A Global Survey and Review of Farmer Field School Experiences

by

Arnoud Braun[1], Janice Jiggins, Niels Röling, Henk van den Berg and Paul Snijders

Report prepared for the International Livestock Research Institute (ILRI)

Final Report, 12 June 2006

Endelea
Rietveldlaan 3
6708 SN Wageningen
The Netherlands

[1] Corresponding author: arnoud.braun@farmerfieldschool.net; for authors' profiles and contact addresses, see Appendix III

Table of contents

List of abbreviations and acronyms

AAA	Armenian Agricultural Academy
AAS	Academy of Agricultural Sciences
AECI	Agencia Espanola de Cooperacion Internacional
AID	Association for Integrated Development
ARC	Agricultural Research Corporation
AREX	Agricultural Research and Extension Department (Govt of Zimbabwe)
AsDB	Asian Development Bank
ASPS	Agricultural Sector Programme Support
ATC	Advisory Training Centre
CDB	Cotton Development Board
CENTA	Centro Nacional de Tecnolgia Agropecuaria
CFC	Common Fund for Commodities
CODA	Cotton Development Authority
CORPOICA	Corporación Colombiana de Investigación Agropecuaria
COSUDE	Agenzia Suiza para el Desarrollo y la Cooperacion
DAALI	Department of Agronomy and Agricultural Land Improvement
DAE	Department of Agricultural Extension
DANIDA	Danish International Development Assistance
DPPQS	Directorate of Plant Protection Quarantine and Storage
DAALI	Department of Agronomy and Agricultural Land Improvement
DAE	Department of Agricultural Extension
DED	German Development Service
DLGs	District Local Governments
DoAE	Department of Agriculture Extension
DoA	Department of Agriculture
DoI	Department of Irrigation
DGPCQPA	Direction Générale de la Protection et du Contrôle de la Qualité des Produits Agricoles
DR	Democratic Republic
DRC	Danish Refugee Council
DSFL	Dry Season Feeding of Livestock
ETL	Economic Threshold Level
FAO	Food and Agriculture Organization of the United Nations
FEDEPAPA	Federación Colombiana de Productores De Papa
FINNIDA	Finnish Development Assistance
FLS	Farmer Life Schools
FlivS	Farmer Livestock Schools
FFS	Farmer Field School
FFSs	Farmer Field Schools
FU	Fertilizer Unit
GoC	Government of China
GoE	Government of Egypt
GoI	Government of Indonesia
GoP	Government of the Philippines
GoPa	Government of Pakistan
GoT	Government of Thailand
GO-INTERFISH	Greater Opportunities for Integrated Rice-Fish Production Systems
GRDB	Guyana Rice Development Board
GRPA	Guyana Rice Producers Association
GSMoA	Gezira State Ministry of Agriculture
HMG/N	His Majesty's Government of Nepal
IARD	Institute of Agricultural Research for Development
IARS	Ismailia Agricultural Research Station

IBAFFS	Institute for Biological Agriculture and Farmer Field Schools
ICB	International Consulting Bureau
ICM	Integrated Crop Management
ICP	Inter-Country Programme
IER	Institut d'Economie Rurale
IM	Integrated Management
INRA	National Institution for Agricultural Research
INRAA	Institut National de la Recherche Agronomique d'Algérie
INRAT	National Institute for Agricultural Research of Tunisia
IPM	Integrated Pest Management
IPPM	Integrated Production and Pest Management
ISWNM	Integrated Soil Water and Nutrient Management
ITGC	Institut Technique des Grandes Cultures
LIFE	Local Initiatives for Farmer Extension
LIFT	Local Initiatives for farmer's Training
LVV	Ministerie van Landbouw, Veeteelt en Visserij
MAFF	Ministry of Agriculture, Forestry and Fisheries
MAFFS	Ministry of Agriculture, Forestry and Food Security
MAC	Ministry of Agriculture and Cooperatives
MAESA	Ministry of Agriculture, Education and Social Action
MAG	Ministerio de Agricultura y Ganaderia
MAGFOR	Ministerio Agropecuario Forestal
MALMR	Ministry of Agriculture, Land and and Marine Resources
MAPA	Ministério da Agricultura, Pecuária e Abastecimento
MARD	Ministry of Agriculture and Rural Development
MARNDR	Ministry of Agriculture, Natural Resources and Rural Development
MASL	Mahaweli Authority of Sri Lanka
MAWMF	Ministry of Agriculture, Water
MAWRD	Ministry of Agriculture, Water and Rural Development
MAWR	Ministry of Agriculture and Water Resources
MBESC	Ministry of Basic Education, Sports and Culture
MDS	Ministério do Desenvolvimento Social e Combate à Fome
MHSS	Ministry of Health and Social Services
MoA	Ministry of Agriculture
MoAC	Ministry of Agriculture and Co-operatives
MoE	Ministry of Education
MTT	Finnish Institute of Plant Protection
MWACW	Ministry of Women Affair's and Child Welfar
NARC	National Agricultural Research Centre
NARC-Nepal	National Agricultural Research Council (Nepal)
NATESC	National Agriculture Technical Extension and Service Centre
NBC	National Biodiversity Center
ncda	no consistent data available
nda	no data available
NDRE	National Directorate for Rural Extension
NGO	Non-Government Organization
NOPEST	New Options for Pest Management
NPDP	National Potato Development Programme
NRCS	Namibia Red Cross Society
NRM	Natural Resource Management
OCHA	Office for the Coordination of Humanitarian Affairs (UN)
OHVN	Opération Haute Vallée du Niger
ORC	Ohangwena Regional Council
PDA	Provincial Department of Agriculture
PDAFF	Provincial Department of Agriculture, Forestry and Fisheries
PPD	Plant Protection Department

PPI	Plant Protection Institute
PPPS	Provincial Plant Protection Stations
PPRS	Plant Protection Research Institute
PPS	Plant Protection Station
PPSD	Provincial Plant Protection Sub-Department
PROMIPAC	Programa de Manejo Integrado de Plagas en Centroamérica
PTD	Participatory Technology Development
RADA	Rural Agricultural Development Authority
RAS	Rural Advisory Service
RMA	Risk Management Agency
RRN	Rural Reconstruction Nepal
SDC	Swiss Development Coorporation
SEARICE	South East Asia Regional Institute for Community Education
SFFP	Integrated Soil Fertility and Fertilizer Management Project
SHABGE	Strengthening Household Access to Bari (homestead) Gardening Extension
SPI	Soil Productivity Improvement
SPPS	Strengthening Plant Protection Services Project
STSS	Soil Testing and Service Section
TITAN	Trainer's Association of Nepal
ToF	Training of Facilitators
ToT	Training of Trainers
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VCC	Vietnam Cotton Company
WB	World Bank
WN	World Neighbours
WNG	World Neighbours Guatemala
WR	World Relief
WUR	Wageningen University and Research Centre

Acknowledgements

The authors wish to thank the International Livestock Research Institute (ILRI) for granting this consultancy to the team of authors. Keith Sones, Bruno Minjauw and Kim Groeneweg are specifically thanked for their comments and inputs to the drafts of this report.

Section 3 and Appenix II would not have been possible without the inputs from a larger group of Farmer Field School practitioners from around the world. Particular thanks go to Kevin Gallagher for providing contacts addresses of FFS practitioners. We appreciate the inputs from all FFS practionioners that have responded to the request for inputs that has been sent out: Clarissa Adami, Iftikhar Ahmad, Souhila Aouila, Randy Arnst, Fantahun Assefa, Joost Bakkeren, Sajeda Begum, Hein Bijlmakers, Anna Blok, Mohamed Bouhache, Margriet Bredewold, Robert W. Caudwell, Ngin Chhay, Jacqueline Chenier, Philip Chung, Naomi Commodore, Loy Van Crowder, Jens Peter Tang Dalsgaard, Soniia David, Russ Dilts, Deborah Duveskog, Mohamed Elansary, Hans Feijen, Elske van de Fliert, Marjon Fredrix, Esbern Friis-Hansen, Edson Gandarillas, Lydda Gaviria, Brice Gbaguidi, Moahamad Gomaa, Femke Griffioen, Kim Groeneweg, Paco Guevara, Daniel Gustafson, Lars Hein, Ole Hendriksen, Alfredo Impiglia, Jayasundara, Ricardo Labrada, Alida Laurense, Vyju Lopez, Jørgen Karlsen, Ganesh Kumar, Eugenio Macamo, Francesca Mancini, Dave Masendeke, Michael McGuire, Bruno Minjauw, Kharrat Mohamed, Hasimi Mzoba, Jacob Ngeve, James Okoth, Peter Ooi, Oscar Ortiz, Palaniswamy Pachagounder, Larry Paul, Neiburt Phiri, Francis Porras, Yang Puyun, Jan Rijpma, Rodnez Pierre, Alfredo Rueda, Joseph Rusike, Nune Sarukhanian, Adrian Shuhbeck, Bill Settle, Stephen Sherwood, Manzoor Soomro, Ad Spijkers, Julianus Thomas, Jan Venema, Janny Vos and her CABI team, Edith van Walsum, Handoko Widagdo, Esther Wiegers, Siebe van Wijk, Midori Yajima, Piao Yongfan, all participants of the May 2005 Kenya FFS Networking and Coordination workshop and others who have contributed but have not been mentioned.

Arnoud Braun, Janice Jiggins, Niels Röling, Henk van den Berg and Paul Snijders

Executive Summary

1. Farmer Field Schools evolved initially to address the challenge of ecological heterogeneity and local specificity in pest management, by supporting ecologically-informed decision-making by farmers that would allow them to reduce pesticide use, improve crop management and secure better profit margins.

2. Classic FFSs rely for their effects on the development of learner-centred curricula for experiential learning that takes place in the field, allowing producers to observe, measure, analyse, assess and interpret key agro-ecosystem relationships as the basis for making informed management decisions. The adult education concepts and principles that underlie the design of curricula and of the learning cycle process have proven robust in all areas where FFSs have been developed.

3. FFSs have spread rapidly to all continents since their first introduction in 1989 in Indonesia, where Integrated Pest Management FFSs were developed to help farmers deal with the pesticide-induced problem of rice brown planthoppers in irrigated rice. As the concept has spread, it has been adapted for a wide range of crops (including tree crops such as bananas, various high value crops such as vegetables and fruits, industrial crops such as cotton, cocoa). FFSs curricula and learning processes also have been developed for the livestock sector (dairying, veterinary care, poultry and integrated rice-duck systems, goat husbandry, aquaculture and fishing), for land productivity issues (land and water management, soil fertility, land degradation), for a range of social and health issues, such as food security, HIV/AIDS and vector-born diseases, and environmental issues, such as water quality. These innovations have brought new types of participants within its ambit, including school children.

4. In the course of the spread, adaptations have been made not only to suit the content and specific purpose but also in the methodology. Innovations here include community-based selection of participants, “commercial plots” that enable participants to recover (some of) the costs of running a school, farmer facilitators, spatially clustered FFFs, and a range of community-based institutional developments that capitalize on the self-confidence and leadership capacities created through the FFSs.

5. FFSs are not a universal panacea for development, nor are they a substitute for more familiar technology-centred or profit-driven approaches to rural development, such as extension, credit cooperatives, core-estates with outgrowers, farmer training centres, or the use of mass media. They share some of the features of other participatory approaches, such as Participatory Technology Development, that seek to catalyse farmer-driven development.

6. On the present evidence they seem best suited for (i) problems and opportunities requiring a location-dependent decision or management, (ii) issues that entail articulation and implementation of changes in behavior within the farm enterprise, household, and community or among institutions at varying scales of interaction, and (iii) situations that can be improved only through development and application of location-dependent knowledge.

7. Their comparative advantage relies on skilful incorporation of the following principles: (i) learner-centred, field based, experiential learning; (ii) observation, analysis, assessment, and experimentation over a time period sufficient to understand the dynamics of key (agro-ecological, socio-ecological) relationships; (iii) peer-reviewed individual and joint decision-making based on learning outcomes; (iv) individual and group capacity building.

8. They are vulnerable to loss of quality (and thus impact) particularly in terms of: (i) poor or inappropriate curriculum design; (ii) inadequate attention to the quality of the learning process; (iii) poor or inappropriate facilitation.

9. They are not meant for technology transfer or the delivery of simple messages – as such they do not have a comparative advantage and are also not cost effective for those purposes. FFS were designed to be time-bound with a built-in exit strategy: graduation. Originally the FFS itself is not meant to be sustained. However, the impact of FFS in terms of economic, social, environmental and political assets are hoped to be sustained. Therefore a livelihood analysis is perhaps more appropriate for sustainability assessments. FFS can be a “stepping stone” to self-sustained groups in some situations. The FFS format builds sustainable human and social capital needed for next step actions among farmers such as

collective marketing of produce and lobbying through farmer networks, savings groups and other associations that are sustained as independent groups, no longer registered by projects as "outputs".

10. There is a need for experimention on how the effects of FFSs might be augmented in purposeful combination with mass media, folk media, extension activities and training.

11. The impacts of FFSs have been variously measured. No agreement as yet exists as to what to measure, how to measure, or how to assess the results of the measurement of impacts. The lack of consensus arises in part because of disputes over whether to classify FFS as an educational investment or as an extension activity and whether the important impacts are those relating to change in practice, knowledge, or technology used, productivity, and profitability, or whether changes in human and social capacity, and impacts on human health and the environment, are as important. There is also no agreement as to the weight to be given to participants' own appreciation of the difference a FFS might have made to their lives, compared to objective measurements.

12. A particular concern regarding impact relates to the diffusion effect of FFSs. If the FFS is regarded as an educational investment, this could be considered the "wrong" question – what a student learns at school is not expected to diffuse widely to those who do not attend. Preliminary data suggest that information, and simple practices that can be observed by non-participating farmers, do diffuse from FFS participants, to some extent, but not the self-confident knowledge and skills in problem-solving required for the kinds of purposes for which FFSs seem best suited (see point 6, above).

13. Another concern is the sustainability of FFSs impacts. There is insufficient long time series data to assess this definitively but the weight of the evidence so far suggests a potential for significant longer-term impact.

14. This appears to be achieved principally through the institutional innovations FFS alumni are able to set in place, or bring about together with other actors, at local levels. The chances of such innovations occurring appear to be strengthened if care is given in the implementation phase to the longer term prospects (e.g. in the processes and criteria used for participant selection and site selection), follow up support is given to farmer facilitators and FFS alumni, and farmer-driven network development is encouraged.

15. There has been relatively little experience in adapting the FFS concept to the needs of livestock farmers. However, there is evidence both from practice and theory that livestock farmers in Africa, too, are facing the kinds of conditions and challenges noted in point 6 above. They thus could benefit substantially from further testing of the contribution FFSs might make to meeting producers' needs for knowledge, enterprise organisation, and the discovery of location-dependent options for development.

16. FFSs hitherto have tended to focus on bringing a limited set of actors into effective relationships and social spaces for shared learning. However, to achieve impacts over the longer term in the livestock or other sectors, as noted in point 13 above, may require changes in larger sets of relationships and institutional arrangements. Evidence does not support the assumption that "markets" will organise themselves to set in place the institutional arrangements that would support the achievement of the Millennium Goals. Overall, the institutional aspects of innovation systems have not been well appreciated in FFS programmes, nor the effects studied from this perspective. There is scope here too for further exploration of the role of FFSs from an institutional perspective, i.e. their contribution to innovation systems that meet the multiple goals desired.

17. On the other hand, it has been emphasised that the sustainable, local-level, institutionalised gains noted under point 14 above, can be negated or diminished if the framework conditions are hostile or unsupportive (e.g. policies and regulations that allow or promote the use of toxic chemicals, or that suppress citizens' self-organising capacities and initiatives, or that hold farm gate prices down). Action at other scales and hierarchical levels would be necessary to bring any required adjustment in the framework conditions.

18. A research organization such as ILRI could make a strong contribution to the further development and testing of the contribution of FFSs by: (i) supporting the design of science-based curricula and learning processes suitable for livestock farmers in specific places; (ii) contributing to the methodological development of impact assessment tools and procedures, as well as carrying out impact assessment

studies in the livestock sector; (iii) testing the (limits of the) comparative advantages of FFSs in relation to the sub-points noted in point 6 above; (iv) exploring how to amplify and augment the impacts of FFSs by skilful and purposive combination of FFSs with other investments; (v) testing how to support FFSs alumni so that local level institutional innovations arise and can be sustained; (vi) investigating the role of FFSs from the perspective of developing location-dependent innovation systems.

