year	Crop	Sample	Coverage	Period[a]	Pesticides	Yield	Pesticides	Yield
A. Longitudinal + latitudinal:							*FFS farmers*		*Control farmers*	
8	Indonesia	1999	rice	small[b]	medium	8 yr	+81%[c]	-11%	+169%[c]	-15%
12	China	2002	cotton	small[b]	Small	2 yr	-51%	+16%	-8%	+2%
18	Thailand	2002	rice	small[b]	medium	1 yr	-58%[c]	-	-10%[c]	-
B. Longitudinal:							*FFS farmers*			
1	Indonesia	1993	rice	Large	Large	1 yr	-61%	-		
5	Indonesia	1998	rice	Medium	medium	variable	-99%	+21%		
19	Vietnam	1995	rice	Large	large	1 yr	-82%	+7%		
20	Vietnam	2001	tea	Moderate[b]	?	1 yr	-61%	-		
C. Latitudinal:							*FFS vs Control farmers*			
7	Indonesia	1999	rice	Large	large	unknown	-35%	+8%		
9	Bangladesh	2002	rice	Large	large	2 yr	-92%	+9%		
10	Bangladesh	2002	eggplant	Large	large	1 yr	-80%	+25%		
11	Cambodia	2003	rice	Medium[b]	medium	1-2 yr	-43%	+4%		
15	Sri Lanka	2002	rice	Large	large	1-6 yr	-81%	+23%		
21	Vietnam[d]	2001	vegetables	moderate	?	-	-53%	+18%		

[a] Period between baseline and final evaluation; for latitudinal studies the period between FFS training and the evaluation is given; [b] Pseudo-replicated design (i.e. individual measurements are part of the same experimental unit to which a treatment level is applied (e.g. people living in an FFS village); [c] Only information available on expenditure, not on use frequency; [d] Results obtained during training, thus do not show adoption of IPM.

Results for rice indicated that economic benefits were mostly determined by yield, not by pesticide expenditures which were small by comparison[2]. Therefore, future studies should look more closely at yield effects. For vegetables and cotton, the contribution of pesticide expenditure are higher.

The four studies from Indonesia showed a considerable variation in results. This can partly be ascribed to sampling. For example, case 5 concentrated on sub-districts

[2] In non-IPM farmers, or before FFS training, pesticide expenditure in rice involved approximately 3% of yield value (3.0% in case 5, 2.0% in case 7, and 3.4% in case 11).

known for their strong IPM programs, whilst other studies used different selection criteria. Also, the contrast between treatment groups may have varied among studies due to differential levels of error (e.g. in identifying treatment groups; in over- or under-reporting of training effects) or bias (likely to increase with post-training period), or due to contemporary socio-economic conditions. One study reported an increase in pesticide expenditure (but not necessarily in actual use) in both comparison groups, which may be a reflection of the extraordinary inflation rate in the year of study. This variation among studies demonstrates the weakness of relying on single or incomplete data sources, even when simple parameters such as pesticide use or yield are considered.

Fewer studies have been completed for non-rice crops (e.g. vegetables, potato and cotton) than for rice. Nevertheless, Table 2 indicates that percentage pesticide reduction in non-rice crops was within the range of that observed for rice. When considering absolute pesticide reduction, however, a distinction has to be made between crops. In rice, pesticides were typically reduced from 1-3 to 0-2 applications per season, but in vegetables and cotton the reduction was from 3-7 to 1-3 applications per season[3], whilst the market value of produce was higher for non-rice crops. Hence, absolute pesticide reductions and farm-level returns were higher in non-rice crops than in rice. Ongoing evaluations of vegetable and cotton IPM programs are expected to confirm this pattern, in particular in areas with gross pesticide over-use (baseline spray frequencies in excess of 20 per season are found in cotton and certain vegetables).

4.2 Developmental impact

Nine studies reported on developmental impacts of the IPM Farmer Field School, mostly using qualitative and open-ended methods, and in several cases by involving farmers in identifying and describing the impacts (Table 3). These studies emphasized social and political impacts. Only one study addressed impact on occupational health. No rigorous effort has been made to measure impacts on the environment or marketing.

The scope of studies ranged from the evaluation of learning processes, description of empowerment processes, to comparison of different approaches of extension. The studies reported the perspectives of farmers, project staff and external researchers.

Table 3. Studies recording developmental impacts.

Nr	Country	Year	Crop	Sample	Result
2	Indonesia	1998	Various	small	Detailed description of local changes
3	Indonesia	1998	Various	large	Wide-spread occurrence of spontaneous programs
4	Indonesia	1998	n/a	small	Evidence of reduced local pesticide sales
6	Indonesia	2001	Various	small	Farmers reporting multiple impacts of the FFS
13	China	1996	Rice	small	The FFS stimulates continued learning
14	Philippines	2000	Rice	small	FFS knowledge is retained but not readily diffused
16	Sri Lanka	2002	Rice	small	Farmers reporting how the FFS influenced their lives
17	Sri Lanka	2001	Rice	large	FFS reduced pesticide-related health effects
24	Global	1997	Various	small	The FFS educational approach is appropriate for IPM

[3] In addition, several studies recorded a decreased chemical dosage per application and/or a shift towards less toxic chemicals.

It was found that complex knowledge on IPM acquired through experiential learning was retained, or even increased, in the years after training. Detailed case studies from Indonesia described that farmers were empowered by the training, in terms of increased self-regard, social skills and their active interaction with service providers, resulting in spontaneous activities, new structures and policy change. It must be noted that the Indonesian program had made considerable investments in follow-up activities (i.e. after Farmer Field School training) to encourage experimentation, community-based planning, farmer-to-farmer extension and networking. The resulting spontaneous actions and local programs were not isolated events but were widespread thoughout project provinces. In participatory evaluations, farmers identified what they most valued as impacts of training: an increase in creativity, independence, and collaboration, and lowered costs and improved incomes.

The described processes of empowerment and community action suggest that the Farmer Field School had an important trigger function, by introducing farmers to ecological and experiential learning methods, whilst enhancing group building and social skills. The exercise of agroecosystem analysis, for example, stimulated skills of thinking and communicating which could subsequently be applied to broader areas of people s lives.

4.3 The added value of multiple perspectives

Each study had its own strengths and weaknesses. Some aimed to be statistically rigorous but were narrow in scope; others aimed to be comprehensive in scope but lacked geographic coverage and thus representation. Some aimed for aggregation; others aimed to capture diversity (in field conditions, in people s responses, in impacts). Some were driven by donor interests, others by the values of local people. The complexity of impact evaluation of the IPM Farmer Field School implies that no single study can provide a complete picture of the reality of impact. However, when data sources from different angles with different objectives are combined, this improves our comprehension of processes that took place in the field, and provides triangulation by looking at patterns.

Eight data sources from Indonesia (Case 1-8) illustrate this point by using a variety of methods from photo reportage to aggregated data. The data show a large-scale impact on input use; spontaneous activities on a broad scale; declined pesticide sales in selected districts; increased farm-level profits; the indirect consequences of training in the lives of local people and farmer testimonies. This construction of perspectives improves the comprehensiveness and rigor of the overall evaluation. Also, the benefits are verified through different viewpoints. For example, pesticide reduction was confirmed by large scale assessments and case studies alike, and was evinced by lower pesticide sales and by organizational and policy changes. This cross-verification provides compelling evidence attributable to the effect of training. In contrast, the apparent lack of training effects in one study was less convincing because it was not verified through other perspectives and because of its small sample size.

The above underscores the importance of pursuing diverse approaches to evaluation and to combine the multiple perspectives, in order to construct a more rigorous and more comprehensive picture of impact as defined by the stakeholders. Ideally, the multiple data sources refer to the same time period and to the same farmer population.

4.4 The issue of cost

Directly related to achievements of the IPM Farmer Field School is the issue of cost. Because IPM conducted in smallholder cropping systems in the tropics is highly dependent on local context (or, generally applicable solutions are rare), it often requires that farmers improve their analytical skills and expertise. To help improve farmer expertise, hands-on education is needed for which there appears to be no shortcut alternative (see Case 24). But farmer education is necessarily labor-intensive and therefore can be costly, even though costs may be quickly recovered at the farm-level, through reduced input costs and increased yield. Unfortunately, no rigorous study has been conducted to compare human resource costs of the Farmer Field School and relevant other farmer education and training investments.

Reported costs per Farmer Field School-graduate are highly variable. A main factor contributing to this variation is whether program costs are included in the calculation of the cost per farmer. Clearly, costs will be higher in pilot projects than in programs that have been assimilated and decentralized within existing structures. Field-level costs are influenced by the level of incentives, travel, the involvement of farmers as trainers, and the level of local contributions. There are recent examples of self-funded and partially self-funded Farmer Field School programs from different continents, and this trajectory needs further exploring. The bottom line is that field training can potentially be conducted with limited sponsorship, which poses a challenge to gradually reduce external support in order to increase local program ownership.

Costs have to be rated against a program's immediate and developmental impact, and how this impact contributes to national or development goals. Ultimately, investment has to be weighed against the cost of 'doing nothing'. True costs of continued pesticide over-use include the full cost of the externalities associated with pesticide use (impacts on human health, soil, water and biodiversity), plus the costs of disposal of out-of-date and unused pesticide stocks. In this regard, government instruments such as taxation of pesticides could be employed to recover true savings which in turn could be used to support IPM training. To further reduce the fiscal burden of a program on one ministry, the institutional basis of the IPM Farmer Field School could be broadened, for example by recognizing the benefits of the Farmer Field School in the areas of education, environmental protection, and public health.

5. Conclusions

i) *Educational approach needed* Because IPM in tropical smallholder farms is highly dependent on local context, it often calls for farmers analytical skills and expertise. Improving farmer expertise requires hands-on education, such as provided by the Farmer Field School, for which there is no shortcut alternative.

ii) *Proven complexity* Impact evaluation of the IPM Farmer Field School has proven to be complex because of methodological obstacles, because of the range of immediate and developmental impacts, and because of different perspectives of stakeholders. Consequently, there is no agreed framework for measuring impact.

iii) *Benefit of combining results* Studies were designed to be either statistically rigorous (but with a restricted scope) or comprehensive (but with limited coverage), but never both. Nevertheless, by converging the results of diverse sources, the comprehensiveness of the overall evaluation was enhanced and the benefits were substantiated through patterns obtained from different perspectives.

iv) *Significant impact on pesticides and yield* The majority of studies measured the immediate impact of training through aggregated data, and reported substantial and consistent reductions in pesticide use attributable to the effect of training. In a number of cases, there was also a convincing increase in yield due to training. Most studies focused on rice.

v) *Highest returns in non-rice crops* Pesticide reduction and farm-level returns were higher in non-rice crops (vegetables and cotton) than in rice.

vi) *Remarkable developmental impact* A number of studies described broader, developmental impacts of training often using qualitative methods, and in some cases involving farmers in identifying and describing the impacts. Results demonstrated remarkable, widespread and lasting developmental impacts, which have been best documented for Indonesia. It was found that the Farmer Field School stimulated continued learning, and that it strengthened social and political skills, which apparently triggered a range of local activities, relationships and policies related to improved agro-ecosystem management.

vii) *Missing data in some areas* No concerted effort has yet been made to measure impacts of the IPM Farmer Field School on the environment or produce marketing. Only one study addressed impact on occupational health.

6. Recommendations

i) *Need for concerted studies* Because of the complexity of impact evaluation, there is a need to combine studies using different perspectives in order to increase the scope and rigor of results. If studies are coordinated (e.g. by targeting the same population or time period), cross-verification of data sources can be enhanced.

ii) *Improve study design* Novel study design is needed (i) to improve measurement of the sustainability of immediate impacts; and (ii) to link disciplines (e.g. economic and social assessment) while taking into account the need for true replication.

iii) *Emphasize developmental impacts* Because of the trigger function of the IPM Farmer Field School (i.e. triggering empowerment and collective action), future impact studies, in particular those looking at long-term effects, should give increased emphasis to developmental impacts through participatory approaches and qualitative methods.

iv) *Broaden institutional basis of the FFS* Because of its multiple impacts, the IPM Farmer Field School should be given a broader basis, for example by involving sectors of education, environmental protection, and public health.

Acknowledgements

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Annex

Summary Sheets of Case Studies

Indonesia

1. Large-scale reduction in pesticide use in rice

Project: National IPM Program
Year: 1993
Crop: Rice
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: Evaluation of project influences on pesticide use
Methods:

1. *Tool:* Semi-structured questionnaires by field trainers
2. *Design*: Longitudinal comparison before and after training; 1-year time lag
3. *Parameters*: Pesticide use (with various sub-parameters)
4. *Sample size*: Very large (3335 individual farmers), from 7 provinces

Results:

1. 61% reduction in insecticide applications due to training; reduction was highest for banned (class I and II) chemicals (Figure A-1)
2. 70% increase reported for rodenticides
3. 60% reduction in total pesticide expenditure
4. Reported change in farmer pest management behavior from prevention-based to observation-based

Figure A-1. Mean pesticide applications per field, before and after training

Comments:

1. Temporal changes in conditions could have influenced the before-after comparison, although price changes had been considered.
2. Paired data involving the same respondents may to some extent have induced overstated or understated reporting.

Conclusion:

The Farmer Field School changed pest management behavior of farmers, resulting in better-informed decision-making and a clear overall reduction in the use of insecticides. In addition, increased awareness about the role of rats prompted trained farmers to spend more on rat control. The scale and coverage of the study suggested a convincing pattern. Unfortunately, the durability of training effects was not tested in this study, nor was a cost-benefit analysis included.

Source:

Monitoring and Evaluation Team (1993). The impact of IPM training on farmers behavior: A summary of results from the second field school cycle. IPM National Program, Indonesia

2. Detailed studies on community-level impact

Project: National IPM Program
Year: 1997-98
Crop: Various
Level: Self-evaluation by a project
Scope: Immediate & developmental impact of training
Objective: To describe the development of spontaneous community programs
Background: A national strategy was established in 1996 to integrate new project activities (in some places this meant intensification) in selected sub-districts with high potential for community-based IPM (approx. 10% of all project sub-districts). Project staff monitored the subsequent development of local programs with farmer-funded or locally funded non-project activities. National Program prioritized IPM sub-districts; however, project implementation in other project sub-districts was continued.

Methods:

1. *Tool:* First-hand field visits and unstructured interviews by project staff and group discussions
2. *Design*: Six IPM sub-districts of particular interest were selected for intensive case studies. A mix of quantitative and qualitative analytical frameworks (the latter describing the degree of participation, farmer relationships to their world, and social gains) were used to measure impact. The focus of study was at the community and village level, not at the farm level.
3. *Parameters*: Mostly qualitative parameters, such as: roles, relationships, actions, reasons, social gains, policies; to some extent economics, pesticide sales and field-level variables
4. *Sample size*: 6 IPM sub-districts from 6 separate provinces

Results:

1. The case studies, with their quotations from farmers, provide a detailed description of local development processes that took place among FFS alumni groups, among larger farming communities and among other stakeholders and local government within sub-districts.
2. Farmers reported strengthened relationships, group formation, and increased group cohesion, with an increase in frequency and regularity of meetings, and an improvement in quality of meetings involving more in-depth analysis of field conditions and group planning.
3. Farmers reported improved skills of field observation, analysis and interpretation, skills of experimentation and improved field practices, and examples of innovations. Farmers also reported new skills to present data, to hold discussions and to make plans with budgets.
4. Indications of increased critical thinking capacity to make independent analyses of situations, and increased self-confidence and awareness about

positions and rights were recorded among farmers; for example, with FFS alumni testing or questioning government recommendations or countering pesticide promotions.

5. An increased status was recorded for FFS alumni, who assumed new roles as consultants, planners and organizers, who became group leaders, or gained control over local funding.
6. FFS training provided new opportunities to learn (e.g. through experimentation), to exchange knowledge (e.g. through new relationships or forums), to increase income (through new innovations or information, e.g. intercropping, hydroponics), and to take action (e.g. through rat control drives).
7. An increase in leverage was reported that allowed farmers to reject certain rules (e.g. pesticide-inclusion in credit packages) to protest against inconsistencies in agricultural policies towards pesticides, to resist pressure (e.g. from pesticide salesmen), and to successfully negotiate their way (e.g. to obtain local funds for field activities).
8. Farmers acquired access to government and agriculture officials to voice their concerns, and an access to official discussions regarding allocation of village funds or the planning of agricultural development.
9. Several local policies were changed due to the efforts of FFS alumni, for example regarding the stocking of pesticides at cooperatives, and the channeling of village funds to support local agriculture.
10. Anecdotal evidence suggested a diffusion effect of a reduced pesticide use in rice. Also, interviews with pesticide salesmen indicated a recent decline in sales.

Comments:

1. Most of the information is qualitative and anecdotal. Hence, it is possible that the degree of impacts has been overstated.
2. Locations had not been randomly selected.

Conclusion:

The case studies explained how local programs developed after project activities were introduced, how local people experienced a change in self-regard, status and leverage position, how these changes were translated into action, and how local government and agricultural officials became actively involved as supporters and sponsors.

Source:

FAO Technical Assistance Team (1998) Community IPM: Six cases from Indonesia. 260 pp.

3. The FFS triggers spontaneous local programs (sub-study of Case 2)

Project: National IPM Program
Year: 1997-98
Crop: Various
Level: Self-evaluation by a project
Scope: Immediate & developmental impact of training
Objective: To describe the development of spontaneous community programs
Background: This study was connected to Case 2.
Methods:

1. *Tool:* First-hand field visits and interviews by project staff.

2. *Design*: Extensive studies were conducted in a large number of IPM sub-districts; the occurrence of spontaneous (i.e. non-project) activities was recorded. The focus of study was at the community level, not at the farm level.
3. *Parameters*: Non-project activities, degree of participation, relationships, social gains, policies, economics.
4. *Sample size*: 182 IPM sub-districts in the nation s major rice-growing areas.

Results:

1. The study showed that spontaneous programs were commonplace. Spontaneous (i.e. farmer-funded or locally funded) activities were reported from all 182 IPM sub-districts. The available information was interpreted, categorized and summarized for the purpose of this summary, and is presented in Table A-1 and Figure A-2. Table A-1 shows the occurrence of as many as 62 types of spontaneous activities in 182 sub-districts. Field studies were found in practically every sub-district. Also, associations of alumni groups were reported from the majority of sub-districts. Collectively, the results indicate a wide variety of spontaneous activities, contributing to the natural, human, social, physical and financial assets of farming communities.

Table A-1. Spontaneous activities reported from 182 IPM sub-districts, as extracted from the original information, with the number and the percentage of sub-districts in each category.

	Type of spontaneous activity	Asset	Sub-districts	Percentage
1	Field studies	Human	180	98.9%
2	Reactivating of alumni groups	Social	75	41.2%
3	Alumni association organized	Social	121	66.5%
4	Farmer trainer association organized	Social	35	19.2%
5	Farmer trainer monthly meetings	Social	20	11.0%
6	Information network created for farmers	Social	28	15.4%
7	Forums for sharing studies organized	Social	8	4.4%
8	Field observation teams organized	Social	23	12.6%
9	Meeting place for association constructed	Physical	9	4.9%
10	Areal planning organized	Natural	4	2.2%
11	Capitalize alumni groups; saving & loan program	Financial	32	17.6%
12	Capitalize association; saving & loan program	Financial	19	10.4%
13	Irrigation maintenance program organized	Natural	12	6.6%
14	Water users groups organized	Social	9	4.9%
15	Crop rotation schedule organized	Natural	7	3.8%
16	Pesticide-free rice produced	Natural	28	15.4%
17	Pesticide-free rice marketed	Financial	9	4.9%
18	Vegetable production project	Financial	6	3.3%
19	Pesticide-free vegetables produced	Natural	5	2.7%
20	Organic fertilizer project	Natural	2	1.1%
21	Seedling sales organized	Financial	9	4.9%
22	Inputs sales program organized	Financial	14	7.7%
23	Marketing project	Financial	3	1.6%
24	Labelled seed sales organized	Financial	7	3.8%
25	Innovative agronomic methods developed	Natural	9	4.9%
26	Non-toxic pest control methods tested	Natural	36	19.8%
27	Rats control methods tested	Natural	6	3.3%
28	Rat control program organized	Natl., social	61	33.5%
29	Stemborer control program organized	Natl., social	5	2.7%

30	Owl conservation/raising organized	Natural	3	1.6%
31	Apple snail control methods tested	Natural	13	7.1%
32	Apple snail control program organized	Natl., social	5	2.7%
33	Pesticide sales off, or kiosks reported partly closed	Natural	17	9.3%
34	Producing IPM calendars/bulletin boards	Social	6	3.3%
35	Regular newsletter by alumni/farmer trainers	Social	14	7.7%
36	Radio broadcast by alumni/farmer trainers	Social	5	2.7%
37	Traditional arts by alumni/farmer trainers	Social	12	6.6%
38	Demonstration field / promotional exhibition by alumni	Human	19	10.4%
39	Pest clinic or library established	Physical	2	1.1%
40	Rice-fish culture project	Natural	12	6.6%
41	Tractor cooperation organized	Physical	2	1.1%
42	Other income generating activities organized	Financial	2	1.1%
43	Miscellaneous activities	n/a	5	2.7%
44	Participatory planning training by farmers	Human	4	2.2%
45	Media training conducted	Human	0	0.0%
46	Farmers trained to conduct Vegetable FFS	Human	1	0.5%
47	Public school IPM organized by farmers	Human	3	1.6%
48	Forestry FFS with university	Human	1	0.5%
49	Local govt staff trained by farmer trainers	Human	3	1.6%
50	Farmers (co-) funding FFS	Financial	46	25.3%
51	Village owned lands given for IPM	Physical	8	4.4%
52	Village govt sponsors IPM activities	Financial	66	36.3%
53	(Sub-) District sponsors IPM activities	Financial	51	28.0%
54	Farmers reject policy on tungro because of alternative	Human	2	1.1%
55	Farmers reject instructions to plant var. IR64	Human	2	1.1%
56	Pesticides removed from village credit package, due to farmers protests	Human	33	18.1%
57	District policy to promote IPM	Financial	3	1.6%
58	District policy for stemborer, due to farmers	Natural	1	0.5%
59	Sub-district policy on FFS funding	Financial	3	1.6%
60	Policy on credit packages	Financial	1	0.5%
61	Crop rotation policy changed due to farmers	Human	6	3.3%
62	Sub-district policy authorizing trainers to change farmer groups	Social	1	0.5%