1. Introduction

The Farmer Field School (FFS) has become an innovative, participatory and interactive model approach for farmer education in Asia, many parts of Africa, Latin America and more recently also introduced in the Middle East, North Africa and Eastern/Central Europe. The approach has been used with a wide range of crops and has subsequently expanded to topics such as livestock, community forestry, HIV/AIDS, water conservation, soil fertility management, food security and nutrition. The aim of an FFS is to build farmers' capacity to analyse their production systems, identify problems, test possible solutions and eventually adapt the practices most suitable to their farming system. The knowledge acquired during the learning process enables farmers to adapt their existing technologies to be more productive, profitable, and responsive to changing conditions, or to test and adopt new technologies. A short description of the elements of the FFS approach is presented in Appendix I.

FFSs are spreading and adapting at an enormous speed over the globe in terms of geographical distribution and entry points/topics. However, concerns have been expressed by various implementing organisations about the relative cost of the FFS approach compared to other extension approaches, the time consuming character of the approach as well as the impact the FFS approach achieves. The management of the International Livestock Research Institute (ILRI) would like to know whether the concerns expressed by others are valid. For this reason ILRI is developing a "Livestock Farmer Field School position paper" for ILRI management and board, and other interested parties that will address the fundamental question "How and with what intent should ILRI be working on FFS?"

This review document will serve as a key background document for the above-mentioned ILRI position paper. This comprehensive review is based on formal and grey literature, and experiences of the authors[2] and a network of FFS contacts[3]. It will address the following key elements:

- Origins and evolution of FFS
- Current status of FFSs globally (in terms of geographic expansion and in terms of topics), including global experiences of livestock FFS
- FFSs in the broader education and extension picture
- Impact or lack of impact of FFSs
- Effectiveness of the FFS approach for stimulating farmer innovation
- Cognitive needs of livestock farmers
- How can research organizations, including ILRI, interact with FFSs to increase the efficiency of their innovations systems?
- What researchable questions remain to be answered in relation to livestock FFSs?

The references in this report have been numbered (see list of references in section 11). In the text each reference is referred as follows: (224) – this is reference no. 224 in the list of references (section 11).

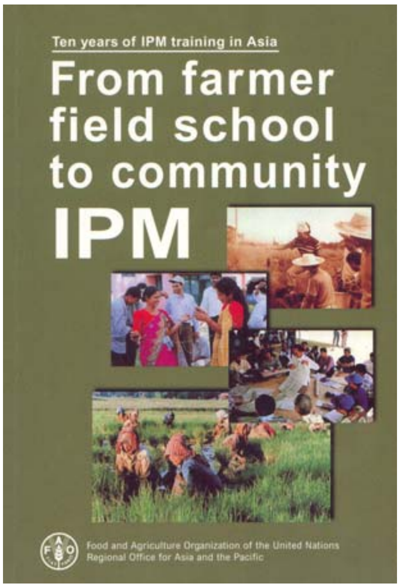
[2] The authors of this document are Arnoud Braun, Janice Jiggins, Niels Roling, Henk van den Berg and Paul Snijders. Short FFS-relevant biodata of each of the authors is provided in Appendix III.

[3] A formalised network of FFS contacts does not exist up to this point. However, at the global level the demand for such a network does exist. Based on this demand Endelea and partners have developed a proposal for funding a Global FFS Network and Resource Center. A list of contacts will become available through http://farmerfieldschool.net/. As a result of the survey carried out for this review a preliminary contact list of potential FFS national nodes has been compiled (Appendix 2, Table II.1 - contacts).

2. The origins and evolution of Farmer Field Schools

This section will briefly cover the origins and evolution of Farmer Field Schools

The FFS approach emerged out of a concrete, immediate problem. Farmers in Indonesia were putting their crops, their health and their environment at severe risk through massive abuse of highly toxic pesticides promoted aggressively by private industry and government. Pest species were becoming resistant and in some cases resurgent. What was called for was a large-scale decentralised programme of education for farmers wherein they become "experts" in managing the ecology of their fields – bringing better yields, fewer problems, increased profits and less risk to their health and environment (68). The Integrated Pest Management Farmer Field School (IPM-FFS) and a corresponding large-scale Indonesian programme were developed in response to these conditions. The genesis of integrated pest management (IPM) was a response to the emergence of problems associated with the reliance on chemical controls for insect pests by governments, extension systems and farmers. The search for solutions to these problems led to the development of a more holistic view of what constituted an agro-ecosystem and how human interventions could either enhance or disrupt one. More on IPM development in the context of the FFS approach can be found in Chapter 6 of the book "From farmer field school to community IPM" (224). FFS alumni are able to not only apply IPM principles in their fields, but also to master a process enabling them to help others learn and apply IPM principles, and organise collaborative activities in their communities to institutionalise IPM principles. A good field school process ensures these outcomes. The educational concepts underpinning the FFS approach are drawn from adult non-formal education. These concepts have been found to be relevant across the many countries and cultures in which the FFS approach has been used, and have proven to be empowering for farmers. More on these concepts that underlie the learning activities found in a field school can be found in Chapter 5 of the book "From farmer field school to community IPM" (224).



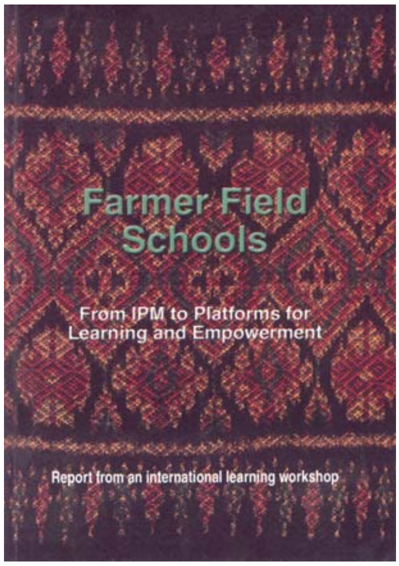
One of the biggest problems with many of the developments in IPM over the years has been the tendency to generalise and make recommendations for farmers across large and highly heterogeneous areas. This has been true for all manner of input recommendations including fertilisers, pesticides and rice varieties. This problem, ecological heterogeneity, has also severely limited the effectiveness of government monitoring and forecasting systems. All of these practical issues vary on a small spatial scale. This local specificity requires that farmers become (IPM) experts. The main crop protection approaches since the late 1960s, from the perspective of donor support, are presented in Table 1. The recommendations or decision criteria of each approach reveal a steady progression in the accommodation of ecological heterogeneity and farmer control of agro-ecosystem management.

Governments across Asia have enacted policy in support of one or more of the four approaches presented above. Some countries have supported each of the approaches over the last four decades, often using more than one approach at the same time. Countries have often adopted new approaches without abandoning old approaches, despite glaring contradictions. Presented in roughly chronological order of emergence from left to right, these four approaches place an increasingly larger burden on the user in terms of ecological knowledge, observation and analysis. Each successive approach requires more data for decision-making and the decisions made cover increasingly smaller units of area and time. This increased precision in decision-making, not surprisingly, has led to better control of insect pests and reduced use of pesticides. The FFS approach was designed to address the problem of ecological heterogeneity and local specificity by placing the control of small-scale agro-ecosystems in the hands of the people who manage them (224).

Table 1. Pest control approaches in tropical irrigated rice (224)

Calendar-based applications	Surveillance systems	ETL-based decisions by farmers	Farmers as IPM experts
Farmers, in this approach, apply insecticides based on number of days post-sowing or transplanting. Goal: prophylactic control of pest populations. Relies on broad recommendations and assumes homogeneity among planting conditions. Developed in 1960s.	Usually an activity of agriculuture departments. Based on ETLs developed at national level to be applied in widely differing conditions. Goal: insure national yield targets achieved by usiung professional pest control agents. Emerged in 1970s as pesponse to massive pest outbreaks.	The count-and-spray approach relies on use of criteria that assumes homogeneity across all local agro-ecosystems. Goal: employ control tactics at predetermined pest population levels to avoid population levels to avoid economic loss. ETLs appeared with advent of surveillance systems, promoted to farmers in 1980s.	Farmers as decision makers; decision based on analysis of agro-ecosystem[4]. Goal: farmers as IPM experts taking action based on analysis of their agro-ecosystem; pesticide-free rice production. FFSs introduced in 1990, has led to a rapid growth in number of farmer IPM experts.

The first wave of FFS was conducted in 1989 in the rice fields of Indonesia. This involved 200 FFSs in four districts of Yogyakarta initiated by the Indonesian National IPM Programme with funds from the Government of Indonesia – United States Agency for International Development (GoI-USAID) and technical assistance from Food and Agriculture Organization of the United Nations (FAO). By 1990, the Indonesian National IPM Programme scaled up and launched 1,800 FFSs for rice IPM in six provinces in Java, Sumatra and South Sulawesi. Around 1991, the pilot FFSs in IPM for rotation crops (mainly soybeans) was initiated while the FFS Programme spread out to different countries in Asia (57).



From 1991 to 1994, with support from the FAO Inter-country IPM Programme, rice IPM-FFSs spread to Bangladesh, Cambodia, China, India, Lao PDR, Philippines, Sri Lanka and Vietnam. During this period, the FFS Programme moved from its single-crop focus to include secondary or rotation crops within the rice-based systems and also vegetables in both low and highland systems. NGOs also became involved in further spreading and developing FFS approaches: CARE Bangladesh developed such things as rice-fish IPM-FFS; Thai Education pioneered "IPM in Schools"; and World Education Indonesia promoted farmer adaptive research approaches. These and other innovations including gender advocacy, health impact studies, field ecology, farmer-led action research and farmer planning were taken up by FAO and national programmes in order to strengthen and deepen the FFS model (57).

In 1990, an initiative of farmers who graduated from the

[4] In Agroecosystem Analysis (AESA) in the classical FFS, crop growth stages, presence and abundance of pests and beneficial insects, weather, soil and overall crop conditions in contrasting plots in a FFS, are recorded by farmers each week on a poster - a large piece of paper – using skethches and symbols. The purpose of the drawing is to stimulate close observation of ecological and climate features that stimulate the crop.

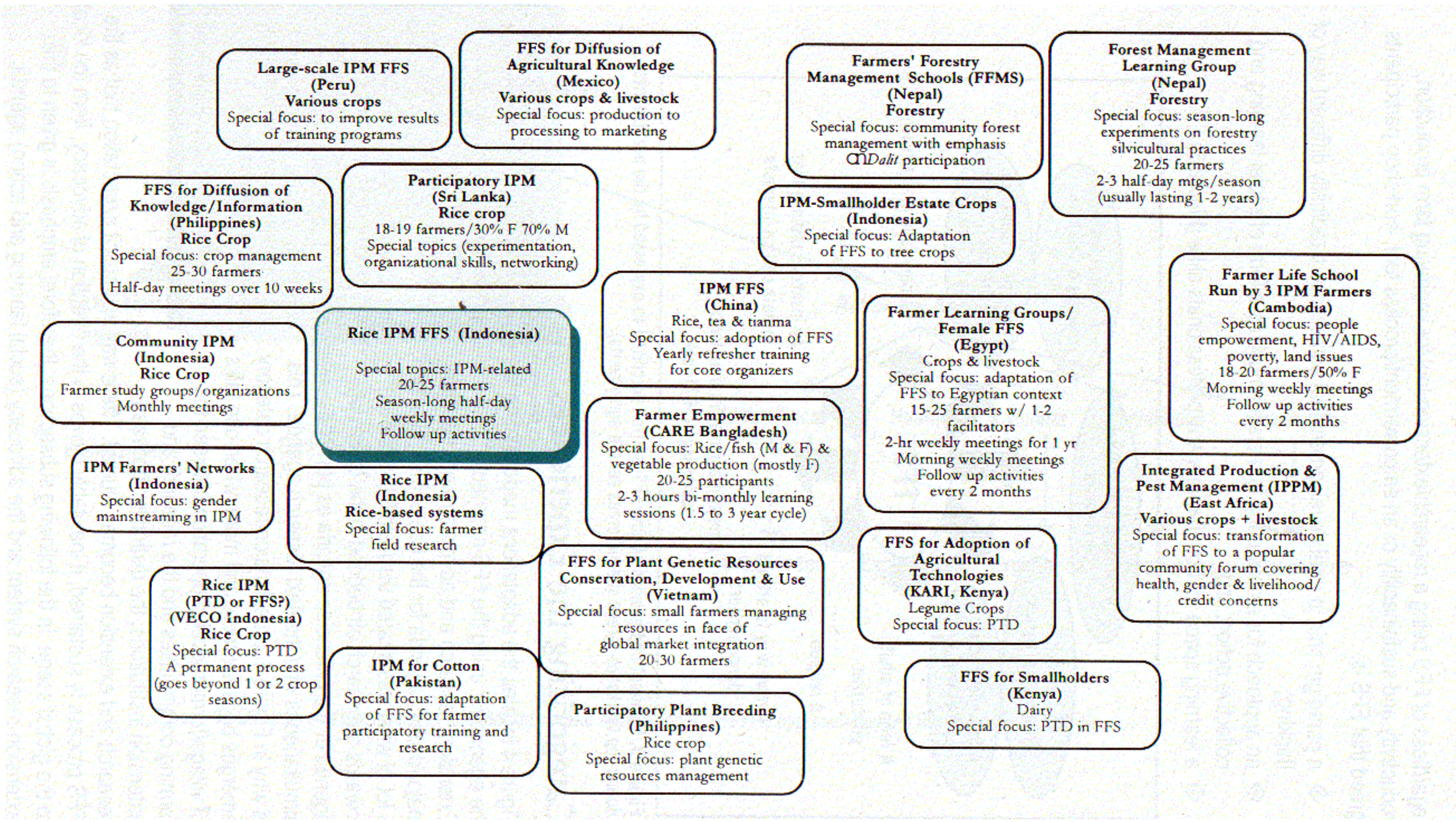


Figure 1. Different experiences in the adaptation of the FFS approach in various settings and contexts as shared during the Yogyakarta international learning workshop (**57**)

first round of FFS, resulted in the fist Farmer-to-Farmer FFS in Indonesia being started and by 1993, Farmer-to-Farmer FFSs were established in Bangladesh, Cambodia and Vietnam. From 1995 to 1999, the Farmer-to-Farmer Programme took roots in China, Lao PDR, Nepal and Sri Lanka (57) and a farmer-led FFS is now a standard element in most FFS programmes around the world.

Central to the success of FFS programmes is an appropriate topic and methodological training of the people who organise and facilitate the field schools. To be a successful FFS trainer/facilitator, one must have skills in managing participatory, discovery-based learning as well as technical knowledge to guide the groups' learning and action process (also see Appendix I). Without an adequate Training of Trainers (ToT) programme, the subsequent FFS programme will fall far of its potential (169).

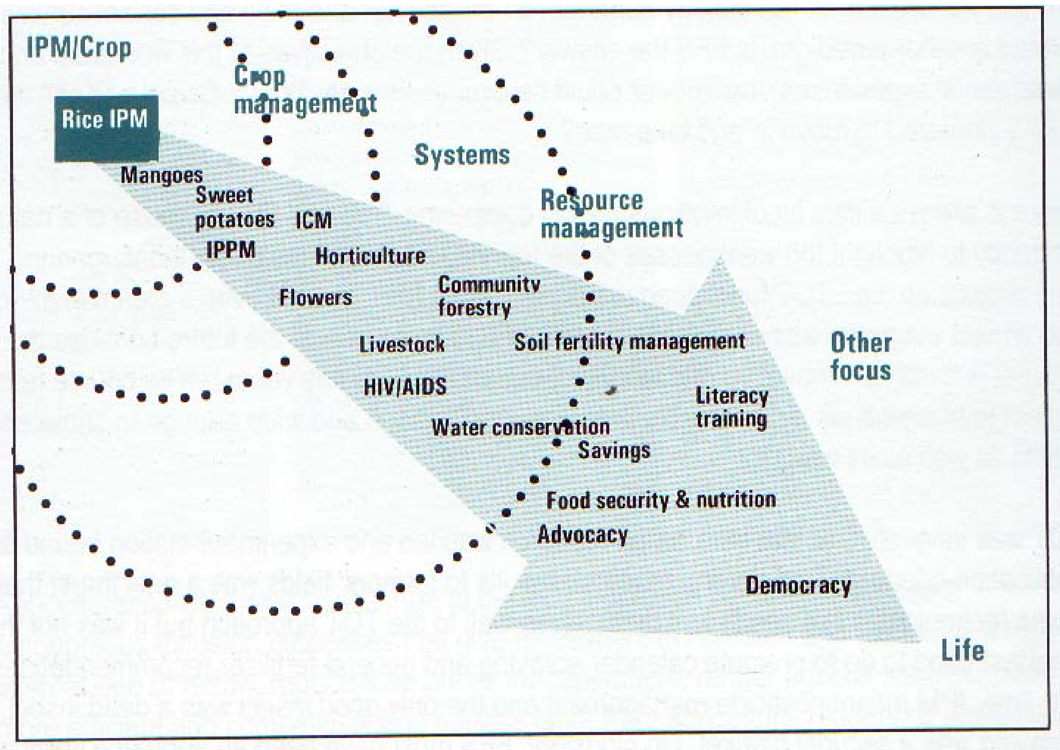


Figure 2. Different waves in adapting the FFS from a focus on a single constraint (pest management) of a single crop (rice) to an emphasis on the multiple dimensions of crop management to cropping systems to resource management to social-cultural dimensions of community life (57).