2. Figure A-2 presents a snapshot of activities by IPM sub-district, showing spontaneous programs on all islands and illustrating the variation in the number of developmental impacts. Two to fourteen types of spontaneous activities were reported per IPM sub-district, roughly representing the state of progress. The graph further indicates that progressive IPM sub-districts were most common in West Java.
3. The diversity of spontaneous activities was largely unrelated to the intensity of project-funded activities, as measured by the number of alumni. In other words, large training efforts did not automatically result in many types of spontaneous activities. Human factors (e.g. the motivation of the sub-district trainer) were likely important.

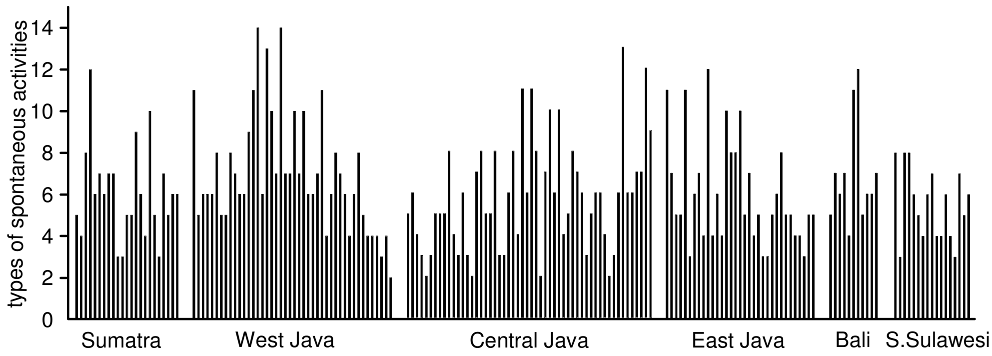

Figure A-2. The number of types of spontaneous activities in 182 IPM sub-districts, arranged according to approximate geographical position, from West to East.

Comments:

1. When attempting to capture the wealth of available information into superficial summaries, such as Table A-1 and Figure A-2, much structural and contextual information is lost.
2. Most of the information is anecdotal.
3. The selection of IPM sub-districts was biased.

Conclusion:

Substantial and widespread evidence from Indonesia suggests that FFS-related project activities provide an impetus for spontaneous local programs with multiple impacts. The diversity of activities is indicative of farmer creativity and situational differences.

Source:

FAO Technical Assistance Team (1998) Community IPM: Six cases from Indonesia. Annex I: IPM sub-district summaries, 54 pp.

4. Trends in pesticide sales in IPM areas (sub-study of Case 2)

Project: National IPM Program
Year: 1997-98
Crop: n/a
Level: Self-evaluation by a project
Scope: Developmental impact of training
Objective: Impact of local IPM programs on pesticide sales
Methods:

1. *Tool:* Yearly sales data per insecticide formula
2. *Design*: Actual insecticide sales data were obtained directly from owners and managers of pesticide kiosks and village cooperatives operating within the boundaries of IPM sub-districts, i.e. areas selected by the program for intensified implementation of training and follow-up activities.
3. *Parameters*: Yearly sales of insecticides by pesticide kiosks and village cooperatives; yearly number of sales outlets
4. *Sample size*: One pesticide outlet in each of 8 IPM sub-districts; in one IPM sub-district the yearly number of sales outlets were recorded

Table A-2. Summary of changes in yearly sales data obtained from eight IPM sub-districts

Store	IPM sub-district	Province	Start of IPM	Sales volume (litre) At onset	1997/8	Decline
"Toko tani"	Bantaeng	S.Sulawesi	1993	2555	535	79%
"Apik"	Tanah Merah	E.Java	1992	156	18	88%
"Bina Tani"	Bongas	W.Java	1990	2725	834	70%
5 stores combined	Tunjungan	C.Java	1993	1781	744	58%
Village coop.	Batang Toru	N.Sumatra	1993	1495	390	74%
Village coop.	Beringin	N.Sumatra	1992	5385	1132	79%
Petani Pestisida	Denpasar Timor	Bali	1992	2551	198	92%
Village coop.	Papar	E.Java	1994	85690	378	99%

Results:

1. A considerable 70-99% reduction in insecticide sales by outlets in IPM sub-districts (Table A-2).
2. The combined sales of all village cooperative units in Papar indicate a drastic decrease for the whole sub-district.
3. From Bangorejo sub-district, a decline in the number of pesticide stores from 45 to 3 was reported between 1992 and 1998 (Figure A-3).

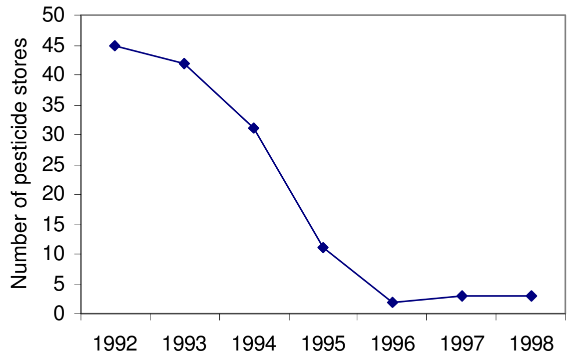

Figure A-3. Number of pesticide stores in Bangorejo sub-district, East Java.

Comments:

1. The selection of pesticide kiosks was possibly biased towards those that were poorly performing. However, the data from Papar and Bangorejo represent entire sub-districts.
2. The National trend in pesticide procurement (weight) for use in rice shows an increase from 1992-96 [4], suggesting that the reported data reflect a localized effect associated with locally strong IPM programs.
3. Reports from 12 additional IPM sub-districts provide anecdotal evidence suggesting that the decline in sales is common in IPM sub-districts.

Conclusion:

The reported cases indicate a clear association between strong local IPM programs a drastic reduction in pesticide sales.

[4] J.H.M. Oudejans (1999) Studies on IPM policy in S.E. Asia: Two centuries of plant protection in Indonesia, Malaysia and Thailand. Wageningen University Agricultural Papers, 99.1. p. 229.

Source:

FAO Technical Assistance Team (1998) Community IPM: Six cases from Indonesia. Annex II: The impact of IPM on pesticide sales in nine sub-districts; Annex I: IPM sub-district summaries.

5. Economic benefits of FFS training (sub-study of Case 2)

Project: National IPM Program
Year: 1997-98
Crop: Rice
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: To study the economic benefits of IPM training
Methods:

1. *Tool:* Semi-structured questionnaires
2. *Design*: Longitudinal comparison on farming practices before and after training obtained through recall data from FFS graduates. In addition, a small latitudinal comparison was made between FFS and non-FFS farmers. Only so-called "IPM sub-districts" were selected, i.e. sub-districts with local programs known to be more effective than average.
3. *Parameters*: Pesticide applications, fertilizers, input costs, yield, financial benefits
4. *Sample size*: Large; 334 farmers, taken from 13 IPM sub-districts on Java, Bali and Sulawesi. The latitudinal comparison involved 20 FFS farmers and 20 non-FFS farmers from 2 IPM sub-districts on Sulawesi.

Results:

1. Pooled data on pesticide use before and after training suggest a drastic decline from 2.8 to 0.02 applications per season.
2. The reported yield increase after training (from pooled data) was 21% or 1.04 t/ha
3. After training farmers spent 50% more on fertilizers, mainly due to an increase in KCl, ZA and, to a limited extent, TSP. This indicates a more balanced use of fertilizers.
4. Partial budgets indicate increased benefits after training ranging from 39,000 to 1,400,000 (Rp ha^{-1}) per IPM sub-district (pooled average is 473,000).
5. The graph below illustrates that increased outputs contributed most to farmer income; reduced pesticide expenditure accounted for 14% of the increased benefits after training.
6. The latitudinal comparison between FFS and non-FFS farmers showed a 24% increase in yield and Rp 628,000 increased benefits per ha.

Comments:

1. Recall data introduce error when respondents don't remember accurately about past events. Moreover, when respondents provide paired data from before and after training, this may cause over-reporting.
2. The latitudinal comparison between FFS and non-FFS farmers provides an independent check, although the rather small sample size and lack of information on selection of farmers introduce new sources of error.
3. By selecting only IPM sub-districts, i.e. the sub-districts with most promising local programs, the sample may not be representative for the national program.

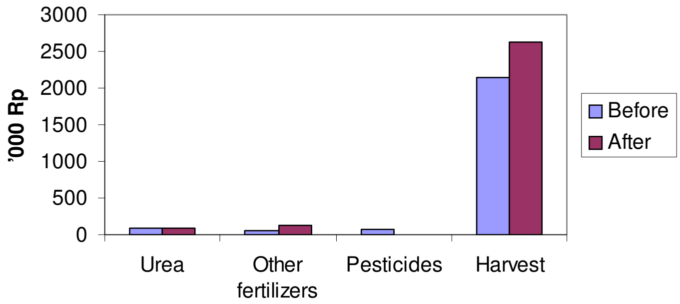

Figure A-4. Pooled average chemical inputs and outputs before and after training in 1998 Rupees.

Conclusion:

Despite possible bias in recall data and respondent selection, the reported effects on pesticide reduction, balanced fertilizer use and yield were large and were found across the board. Figure A-4 indicates that the cost-benefit analysis was mostly determined by a change in yield.

Source:

FAO Technical Assistance Team (1998) Community IPM: Six cases from Indonesia. Annex III: Financial benefits realized by IPM alumni due to their application of IPM principles.

6. Farmers picturing impact

Project: Indonesian IPM Farmers Association; FAO Programme for Community IPM in Asia
Year: 2001
Crop: Various
Level: Self-evaluation by farmers
Scope: Immediate & developmental impact of training
Objective: Study the impact of community IPM on poverty / providing farmers with opportunity to evaluate and plan

Methods:

1. *Tool:* Photo reportage; writing captions; group discussions
2. *Design*: One village from each of three sub-districts that had received a concentration of program activities. 5 IPM-farmers per village were introduced to methods of self-evaluation. Workshops before and after data collection enable farmers to analyze the impact on poverty based on their own criteria.
3. *Parameters*: Specified by participants; any immediate or developmental impacts of training
4. *Sample size*: 5 participants from each of 3 villages in West Java

Results:

1. A variety of data in the form of a photo-reportage and accompanying captions described how FFS graduates continued to apply IPM learning principles to new areas of farming (illustrated in Figure A-5). The number of impacts per village suggests that active local programs developed after training.
2. Some examples of impacts are: Innovative ways of producing, utilizing and applying organic manure, the production of rice seed, and the initiation of

growing alternative crops or developing various income-generating activities, all resulting in a diversification of agroecosystems and income sources.

3. Farmers recorded social gains, and how impacts of the FFS influenced non-participants in the village, e.g. through advocacy causing improved irrigation conditions, or through following innovative agricultural practices of FFS graduates.
4. In general terms, farmers concluded that community IPM activities had led to greater creativity, more independence, lowered costs and improved incomes.
5. By analyzing the effect of training on the causes of poverty, farmers reported increased opportunities for all members of the community to learn, a more balanced diet through agricultural diversification, increased scope for on-farm work, improved living conditions, an enhanced self-regard and reduced discrimination.

Figure A-5. Examples by farmers: [Left] *One impact of IPM activities has been the emphasis on making compost. The materials that we need for compost, manure and leaves, are easy to find in the village. We should use these things because God created them to be used. Aos Rosidin*

[Right] *Anyone who has attended an FFS and been involved in post-FFS activities ends up being creative, critical, scientific, and having lots of friends. This is Bapak Engkos and his wife. He attended an FFS in 1994 and then became an IPM Farmer Trainer. He has since been elected our village head.*
Iin Suryanih

Comments:

Even though the study draws predominantly on qualitative data, some of which may be over-stated for competitive reasons, the strength of this approach is that it reveals a broad range of impacts of training, normally missed in externally-planned evaluations.

Conclusion:

According to the primary stakeholders of IPM, and captured through their photographs, the FFS has set in motion the development of active local programs resulting in advocacy, innovations and adaptive management of farming systems. Participatory evaluations like this enrich our understanding of how the FFS enables local communities to become a factor in development.

Source:

J.C. Pontius (2003) Picturing impact: participatory evaluation of community IPM in three West Java villages. International learning workshop on farmers field schools: Emerging issues and challenges. Yogyakarta, Indonesia, 21-25 October 2002.

7. SEARCA study on farm-level outcomes

Project: National IPM Program
Year: 1999
Crop: Rice (with limited data on soybean)
Level: External evaluation
Scope: Immediate impact of training
Objective: To evaluate the impact of the project in rice-based farming communities
Methods:

1. *Tool:* Structured questionnaires, semi-structured interviews.
2. *Design*: Latitudinal comparison between FFS farmers and non-FFS farmers. The time passed between training and the survey was not considered.
3. *Parameters*: Insecticide volume, yield, knowledge, practices
4. *Sample size*: (i) Rice: 627 FFS farmers and 380 non-FFS farmers; (ii) soybean: 69 FFS farmers and 49 non-FFS farmers. Sample size per province reflected the number of FFS alumni per province. Collectively, the rice and soybean farmers were selected from 233 FFS villages and 52 non-FFS villages, and villages were selected from 6 provinces.

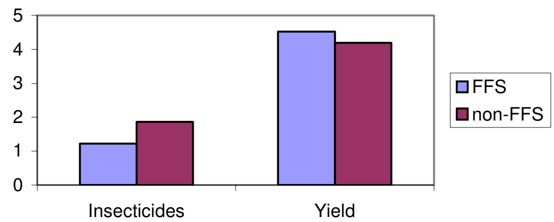

Figure A-6. Insecticide use (l ha^{-1}) and yield (t ha^{-1}) of rice by FFS farmers and non-FFS farmers.

Results:

1. Use of four insecticides was 35% less for FFS farmers than for non-FFS farmers (recalculated from data pooled per province) (Figure A-6). In both groups, insecticide use was low (1.1 and 1.6 l ha^{-1}, resp.). Spray frequencies are unknown.
2. Yield of rice was 7.9 % higher for FFS farmers than for non-FFS farmers in the 6 provinces (recalculated from pooled data, and omitting unspecified data from East and West Java), however, the variation in yield advantage between provinces was large (-8% to +28%); for soybean, yield advantage was 28%.
3. The use of carbofuran, which was the predominant insecticide in earlier studies, was zero in both groups of farmers. This could possibly be interpreted as a long-term impact of the program.
4. FFS farmers spent 21% less on pesticides, 12% more on fertilizers and 4% more on labor than non-FFS farmers (recalculated from pooled data). In total FFS farmers had 5% lower production costs than non-FFS farmers. However, this cost difference was small compared to the difference in revenue from harvested produce, which was highest for FFS farmers due to higher yield. A high internal rate of return was recorded.
5. FFS farmers had higher knowledge scores on pests, natural enemies and pesticides than non-FFS farmers.
6. Balanced use of fertilizers and composting was marginally higher in FFS farmers.

Comments:

1. Data are reported for only four insecticides, one of which an insect growth regulator. This selection possibly masked a difference in use of total pesticides, including chemicals not allowed in rice.
2. The report mentioned that non-FFS villages were selected which had "the same agro-climatic factors" as FFS villages, and moreover, that non-FFS farmers were selected who had "the same characteristics" as FFS farmers. However, no information is provided to prove that the two groups were comparable.
3. The sample under-represented the program's efforts on Java.
4. The cost-benefit analysis (both, of farm-level returns and project rates of return), depended largely on the data on yield (production costs were relatively minor). However, a high degree of variation is visible in the yield advantage between provinces, which weakens the cost-benefit analysis. Moreover, the figure on average yield advantage used in the report (10.7%, compared to 7.9% for the recalculated value) is based on the average of each province, without weighing each province's contribution, and also includes data on 2 provinces not part of the original study as described in the methods.
5. The time passed between training and the survey was not considered, which may have affected the data.

Conclusion:

A modest reduction in insecticide use and an increase in knowledge and improved practices were attributed to the effect of training. Also, there were indications of an important yield advantage due to training.

Source:

SEARCA (1999) Integrated Pest Management Training Project, World Bank Loan 3586-IND: Impact Evaluation Study. Final Report, prepared for the Ministry of Agricultural, Indonesia, and the World Bank. SEAMEO Regional Center for Graduate Study and Research in Agriculture, Laguna, Philippines, 168 pp.

8. World Bank study on long-term farm-level outcomes

Project:	National IPM Program
Year:	2002
Crop:	Rice
Level:	External evaluation
Scope:	Immediate impact of training
Objective:	To evaluate the impact of FFS training and diffusion on farm-level outcomes

Methods:

1. *Tool:* Econometric difference-in-differences analysis based on (i) data collected by CASER, Bogor, through structured questionnaires in 1991 and (ii) a partially retrospective study in 1999.
2. *Design*: Longitudinal and latitudinal comparison of data collected in 1991 (i.e. a variable number of years before training) and 1999 (variable number of years after training) in three groups of farmer households: non-FFS, exposed to IPM (i.e. FFS in the village but did not participate) and FFS households.
3. *Parameters*: "Growth rate" of pesticide expenditure and yield.

4. *Sample size*: 52 non-FFS households from 5 villages (pseudo-replicated), 156 households exposed to IPM and 112 FFS households (both groups mixed from 21 villages; pseudo-replicated).

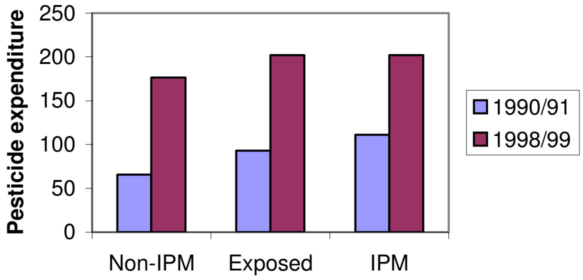

Figure A-7. Shift in pesticide expenditure (in '000s of 1998 Rp/ha) over nine years for non-FFS farmers, exposed farmers and FFS farmers.

Results:

1. Yields decreased from 1991-99 for all comparison groups.
2. Pesticide expenditure (corrected for inflation) increased for all comparison groups (Figure A-7). Spray volumes or frequencies are unknown.
3. The multivariate analysis showed no significant effect of training on the change in yield or pesticide expenditure between comparison groups.

Comments:

1. The distinction between target group and control group may have been biased because of retrospective questions in 1999 going back up to 8 years in farmer memory and because of the risk of confusing genuine IPM-FFS with other training programs.
2. The study depended on, and extrapolated from, a small control group (5 villages as true replications) with substantially different conditions from the target group. Roughly, a comparison was made between (i) FFS farmers with predominantly irrigated fields, and (ii) non-FFS farmers with largely rainfed fields and with on average only half the land area. The group of exposed farmers had intermediate conditions.
3. To deal with this flaw in the available data, the difference in slope of pesticide expenditure and yield before and after training was studied. Thus, a steeper increase in yield indicated more impact, irrespective of the initial yield level. By eliminating the intercept, incorporating pre-program growth rate estimates, and including certain household, village and district variables into the regression, it was assumed that situational differences between the comparison groups were accounted for. Despite the multivariate analysis, however, the low R^2 values in the results indicated that the bulk of variation remained unexplained, suggesting that other, non-measured, parameters were important in comparing the dissimilar groups.
4. A related problem when choosing growth, instead of level, as the object of study is that the influence of limiting factors or ceiling-levels (likely to differ between the comparison groups) is ignored. This is important because of the long time span of the study.
5. The economic crisis in 1998/1999 and its high inflation rate was another source of error. Low spending power due to the crisis may have suppressed differential pesticide use among treatment groups. Moreover, pesticide use was only expressed in terms of expenditure. From 1997-98, national pesticide sales increased with about 170% when expressed in Rupiah, but declined

with about 20% when expressed in US dollar[5]. To interpret the data on expenditure, further information on actual price changes is needed, as there are indications that the price increase for pesticides was higher than the Consumer Price Index used in this study. Hence, pesticide use has likely been overestimated.

6. Pesticide use expressed in terms of expenditure could conceal a shift from hazardous chemicals (OC s, OP s) to less hazardous ones (growth regulators, pyrethroids), or a shift from insecticides to fungicides or herbicides. Therefore, the suggested linear relationship between pesticide expenditure and health or environmental benefits remains unproven.