As a result of the success of the IPM-FFSs in Asia, there was a strong movement to copy and adapt the approach to other situations (see Figure 1). The concept has now developed far beyond IPM in rice. FFSs are now active in Asia, Sub-Saharan Africa, Latin America and the Caribbean, Near East and North Africa, and Central and Eastern Europe in at least a total of 78 countries (Appendix II, Table II.1). Further spread has taken place with the focus of the FFS moving from primarily rice IPM in Asia to vegetable and cotton IPM (205; 206) in Asia to potato IPM in Latin America, cotton, rice, tree crops (cocoa) and vegetable IPPM in Africa, vegetable and fruit IPPM in the Middle East, the control of Western Corn Rootworm - a quarantine pest (147) - in maize in Eastern and Central Europe and now towards mixed systems in East Africa with crops, poultry and dairy cows (164; 165; 5; 57). Agricultural topics in the context of FFSs that do not follow a specific crop developed more recently include soil fertility management (191; 250), land and water management (251; 132; 92), conservation agriculture, land degradation, agroforestry (198), food security, nutrition, fishing (24) and biodiversity (218; 179). More and more topics are outside the agricultural field, which include integrated vector management (32), community forestry (183; 184), FFSs networks for marketing (150), health and HIV/AIDS through Farmer Life Schools (286; 265; 47) and Junior Farmer Field and Life School (89; 69), FFSs for illiterates and advocacy (233).

Waves of adaptations in FFSs have occurred from a focus on a single constraint (pest management) of a single crop (rice) to an emphasis on the multiple dimensions of crop management to cropping systems to resource management to socio-cultural dimensions of community life (figure 2). This may be seen as the natural progression of the FFS; the phasing or timing by which particular FFSs would evolve to multi-dimensional and/or higher-level concern is for the groups itself to determine (57).

The report of the international FFS Learning Workshop (57) presents a good overview of FFS adaptations and institutionalisation.

3. Current Global Status of Farmer Field Schools

This section covers the global status of FFSs since its introduction in 1989 in Indonesia, with specific attention for livestock. Details for each country are presented in Appendix II. Table II.1 provides an overview of the characteristics about the implementation of FFSs in each country for the period 1989-2005.

To obtain an overview of the global status of FFSs the authors used available FFS documentation, searched the Internet and contacted key FFS practitioners globally. For each country the key characteristics of FFS implementation collected were: lead institutions, main donors, start year, major FFS topics, number of facilitators and/or trainers trained, number of farmers trained in FFS, number of FFSs implemented and main country contact person. Feedback varied largely[5], as a result of which the data presented in Table II.1 can only be used as indicative estimates. To obtain a full quantitative overview for each country a survey/questionnaire would need to be carried out in each country, as was done for Kenya (91)[6] followed by Zimbabwe (91a).
FFSs are now active in Asia (including East, South-East, South, Central and Middle East), Africa

Table 2. Cumulative number of countries that use the Farmer Field School approach

Year	No.	Cumulative	Countries
1989	1	1	Indonesia
1990	0	1	
1991	0	1	
1992	1	2	Vietnam
1993	3	5	China; Philippines; Sudan
1994	2	7	Bangladesh; India
1995	1	8	Sri Lanka
1996	4	12	Cambodia; Egypt; Ghana; Kenya
1997	6	18	Laos PDR; Mali; Pakistan; Peru; Tanzania; Zimbabwe
1998	2	20	Nepal; Thailand
1999	6	26	Brazil; Bolivia; Ecuador; Ethiopia; Uganda; Zambia
2000	5	31	Colombia; El Salvador; Honduras; Nicaragua; Senegal
2001	7	38	Benin; Burkina Faso; Malawi; Mexico; Mozambique; Niger; Nigeria
2002	7	45	Dominica; Dominican Republic; DR Congo; Haiti; Jamaica; Suriname; Trinidad and Tobago
2003	15	60	Bosnia-Herzegovina; Bulgaria; Cameroon; Croatia; Guyana; Hungary; Iran; Kyrgyzstan; Romania; Serbia and Montenegro; Sierra Leone; Slovak Republic; Syria; Turkey
2004	12	72	Algeria, Armenia; Bhutan; Gambia; Guatemala; Jordan; Lebanon; Morocco; Namibia; Palestine Territory; Togo; Tunisia; Uzbekistan
2005	3	75	Angola; Rwanda; USA

(Western, Southern, Eastern and Central), Latin America (South and Central America), the Caribbean and Eastern Europe (Table 2). It should not be surprising that FFS-type activities are conducted in Australia through RiceCheck programmes and in the USA on fruit trees (OrchardCheck); the basic idea of aligning training with the crop phenology[7] or livestock management and undertaking hands-on practical training has always been a "normal" practice in western country organizations such as Future Farmers of America (FFA) and 4-H (169). The geographic spread has been accompanied by local cultural and socio-economic adaptations by local facilitators. In the case of moving from Asia to Africa, the focus

---

[5] Some feedback was very detailed, whilst in others there was clearly data missing. For certain countries no feedback was received at all.
[6] This country information will become available on-line through http://farmerfieldschool.net/
[7] The term crop phenology refers to the growth stages of the crop.

moved from IPM to Integrated Production and Pest Management (IPPM) due to an emphasis on production and already low levels of pesticide use in most crops since structural adjustments took place.

Asia[8]

As noted in section 2, FFSs originated in Indonesia, and have subsequently spread to many institutions in Asia, including the governmental extension programmes of various countries and national and international NGOs across the continent. Application of the FFS approach beyond IPM has perhaps diversified most in Asia, with it being applied to community forest management in Nepal (183, 184), gender issues in Indonesia (92a), HIV/AIDS in Cambodia (293), women's self-help groups in India (276), and a variety of other areas.

Evolution of FFSs in Asian FAO Programmes and Community IPM

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

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

The Indonesian success was followed by expansion and innovations in Vietnam, the Philippines, Thailand, Bangladesh, India and China. Eventually, the FFS was no longer only for learning about IPM. Driven by farmer and donor demand for greater sustainability and wider impact, FFSs evolved under the leadership of Russ Dilts and the FAO Inter-Country IPM Programme towards "community IPM" under which the wider livelihood issues of IPM were explicitly developed around FFSs for education but also farmers' fora and community associations for focusing on social capital development and dealing with environmental, health and local policy issues related to pesticides and IPM (224). Although many of the "national" projects have not continued after the end of this project, national and local farmers' associations are still active, being testament of the sustainable nature of community IPM. Institutionally, NGOs have taken the place of the FAO programmes in many of the countries (e.g. FIELD Indonesia, Srer Khmer in Cambodia).

NGOs in Asia

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

[8] This section is partly adapted from Luther et al. (2005) and summarises Appendix II; details for each country are presented in Appendix II.

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

Table 3. Summary data of FFS implementation in Asia (1989-2005); for details see AppendixII, Table II.1

Country	Start Year	Facilitators/ Trainers	Farmers trained	FFS
Bangladesh	1994	~20,000	~650,000	~31,000
Bhutan	2004	15	176	11
Cambodia	1996	~2,950	~92,000	>1,550
China	1993	~2,500	~130,000	~4,000
Indonesia	1989	>30,000	>1,100,000	>48,000
India	1994	>31,000	>255,000	>8,700
Laos PDR	1997	201	ncda	~768
Nepal	1998	619	57,050	2,282
Pakistan	1997	>480	>13,000	>525
Philippines	1993	>4,000	>520,000	>14,000
Sri Lanka	1995	102	45,107	2,453
Thailand	1998	352	74,585	2,985
Vietnam	1992	7,210	930,000	33,400

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

Recent adaptations and developments

Following the rice and vegetable programmes in Asia, between 1999-2004 FAO implemented a cotton IPM programme in six countries in Asia (206). In India a number of state governments, realizing the effectiveness of FFSs and economic and social benefits to resource-poor farmers, have taken steps to institutionalise the IPM-FFS model for cotton and other crops in their mainstream extension.

A recent development in SE Asia has been the adaptation of the FFS approach for recovering biodiversity knowledge (218; 179).

Diversification of the FFS approach at the institutional level has occurred with the livestock and seed FFS programmes with DANIDA support in Vietnam (17; 61).

Sub-Saharan Africa (SSA)[9]

After a brief introduction in Sudan in 1993 and Kenya in 1995, a larger-scale launch of the approach in Africa actually started in Zimbabwe in 1997. FFSs are presently being conducted by a wide range of institutions in Africa, including FAO, DANIDA, many national governments, and numerous non-governmental organizations (NGOs). Unique challenges have arisen while attempting to apply in Africa this approach first developed in Asia. At its introduction in Africa the focus of FFSs was on production and pest management (IPPM) because of the relatively low levels of production and pesticide usage. Cotton, vegetables and tobacco are the largest recipients of pesticide treatments. For example, in cotton IPPM, most farmers conclude that they are over-using pesticides and under-using quality seed, irrigation and fertilisers. In rice IPPM as well, farmers learn to improve yields without increasing use of (or beginning to use) costly pesticides.

In Africa the problem of pesticide use was less apparent and as a result several innovations have taken place since FFSs were introduced from Asia. First is the inclusion of more health and nutrition "special topics" due to the low level of awareness by farmers about the dynamics of diseases such as HIV/AIDS

[9] This section is partly adapted from Luther et al. (2005) and summarises Appendix II; details for each country are presented in Appendix II.

and malaria that are crippling many rural communities. Basic nutrition, water boiling, intestinal parasites and women's reproductive health are included in FFSs by non-IPPM extension officers or NGO guest facilitators. Perhaps the most exciting innovation, developed by womens' groups in Western Kenya, are "commercial plots" which are group production plots adjacent to the FFS learning plots. Such commercial plots allow the groups to raise funds and become self-financing in their activities. Efforts are underway to institutionalise these commercial plots in the FFSs so that they will be largely self-financed from the outset of programs. The International Fund for Agricultural Development (IFAD) is funding a four-country effort to develop the methodology by working with these innovative FFS groups.

As a result of the interest shown by farmers in health and nutrition, FAO, Wageningen University and Research Centre (WUR) and other institutions are in the process of adapting the approach to work with vector-borne diseases (32) such as malaria and bilharzia, particularly in West Africa. The gender and development service of FAO has put a large effort in adapting the approach in the area of health, particularly on HIV/AIDS and, also working with young orphans. These so-called Farmer Life Schools (FLS) and Junior Farmer Field and Life Schools (JFFLS) have built on the experience in Cambodia (293); pilots are taking place in Kenya, Mozambique, Namibia, South Africa, Zambia and Zimbabwe (89; 69).

ILRI started adapting the FFS approach in Kenya in 2001 for similarly complex situations like animal health and production (185). As a result of the demand for livestock activities, ILRI now provides training and capacity building support in various other countries, such as Tanzania, Uganda, Pakistan, Costa Rica and others.

Table 4. Summary data of FFS implementation in SSA (1993-2005); for details see Appendix II, Table II.1

Country	Start Year	Facilitators/ Trainers	Farmers trained	FFS
Angola	2005	-	-	-
Benin	2001	125	~1500	80
Burkina Faso	2001	> 217	> 6,253	360
Cameroon	2003	58	nda	64
DR Congo	2002	848	11,281	357
Ethiopia	1999	> 500	> 2210	~571
Gambia	2004	nda	nda	nda
Ghana	1996	nda	nda	nda
Ivory Coast	nda	41	nda	126
Kenya	1996	~1,660	nda	~2300
Madagascar	nda	nda	nda	nda
Malawi	2001	32	nda	>77
Mali	1997	>179	>7,693	>430
Mozambique	2001	>158	~1,605	243
Namibia	2004	40	240	8
Niger	2001	~50	~500	25
Nigeria	2001	>90	>1,000	>57
Rwanda	2005	-	-	-
Senegal	2000	>277	>6,468	>370
Sierra Leone	2003	260	18,400	736
South Africa	nda	nda	Nda	nda
Sudan	1993	1,626	4,197	>812
Tanzania	1997	>456	>10,000	>560
Togo	2004	30	307	12
Uganda	1999	>290	nda	>500
Zambia	1999	~382	~1,900	~140
Zimbabwe	1997	166	>3,500	>480

The water and soil services of FAO, in collaboration with ICRISAT and national extension, have been especially active in Eastern and Southern Africa developing FFSs for soil husbandry, minimum tillage conservation agriculture, soil conservation, water harvesting and water moisture management in rain-fed systems (132; 92), and a project in Kenya will also start to tackle land degradation. These new field schools combine both educational and participatory technology development (PTD) methods.

In West Africa FFS developments have largely remained in deepening IPPM and diversification to other crops (cowpea by IITA; cocoa by IITA). After the introduction in West Africa in Ghana in 1996 a steady increase in the number of West African countries has occurred since, mainly thanks to a number of regional programmes.

Also in Africa, FFSs are becoming the foundation of field-based food security programmes and taking on a new role. Under IPM, farmers learn to better manage their crop for efficient use of resources (time, inputs, etc.). After the FFS, which is typically one to two seasons, farmers graduate with new skills. In fact, many groups of farmers in FFSs decide to continue their group as some type of informal or formal association as they have built trust and confidence together. This is a natural occurrence not unlike the emergence of alumni associations or the continuity of Lions or Rotary Clubs. A new trend that is emerging is marketing networks in FFSs that cooperate as a larger unit (150). FFS networks in Western Kenya consist of about 3,000 farmers per district and have won supermarket contracts for IPM tomatoes. The skills required for shipping the right quality and quantity at the right time are new to these farmer-owned networks and therefore the FFS curriculum is moving towards management topics as well.

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

South America and the Caribbean[10]

"Modernization" policies and structural adjustments throughout Latin America have dismembered classical agricultural extension and research services. This is transforming the roles of researchers and extensionists and placing greater responsibility on rural communities. While tremendously challenging for today's professionals and their institutions, improving present-day agricultural research and development has demanded approaches that are more responsive and better suited to local agro-ecological and socio-economic conditions. The efforts to introduce FFSs have led involved institutions to re-think how to organise themselves for greater and more effective agricultural innovation.

Responding to public sector collapse through collaboration

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

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

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

Strengthening research and community-based agricultural development through FFS

[10] This section is largely based on the section on Latin America in Luther et al. (2005) and summarises Appendix II; details for each country are presented in Appendix II.

In 1997, CIP and its institutional partners in Bolivia and Peru started to experiment with more participatory approaches to training (275a; 275b), incorporating some elements of the FFS approach, but not the Agro-ecosystem Analysis (AESA)[11], which many consider to be its distinguishing feature. CIP has promoted the FFS approach through a project financed by IFAD in six different countries, including Bolivia and Peru. In each country a national research institute and an NGO, or other extension organization, has been included. In 1999, to support this project, the Global IPM Facility organised a course of three months to train FFS facilitators in Ecuador, Bolivia and Peru. These facilitators then returned to their work places and implemented the FFS, incorporating other important elements of the Asian model, such as the AESA. Although many of the fundamental principles have been the same, each country has had its own strategy of implementation, depending on the demands of the farmers and the unique institutional and organizational setting of each context.