Conclusion:

The study attempted to find a solution for the problem of non-identical treatment groups in a longer-term study. It reported no significant impact on pesticide expenditure and yield. However, small sample size and large unexplained variance in the analysis produced results which are difficult to interpret, as discussed above. Moreover, the results are not consistent with those of other studies. The choice of the economic crisis period 1998/1999 as the only reference point to measure impact introduced another source of error.

Source:

G. Feder, R. Murgai & J.B. Quizon (2003) Sending farmers back to school: The impact of Farmer Field Schools in Indonesia. Accepted by *Review of Agricultural Economics*.

[5] S. Watkins (2003) The world market for crop protection products in rice. Agrow Report, PJB Publications, London.

Elsewhere in Asia

9. Bangladesh: Benefits of IPM for rice farmers

Project: Strengthening Plant Protection Services Project, Department of Agricultural Extension & DANIDA
Year: 1998-2002
Crop: Rice
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: To study the effects of training on knowledge, pesticide use and crop yield
Methods:

1. *Tool:* Structured questionnaires
2. *Design*: A latitudinal comparison was made between FFS and non-FFS farmers at 2 years after the former group had received their training.
3. *Parameters*: Pesticide use, pesticide cost, varieties, yield, pest management practices, knowledge
4. *Sample size*: 166 FFS farmers and 140 non-FFS farmers, taken from 15 districts.

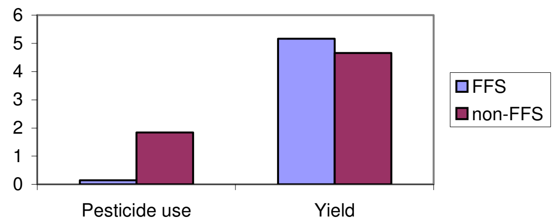

Figure A-8. Pesticide use (in number of applications season^{-1}) and yield (in t ha^{-1}) of rice by FFS farmers and non-FFS farmers.

Results:

1. A 92% reduction in pesticide spray application rate was attributed to training, from modest 1.0 application per season in non-FFS farmers to a negligible 0.1 applications per season in FFS farmers (Figure A-8). In addition, a 92% reduction in granular pesticide application rate was recorded, from 0.8 to 0.1 applications per season.
2. A 9% increase in yield was attributed to training, from 4.7 t/ha in non-FFS farmers to 5.2 t/ha in FFS farmers.
3. FFS farmers were able to mention more types of pests, types of natural enemies, crop management methods, and pesticide side-effects than non-FFS farmers. The level of knowledge was positively associated with the use of IPM methods.

Comments:

1. In addition to the data discussed above, large-scale routine monitoring data using longitudinal and latitudinal comparisons are available for 8 seasons (SPPS documents nr 17, 32, 54, 55, 66, 71, and 77). These data indicate a consistency in pesticide reductions (83-98% per season) and yield increase (6-20% per season) attributable to training. However, the routine data refer to the season in which the FFS respondents were trained (i.e. before their graduation), and as such they do not show the adoption of IPM.

2. Literacy was higher among FFS farmers (74%) than among non-FFS farmers (52%), which may have influenced the results.
3. Recall data referring to the season prior to the most recent season were omitted from this case.
4. The data on pesticide use do not differentiate between insecticides, fungicides, herbicides, etc. Hence, the data could conceal a shift between groups of pesticides or a shift between hazard levels of pesticides.

Conclusion:

Even though pesticide use in non-trained farmers was moderate (roughly 1 spray plus 1 granular application per season), training was shown to reduce pesticide use to negligible levels. Perhaps more important to farmers, the data indicate a consistent increase in yield attributable to the effect of IPM.

Source:

E.W. Larsen, M.L. Haider, M. Roy & F. Ahamed (2002) Impact, sustainability and lateral spread of integrated pest management in rice in Bangladesh. Document SPPS 73, Department of Agricultural Extension and DANIDA. See also SPPS documents nr 17, 32, 54, 55, 66, 71, and 77.

10. Bangladesh: Reduced spraying in eggplant

Project: Strengthening Plant Protection Services Project, Department of Agricultural Extension & DANIDA

Year: 1998-2002

Crop: Eggplant

Level: Self-evaluation by a project

Scope: Immediate impact of training

Objective: To study the effects of training on knowledge, pesticide use and crop yield

Methods:

1. *Tool:* Structured questionnaires
2. *Design*: A latitudinal comparison was made between FFS and non-FFS farmers at 1 year after the former group had received their training.
3. *Parameters*: Pesticide use, pesticide cost, varieties, yield, pest management practices, knowledge
4. *Sample size*: 193 FFS farmers and 167 non-FFS farmers, taken from 16 districts. In addition to training on eggplant, training on three other vegetables was evaluated (cabbage, country bean and okra), but sample sizes were small.

Results:

1. Eggplant received high frequencies of pesticide spraying by non-FFS farmers, with up to 32 spray applications per season. Pesticides were mainly targeted against *Leucinodes orbonalis*, a pyralid moth, the larva of which feeds inside fruits and shoots and is therefore shielded against contact insecticides.
2. An 80% reduction in pesticide spray frequency, from 7.0 to 1.4 applications per season, was attributed to the effect of training (Figure A-9). In addition, granular pesticides were reduced from 0.7 to 0.1 applications per season. 58% of trained farmers reported using no pesticides at all.
3. Despite reduced spraying against the main pest, trained farmers reported 25% higher yields (from 13.7 to 17.1 t ha^{-1}) than untrained farmers, presumably

attributable to a change in agronomic practices. The quality of produce was not considered.

4. Limited data obtained from training in other vegetable crops showed drastic reductions in pesticide use (82% for cabbage, 92% for country bean and 97% for okra), apparently without compromising yield weight.
5. FFS farmers were able to mention more types of pests, diseases, natural enemies, crop management methods and pesticide side-effects than non-FFS farmers. The level of knowledge was positively associated with the use of IPM methods.

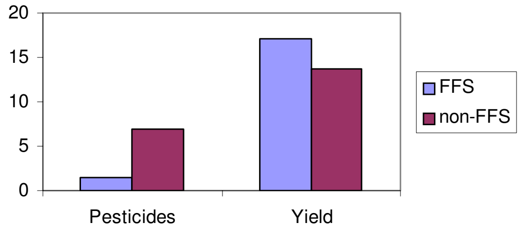

Figure A-9. Pesticide use (in number of applications season^{-1}) and yield (in t ha^{-1}) of eggplant by FFS farmers and non-FFS farmers.

Comments:

1. In addition to the data discussed above, large-scale routine monitoring data using longitudinal and latitudinal comparisons are available for 5 seasons (SPPS documents nr 20, 26, 56, 64, and 76). These data show a consistency in pesticide reductions (52-87% per season) and yield increase (9-25% per season) attributable to training. However, the data refer to the season in which the FFS respondents were trained (i.e. before their graduation), and as such they do not show the adoption of IPM.
2. Literacy was higher among FFS farmers (71%) than among non-FFS farmers (49%), which may have influenced the results.
3. The data on pesticide use do not differentiate between insecticides, fungicides, herbicides, etc. Hence, the data could conceal a shift between groups of pesticides or a shift between hazard levels of pesticides.

Conclusion:

Training caused a drastic reduction in pesticide use in eggplant. The results, in combination with monitoring data, indicated a consistent increase in yield weight attributable to the effect of training. This increase was presumably due to improved agronomic practices, although this was not discussed in the study.

Source:

E.W. Larsen, M.L. Haider, M. Roy & F. Ahamed (2002) Impact, sustainability and lateral spread of integrated pest management in vegetables in Bangladesh. Document SPPS 74, Department of Agricultural Extension and DANIDA. See also SPPS documents nr 20, 26, 56, 64, and 76.

11. Cambodia: Reduction in use of hazardous insecticides in rice

Project: Danida IPM Farmer Training Project
Year: 2003

Crop: Rice
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: To study the effect of IPM on knowledge, skills and farming practices, and to study spread of IPM

Methods:

1. *Tool:* Semi-structured questionnaires; group discussion tools; field observations
2. *Design*: Latitudinal comparison between FFS farmers, exposed farmers (i.e. FFS in the village but did not participate) and non-FFS farmers (from outside villages with comparable conditions). In addition, a longitudinal comparison was made between the season of training and 1- and 2-years after training. However, because no baseline was available, the longitudinal comparison will be omitted here.
3. *Parameters*: Pesticide use, inputs and costs, agricultural practices, yield, knowledge
4. *Sample size*: 180 FFS farmers and 174 exposed farmers selected from 12 villages (i.e. 15 FFS farmers and 15 exposed farmers per village; 2 villages from each of 6 provinces; pseudo-replicated). 174 non-FFS farmers selected from 12 villages (15 per village; 2 villages from each of 6 provinces).

Results:

1. A 43% reduction in insecticide use from 2.9 to 1.6 applications per season was associated with training; for pesticide volume the reduction was 64%. The reduction was most pronounced for hazardous class Ia and Ib chemicals. Large differences in pesticide volumes were found between provinces.
2. Exposed farmers showed a pesticide use similar to that of non-FFS farmers. However, they appeared to select less toxic products.
3. Yield and profits were not significantly affected by training.
4. FFS respondents knew more types of beneficial organisms and alternative pest control methods, were better aware of pesticide health risks, and were more often asked for advice by other farmers, than were non-FFS respondents.
5. Despite the positive effects, it was found that FFS farmers experience much pressure from their surroundings to continue using pesticides. Hence, follow-up activities after the FFS were considered important.

Comments:

1. The data refer to the season in which half of the FFS respondents were trained (i.e. before their graduation); the other half was trained a year earlier. Therefore, it is unclear to what extend the aggregated data indicate adoption of IPM. Moreover, respondents were asked to recall their practices from one and two years earlier, which may not be accurate.
2. It was shown that FFS farmers were younger, more literate and better educated than non-FFS and exposed farmers, suggesting a possible source of bias.

Conclusion:

An apparent reduction in pesticide use was recorded; however, because part of the data refer to the season of training, it is possible that the training effect was underestimated. Within-village diffusion of knowledge and practices was limited.

Source:

B. van Duuren (2003) Report of a consultancy on the assessment of the impact of the IPM programme at field level. Integrated Pest Management Farmer Training Project, Cambodia. DANIDA, unpublished report.

12. China: IPM impact in Bt cotton

Project: China/FAO/EU Cotton IPM Program
Year: 2001-02 (and ongoing)
Crop: Bt Cotton
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: To study the impact of training in a range of fields (i.a. poverty alleviation, pesticide reduction, health, education, social capacity) for different interest groups.
Background: 100% of farmers in the study area had adopted growing of Bt cotton prior to the project.
Methods:

1. *Tools:* Structured questionnaires (supplemented with rapid appraisal techniques, case studies, secondary data, participant observation and seasonal monitoring)
2. *Design*: Longitudinal and latitudinal comparison. Three groups of farmer households were compared: (i) FFS, (ii) exposed to IPM (i.e. FFS in the village but did not participate) and (iii) non-FFS households. For each group, a baseline survey was conducted early 2001 to recall data from 2000, IPM training was conducted in 2001, and a post-survey was done in 2002 referring to the 2002 season. The selection of respondents involved a two-step procedure: (i) 50 respondents were sampled village^{-1} group^{-1} and (ii) out of these, 20 were selected village^{-1} group^{-1} such that a similar background on land size, education and production conditions was obtained across groups.
3. *Parameters*: Knowledge; pesticide use; agronomic; yield; income; inputs
4. *Sample size*: 60 FFS farmers, 60 exposed farmers (20+20, resp., from each of 3 villages; pseudo-replicated), and 60 non-FFS farmers (20 from each of 3 villages). All villages were in Lingxian county.

Results:

1. FFS farmers reduced insecticide spraying from 6.3 to 3.1 applications season^{-1} after training, whilst non-FFS farmers reduced spraying from 6.3 to 5.8 applications season^{-1} during the same period. For insecticide amount, the reduction was from 7.4 to 1.3 kg ha^{-1} in FFS farmers versus 4.4 to 4.0 kg ha^{-1} in non-FFS farmers (Figure A-10). Moreover, there is evidence that FFS farmers used relatively fewer hazardous class I chemicals than non-FFS farmers.
2. After the training season, FFS farmers increased their yield by 16% (and their income from cotton by 20%), compared to a 2% yield increase (9% increased income) in non-FFS farmers during the same period.
3. Exposed farmers reduced their spraying frequency by 46% and their insecticide volume by 78%, but unlike in FFS farmers no clear yield increase was observed. This suggests that diffusion was strong for insecticide use, but not for other practices that affect yield.

Comments:

1. The background on land size, education and production conditions was similar between the three groups, justifying a comparison. Moreover, longitudinal data available for each group improved the resolution of the effect attributable to training.
2. However, the number of true replicates was small. This is relevant because there were clear differences between FFS and non-FFS villages in seed rates, varieties and fertilizer inputs prior to training. The small number of villages taken from one county furthermore raises the question to what extent the results are representative of the overall program.

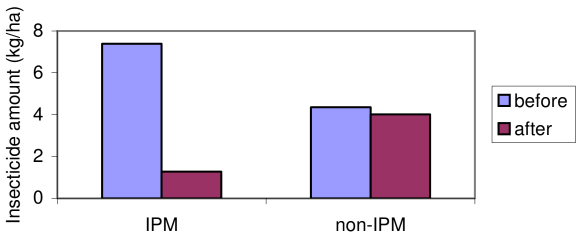

Figure A-10. Insecticide amounts used by FFS farmers and non-FFS farmers, before and after the FS season.

Conclusion:

Despite small sample size, the data show a convincing effect of training on insecticide use, which readily diffused among villagers.

Source:

National Agro-technical Extension and Service Center (2003) Report on impact assessment of China/EU/FAO Cotton IPM Program in Shandong Province, P.R. China. Unpublished Report, Ministry of Agriculture, Beijing.

13. China: Evidence of continued learning after the FFS

Project: FAO-Intercountry Program
Year: 1995-1996
Crop: Rice
Level: External evaluation
Scope: Immediate impact of training
Objective: To compare the development of learning concepts in two types of field-based training

Methods:

1. *Tool:* Structures questionnaires
2. *Design*: Evaluation of farmers understanding of agroecosystem concepts before training, immediately after training, and one year later. This longitudinal comparison was done for two treatments: training focusing on ecosystem analysis (i.e. FFS) and training focusing on pest identification, thresholds and pesticide choice (so-called 3-Pests-3-Diseases training; 3P3D).
3. *Parameters*: Agroecosystem concepts (i.e. the consistency of answers to three related questions); pesticide applications; yield

4. *Sample size*: 1 village for each treatment; 10 km distance between villages; total 45 farmers (pseudo-replicated)

Results:

1. Immediately after training, farmers had similar concepts in both treatments, but one year later, FFS graduates had increased their concepts whereas the 3P3D graduates had reduced their concepts (Figure A-11).
2. Insecticide use one year after training was lower for FFS graduates (2.2 applications per season) than for 3P3D graduates (3.1). No yield difference was found.

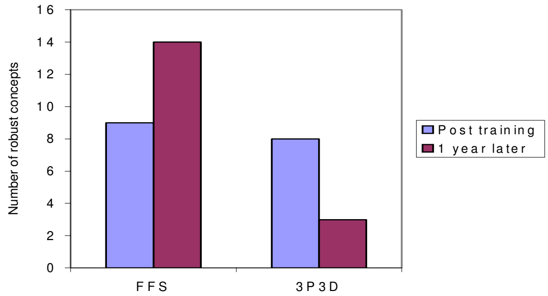

Figure A-11. Comparison between FFS and 3P3D training in the number of respondents with robust concepts immediately after training and one year later.

Comments:

Small sample size and pseudo-replication render data on spraying and yield weak.

Conclusion:

However small the study, it recorded that continued learning takes place following the discovery-learning approach of the FFS. In contrast, the effect of the message-based approach (3P3D) appeared to erode in the course of time.

Source:

J. Mangan & M.S. Mangan (1997) A comparison of two IPM training strategies in China: The importance of concepts of the rice ecosystem for sustainable insect pest management. Agriculture and Human Values 15, 209-221

14. Philippines: Strong retention but slow diffusion of FFS knowledge

Project: Kasakalikasan
Year: 1995-2000
Crop: Rice
Level: External evaluation
Scope: Immediate impact of training
Objective: To study knowledge retention and farmer-to-farmer spread of FFS-acquired knowledge and practices

Methods:

1. *Tool:* Structured questionnaires
2. *Design*: In a survey in 2000, knowledge on agriculture and pest management was compared between old (> 5 yrs ago) and new (< 5 yrs ago) FFS

graduates. Also, knowledge was compared between FFS farmers and non-FFS farmers, and between exposed and non-exposed farmers.

3. *Parameters*: Knowledge scores; socio-economic parameters
4. *Sample size*: In total 308 respondents were taken from 5 FFS and 5 non-FFS villages (69 FFS farmers [51 old and 18 new graduates], 89 exposed farmers (i.e. FFS in the village but did not participate), and 146 non-FFS farmers.

Results:

1. FFS farmers had significantly higher scores on agricultural and pest management knowledge than non-FFS farmers, indicating an effect of training.
2. No difference in knowledge was found between old and new graduates, suggesting that knowledge had been retained.
3. 70% of FFS farmers claimed to have shared their acquired knowledge with, on average, 1.5 farmers, one third of who resided outside the village.
4. There was no significant difference in knowledge scores between exposed and non-FFS farmers. Likewise, no difference was found between those who had received knowledge from FFS farmers and those who had not. Hence, there was no evidence of diffusion of knowledge.

Conclusion:

Although complex knowledge on agroecosystem management was retained by FFS graduates, it was not readily diffused through informal interactions.

Source:

A.C. Rola, S.B. Jamias & J.B. Quizon (2002) Do farmer field school graduates retain and share what they learn?: An investigation in Iloilo, Philippines. International learning workshop on farmers field schools: Emerging issues and challenges. Yogyakarta, Indonesia, 21-25 October 2002.

15. Sri Lanka: Cost-benefit analysis and durability of training in rice

Project: National IPM Program
Year: 2002
Crop: Rice
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: To study training impact on pesticide use and agricultural practices
Methods:

1. *Tool:* Structured questionnaires
2. *Design*: Latitudinal comparison between FFS and non-FFS sites; non-FFS sites were coupled to FFS sites to limit bias
3. *Parameters*: Pesticide use; agronomic; socio-economic
4. *Sample size*: Large (275 FFS sites; 117 non-FFS sites)

Results:

1. 23% yield increase and 41% increase in profit was ascribed to FFS
2. Insecticide use was reduced by 81% (from 2.2 to 0.4 sprays season^{-1})
3. Incorporation of rice straw to improve soil characteristics was applied by 84% of FFS farmers compared to only 31% of non-FFS farmers
4. FFS farmers visited their fields at shorter intervals allowing for timelier crop management

5. Low training costs (FFS and cost of training-of-trainers, i.e. $12 per farmer) were recovered 7-fold within a single season due to relatively high benefits
6. Training effects on insecticide use, rice straw use and yield were durable over the study period of 6½ years (Figure A-12, A-13)
7. There was evidence of diffusion of IPM within a village, but diffusion between villages was not found

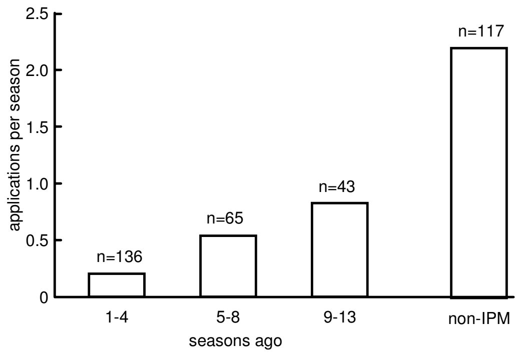

Figure A-12. Insecticide applications in 2001 by farmers trained 1-4, 5-8 and 9-13 seasons ago, and by non-FFS farmers. 'n' indicates the number of sites.

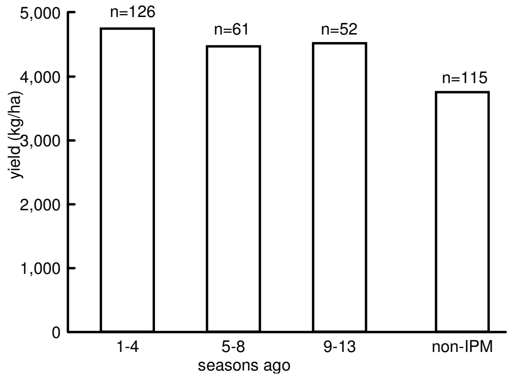

Figure A-13. Rice yield in 2001 by farmers trained 1-4, 5-8 and 9-13 seasons ago, and by non-FFS farmers. 'n' indicates the number of sites.

Comments:

1. The general profile of FFS and non-FFS farmers was fairly similar, justifying a comparison.
2. Low training costs and large benefits can make up for considerable levels of bias.

Conclusion:

Low cost of training, high benefits and durable impacts indicate that the FFS is effective in Sri Lanka. This study was coupled to a participatory evaluation, which confirmed the main findings and described additional developmental impacts of training (see Case 16).

Source:

H. van den Berg, H. Senerath & L. Amarasinghe (2002) Participatory IPM in Sri Lanka: A broad-scale and an in-depth impact analysis. FAO Programme for Community IPM in Asia. Summary published as: Farmer field schools in Sri Lanka: Assessing the impact. *Pesticide News* 61 (2003), 14-16.