Table 5. Summary data of FFS implementation in Latin America and the Caribbean (1997-2005)[1]; for details see Appendix II, Table II.1

Country	Start Year	Facilitators/ Trainers	Farmers trained	FFS
Bolivia	1999	175	~5,000	~100
Brazil	1999	160	~1,614	89
Colombia	2000	20	nda	>25
Dominica	2002	12	67	6
Dominican Republic	2002	8	10	1
Ecuador	1999	nda	nda	nda
El Salvador	2000	127	2,387	127
Guatemala	2004	53	136	29
Guyana	2003	>12	nda	6
Haiti	2002	24	55	2
Honduras	2000	nda	nda	nda
Jamaica	2002	12	25	1
Mexico	2001	>70	>2,500	>250
Nicaragua	2000	136	2,390	108
Peru	1997	nda	nda	nda
Suriname	2002	>13	>5	>1
Trinidad and Tobago	2002	16	19	2

In Bolivia, the PROINPA Foundation and the NGO ASAR have taken the lead in the design of the training curriculum. Both institutions, in close coordination, have promoted FFSs in different communities. In Peru, the NGO CARE has been responsible for the first implementation of the FFS. In Ecuador, CIP and INIAP, the national agricultural research institute, have promoted the FFS approach in the most important potato producing provinces through a network of local institutions. More recently, FAO established a national FFS programme in Peru that has effectively scaled-up IPM throughout the country. FFSs have also spread to Colombia, with the leadership of CORPOICA and FEDEPAPA, and to Central America (El Salvador, Guatemala, Honduras and Nicaragua) and Mexico, with the leadership of Zamorano/PROMIPAC and World Neighbours, and the Rockefeller Foundation, respectively. FAO has introduced the approach in Brazil and CABI has introduced FFSs to six Caribbean countries (Dominica, Dominican Republic, Haiti, Jamaica, Suriname and Trinidad and Tobago); this probably resulted in more interest in the approach in Suriname, which now has a joint FFS project with Guyana on rice and aquaculture. Eight years after its introduction, the FFS approach has become well established throughout Latin America (Table 5).

Similar to the African experience, the practice of FFSs in Latin America brought a number of innovations to the methodology as a result of lessons learned in Asia and the unique farming systems and ecologies, institutions, and politics of the region. Introducing FFSs to Latin America required more than just a re-writing of extension manuals. Partner organizations were generally hesitant to blindly accept external ideas, but they were willing to explore common principles among successful IPM work and to adapt local methods. For example, after agreeing on the benefits of "discovery learning", local extensionists took to heart the re-design of their activities to create a new extension guide (see 229a). The result was both a rectification of and improvement on existing experience in the region.

[11] AESA is the process during which participants of the FFS observe and analyze the field situation, based on which they make the proper management decisions.

Presently, the chief challenge is political and institutional in nature. Impact studies conducted by CIP, INIAP, and the FAO have shown important contributions to farmer knowledge and a relationship between knowledge and increased productivity (33). Other studies in market and input intensive areas have shown that FFSs has enabled farmers to significantly decrease dependence on pesticides without negatively harming production per area and in many cases improving overall productivity (22b). Despite such impressive results, without public investment in agriculture, it has been difficult for FFSs to reach more than a small group of farmers.

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

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

Table 6. Summary data of FFS implementation in the Near East and North Africa (1996-2005); for details see Appendix II, Table II.1

Country	Start Year	Facilitators/ Trainers	Farmers trained	FFS
Algeria	2004	25	74	4
Egypt	1996	>950	>2,210	~571
Iran	2003	>49	nda	>42
Jordan	2004	8	nda	7
Kyrgyzstan	2003	nda	nda	19
Lebanon	2004	6	nda	6
Morocco	2001	>130	nda	~270
Palestine Authority	2004	6	nda	11
Syria	2003	>6	nda	>18
Tunisia	2004	23	44	3
Turkey	2003	nda	nda	nda
Uzbekistan	2004	12	240	12

Near East and North Africa

In the Near East and North Africa FFSs were first introduced in Egypt in 1996. Although these projects used FFS concepts as originally developed in Asia, several modifications were made. For example, efforts to implement FFSs in Egypt have found that group dynamics activities developed in Asia do not work in the Arabic-Egyptian culture (223). Reorienting FFS facilitators from a top-down technology transfer approach to a participatory approach has been especially challenging in Egypt, and has required intensive training in the latter over a prolonged period. Overall, adapting the FFS process to local circumstances must be a collaborative activity among farmers, facilitators and project staff (223). Other countries in the region did not follow the Egyptians in introducing the approach until 2003-2005. However, the approach is now established on a small scale in Algeria, Iran, Jordan, Kyrgyzstan, Lebanon, Morocco, Palestinian Teriitory, Syria, Tunisia, Turkey and Uzbekistan, involving five major projects, four of which are on IPM and one on management of salt-affected and gypsiferous irrigated lands (Uzbekistan).

Central and Eastern Europe

In Central and Eastern Europe (CEE) the FFS approach was first introduced in seven countries in 2003 through an FAO project with the aim of exploring and supporting farmers' roles in managing an introduced pest on maize, the Western Corn Rootworm, by means of IPM, and the longer term contribution of FFSs in strengthening farmers' farm enterpise management and agro-ecosystem innovation in CEE contexts (147). An innovative feature of this experience has been the development of *risk mapping* as a tool for farm- and community-based risk management.

Two other projects have also introduced the approach in Armenia; one on rodent control through FAO funding and the other with support from USDA has triggered the emergence of an NGO that now coordinates a number of FFS projects in the country.

Table 7. Summary data of FFS implementation in Central and Eastern Europe (2003-2005); for details see Appendix II, Table II.1

Country	Start Year	Facilitators/ Trainers	Farmers trained	FFS
Armenia	2004	13	110	14
Bosnia-Herzegovina	2003	23	260	24
Bulgaria	2003	9	110	10
Croatia	2003	11	170	14
Hungary	2003	15	210	21
Romania	2003	13	130	13
Serbia and Montenegro	2003	25	385	37
Slovak Republic	2003	5	40	6

Farmer Livestock School experiences

As mentioned in the section on Asia and Sub-Saharan Africa, the major experiences in Farmer Livestock Schools comes from an ILRI project in Kenya (185) and from the DANIDA-supported Agricultural Sector Programme Support in Vietnam (17; 61). Whereas the ILRI project focused on adapting the FFS approach for animal health and production, focusing on smallholder dairy cattle, the programme in Vietnam focused on developing curricula for pig, duck and chicken farming. Both experiences are explained in detail in Box II.1 and Box II.2. Two other DANIDA-supported programmes in Benin and Senegal have been using similar approaches to FFS, including PTDs, simple AESAs and group work, in the implementation of smallholder poultry activities during 2001-2004 (pers. Comm. Jens Christain Riise; 234). Less pronounced and less documented experiences with livestock experiences in FFSs exist in Ecuador, Egypt, Guatemala, in Pakistan by CABI, in Peru and in Zimbabwe on dry season feeding of livestock and poultry FFSs (pers. comm. Dave Masendeke). As a result of the experiences in Kenya by ILRI, Farmer Livestock Schools (FlivS) are now in great demand, especially in Africa but also elsewhere. ILRI receives many requests for support and the number of FLS is expanding quickly. IFAD and the Government of Tanzania for example are considering a major FLS component for the Pastoral and Agro-pastoral Livestock Development Programme (PAPLIDEV) (pers. comm. Ide de Willebois).

4. The Broader Picture

This section discusses how FFSs fit into the broader education and extension picture; how FFS can be used as a tool for empowerment, education, innovation and extension, including comparative advantages and disadvantages for these areas of use in comparison with other approaches.

Introduction

Broadly speaking, the FFS approach can be viewed as a capacity-building investment in the sector "education, information, and training". Where the FFS fits in the spectrum of services and development support in this sector can be examined through two "windows". One focuses on the FFS in relation to approaches based on extension and training, the other on FFS in relation to farmer-centred, learning-based approaches. Both will be addressed here.

Both the "grey" and published literature must be handled with great care in making assessments of any particular approach. As van den Berg (2004) has stressed with respect to the FFS, there is no agreed framework of assessment in relation to the various approaches, nor in terms of the FFS' own performance (as an event, or a process, or an approach), no agreement on the scope of what is to be legitimately taken into account (particularly in how far (i) development impacts such as empowerment or self-organised community development, and (ii) externalities such as health and environmental impacts, should be taken into account), and no agreed assessment methodology. These cautions apply across the entire field.

Approaches based on extension and training

Approaches to innovation based on extension and training focus on what is supplied, and how it is supplied. The "problem of innovation" is then cast in terms of getting others to adopt what is on offer. Three theoretical domains provide "mental models" that have been highly influential in shaping practical actions and the design of services under this heading. These are: diffusion; adoption behaviour; and decision-making. They have been the focus of many thousands of empirical and theoretical studies worldwide over the last century, inspired by Everett Rogers and his colleagues at Michigan State University, and few new contributions to understanding are now expected in this area. A brief summary of the three domains follows.

Diffusion: an autonomous social process that "works while you sleep" (243). It is not, however, a random process, being inextricably associated with social and other characteristics. The conditions, social characteristics, limiting factors, and interventions that allow, inhibit or support diffusion processes have been clearly established, as well as the kinds of technology and information that diffuses, and the influence of the "marketing" and "packaging" of the technology and information on diffusion potential. Careful design can manipulate these factors to a large but not unlimited extent. Uncritical optimism about the power of diffusion processes underpins linear models of RD&E. Formal research is positioned as the source of new technologies and messages delivered along an organisational chain through extension services to target farmers. Diffusion processes are assumed to reduce unit costs and deliver wide impact (235). "Lumpy" technologies, which require complex changes in practices, the organisation of work, and behaviour or complex messages that require associated changes across a range of institutional relations, norms, values and behaviours do not diffuse widely (246; 247a).

Adoption behaviour: The behavioural, locational, psycho-social, and demographic profiles of adopters also have been exhaustively studied (19). Researchers of diffusion processes found that adopters of a given technology or message could be categorised in relation to time as early adopters ("progressives"), adopters, or late adopters ("laggards"). These *post-facto* categories, elicited in response to particular technologies or information, in specific contexts, came to be used *prescriptively* to identify "target" populations and their presumed readiness to adopt. Yet research meanwhile was demonstrating that slight shifts in individual circumstance, structural context, the nature or design of the technology or the way it was packaged, also shifted an individual's readiness to adopt. None-the-less, many extension practitioners continue to use this mental model to guide their practice, choice of target contacts, and the design of services (243).

Decision-making and decision support: Three basic decision rules have been established with respect to the adoption of what is supplied: an individual must want to, know how to, and be able to adopt any given technology or message. How to manipulate these three factors has been thoroughly researched, including the role of advertising (all media), special campaigns, and other "pre-disposing" approaches, as well as the role of demonstrations and open days. Group processes have been shown to strengthen the decision-making capacity of individuals and communities (but can lead to premature closure; "group think"; the undue influence of the most powerful; and can encounter problems of representation. Poorer and more remote individuals typically cannot sustain the higher transaction costs involved in group-membership). Effort to establish "knowledge, attitudes and practices" as predictors of adoption decisions has been less fruitful. This has to do with the conceptualisation of knowledge (see further section 7), and the positioning of the adopter as a passive recipient of the information and knowledge embodied in a technology or message, that is implied in linear "transfer of technology" models of innovation processes. Decision-support tools, on the other hand, have been shown to play a useful, cost-effective role, especially if they are non-prescriptive, simple, low cost, incorporate tangible actions that provide feedback on effects, allow incorporation of data from producers' own enterprises, and allow exploration of scenarios "at the extremes", i.e. if they allow the user to learn (180). Effort to build elaborate decision-support tools on the back of scientific modelling have not proven cost-effective, not least because the decision support tool tends to incorporate the assumptions of scientists' own mental models of how the world works and because, once the user has extracted the learning value, the tool quickly become redundant (163).

In the frame sketched above, the following models are among the most common. The *Training and Visit* system of extension can be seen as a modification that rationalises management of the linear, transfer model, strengthens diffusion potential through group interaction and, by eliciting feedback flows of information from end users to researchers, allows adaptation of what is supplied. *Supervised credit schemes,* often tied to fixed input packages and/or marketing outlets, attempt a more comprehensive provision of services. Typically they target those who are assumed to be "progressive early adopters", in the expectation that the supplied practices and technology will diffuse to others – and cost recovery from the financially viable will sustain the credit line. Yet "progressives" typically are the better-off (thus less deserving of subsidised credit), educated and well-connected (who thus can avoid repayment), while the packages are typically not well-adapted to poorer farmers' needs or circumstances. *Core estates-with outgrowers* close the loop between production and sale in a system of managed inter-dependence. They can shift small holders from subsistence to cash cropping of the target commodity but profit

Box 2. Differences in technology diffusion, adotion and decision-making

Theories of diffusion, adoption behaviour, and decision-making offer a certain and successful basis for certain kinds of agricultural modernisation. The accompanying models of innovation are efficient and effective if, and only if, the many and critical limitations and conditionalities are understood and observed in practice. They contribute only marginally to the creation of strong, independent and organised farmers and neglect almost wholly the organisation of the multi-sided institutional development beyond the farm gate that is necessary to create a vibrant, competitive farming sector.

It has been shown that "lumpy" technologies or complex messages that require associated changes across a range of institutional relations, norms, values and behaviours do not diffuse widely (246; 247a).

If simple messages, and simple technologies, are required to deal with straightforward problems in largely homogenous landscapes, and among largely homogenous populations, cost-effective options are available to guide extension and communication practice.

considerations on the part of the organising interest typically hold farmers' incomes and opportunities below what is required for sustained development. More recent *supermarket-led contracting* arrangements offer similar potential but also similar limitations. Farmer-owned and managed *co-operatives* can create relations that strengthen farmers' position *vis a vis* other actors in the value-added chain but co-ops are a complex organisational form that demand high management capacities. *Farmer Training Centres*, whether privately operated or state-run, by concentrating on courses that train participants in what is supplied, largely in a classroom setting, can impart skills, share technologies, and certify practitioners and service providers but they contribute only marginally to transformational change, while carrying high overhead costs and inflexible staffing.

Learning-based approaches

Learning-based approaches seek to address four elements of sustainable development (138) neglected or only weakly addressed by the above:

- the creation of strong, independent and organised farmers
- the organisation of the multi-faceted institutional development beyond the farm gate that is necessary to create a vibrant, competitive farming sector and sustain community-based livelihoods
- the strengthening or development of individual and collective capacity to benefit from multi-sourced potential for innovation, drawing on formal, informal and indigenous knowledge and experience
- take into consideration (livestock and human) health and environmental concerns and internalise these as "goods" within the farm enterprise, rather than externalising the "bad" effects of much of what has been supplied as "modern" technology.

The accompanying theories of *learning*, based on a range of foundational sciences, experiment, and in-depth empirical study, position the farmer as a cognitive agent (see further section 7).

The accompanying theories of *knowledge and knowledge creation* describe knowledge as something that is generated "between the ears" in each person's experience in confrontation with a specific environment: it follows that knowledge cannot be transferred. However, *communication about* others' knowledge can be shared (163; 162)

Systems-thinking and systems models of innovation (217) build on this foundational understanding in relation to the agent as an actor in a world that is perceived as systemic, communicating with others about perceptions of the world, which can be empirically explored and "made to speak", and thus rendered a participant in the discourse. They provide examples of applications in pasture management. *Farming Systems Research and Extension* is centrally located in this body of understanding (124; 59; 97). In practice, however, many FSR&E activities have fallen back into the linear ways of thinking and behaving that underpin "non-learning" approaches, in what often seems to have become an obsessive focus on *system diagnosis*.

Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) RRA was developed as a toolbox of methods (originating in a range of professional practices), that allow cost-effective scoping and diagnosis of complex problem situations, typically involving mixed discipline teams, and consultation with a range of stakeholders (49). PRA developed these methods to allow and support stakeholders to become co-researchers in these processes of joint fact-finding. Both RRA and PRA encompass tools and techniques that generate qualitative and quantitative results; both can, if suitably located within a rigorously designed sampling frame, be iterated across large populations to deliver generalisable data, although they are more typically used for generating rich, deeply layered information about sub-populations. RRA and PRA customarily are used to initiate and enrich the early phases of innovation approaches, but can be drawn upon at any point, as needed.

Participatory Learning and Action Research (PLAR): PLAR takes Participatory Technology Development (PTD) in a looser, but possibly also a more empowering direction, by stressing the opportunity for "double loop learning" in which participants are encouraged to observe and reflect on their own learning processes during "reflective activity" (66). PLAR builds on earlier traditions of group-based RD&E and field-based "schools". Jiggins et al. (1992) presents an example of field-based learning combined with group development and empowerment among women farmers in relation to ox-ploughing in Western Zambia. Pioneering work in the 1980s among pastoralists and nomadic herders in dryland Africa and western Mongolia, to build on indigenous veterinary and husbandry practices and social organisation, bears many of the hallmarks of PLAR, although not labelled as such at the time (27).

Farmer Participatory Research: FPR focuses on the structuring of the farmer-researcher relationship in the PTD approach. Specific forms that can be included here are: Participatory Plant Breeding, Participatory Varietal Selection, Farmer Research Groups (including the *CIALs* that have spread through South and Central America), and various mixes of these arrangements (105; 142; see also 160 for examples from industrial agricultures). The functioning and characteristics of effective FPR partnerships have also been studied (283).