16. Sri Lanka: Farmers describing multiple impacts of training

Project: National IPM Program
Year: 2002
Crop: Rice
Level: Self-evaluation by farmers
Scope: Immediate & developmental impact of training
Objective: To evaluate how the FFS has influenced our lives
Methods:

1. *Tool:* Photo reportage; writing captions
2. *Design*: 6 villages were selected by program staff according to preset criteria; 5 farmers per village were introduced to methods of self-evaluation
3. *Parameters*: Specified by participants; any immediate or developmental impacts of training
4. *Sample size*: 5 participants from each of 6 villages

Results:

1. Farmers recorded a variety of immediate or developmental impacts of training in photographs accompanied by captions (illustrated in Figure A-14).
2. Farmers described that women became more closely involved in farming, farmers started helping each other at labor-intensive times; farmers organized themselves to produce seed paddy or to market pesticide-free rice; the access to government aid improved; and farmers assumed new leadership roles in their villages.

Figure A-14. Examples of farmer-taken photographs and captions: [Left] *"This picture shows how we harvest the crop as a group. Before the FFS we used to do our own work either with family labor or by hiring labor. When you have to hire labor it is difficult to accomplish your work on time and the quality of work is also poor. After the FFS the group members have gotten so close that we help each other in activities like this."* [Right] *"We have learnt the value of green manure [...]. So we use whatever green matter is available to the crop. [Gliricidia] which grows on fences is a good green manure".*

3. Farmers described innovative agricultural methods attributed to training, and how IPM was extended to other commodities. Farmers also described how profits from IPM were used to build new houses, improve or diversify agricultural production, and provided various new business opportunities (3-wheel taxi, sewing machine, refrigerator for yogurt production, grinding machine, vegetables sales outlet, shop, pesticide-free marketing unit).

4. More impacts were recorded as villages had a longer post-FFS history, suggesting that the FFS can set in motion a development process (Figure A-15).

Comments:

Selection of villages was biased towards those known or favored by program staff. Moreover, the impacts of IPM were possibly over-stated. Nevertheless, the cases describe how local programs can potentially develop after the FFS.

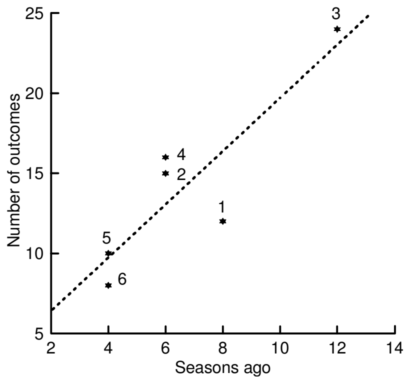

Figure A-15. Scatter plot of the number of impacts of IPM in relation to the number of seasons ago that participants followed field school training (n = 6 villages).

Conclusion:

This study by farmers indicated that the benefits of FFS training are not restricted to IPM but the learning approach potentially sets in motion the development of local programs which may affect all assets (natural, human, social, physical and financial) of rural livelihoods. The stories by farmers express a dynamism, creativity and collegiality.

Source:

H. van den Berg, H. Senerath & L. Amarasinghe (2002) Participatory IPM in Sri Lanka: A broad-scale and an in-depth impact analysis. FAO Programme for Community IPM in Asia. Summary published as: Farmer field schools in Sri Lanka: Assessing the impact. *Pesticide News* 61 (2003), 14-16.

17. Sri Lanka: Impact of IPM on occupational health

Project:	International Water Management Institute research project
Year:	2000
Crop:	Rice
Level:	External evaluation
Scope:	Developmental impact of training
Objective:	To evaluate the impact of pesticide use on occupational health of farmers.

Methods:

1. *Tools:* Structured questionnaire; blood sampling to measure activity of acetyl cholinesterase.
2. *Design*: Three groups of people were compared: (i) FFS farmers, (ii) non-FFS farmers and (iii) non-farmers. For each group, data were obtained before the *yala* season (low exposure period, as baseline) and during the *yala* season (high exposure period).

3. *Parameters*: Time spent spraying, self-reported symptoms of pesticide poisoning in the past week, acetyl cholinesterase activity in blood samples.
4. *Sample size*: 122 FFS farmers; 94 non-FFS farmers; 44 non-farmers from a fishing village.

Results:

1. The group of FFS farmers spent only one-fifth as long spraying insecticides as non-FFS farmers, indicating an impact of training on behavior. The group of non-farmers did not spray.
2. Farming was associated with higher prevalence of pesticide related symptoms (e.g. fainting, vomiting, nausea, blurred vision, headache, dizziness) and higher acetyl cholinesterase inhibition levels. 24% of all farmers suffered at least once from acute pesticide poisoning.
3. FFS farmers exhibited a significantly lower inhibition level than non-FFS farmers. However, the general inhibition level was low in all groups, indicating a modest pesticide exposure at the time of blood sampling.
4. The results did not demonstrate an association between cholinesterase inhibition and prevalence of symptoms.

Comments:

1. Not all farmers had recently been exposed to organophosphates or carbamates at the time of blood sampling which could explain the relatively low average inhibition level.
2. Acetyl cholinesterase is inhibited only by organophosphate and carbamate insecticides.

Conclusion:

Farming was associated with a high incidence of pesticide related symptoms, but FFS farmers spent considerably less time spraying pesticides than non-FFS farmers and accordingly exhibited lower cholinesterase inhibition. This indicates a positive effect of training on health.

Source:

L.A.M. Smit, B.N. van Wendel de Joode, D. Heederik, R.J. Peiris-John & W. van der Hoek. Effects of occupational pesticide exposure on symptoms and acetyl cholinesterase inhibition among Sri Lankan farmers. *Journal of Occupational and Environmental Medicine*, in press.

18. Thailand: Ongoing study in rice

Project: National Program on Integrated Pest Management
Year: 1999-2001 (and ongoing)
Crop: Rice
Level: External evaluation
Scope: Immediate impact of training
Objective: To test if farmers participate to a degree necessary to understand ecosystem principles, and to test whether farmers apply what they have learned.

Methods:

1. *Tools:* Structured questionnaire
2. *Design*: Longitudinal and latitudinal comparison. Three groups of farmers were compared: (i) FFS, (ii) exposed to IPM (i.e. FFS in the village but did not participate) and (iii) non-FFS farmers. For each group, a baseline survey was conducted before the IPM training season of 1999-2000, and a post-survey was done at the same time after one year. Exposed and non-FFS

farmers were selected according to a similarity with FFS farmers in observable characteristics with regard to the natural environment and socio-economic conditions. Drop-out analysis was conducted using a multinomial logit model.

3. *Parameters*: Knowledge; practices; attendance; pesticide cost; yield; socio-economics; income.
4. *Sample size*: 107 FFS farmers and 58 exposed farmers from 5 villages, and 76 non-FFS farmers from 5 different villages. Pseudo-replication. Paired FFS- and control-villages were taken from 5 different provinces. Data on 24 drop-outs were used for drop-out analysis.

Results:

1. An increased knowledge about pests and natural enemies was ascribed to the effect of training.
2. Trained farmers reduced their costs of insecticides by 58% and their costs of moluscicides by 59%, while costs for exposed farmers and non-FFS farmers did not change over the study period.
3. Regarding the level of drop-out: 81% of participants attended more than half of the FFS classes, half of whom missed only up to 2 classes. Provisionally, several factors limiting drop-out could be identified: regular training sessions, a priori knowledge about pests, and low opportunity costs of labor.

Comments:

1. Differences in background and characteristics between FFS farmers, exposed farmers and non-FFS farmers had not been assessed. However, prior to training, FFS candidates had more knowledge about pests and had higher insecticide costs than non-FFS farmers, which indicates dissimilarity to some extent.
2. Details on pesticide use, data on yield and other variables are not reported, but this study is ongoing.

Conclusion:

Training caused a substantial reduction in the use of insecticides and moluscicides the season after training.

Source:

Praneetvatakul, S. & H. Waibel (2003) A socio-economic analysis of farmer field schools (FFS) implemented by the National Program on Integrated Pest Management of Thailand. Paper presented at the CYMMIT impact assessment conference, 4-7 February 2002, San Jose, Costa Rica (in preparation).

19. Vietnam: Widespread insecticide reduction in rice

Project: FAO Programme for Community IPM in Asia.
Year: 1994-95
Crop: Rice
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: Measure the farm-level economic impact of training to provide feedback for program planning

Methods:

1. *Tool:* Semi-structured questionnaires

2. *Design*: Longitudinal comparison, before and after training; 1-year time lag. In 2 provinces, a control group of non-FFS farmers was added.
3. *Parameters*: Pesticide use, inputs and costs, yield
4. *Sample size*: Very large (866 farmers, 1112 field plots; 76 non-FFS farmers as comparison in 2 provinces; coverage over 7 provinces).

Results:

1. Sharp 82% reduction in insecticide use, from 1.7 to 0.3 applications per season (pooled by province, but considerable differences in levels between provinces) (Figure A-16). This decline was linked to improved farmer knowledge.
2. Fungicide use was reduced in the North (-76%), but increased in the South (+47%)
3. Farmers saved on average $8 on pesticide expenditures per season
4. Yield increase was 7% over the study period (pooled by province; -2 to 13% per province)
5. There was evidence of innovative techniques after training (e.g. low seed rates, low plant density, balanced fertilizers, delayed nitrogen application).

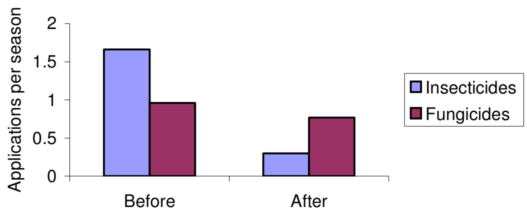

Figure A-16. Seasonal applications of insecticides and fungicides before and after training.

Comments:

1. Due to the comparison over time, yield increase could not be ascribed solely to the effect of training.
2. In the South, an increase in fungicide use was also found in non-FFS farmers, and may have been caused by a changed marketing of fungicides, changed prices or changed disease pressure.
3. It is not clear whether the latitudinal comparison with non-FFS farmers expresses a trend in time or a diffusion effect (i.e. is an increased yield or a reduced insecticide use in the control group a general trend or contagion?).

Conclusion:

Data from all seven provinces demonstrated a sharp decline in insecticide use the season following training. There was possibly an effect on yield, which would contribute more to farm-level productivity than the reduced pesticide expenditure, but this requires further study.

Source:

J. Pincus (1999) The impact of IPM farmer field schools on farmers cultivation practices in their own fields. Unpublished report, FAO Programme for Community IPM in Asia.

20. Vietnam: Success with Tea IPM

Project: Tea IPM Training and Development Programme in Thai Nguyen and Phu Tho Provinces

Year: 1999-2001
Crop: Tea
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: To study the impacts of training on practices
Methods:

1. *Tool:* Unstructured interviews supplemented with field visits
2. *Design*: Longitudinal comparison, before and one year after training.
3. *Parameters*: Pesticide use, yield, profit, new farmer initiatives
4. *Sample size*: Approx. 875 FFS farmers and 875 non-FFS farmers, taken from 35 villages (25 FFS and 25 non-FFS farmers from each of 35 villages). Non-FFS farmers were selected who had tea fields as part of the same contiguous growing area as FFS farmers. The unstructured interviews were conducted for 44 FFS and 22 non-FFS farmers.

Results:

1. Following training, a reduction in pesticide applications of 53% and 68% was reported from Thai Nguyen and Phu Tho district, respectively. Non-FFS farmers reduced spraying by 44% but still sprayed twice as often as FFS farmers.
2. In Thai Nguyen district, a slight decrease in yield was reported in FFS farmers in the year after training. However, due to reduced pesticide expenditure, profits increased by 13%.
3. In Phu Tho district, a 54% yield increase and a 54% increase in profits was observed after training. Non-FFS farmers increased their yield by 36% and their profit by 17% during the same period.
4. Half of non-FFS farmers said they had adopted at least one practice from FFS farmers, suggesting a local diffusion effect.
5. FFS farmers reported the use of improved mulching and fertilizing practices, and planted shade trees.
6. It was further reported that some FFS farmers assumed leadership roles as trainers of other farmers, and that farmers started field experimentation, tea nurseries, and small credit schemes.

Comments:

1. Details on the methods and results are in Vietnamese.
2. The reported diffusion effect between FFS and non-FFS farmers in the same contiguous areas suggests that the comparison between FFS and non-FFS farmers causes under-estimation of benefits.

Conclusion:

The results show that an ecological educational approach in tea helps farmers reduce pesticide use, while adoption of improved agronomic practices potentially increases tea yield.

Source:

Le Toan (2002) IPM impact evaluation of Training and Development of IPM in Tea V204 , Phu Tho Plant Protection Sub-Department (*in Vietnamese*). And: Luong Van Vuong (2002) IPM impact evaluation in tea, 2001. Thai Nguyen Plant Protection Sub-Department (*in Vietnamese*), as discussed in: Vietnam country report: The state of farmer education in IPM farmer field schools and follow-up activities. FAO-EU Cotton IPM Steering Committee Meeting, Chizhou, China, 2002.

21. Vietnam: Preliminary results on vegetable IPM

Project: ADDA-Phase II Vegetable IPM Project
Year: 1999-2001
Crop: Cabbage, tomato, bean
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: To study the merit of IPM practices in vegetables
Methods:

1. *Tool:* Field data obtained during FFS training
2. *Design*: Direct latitudinal comparison between small field plots with IPM and farmer practice treatments during Farmer Field School training; one block at each field school.
3. *Parameters*: Pesticide use, fertilizer use, yield
4. *Sample size*: 49 FFS on cabbage, 49 FFS on tomato, 33 FFS on bean

Results:

1. For cabbage, insecticide use could be reduced by 70% in IPM treatments compared to the farmer practice (Table A-3). Fungicide use was reduced by 40%.
2. For tomato, insecticide use was reduced by 38%, fungicide use by 47%.
3. For bean, insecticide use was reduced by 52%, fungicide use by 27%.
4. Nitrogen fertilizer was reduced by 20-26% while use of potassium fertilizer was increased by 9-34% in the three vegetable crops.
5. Yield was increased by 14% for cabbage, 27% for tomato and 14% for bean.

Table A-3. Number of insecticide applications per season in field plots under farmer-practice and IPM treatments during Farmer Field Schools. n indicates the number of FFS in each category. Vietnam, 1999-2001.

Crop	Farmer practice	IPM	n
Cabbage	5.3	1.6	49
Tomato	2.7	1.7	49
Bean	3.4	1.6	33

Comments:

1. Results were obtained during training; thus, they do not show whether IPM had been adopted by farmers.
2. The farmer-practice treatment was possibly biased by the IPM treatment, because farmer concepts about their previous practice can change during training. Consequently, the difference between treatments could have been underestimated.

Conclusion:

This preliminary result demonstrated the potential of IPM to substantially reduce pesticide use in vegetables while improved agronomic practices can help increase yield. Further evaluation is needed to study whether IPM is being adopted by vegetable farmers.

Source:

Agricultural Development Denmark Asia (ADDA) (2002), IPM Farmer Training 2nd Phase, Participatory Farmer Training in Vegetable Production in Hanoi Based on the IPM Concept. Unpublished proposal.

Other regions

22. Peru and Bolivia: Early experiences with potato FFS

Project: International Potato Institute and CARE, Pilot Project
Year: 1999-2000
Crop: Potato
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: Impact of pilot FFS training on farmer knowledge about potato crop management

Methods:

1. *Tool:* Semi-structured questionnaires
2. *Design*: Latitudinal comparison between FFS and non-FFS farmers, conducted 1 season after training
3. *Parameters*: Knowledge about late-blight management; economic benefits
4. *Sample size*: 35 FFS graduates; 35 non-participants from communities without FFS; 20 non-participants from communities with an FFS; 15 farmers who received conventional training

Results:

1. FFS training increased knowledge about the principles of late-blight management. Immediately after training, farmers had significantly more knowledge then those trained with conventional methods or than non-participants.
2. Doubling of net economic benefits from $2500 for non-participants to $5000 for FFS graduates. Accordingly, a high recovery rate of project costs was reported.

Comments:

Details on selection of FFS graduates and other comparison groups, and details on benefits, are not known

Conclusion:

The FFS model was found to increase farmer knowledge necessary for the management of late blight, and to increase farmer income. But locally appropriate training methodology needs to be further developed.

Source:

1. G. Thiele, R. Nelson, O. Ortiz & S. Sherwood (2001) Participatory research and training: Ten lessons from the Farmer Field Schools (FFS) in the Andes. Currents, 27, 4-11.
2. R. Torrez, J. Tenorio, C. Valencia, R. Orrego, O. Ortiz, R. Nelson & G. Thiele (1999) Implementing IPM for late blight in the Andes. Pp 91-99, in: Impact on a changing world. Program Report 1997-98. Lima, CIP.
3. Related study: E. Godtland, E. Sadoulet, A. de Janvry, R. Murgai & O. Ortiz (2003) The impact of Farmer-Field-Schools on knowledge and productivity: A study of potato farmers in the Peruvian Andes. Unpublished report.

23. Burkina Faso: Preliminary results on vegetable IPM

Project: IPPM FFS Project
Year: 2003
Crop: Tomato, cabbage, onion

Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: To study the merit of IPPM in vegetables
Methods:

1. *Tool:* Field data obtained during FFS training
2. *Design*: Direct latitudinal comparison between small field plots with IPPM (integrated pest and production management) and farmer practice treatments during Farmer Field School training; one block at each field school.
3. *Parameters*: Yield, pesticide use
4. *Sample size*: small (6 FFS for tomato, 4 FFS for cabbage, 1 FFS for onion)

Results:

1. Field data obtained during FFS training suggest a yield increase of 19% for tomato, 42% for cabbage and 19% for onion (Table A-4).
2. Chemical insecticides were reduced from 3-4 applications per crop in the farmer practice treatment to zero in the IPPM treatments, but botanicals (mostly neem) were used in the latter treatment.

Table A-4. Yield (t ha^{-1}) in field plots under farmer-practice and IPPM treatments during Farmer Field Schools. n indicates the number of FFS in each category. Burkina Faso, 2003.

Crop	Farmer practice	IPPM	n
Tomato	18.5	22.1	6
Cabbage	26.9	38.2	4
Onion	17.0	20.3	1

Comments:

1. Results were obtained during training; thus, they do not show whether IPM had been adopted by farmers.
2. The sample is very small.

Conclusion:

This preliminary result demonstrated the potential to reduce reliance on chemical insecticides in vegetables while increasing yield.

Source:

Souleymane Nacro (2003). Unpublished data.

24. Global comparison of five approaches to IPM extension

Countries: Indonesia, Nicaragua, Pakistan, Philippines, Thailand
Project: Swiss Agency for Development and Cooperation
Year: 1997
Crop: Various
Level: External evaluation
Scope: Immediate impact of training
Objective: Determine success factors in five IPM-extension approaches
Methods:

1. *Tool:* Secondary information; discussions with and feedback from projects
2. *Design*: Qualitative study to extract success factors from five projects; success was defined in terms of acceptance by clients, efficiency, broad impact, sustainability, and adaptability.
3. *Sample size*: 1 example for each approach

Results:

1. The study ascribed a number of success factors to the FFS that make it more promising than hierarchical approaches:
2. The FFS provides farmers with skills to make their own informed decisions, and promotes local program ownership.
3. Hands-on training enhances farmers' analytical and communication skills and promotes local experimentation.
4. A broad impact has been demonstrated through a replicable training model, farmer-to-farmer extension and a group approach.
5. The relationship between facilitator and participants is horizontal and collegial.
6. An emphasis on training of facilitators has increased competence and motivation of program staff.
7. The study concluded i.a. that, to be successful, extension on complex issues should abstain from simple boiled-down messages because these would take away local problem-solving ability and thus farmers' responsiveness to local and dynamic conditions, drawing on lessons from the past.

Conclusion:

Based on the preset definition of success, the FFS approach contains the main ingredients necessary for successful extension on complex issues such as IPM.

Source:

P. Schmidt, J. Stiefel & M Hürlimann (1997) Extension of complex issues: Success factors in Integrated Pest Management. Swiss Center for Agricultural Extension, Lindau, Switzerland.

25. Kenya: How participants viewed the FFS

Project: IPPM FFS Project
Year: 2002
Crop: Various
Level: Self-evaluation by a project
Scope: Immediate impact of training
Objective: To evaluate the benefit of training
Methods:

1. *Tool:* Structured questionnaires
2. *Design*: FFS farmers were interviewed over the period 1999-2002
3. *Parameters*: Yield, risk, profit, skills
4. *Sample size*: 400 farmers

Table A-5. Results of multiple-choice questions, indicating the percentage of respondents in each score category (n = 400).

	Disagree				Agree
As a result of the FFS, I feel that:	*Score: 1*	*2*	*3*	*4*	*5*
Profits increased	1	3	5	50	41
Yields increased	0	1	3	41	55
Skills improved	0	0	0	39	61
Risk decreased	0	6	5	49	40
Would participate again	0	1	0	21	78

Results:

Respondents overwhelmingly felt that the FFS had increased their skills, profits, and yields, and had reduced risks (Table A-5).

Comments:

The multiple-choice questions rely on the general feeling of respondents, which may overstate or understate reality.

Conclusion:

This is an example of a simple and quick evaluation using scores. The study indicated that participants generally considered the FFS useful.

Source:

K.S. Godrick & W.K. Richard (2003) Farmer field school feedback: a case of IPPM FFS programme in Kenya. Draft project report.