Box 3. Conditions for innovation processes in the rice-duck system of Bangladesh (182)

The introduction of rice-duck enterprises in over forty villages in Bangladesh has required the development of co-operation between the livestock department (the only source of duck vaccines), the national rice research institute, NGOs and poor women farmers. The negotiation of new organizational roles and responsibilities has been essential for creating the conditions for innovation, by reducing the transaction costs and labour costs sufficiently to make the new enterprises economic. Women need access to ducklings, credit, vaccines, information, and training, at the right place, right time, and in the right mix, to be able to participate effectively. The innovation process then began with a promotional video, (which allowed the village communities to compare their own situation with the successful rice-duck systems shown in the video), and with participatory experiments and economic analyses. In the next season village vaccinators, who could earn an income by providing fee for service, were trained and village hatcheries developed. The rice-duck systems turned out to be simple to manage but required complex negotiations within the community over access to grazing land, herding responsibilities, and the production of snails and duckweed for feed. Rice producers had to agree to reduce the amount of chemicals used in the rice fields. The emergence of mongooses as predators in turn was a surprise that the women had to develop creative ways to deal with.

It should be stressed that none of the learning-based approaches preclude resort to reductionist experimental work, or other modes of innovation. The privatisation of services (287) does not change the underlying theory or lessons from practice. Highly professional private advisory agents typically move comfortably, and knowledgeably among the various approaches.

Intermediate forms of innovation systems

Chain-linked models of innovation: Kline and Rosenberg (1986) systematised a model of innovation processes in market driven R&D for industrial and commercial products in industrial countries. Familiarly known as the "chain-linked model", it builds iterative feedback from market research into each stage of a linear innovation process, and positions "science" both as a store of knowledge and as a problem-solving capacity, that can be accessed at any stage of the process. Emphasis is given to the "prototyping" of unfinished products, with a range of end users, at key stages in the process. Douthwaite (2002: 217-238), and Tecklenburg et al. (2002: 167-181) provide instances of adapted chain-linked models with reference to a number of innovations in tropical agriculture.

Box 4. Differences among learning-based approaches

The differences among learning-based approaches has to do essentially with who controls and manages the process, whose interests are taken into account, and the ways in which relationships are structured and processes unfold (182 for examples from Bangladesh, including applications in the poultry sector; see Box 3).

When applied in "recipe' fashion, participatory approaches that rely on co-generation of knowledge through shared learning become untrustworthy and can discourage further stakeholder involvement in co-learning processes.

Learning-based approaches are consistent with, and allow us to explain, the otherwise unexplainable capacity of farmers and farming communities to undertake their own agricultural and environmental modernisation and to build innovation systems (72; 281; 41).

Five element model of innovation: Early theoretical work by systems practitioners, and efforts during the 1960s and 1970s to improve rural administration capacity and performance in poor countries, led to the identification of "five element models" of innovation (140). The elements identified were: local level organisation among farmers to build "demand capacity"; development of the participants' experimental capacity; training support; resource provision; and system management. Such models recently have come back into favour, partly for the guidance they seem to offer for building collaboration between public and private actors. Smits and Kuhlman (2004) label the elements as follows: the management of interfaces; building and organising systems of discourse and interaction; providing platforms for learning and experimenting; providing platforms for strategic intelligence; stimulating demand articulation and shared development of strategies and visions. The essence of such models is to create purposeful, relevant, effective, and efficient relationships between the demand and supply sides of innovation systems.

Comparative studies

Attempts have been made to analyse and compare FFSs in relation to the various approaches mentioned above, and specifically to other ways to deliver IPM messages[12]. By far the largest number has dealt with comparisons involving IPM-FFSs.

> The strong conclusion is that choice of approach has to be related to a prior clarification of assumptions about how innovation works, the purpose of the intervention, its goals, and the context. Learning based approaches score highest when:
>
> - problem situations exhibit high diversity and complexity;
> - management options are site-specific and require informed decision-making based on understanding of principles, rather than application of recipes;
> - "empowerment' of poor, marginalised or vulnerable people is desired;
> - institutional development at local levels is sought; and,
> - reducing the costs and impacts of externalities is required.

What can we expect the FFS to achieve?

In formulating an answer to this question we must recognise that the FFS is not a "given thing": it's intrinsically protean nature means that its form is constantly in a state of adaptation, as new opportunities, contexts and needs are confronted. There thus remains considerable scope for disagreement about what we can expect "FFSs" to achieve.

None the less, the points on which almost all researchers, practitioners and commentators agree are:

---

[12] Röling and Jiggins (2003) clarified the implications for practice of the underlying theories on which extension, training and learning-based approaches are based. The strong, necessary relation between (implicit) espoused theory, and theory in use, has been further elaborated by Leeuwis (2004).

Jiggins (1993) examined in detail the characteristics of six RD&E models, the implications for practice of the choice of model, especially with reference to extension approaches and tools, RD&E roles, information outputs, educational needs, and sensitivity to gender variables, natural resource and poverty trends. Contrasts in decision-making roles, styles, frequency, and nature; institutional arrangements and who pays and who benefits, were also compared (Charts 1 through 5).

Meir and Williamson (2005) compared the relative merits of message-based vs learning-based approaches to IPM (Table 6.1:94), in relation to a number of case studies. Mangan and Mangan (1997) compared two IPM training strategies; Heong et al. (1998) studied the relative merits of FFS and communication strategies in mass diffusion of IPM messages; Rola et al. (2002) examined the limits to diffusion of IPM-FFS in terms of specific elements in the curriculum.

Jiggins (2001) examined a large number of cases from both tropical and industrial countries, of inter-active R&D in the livestock sector. van de Fliert et al. (2005) analyse farmer research teams, farmer field schools, and community IPM in relation to IPM in Asia. van Mele et al. (2005) present and analyse cases of IPM-FFS, non IPM-FFS, and adaptations to these, in combination with other approaches: linear extension, training, visual communication media. Schmidt et al. (1997) and Tripp et al. (2005) tease out success factors and limitations of IPM-FFS.

- Although often organised and delivered within - or with the assistance of – extension services, it is not an extension instrument, i.e. it is not designed or fitted for message delivery or for demonstrations of pre-determined technologies or for technology transfer. If these are the objectives, there are better, more cost-effective instruments and approaches to hand;
- The FFS is not a universal panacea. It was designed for and has its greatest impact in particular situations, for particular kinds of problems;
- The FFS learning group ("the school") as such may – but need not – choose to perpetuate itself; it is not the school that requires "institutionalisation";
- The experience can improve (human, livestock) health, and environmental quality (see section 5);
- The experience can instil an enduring interactive learning capacity that is applied to problems other than those addressed in the school and at spatial scales larger than that of the FFS – it is this capacity that the FFS experience seeks to institutionalise;
- Its wider societal impact does not rely primarily on diffusion processes. Such wider impacts come about as a result of largely self-organised processes reflecting institutionalised learning capacity, across varying spatial scales and hierarchical levels (137), or as the result of deliberate intervention to stimulate and support post-FFS community-based, area-scale interaction (119);
- Such "scale enlargement" of FFS impacts can be strengthened and promoted by careful pre-FFS selection of sites and participants, as well as by post-FFS support, such as by linking FFS alumni to each other to form district associations; by providing scientific support for the planning and execution of district-wide experiments; and by continuing to support by training and mentoring the roles of farmer facilitators in extending FFSs to more farmers;
- As long as the underlying principles of the FFS approach are thoroughly understood, FFSs can be adapted to meet the needs of a large range of content matter and circumstances. Food security, junior life schools for adolescents in heavily HIV/AIDS affected areas, entrepreneurial development and, soil fertility are among the more recent curricula.

There is also consensus on a number of points which are not inherent in the approach but which can give rise to concern in practice. These can be best seen as areas where care and improved performance are required:

- Use of the FFS for objectives and problems for which it is not (cost) effective;
- Application of the FFS approach without internalised understanding of the principles;
- Mechanical delivery of curricula – seen as "recipes";
- Curricula not adapted to the need or circumstance, or the priorities of intended participants;
- Poor facilitation;
- Weak follow up and little or no provision of support to wider scale, higher level institutionalisation;
- Physically scattered FFSs that offer little prospect of graduates interacting with each other to further build post-school institutional capacity.

The development of curricula for new topics, crops, or subjects, is hardly dealt with in the published literature (147a). Instances in the "grey" literature can be found of rice-based curricula being mechanically applied, even when rice is not the focus crop, and the maintenance of the quality of curricula as FFSs are "rolled out" in large government programmes or by farmer facilitators, has been questioned. Examples also have been documented of FFSs run as a series of one-off learning events, with little understanding of how to build a sequence of learning through the whole crop cycle. These weaknesses perhaps in part reflect the typical dominance of technically-trained expertise among the organisers of FFSs, and the relative lack of adult education support. At the same time, there are also many instances of creativity in the way that the principles have been brought into play as the FFS experience has moved beyond rice IPM. Examples include: participatory use of mapping in soil management, risk estimation, and the incidence of animal disease; the use of simple peisometers made of piping, string, and a pebble, for measuring soil water depth and testing for salination across hydrological profiles; and farmer-developed and tested data-recording and information materials.

A particular concern has been the capacity of IPM-FFSs to reach women, commensurate with their actual roles as labourers, farm family workers, and crop/animal handlers. Some programmes have invested sustained effort, as in Vietnam over more than a decade, to ensure that women's participation, at all levels of the programme, and gender issues, are satisfactorily handled (152; 153; 188). Others lag behind and this remains a concern.

Within this general prospectus, it is often heard that IPM-FFSs "failed to adapt" when transferred to Africa, and thus have not met expectations (208). This conclusion seems unwarranted, both on the basis of historical fact, and in its lack of familiarity with grey literature documentation that is capturing the fast-evolving experience. Within the space of the first two years of introduction by FAO of the Asian IPM-FFS experience into Africa, under the prompting of farmers in Zimbabwe this became "Integrated Production and Pest Management" schools, in the face of field realities and farmers' priorities. After the first wave of Training of Trainers (ToTs) conducted with the help of experienced facilitators from Asia, facilitators from Africa have taken over the start-up ToT process and given it their own accent, with exercises and materials adapted to local contexts and cultures (80). There has been an explosion of subject content, today including food security, marketing, financial services and credit management, HIV/AIDS related issues, small livestock (goats, poultry), development of the value-added dairy chain, on-farm fish ponds, soil fertility and weed management, that reflects the highly diverse mixed farming and marketing opportunities encountered. Africa has also seen pioneering efforts to introduce FFSs into commodity crop management (plantation and smallholder cocoa in Ghana; smallholder bananas in Zanzibar; smallholder cotton in various West African countries and Uganda), with experimentation still underway in the design of curricula and the technical options for a range of crops, livestock, pest, disease, soils, nutrient, and management problems.

A more specific point of contention is the effectiveness of FFSs as a "stand alone" investment in terms of transformative change at societal scale. It is evident that IPM farmers, for example, cannot for long sustain movement toward better crop protection practices in the face of heavy commercial promotion of synthetic pesticides[13], especially where this is sanctioned by – or even pushed by – governments (often in spite of their own laws, regulations, and national self-interest) (262 for an example from the cotton industry in Benin). "Food security" FFSs cannot alone alleviate hunger in conditions of prolonged drought. In other words, the full potential that the FFS offers cannot be won if the framework conditions are inimical and the mix of development policy instruments is pulling in another direction (259). Conversely, the FFS does not remove the hard necessities of confronting politically powerful interests that corrupt or block movement toward sustainable development[14].

There have been various attempts to break through these blockages, both from within the farming community, and by external support, to achieve larger scale impacts. These include:

- Self-confident graduates in certain contexts have organised themselves subsequently to negotiate higher level change. Instances include: for Indonesia, the national IPM Farmers' Association, established in 1999; Srer Khmer ("The Good Earth") established in Cambodia by farmer trainers and plant protection workers; and district-wide networks of FFS trainers and graduates that are forming in Kenya, Uganda and Tanzania. They are taking what they have learned in interesting directions: partly, of course, they are simply seeking to extend the FFS experience to more farmers, but they are also beginning to organise themselves to gain more control over processing and marketing chains; to support their members to be elected to village or local government and take on broader development roles; others are linking up with organic movements to begin to press for the creation of agro-ecological areas and group certification schemes that can gain them access to "fair trade" and other market opportunities; yet others find they can negotiate more effectively to supply supermarkets when organised as IPM groups.

---

[13] Such as subsidised pesticides, but also dirty practices, like adding pesticides to foliant feeds, free give-aways of seed or fertiliser so long as the farmer buys pesticides too, collusion between land owners and salesmen who provide kickbacks, and who then require their tenants to use pestcides, the tying of credit to compulsory purchase of input packages and other forms of corruption.

[14] Although FFSs empower farmers to be able to better confront abuses and excesses, it is unrealistic to expect local level FFS to take on corrupt, uncaring, and oppressive governments – and, after all, even in Indonesia, although thousands of farmers have experienced FFSs, this number is a drop in the ocean among the millions who have not.

- Facilitators, too, have organised to strengthen their own professional skills and provide an alternative service (for instance in Nepal, as the TITAN IPM Trainers' Association, and in Indonesia, as a registered NGO, FIELD – Farmer Initiative for Facilitating Livelihoods and Democracy).
- Other options include Community IPM, signalling post-FFS activity to tackle community-wide development concerns, build local level development leadership able to negotiate for funding with local government structures and engage in district-level planning, and to sustain district-wide farmer-led RD&E (108).
- In the Andean region experimentation is underway to link FFS graduates with people-centred "humanist" social movements (Sherwood and Paredes, pers.comm.).
- A further strategy for institutional up-scaling is to embed FFSs with non-agricultural ministries, such as the Ministry for Education, where links to school curricula and formal education institutions can be created (51). In Thailand, this is occurring through the Office of the National Primary Education Commission and in Cambodia in the form of Student Life Schools (288; 112), while in Bangladesh, an NGO – BRAC – is experimenting with such schools in its own informal rural schools programme. Sri Lanka and the Philippines are also running pilots.
- Large-scale development programmes can also provide opportunities. In Kenya (as well as in Tanzania and Mozambique), the Special Programme on Food Security has brought together the experience of FFSs on soils in Zimbabwe, Family Life Schools in Cambodia, and HIV/AIDS programming, to create Junior Farmer Field and Life Schools to cater for HIV/AIDS orphans and other vulnerable children (3; 4). In West Africa, links are under construction, with support from FAO and the Global Environment Facility (GEF), between IPM-FFSs and national or local environment authorities, for the purposes of environmental monitoring, especially of water quality in areas of heavy synthetic chemical use.

The questions of scale and of institutionalisation are critical to questions of unit cost and recurrent costs. These questions are not yet resolved (see section 5 for further discussion). However, considerable progress has been made in East and southern Africa (Kenya, Tanzania and Uganda) in supporting farmers to run semi-self-financed and self-financed FFSs (202; 121; 110; 203; 150; 180). Semi-self-financed FFSs for food crops in these cases are based on a grant mechanism paid to either local sponsoring groups or direct to farmer groups by local governments, in order to cover the salary and operational costs of the FFSs facilitators, i.e. public extension staff. The grants typically comprise both cash and materials, and are allocated against submission of a written proposal and budget; a commitment to keep receipts, bookkeeping, and accept an audit, and to assist in the training of one other group is also required. The groups in their turn maintain a group study plot through the duration of the school. In the self-financed model, the FFS includes a commercial plot. The proceeds are sold and re-invested in the group's own account. This can be and often is used in turn to finance farmer-led FFS. This self-financing model works on the basis of revolving funds. The operational costs are pre-financed and the group returns the costs in the form of an operating fee at the end of the season from funds generated by the sales from the group study plot and education fees levied on the participants. Problems of "leakage" of funds, crises brought about by failure of the rains, drought or flood, and the lack of physical security for money-holders in some areas are problematic issues but they are not unique to FFS. As a result of the introduction of the self-financed FFS model, the emergence of self-sponsered FFS in Western Kenya have also initiated. In the D.R. Congo, women-run cassava FFSs are becoming self-financed through sales of fresh and processed cassava from FFS "commercial" plots (M. Frederix, pers. comm.) Systematic evaluation of these models is currently in progress. Other financing modalities are being tried. In Ecuador, for example, some IPM-FFS graduates are linking up with supermarket chains as recognised producers of preferred traditional crop varieties, with the supermarkets beginning to invest in expansion of IPM-FFSs so as to secure guaranteed volume purchases (pers. comm. Stephen Sherwood).

5. Impact of Farmer Field Schools[15]

This section discusses the impact (or lack of impact) of FFS.

The impact of the FFS is an issue of current debate, in particular in connection with IPM. The data from a wide variety of published and unpublished sources are positive, with probable under-reporting of less positive cases and an over-enthusiastic reporting of the FFSs' merits. There have been a number of recent studies questioning the impact (e.g. 277) and the financial sustainability of the FFS. Given the substantial donor investment into FFS programmes since the 1990s, the issue of impact and cost-effectiveness is pressing.

Three studies in particular that have drawn attention are research papers funded by the World Bank. The first paper reviews the costs and farmer-to-farmer training of the National IPM-FFS programmes in the Philippines and Indonesia (231). The authors conclude that the programmes are fiscally unsustainable because the high cost of substantial up-scaling cannot be paid by the traditionally small government budgets allocated to extension services. Furthermore, the authors assert that farmer-led IPM-FFSs cannot be relied upon for achieving up-scaling with their own, non-government funding.

The cost profiles of FFS projects vary considerably, between settings and content, as well as over time (in general, costs per FFS decline as routines become established, bulk purchase of materials reduces the price, trainer skills increase, and facilitators become more experienced). Although FFS are often quoted as being expensive no general conclusions can as yet be made about the cost-effectiveness of FFSs, not least because there is no agreement about which output and outcome measures to take into account, nor about the relative cost-effectiveness of FFSs, because no case comparison exists in the literature on the costs of FFSs in comparison with other relevant farmer education approaches. For the purpose of this study a quick inventory of the costs to run an FFS was done (Table 8), not including the costs of ToTs and ToFs. Costs vary from as high as US$ 1300 in Armenia to US$ 150 in Sri Lanka per FFS; it should be noted that this can include a large variation in the number of FFS sessions per FFS.

Table 8. Costs to run a season-long FFS per country (not including ToF costs).

			Costs pers FFS (US$)			
Country	**Type of FFS**	**Year**	**Min**	**Max**	**Average**	**Source**
Armenia	vegetable-IPM, fruit, organic farming	2003	1000	1600	1300	Pers. Comm. Nune Sarukhanian
Bolivia	nda	1999	500	700	600	PROINPA (2000) Annual report
China	Vegetable, Yunnan province	2004-2005	nda	nda	426	pers. Comm Elske van de Fliert
Egypt	IPM	2005	nda	nda	318	pers. Comm. HansFeijen
Kenya	Extension-led FFS	2005	nda	nda	600	pers. Comm. Deborah Duveskog
Kenya	Farmer-led FFS	2005	nda	nda	400	pers. Comm. Deborah Duveskog
Mozambique	Food-secrity FFS	2004	600	700	650	pers. Comm. Eugenio Macamo
Nicaragua	Vegetables, grains, livestock	2004	77	249	163	pers. Comm. Francis Porras
Nigeria	Farmer-led FFS	2005	nda	nda	150	pers. comm. Anthony Youdeowei
Sri Lanka	IPVM FFS	2005	nda	nda	180	pers. Comm. Jayasundara
Thailand	rice, fruit trees, vegetables	2004	200	450	350	DOAE (pers. Comm. Aroonpol Payakaphanta)
Thailand	nda		250	500	375	pers. Comm Hein Bijlmakers
Vietnam	Livestock (pig, chicken, duck)	2004	408	624	516	Dalsgaard et al., 2005
Vietnam	Vegetables	2003-2005	nda	nda	410	Pers. Comm. Elske van de Fliert

The other two World Bank papers have questioned the effects and diffusion of the FFS experience (95; 96). These studies, analysed in van den Berg (2004), were based on a re-examination of panel survey[16] data. These were conducted in 1991 and again in 1999 in Java, Indonesia, and were focussed rather

[15] Most impact studies of Farmer Field Schools so far have focussed on IPM FFS, which is logical since impact studies look at the effects of a process, project or programme after a certain period after project or programme termination. Only IPM programmes and projects have really reached this stage.

narrowly on the pest management and yield impacts of the FFS curriculum. The studies found no long-term effect of the FFS on pesticide expenditure and yield in rice, and no diffusion of knowledge related to pest management, pesticides or improved production practices to neighbouring farmers. The authors attributed the lack of impact, as measured in these terms, to quality issues related to the large scale of the programme, the complexity of IPM, and the low share of pesticides in production costs. Despite the lack of impact in their results, the authors suggested simplifying the curriculum (implying shorter and less intensive training) in order to cut programme costs and assist the diffusion of the programme's content, regardless of the basic principles of the FFS and the purposes for which it was designed. Their suggestions seem to indicate that they view the FFSs as an overly-sophisticated transfer of technology approach, rather than an investment in farmer education, which contrasts with the view of the FFS as an investment.

There are, however, two problems with the selection of the control in this particular data-set used that, in view of the controversies that the studies have generated, we need to point out as highlighting more general problems in the assessment of FFS impacts (which we discuss further below). First, the general conditions in the FFS villages differed markedly from those in the few villages not reached with FFS by 1999 which were thus destined to serve as control. As the authors note "the FFS program focuses on more productive, better-irrigated rice production areas" (95); this could result in different production functions for FFS and control farmers. Farmers in control villages had largely rain-fed conditions and small land size, whereas FFS graduates had predominantly irrigated fields and on average double the land size[17]. The analysis attempted to correct for this flaw by adding other variables into the regression analysis, however, the bulk of variation remained unexplained, suggesting that other, not measured, parameters were important in comparing the dissimilar groups. Individual farmers were considered the sampling units in the analysis. A recent workshop on FFS impact assessment, however, noted the issue of data dependency between farmers within an FFS (e.g. due to the FFS quality, the FFS facilitator, or village-specific variables) and recommended the FFS to be taken as primary sampling unit in impact analysis. Second, the control against which the effect of the FFSs was measured was based on only four villages (not five as erroneously mentioned in the first paper). Independent observations aiming at verifying the validity of these particular control villages have indicated that FFSs have been conducted from within 1 km of each of three control villages, although not from the hamlets within the village that served as control (G. Walter-Echols, pers. comm.). Hence, considering the proximity of FFSs to the control as well as the long period between the panel surveys, a certain 'contamination' of the control is to be expected, even though in general the rate of diffusion of FFS impacts has not been as substantial as anticipated by extensionists (as we will discuss further on). Hence, the strong conclusions and generalizability of the World Bank studies are brought into question[18]. Several other, comparable studies with similar limitations of sample size but paying more attention to the selection of the control have demonstrated positive impacts on pesticide use and/or crop yield (148a; 172; 193a; 226).

Other authors have pointed to broader impact concerns, which were not taken into account in the three World Bank papers. By reducing the FFS to a means for diffusing knowledge and transferring technology (which, as noted in the previous section, the FFS is not best-suited to deliver), the authors by-pass the role of adult education in local adaptation of farming practices, social organisation (194), and in farmer empowerment (37). Further, pesticide management by means of synthetic chemicals has been shown to incur significant additional private and public costs (including costs to the environment, animal and human health, and in safety regulation of pesticide residues in food and water) (221; 228). Pretty and Waibel (2005) examine the issue of full cost valuation of pesticide use, by reviewing economic studies on pesticide benefits and exploring the valuation of externalities. They examine in detail the cost categories for four studies of full cost estimation, for China, UK, US, and Germany, and then give values to each of these. They then look at the costs and benefits of IPM, postulating four possible trajectories: A) both pesticide use and yields increase; B) pesticide use increases but yields decline; C) both pesticide use

[16] A panel survey is based on questionnaires administered to a panel of respondents, who are re-surveyed at a later point in time.
[17] Land sizes for non-FFS vs FFS graduates: 0.61 vs 1.24
[18] There has been an extensive "private" exchange of views with the authors by e-mail/over the internet, public discussions at academic conferences, and a number of publications offering empirically-grounded counter arguments are in press.

and yields decline; D) pesticide use declines but yields increase. They then plot data for yield and pesticide use (gathered through a research audit methodology, developed and published elsewhere), for 62 studies of IPM (26 in developing countries). The data cover 25.3 M ha and, directly, 5.4 million farm households. There is only one example of declining yield and increasing pesticide use, and that is precisely the IPM-FFS study in Java conducted by Feder et al. (2004). Pretty and Waibel (2005) conclude: …"the paper does not offer any plausible explanation for this result but does point out that there were administrative problems in implementing the project that was funded by the World Bank". It seems that opinion remains divided on the conclusions of the World Bank papers.

Complexity of impact evaluation

A recent study reviewed 25 impact evaluations, largely from unpublished sources[19]. They show that efforts to capture impact of the FFS have been complicated by several factors (33). There is the problem of defining what constitutes impact of the FFS. In case of a straightforward technology change, its impact and diffusion is simply measured by the level of adoption[20]. A study in Malawi has offered perceptive comments on the adaptations to conventional farmer training and extension methods that would be needed to secure poor farmers' interest in IPM and wide adoption in "typical" African rain-fed, mixed farming conditions (209). Orr (2003) offers a more negative assessment of the relevance of IPM to African smallholders, using essentially the same project data, and queries the wisdom of investing in IPM-FFSs in African conditions at all. However, others argue that the FFS is essentially an educational investment, that can be adapted to suit many purposes, and one that emphasises farmers' analytical skills and decision-making abilities rather than the adoption of practices. In this view, a broad range of impacts can be expected, including economic, health, environmental and other socio-political benefits. Moreover, impact can be identified at several levels of causation: improved knowledge and skills result in better farming practices, affecting the environment, health and livelihood situation.

Another problem in impact evaluation is the choice of the control. The selection of FFS participants or locations is potentially biased towards farmers who are privileged or motivated, or towards locations with favourable conditions. As in any group-based approach, the costs of attending group meetings – such as time, the need for some clothes - tend to deter the very poorest. Other biases may relate to the fact the men responsible for site selection and the definition of the criteria for selecting members can, consciously or not, exclude women; caste, family, ethnic, tribal and other considerations may also come into play – but these biases are hardly exclusive to the FFSs, as Chambers (1983) has noted. A number of studies have taken steps to ensure that comparison groups were similar (e.g. 257), whilst other studies have attempted to correct for dissimilar groups by adding other variables to the analysis.

The need to document broad outcomes of the FFS and the need for statistically sound data to attribute effects to the FFS presents a dilemma, considering the limited resources that are usually available to impact evaluation. Hence, most impact studies have concentrated on a few indicators of impact, missing out on other potential outcomes. The most recent in a series of workshops on IPM-FFS impact assessment in Hannover recommended that studies should measure a number of factors, including socio-political impact, but prioritise a few of them, in accordance with the objectives of the "clients" of the impact studies – while farmers are always the clients of the FFS, those commissioning impact studies tend to have a wider variety of concerns they wish to have clarified (13). It was also recommended that, to prevent interference, control villages and FFS villages should not share a common market, and to circumvent data dependency (e.g. a somewhat better educated member is likely to be male rather than female), within the FFS group, the FFS (not the farmer) should be the primary sampling unit.

[19] The reason that these impact evaluations are unpublished – as a result of which much of the good data remaining hidden to public view - is that they were conducted for the purposes of improving programme implementation rather than for academic purposes.

[20] Technology change is often the result of the informed decision-making brought about through the learning processes of the FFS – and hence a change in technology is often taken as a proxy indicator of the effectiveness of the learning process.

Natural and economic impact

Not surprisingly, most of the available impact studies are related to IPM, and the types of impact most thoroughly studied are the change in pesticide use and yield. Almost unanimously, with the exception of the study by Feder et al. (2004), studies have demonstrated drastic reductions in pesticide use as well as notable increases in yield in rice, cotton and vegetables, despite the methodological and analytical flaws in several studies, as evaluated in van den Berg (2004). In particular, major nation-wide studies in rice in Indonesia, Vietnam and Bangladesh found reductions in pesticide use ranging from 35 to 92% (187; 260; 2; 159). Also interesting are two matching studies in Sri Lanka, one independent study and an internal study, that both show the durability of the effect: farmers trained more than five years ago were still using only a third of pesticides in rice compared to control farmers (277; 31).

The most recent set of impact studies have used a robust design that combines with-without FFS and the before-after FFS comparisons, and a carefully selected control. Preliminary pooled average results from seven studies on cotton IPM in five Asian countries indicate that FFS graduates increased their income by 31% in the year after training, due to 10% better yields and 39% lower pesticide expenditure, in relation to control farmers (88). A similar study set-up in rice in Thailand showed a 50% reduction in pesticide expenditure attributable to the FFS (226). A planned follow-up of these studies will determine impact in the longer term.

In addition to FFS impact on pesticide use, there are several documented instances where improved crop husbandry practices or varietal selection promoted in the FFS resulted in higher yields (116; 104; 42).

Large variability in impact results may exist within a country, as was demonstrated in the nation-wide study in Vietnam where fungicide use was reduced in the north but increased in the south as a result of the FFS (222). Variability in impact can be caused by market forces, environmental stress, local culture and tradition, and the role of the trainer and local government.

Recent efforts to measure impacts additional to pesticide knowledge, practices, and crop yield, include:

- *The contribution of FFS investments to meet the special challenges posed by pest and disease management in crops that require phyto-sanitary action beyond individual farms.* Bruin and Meerman (2001) detail the development, implementation, and effects of FFS curricula for long-maturing clonal crops (cassava and banana) in Zanzibar. The Regional IPPM-FFS Programme in East Africa, funded by IFAD, is continuing to experiment with and adapt FFS curricula for these crops (to date, only internal project evaluation reports are available). An assessment report on the ACIAR and AusAid-funded rodent control projects in Vietnam - adoption and impact (215a), suggests how conventional training and extension approaches can capitalise successfully on prior FFS investments to achieve area-wide coverage and positive impact where coordinated action is required. For example, once FFS-trained farmers are present in the rural landscape, they can be quickly mobilised to deal with disease outbreaks, flood control, and to disseminate farmer-to-farmer “messages”.
- *Environmental impacts.* One of the first environmental impact studies (155), comparing 15 conventional, 10 IPM, and 12 organic farms in the central rain-fed cotton zone in India, using Life Cycle Analysis, a technique for documenting the flux of chemical and bio-physical processes over time, has shown that IPM practices (introduced through FFS) greatly reduces the negative environmental impacts of cotton production compared to conventional practices, with organic practices scoring best on all indices measured[21]. The practices on organic farms that contributed most to their overall performance were found to be zero use of artificial fertilisers and the elimination of burning of organic residues. The scores for pesticides, calculated by application of a standardised conversion instrument to actual recorded pesticide use, were 251, 62, and 0 per tonne respectively for the conventional, IPM, and organic farms.

[21] Only the IPM practices had been introduced through FFSs.

Human and social impact

Human and social impacts of the FFS have received relatively little attention, and are mainly limited to qualitative, mostly anecdotal data. Meaningful indicators are absent, or not agreed upon, and hence strong evidence on attribution is generally missing (13; 28).

Remarkably, in one study in Indonesia the impacts most valued by the graduates of FFSs in one area were related to human capital. The members reported increased self-regard, creativity, independence, and mutual collaboration (G. Meijerink, unpublished data). A study in China which compared the development of learning concepts in a message-based approach with FFS, showed that the effect of the message-based approach eroded after training, but in case of the FFS, learning increased in the period after training (176). This would indicate that the FFS not only increases the knowledge level, as has been repeatedly found, but that it has the potential to help farmers continue increasing their abilities.

Group dynamics and communication exercises are usually a main feature of the FFS, meant to strengthen group cohesion, maintain motivation and help participants develop organisational skills (224). Group formation is important in approaches such as IPM and Natural Resource Management (NRM), which benefit from collective management of resources over a large area. The clearest example is rat control, which is not effective at the farm level but only at the village level (100). Other examples are the management of rice stem borer pests, irrigation resources and hired labour arrangements. The impact of the FFS on the activity level of farmer groups has not been systematically studied.

A large amount of additional information on group activities is available from Indonesia. An enormous qualitative study, covering 182 designated IPM sub-districts throughout the country, recorded the existence of non-project activities spontaneously following project activities (and presumably attributable to it) and reported between two and 14 types of IPM-related activities in each sub-district (83). Non-project activities involved innovations, collective action, organization, marketing, sponsorship, and protests. In 67% of the sites, FFS alumni associations existed; in 34% of the sites, rat control drives had been organised by the former members of the FFS; in 18% of sites, farmers' protests led to the removal of pesticides from village credit packages; in 36% of sites, village sponsorship was given to promote IPM. It should be noted that project activities included not only the FFS itself but also post-FFS activities to strengthen planning for community development and networking by farmers (224) and, consequently, mixing-up of project and non-project activities may have occurred. Also, the number of farmers involved in the activities remained unknown, a weakness in the study. Nevertheless, these results suggest that continued learning, group action, and socio-political benefits triggered by the FFS were a common phenomenon in the nation-wide programme during the mid- to late-1990s. In-depth case studies from six of these sub-districts described in more detail how the FFS affected farmers' skills, status and ability and to leverage development resources from local government, and how these changes led to action and to better access to service providers (82).

Others have sought to develop or adapt methods that can capture otherwise hard to assess livelihood impacts. Seema Khot, a senior researcher working with BAIF, India, introduced participatory spider diagramming (also known as kite diagramming[22]) as an M&E tool to the IPPM FFS programme in Uganda, in the context of the GIF Mid Term Review (86). This method has since become a widely disseminated practice in East Africa and included in FFS manuals. A systematic trial of the method for the purpose of Sustainable Livelihoods Analysis has been undertaken in the central rain-fed cotton area of India, using the "double delta" sampling design. This means sampling farmers in selected villages

[22] Participatory spider or kite diagramming involves determining with participants what will be assessed – each item forms one of the axes of the web – and what each of these items mean to them, and then scoring achievement (or satisfaction) on the scale marked on each axis. The points marked on the scale are then joined up to visualise the web. The diagrams can be used to assess changes over time by superimposing the webs derived from the scores for two of more points in time. The results can be analysed using non-parametric statistical software to determine the degree of consensus among respondents as to the meaning of each axis; between-year differences can be analysed using the Wilcoxon Matched Pairs Signed Ranks Test; and discriminat analysis can be used to determine which of the scores contributes most to the differences in the diagrams of the different sets of participants involved (usually: FFS participants; non-participants in the same village; and control farmers)

before and after they have attended an FFS, farmers in the same villages but who have not attended an FFS, and farmers in the same agro-ecological zone but who supply/purchase from different market. Ethnographic software was used for visual analysis of the resulting diagrams (172). The results show significantly higher impacts across all five dimensions of sustainable livelihoods for the IPM-FFS farmers, with the gains to "human capital" being especially valued. The results also show that FFS farmers see themselves as better able to sustain, reduce, or avoid the financial and physical costs incurred by cotton farmers in poor growing seasons, and – a surprising result – the value placed by non-FFS farmers in the same villages where FFS have taken place, on the cleaner air and less toxic environment for birds and animals as a consequence of reduced spraying. The method is being currently being tested also among dryland cotton farmers in Benin.

FIELD (2001) introduced a new method, photo-visioning, to capture FFS villagers' assessments of the difference that the FFS had made to family and village life. This method has not been widely adopted, although it has been replicated as a supplementary study (31; 172). It involves giving FFS participants disposable cameras, to take pictures of the impacts they think the FFS has made to their lives, and the problems that those who have not attended may still be facing. This method has the advantage of capturing the meanings that the clients themselves give to the FFS experience.

A recent study looked at acute health impacts of pesticide use in the rain-fed central cotton zone in India. It used an established self-monitoring method for recording signs and symptoms of pesticide poisoning among male and female cotton workers (see 173 for baseline data on incidence. The recorded incidence of a range of severe acute effects was far higher than previous studies had suggested, as well as the degree of exposure of women). The study has established that FFS significantly increased farmers' awareness of pesticide use risks and the health impacts, and did contribute to a change in pesticide use practices; these effects were stronger in the villages where the first "signs and symptoms" study had been carried out (173a).

In the context of a large-scale impact study in Vietnam (222), a number of studies were carried out through the Centre for Family and Women's studies of the impacts of the Community IPM programme on women (60). These studies, and subsequent programme reports, show the percentage of women farmer participants in FFS rising from around one in ten in 1992 to around a third by 2000. Both objective measures of impact and studies of the value that men and women themselves place in women's participation have yielded positive results in terms of women's participation, women's leadership, and the effects on women's incomes and livelihoods. The sustained support of the DANIDA-funded Special Programme on Plant Protection the commitment of the national government, and the involvement of the Vietnam Women's Union, have been instrumental in this success. Other trends, however, such as the continuing migration out of farming of men, have also been a factor in bringing about this change. In other countries, both the commitment and capacity to work with large-scale social movements have been lacking, and women's participation in FFS still lag behind their actual roles in and contribution to farming.

Dissemination of impact

It is fair to assume that the analytical skills acquired through the FFS are not easily transferred to other farmers by diffusion. Unlike messages or technologies, skills cannot be readily conveyed. And easily diffusable agricultural improvements do not necessarily require an intensive educational approach such as the FFS.

Empirical studies on dissemination of FFS impacts show a mixed picture. In these studies, comparisons were made between FFS farmers, neighbouring farmers (i.e. non-participants living in the FFS village) and control farmers (outside the FFS village), which provides a measure of dissemination at the village-level under the assumption of random diffusion. This will underestimate aggregated dissemination processes, for example through channels of extended family members and direct neighbours (see section 4).

In the Philippines, FFS graduates had higher knowledge scores than non-FFS farmers, but no dissemination of knowledge was found within the village (240). Apparently, IPM knowledge, when detached from field practice, did not readily flow through informal channels. Studies from Thailand, Sri Lanka and Cambodia reported that neighbouring farmers had the same pesticide use or pesticide expenditure as control farmers, despite the presence of an FFS in their village (226; 277; 73), indicating that the practice of pesticide use did not disseminate. However in the Cambodian study, the non-FFS villagers appeared to select less toxic insecticides than control farmers, possibly because the awareness about harmful effects of certain insecticides was disseminated within the village based on simple messages that did not warrant a learning experience.

The results in cotton IPM show a somewhat different pattern. FFS graduates reduced their pesticide expenses by 39% relative to control farmers, while neighbouring farmers also showed a 26% reduction in pesticide expenditure compared to the control. This was the general trend among the seven studies in five countries. However, unlike FFS graduates who managed to increase cotton yield by 10% relative to the control, neighbouring farmers did not improve their yield in relation to the control, although they may have increased their profits because of decreased input costs. In Sri Lanka, the concept of using rice straw as a soil conditioner was more readily conveyed and acted upon by neighbouring farmers than the concept of judicious insecticide use (277).

Evidently, certain aspects of the FFS are more easily disseminated than others, depending on the simplicity and tangibility of what is conveyed. This could explain why the use of rice straw is disseminated, but practices of crop husbandry are not. The analytical skills involved in IPM (or NRM for that matter) are neither simple nor tangible. Likewise, IPM practices are not easily defined or noticed but are adaptations to local-specific conditions. Consequently, genuine IPM is not easily imitated but has to be individually learned through repeated practice and through the application of knowledge.

Interestingly, the results from Cambodia and the results on cotton IPM indicate that, to an extent, neighbouring farmers began using pesticides more judiciously. What is thus disseminated is the practice of reduced spray frequency or the message about pesticide side-effects, but probably not the critical analytical skills. The sustainability of diffused effects remains a matter of concern, if the changed behaviour is imitated but not rooted in critical analysis or the understanding of underlying reasons. This requires further study.

As discussed above, the Community IPM programme in Asia supported the spread of IPM skills through farmer-led FFS, and through facilitating local-level leadership to negotiate funding with local government. The objective of Community IPM was to institutionalise IPM at the local level through strengthened farmer groups and increased linkages with their wider community.

Institutional impacts

In several instances, FFS has provided an opening for establishing farmer-researcher linkages in farmer participatory research (see section 4). In Peru, the FFS was used to increase farmers' access to new potato clones, and involve farmers in clone selection, which reportedly resulted in a change in priority settings of researchers, facilitators and farmers, and an enhanced institutional capacity for participatory research (56). The Convergence of Sciences project, jointly led by universities in Wageningen, Benin, and Ghana, is demonstrating similar processes of institutionalisation of learning capacity among farmer-researcher-extension groups undergoing FFS-like processes (131). However, much more attention to the institutional impacts of FFS seems warranted.

Semi-self-financed and self-financed FFS in East Africa and DR Congo appear to be demonstrating capacity for self-sustaining activity and expansion but more impact data is required to confirm early reports. In Indonesia, Uganda, Tanzania and Maharashtra, India, there is evidence of local, provincial and state commitment to including FFS provision in development expenditure budgets, as one component of their agricultural modernisation plans, and as complementary to conventional extension and training approaches. The comparative benefit of these allocations has not yet been studied.

Conclusion

Despite the ongoing debate on the impact of FFS on IPM, the available data sources show a rather consistently positive picture of short- and medium-term impact, with farmers able to improve their agricultural productivity and to increase their leadership role in community-based activities. Even though negative results have probably been under-reported, and peer-reviewed papers are few, the conclusions of the only studies that showed lack of impact are unfounded. Considering the broad scope of FFS impacts and indications of their durability, investment in the FFS has clearly delivered some important results that justify the continuing interest in the approach.

Many aspects of NRM (including IPM) require skill development (not just the technologies) to adapt practices to prevailing conditions; this implies the need for education. The weakness of a focus on education and skills, however, is that the outcomes are not readily disseminated to neighbouring farmers, which restricts the achievable coverage to a minority of the farming population unless farmer-to-farmer training (and its evaluation) is given a priority. Therefore, the dilemma will remain between an equitable distribution of extension resources (but with questionable effects on adaptive management of resources and a lack of empowerment effects) and the intensive and successful education for a minority (e.g. targeted according to vulnerability or productivity criteria).

6. Addressing Cognitive Needs of Livestock Farmers

This section discusses how the education, information and extension needs of livestock famres can be addressed other than by FFS.

Integrating the body of experience with extension, information and education through using the model of the livestock farmer as a cognitive agent

In order to be short and concise, this section requires a high level of integration. The world's experience in addressing livestock farmers' cognitive needs is vast and diverse. Therefore, we have opted for an overview based on a model of the livestock farmer as a cognitive agent who pursues and adjusts his/her goals and purposes on the basis of iterating through information about the changing environment, his/her knowledge, and his/her perceived options for acting upon the environment. This model will be used as a "coat hanger" for presenting the world's experience with trying to help farmers make better decisions about their livestock enterprises.

The model of the cognitive agent explained

The model of the cognitive agent is based on fundamental research in biology (177; 45), cognitive psychology (e.g. 166) and cognitive anthropology (e.g. 133), and applied work on learning and innovation (245). This model is more useful for understanding the education, information and extension needs of livestock farmers than the model of an economic agent who seeks to optimise the satisfaction of preferences through rational choice.

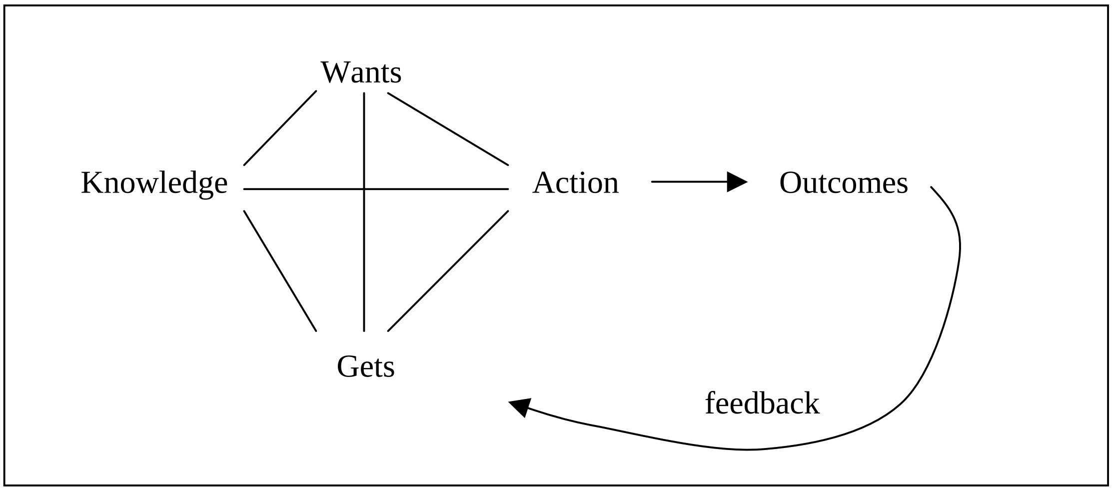
Looking at livestock farmers as cognitive agents emphasises the fact that they have *veto power* over whether or not to adopt innovations, as many an interventionist convinced of the superiority of his message has discovered to his chagrin (249). Cognitive change is *voluntary* change. Research by rural sociologists has shown that dairy farmers in the seemingly highly constrained technological and market conditions of industrial farming still differ vastly in the purposes they pursue, which can vary from owning a beautiful herd, to being profitable entrepreneurs, optimising the mechanisation, or being as frugal as possible (284; 238). Even in a highly competitive market, livestock farmers therefore differ widely in the messages that appeal to them or the information they use from decision support systems such as computerised record systems (e.g 161). Livestock farmers in the South are much more diverse and it is even more difficult for a change agent, such as an extension worker or a veterinary officer, to effectively engage with them (e.g. 216). A first condition for effective engagement is to understand this diversity and the cognitive needs that emerge from it.

The model of the cognitive agent is presented in Figure 3. The key elements of the agent are (1) *wants:* emotions, goals or purposes, (2) *gets:* perception of a changing environment, (3) *knowledge:* theory that allows interpretation and (4) *action:* the capacity to change the environment. The *outcomes* of action can be perceived again and act as *feedback.* A difference between *wants* and *gets* is a problem; *knowledg*e that allows understanding the causes of a problem is a diagnosis.

The model of the cognitive agent closely reflects models of decision-making emphasising choice based on iteration through facts, their interpretation, goals and means (38).

The cognitive agent optimises cognitive *coherence* among the elements (avoids dissonance) and seeks *correspondence* between purposes and outcomes (113; 244). In that sense, cognition can be seen as "effective action in the domain of existence" (177).

Figure 3. The Cognitive Agent: basis for understanding education, information and extension needs



Cognitive agents can be individual farmers, but also households, extended families, tribes, sectoral or professional groups, as long as they pursue shared or collective purposes by making collective decisions. Livestock farmers depend on concerted or collective action for a considerable part of their returns, for example when they strive to keep down the bacterial count of the milk that the factory picks up from the collecting point, as for example in Maharashtra, India, and in Southern Chile when they maintain shared standards for their breed of cow, or when they seek to prevent diseases such as foot and mouth disease (FMD). That such concerted action is a complex issue is clear from the free rider behaviour that tends to accompany group decisions to engage in concerted action (e.g. transporting diseased cows during an FMD outbreak).

The Cognitive Agent as a "coat hanger" for understanding attempts to inform, train, educate, organise and otherwise change livestock farmers

Below, we shall use the model of the cognitive agent to give an overview of attempts to address the information, extension and education needs of livestock farmers. The basic point is that such attempts often seek to change a specific component or combination of components of the cognitive agent. We provide a brief overview.

1. *Changing the "gets":* Many efforts by change agents are aimed at changing the farmer's perception of what happens in a changing environment. This includes information about market prices, about criteria for what constitutes a good bull, the results of research, policy changes, or about what other farmers think. Many attempts are also aimed at "making visible" aspects of the environment (e.g. training farmers to recognise the symptoms of a disease, providing feedback on milk quality, etc.).
2. *Changing the "wants":* "If I could only motivate them!" is an often-heard cry of frustration when farmers have again exerted their veto power and refused to adopt one's favourite technology. Appeals based on profit, productivity and other assumed incentives often fail to have effect. Notwithstanding these difficulties, change agents often try to affect the "wants". They might use a popular leader to promote an idea, or they use strong appeals to presumed needs or desires. In highly variable, uncertain and high risk environments (e.g. threat of droughts, cattle thieves, etc.) farmers might have wants that are difficult to understand by anyone who does not have to live by the results. For example, the Pokot of Kenya are known to leave parts of their herds with distant relatives so as to reduce risk. Many extension efforts are geared towards helping farmers to clearly define problems, i.e. to specify the differences between their gets and wants.
3. *Changing knowledge:* Training, farmer education courses, FFSs and many other efforts are geared to enhancing farmers' ability to base their diagnoses, interpretations and actions on "sound" knowledge. Farmers are better prepared for taking effective action if they have background knowledge about such issues as nutrition, genetics, lactation, the life cycles of parasites and tick-borne diseases, microbes that affect milk quality, pasteurisation, etc. This type of knowledge is made available through education. In industrial nations, (young) farmers acquire it through formal

education, evening courses, publications, etc. In most developing countries, such education is usually lacking. FFSs are one way in which adult farmers can gain an understanding of background principles involved in animal husbandry. As has been explained earlier in this report, they should definitely be seen as a form of adult education and not as a form of extension. Typically diffusion of what has been learned in a FFS is slow or limited (33; 277; 96; 148). FFS also attempt to help farmers become experimenters who are capable of developing their own knowledge. Most so-called traditional agricultural systems reflect centuries of "farmers' research" and are usually adaptive, reflecting ongoing experimentation.

4. *Changing (the capacity for) action:* This is the area of most extension effort. It is targeted, first of all, at awareness and understanding of new ways of being effective, with respect to animal housing, breeding, rearing, feeding rations, milk quality management and animal health. Important in changing knowledge is feedback: do farmers perceive a change in the effectiveness of their actions (greater or less correspondence)? This type of cognitive change is expected from public or private agents with an extension function, such as animal husbandry officers, veterinary doctors and assistants, feed salesmen, AI servicemen, dairy companies and cooperatives, animal traders, etc. The experience is that such external agents are especially good at introducing new ideas and at raising awareness. In a number of cases, they might also be trusted enough to have a direct impact. Usually, however, actual adoption of new component technologies in the animal production system is the result of discussion with trusted and comparable other farmers. In some countries, study clubs of farmers or informal discussion circles play important roles in this respect in that they link external information to a local capacity for processing, assessment and translation into action. A French researcher who studied informal chat among dairy farmers found that it not only serves to pass on information, but especially to determine what is acceptable and appropriate (65). One reason is that the technologies promoted by external public or private agents often are not appropriate or adapted to the situation, or desirable from the farmer's point of view. Simple instruction in how to apply some techniques (skill training) is an important aspect of improving the ability of a farmer to act.
5. *Changing the ability to perceive feedback:* One of the most influential strategies of change is to help farmers "see for themselves", i.e. to help them "see" the outcomes of their action. An accurate measurement of achievement is a necessary condition for learning to improve one's performance. Typical examples are enabling farmers to measure their yields, book-based and other record keeping, computer-based information systems providing farmers feedback on the quality and quantity of their milk, etc.
6. *Building the capacity of the cognitive system as a whole, including empowerment, and organisation*. Information, education and extension to improve effectiveness and efficiency, given existing purposes, lead to changes that are usually called single loop learning. Creating coherence among purposes, options for action, knowledge and understanding of the environment, as well as changing this system in a direction of greater correspondence or effectiveness, is called double loop learning (14). This type of learning is more transformational. It creates better clients for extension, more empowered and demanding voters, and better farmer organisations to undertake the kind of concerted action that might be required to achieve essential elements of effective action, such as political influence, cooperation in the provision of services, etc. This type of education requires group learning, learning from experience and discovery learning, and group process. Such learning is, therefore, more often than not the outcome of participatory group methods, FFSs, participatory learning and action research, etc. (e.g., 67; 227).
7. *Conflict resolution, dealing with competing claims, building capacity among cognitive agents with conflicting purposes*. A typical example of such situations is the frequent conflict between arable farmers and herders all over Africa. Dangbégnon (1998) has described a number of cases where local people have successfully solved such conflicts, sometimes with the help of public or private mediators. Negotiating sustainable agreements that can be monitored by both parties can make an important contribution to peace and stability in a region. Typical methodologies for dealing with competing claims on natural resources include multi-stakeholder processes and platforms for resource-use negotiation (e.g. 163).

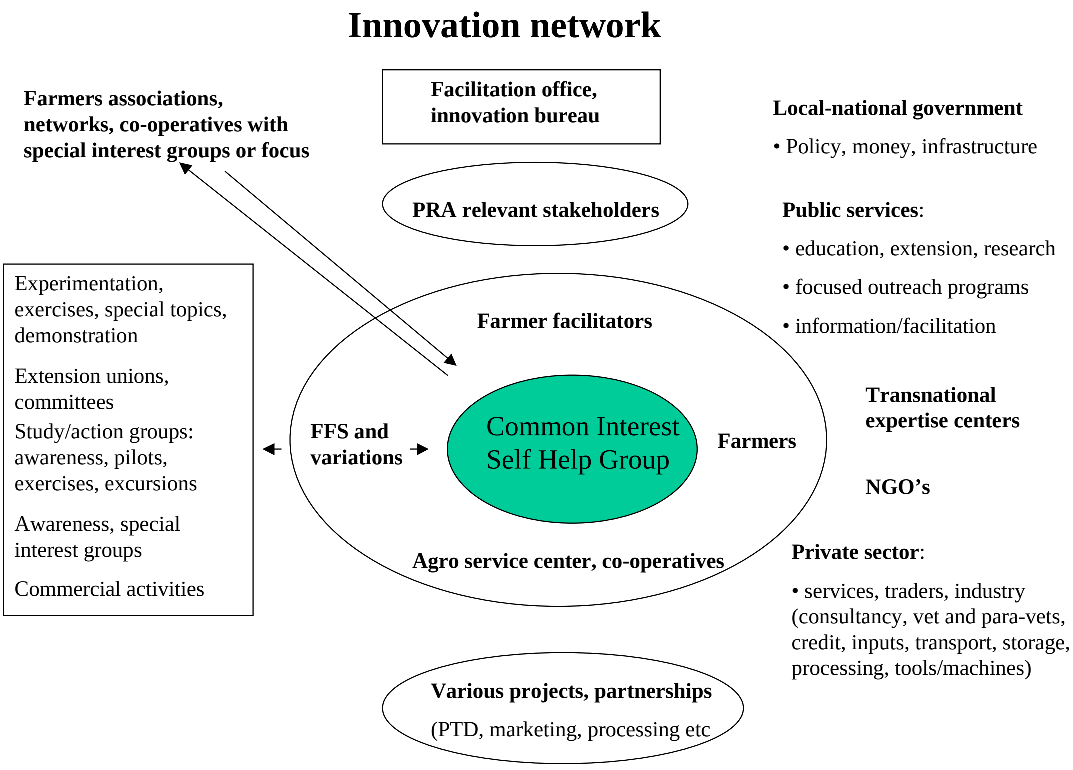
In all, the information, education and extension needs of livestock farmers can be very different, depending on the nature of the cognitive change involved. What often happens is that outcomes are expected from an intervention that by its very nature it cannot deliver. For example, transformational change is often expected to result from simple technology transfer, or mass diffusion of simple technologies from FFSs. Another often-made mistake is to expect cognitive change by itself to be a sufficient condition for development, as if framework conditions and markets were not also important.

A brief overview of attempts to address the cognitive needs of livestock farmers

This overview may provide some links to FFS-like approaches, which could help to build bridges to existing extension approaches and to expand or support continuation of FFS-type activities. Farming with livestock (ranging from rather extensive grazing to mixed farming, specialised livestock farms and to integrated mixed farming of rather specialised farms) at village or regional level (268) is often rather capital and labour intensive compared to crop farming. Livestock can have multiple functions, including a savings and risk reduction function, e.g. through variation in production and "adaptation" of body condition, if weather conditions limit feed supply, with compensatory gain once feed supply improves again. Farmers consider ownership of large livestock as an indication for the way out of poverty (156). Livestock can add value to by-products from crops and provide manure and traction. For smallholders, export of animals and animal produce can be more difficult compared to crops such as horticultural crops and fruits, among others due to health related problems. In a transitional phase towards commercialisation, mixed crop-livestock farmers may tryout several development options, later selecting and concentrating more on a few promising options based on experiences. The special functions of livestock in the farming systems make special demands on efforts to assist farmers through information provision, training, education, and extension.

In Figure 4 and text below, various approaches to cognitive change among livestock farmers are briefly

Figure 4. Possible links in innovation network (adapted from 276)



presented in relation to the organization providing extension (20; 21). Farmers' groups and related actors, and activities are within the circles in the centre, other stakeholders outside. Within the innovation network each stakeholder has its own role in providing information and other services to farmers groups and individual farmers, in more or less participatory and learning/discovery based approaches, depending on the situation, and interacting when and where relevant and depending on characteristics of farmer groups and stakeholders and the need for external knowledge. Within the information network a co-ordinating and/or innovation agency may facilitate and fund first a type of PRA in as far as needed, followed by PTD and exchange of knowledge and experience between relevant partners. Various projects and partnerships may facilitate the innovation process.

Public extension services

Public extension (including animal health) services have traditionally aimed at changing farmers' practices through introducing component technologies. The usual basis for extension work is the idea that results of scientific research are transferred to farmers through explanation, demonstration, pilot farms, etc. Both individual and group extension approaches are used. Individual extension may emphasise technical, economic and farm development issues. Group extension uses meetings, study (and action) groups, field days (on farms and regional research farms), demonstrations/shows, leaflets, radio, etc. Subject matter specialists are supposed to link front-line extension workers with research and other information suppliers. Regional research/information centres are used to play a bridging role between farmers, research, extension and other stakeholders. Many public extension services are organised as linear "chains" between research and contact farmers. Spontaneous diffusion of innovations (239) is expected to multiply the extension impact to those that have not been reached directly.

The Training and Visit System of Extension, widely applied throughout the 1990s, has finally been acknowledged not to have been successful (11), among other reasons because it was not flexible enough. Many efforts have been made to adapt the system, for example through building in farmers' action or study groups or farmers' extension societies so as to give farmers more influence and to enable them to set their own agenda (see for instance 234).

In developing countries, development projects financed by multi-lateral and bi-lateral donors and NGOs have played an important role in extension efforts. But it has proved very difficult to scale up project benefits that were achieved in the special circumstances that a donor can provide. Typical is the example of the Dutch-funded Dairy Development Programme in Kenya. This programme put together a minimum package required for an effective, rather specialised, smallholder household dairy unit, with emphasis on zero-grazing. Farmers who wanted the full package were given intensive extension support, self and external monitoring playing a role as well. Group related activities got attention as well. It turned out that only those farmers who could actually adopt the whole package subscribed to the project. Many others adopted some of the technologies. Most farmers were well aware of the package that was on offer. The very intensive donor involvement lasted *about 15* years, but was too expensive to replicate and sustain using the same approach when using Government resources only.

But public extension has used projects with pilot farms to focus on specific issues (farm development, environment, food chain safety). They can allow co-operation among partners other than just extension workers and farmers, such as private actors. Results from monitoring and evaluation of pilot farms can be used to involve other farms, e.g. through study groups, sometimes forming a link to pilot farms in a larger project (with farmers, extension, research and private parties in one project).

Increasingly, participatory extension and farm development approaches, including participatory research, are being tried. The term "participatory" covers a wide range of approaches, all the way from simple consultation of farmers to self-determination and farmer influence over extension activity (e.g. Pretty's (1994) participation ladder). In general, "participation" refers to a deliberate attempt on the part of an extension agency to move in the direction of both greater say of farmers in extension planning and implementation, and greater inclusiveness (e.g. by including women as legitimate clients of extension). However, given that farmers, and especially women, have very little political influence in most developing countries, such efforts to move towards participation often flounder on bureaucratic procedures, hierarchical structures, political exigencies, budget constraints, etc. The impact of the recent trend towards decentralisation is not clear yet, but in countries were farming is the traditional source of government revenue, decentralisation might mean that farmers now also have to finance local government.

An example of a participatory approach and demand driven knowledge exchange featured the distribution of a large number of vouchers to farmers which could be spent in a "knowledge shop" to purchase various services such a knowledge products, tools and knowledge exchange in new and existing study groups. It was a follow up and linked to projects from research, extension and farmers organisations, with innovation/pilot and demonstration farms in which individual farm plans were developed, implemented and monitored. Although most farmers were satisfied with the product they bought, often from a known knowledge supplier, results were variable because farmers were not sufficiently aware of objectives and considered the voucher more as a gift, and because group co-ordinators were not trained well enough to guide the process of demand articulation (157).

Governments sometimes provide vocational training through farmers' training centers. On-farm training courses are sometimes provided by extension/applied research, e.g. on specific issues such as indicators for good livestock management. For example, Baraka College in Kenya offers short courses on demand for groups lasting about a week using a mobile team.

"Towards extension-plus" involves the need to combine location-specific extension approaches focused on cognitive needs of farmers (e.g. strengthening of local innovation processes and partnerships) with services that include other than cognitive needs, such as providing access to input and output markets, poverty reduction, product processing, and environmental conservation (269; 125). Regional rural innovation agencies may supervise and monitor financing of innovative rural projects where different partners co-operate. China uses an integrated approach in Agro-Technical Extension Centres at county level to improve efficiency (271). Such approaches have often been tried by donors when it became clear that it is very difficult to really make an impact by cognitive change alone, for the simple reason that farmers are usually clever enough to have exploited the available opportunities by themselves. Hence donors provide fertilisers, AI services, transport, artificial market access, etc., usually with great effect. However, such projects collapse as soon as the artificial conditions are pulled out. The success of pilot projects and their subsequent collapse is a recurring feature especially in Africa (e.g. 280; 249).

Farmers organizations, producer associations and other common interest groups

Farmers organizations/associations can be directly responsible for extension (like in Denmark), or they may focus more on households and socio-economic extension, or act as mediators in setting of agendas or programme planning for extension and research and to improve accountability (22; 271; Ugandan extension approach). They may alternatively provide funds or participate in projects. The role of common interest groups, and study and action groups, has been increasing in several countries, in sectors like for instance horticulture and livestock. Methods used are: special topics, monitoring and discussion, exchange visits, field days and demonstrations, *improved logistics, storage and processing* and bargaining power in contacts with traders/companies (e.g. through agro-service centers providing i.e. various inputs or services (276; *co-operatives)*, facilitating access to and purchase of information like in study groups (or grants, see FFS and before). Access to information is sometimes organised through local/regional associations/unions for agricultural extension. In Latin America, Local Agricultural Research Committees are managed *by* and belong to the rural community (39; 40). They are a permanent agricultural research service, staffed by volunteer farmers elected by the community to create a link between local and formal research. Farmers' organizations and co-operatives, including micro-credit organizations and co-operative banks, can be important suppliers of information also through farmer/member journals or newsletters. In India, Operation Flood started by a the Indian Dairy Board (44) played a role in extension and empowerment of smallholder farmers, using milk collection centers as an entry point, but the approach was criticised for being too top-down. Networks like IFAP (International Federation of Agricultural Producers - http://www.ifap.org/) and farmer organization-related NGOs like Agriterra (http://www.agriterra.org) support exchange of experiences and knowledge between farmers in different countries.

Private extension

The extent to which individuals like veterinarians and para-vets (279; 46) and artificial insemination technicians and accountancy bureaus (sometimes started through farmers' organizations) provide extension varies, depends on the situation and organization (e.g. agreements made in case of paid services). Advice from agricultural input and output supply companies and processors, traders and service providers (credit, book keeping, contract farming) become more important if market access and value of input and output and commercialisation increase (fertiliser, feeds, agro-chemicals and drugs, storage and processing milk, meat, eggs). There is large variation in quantity and quality of extension and payment (like newsletters, individual and group extension, costs included in the product price, penalties for lower milk quality). With external funding and if milk is scarce for instance a wider focus may be used, providing extension on several subjects to increase milk production as well, while in case of milk surplus, limited advice on milk quality only may be given. Government regulations on food safety and milk quality can play an important role as well. Public-private partnerships, for instance with umbrella organizations from the fertiliser, seed/breeding, feed or dairy industry participating in projects with more partners may be, but are not necessary, less subjective.

Non Governmental Organizations

NGOs can play an direct role in extension and innovation, e.g. BAIF (http://www.baif.com), Heifer (http://www.heifer.org), or marketing (http://www.fairtrade.net), or more indirectly, through facilitating communication, (like ILEIA - http://www.leisa.info), some being more specialised than others and some linking supply of livestock to training and extension.

Public-private partnerships

Public-private partnerships in projects or innovation networks including other partners like farmers associations and NGOs in different combinations become more important (236; 125). Co-operation in field days and shows (like the Nairobi Show) has been common for a long time. Implementation of environmental or food safety related regulations and involvement of farmer groups in marketing (chain management) becomes more important (organic produce, links to supermarkets, auctions). This more integrated approach for specific products may focus training and advice better than traditional extension. Projects can be sub-contracted to others, including privatised former-government extension.

Public markets, mass media, networks, expertise centers

The use of mass media through use of newsletters, radio, internet and mobile phone (e.g. through roadside kiosks in India) has become increasingly important. Farmers and others demanding knowledge can demand and exchange information and experience with all type of information suppliers, including networks or expertise centres with a more or less specialised focus (see for instance the Smallholder Poultry Network - http://www.poultry.kvl.dk/). Public places, in particular markets, have traditionally had, and continue to have, an important role for exchange of knowledge as well as materials like seeds or breeding stock. These functions can vary with the situation, may be more or less linked to actors mentioned before and are or might be modernised through the use of new technology.

7. How effective is the Farmer Field School for stimulating farmer innovation?

This section discusses how effective FFSs are for stimulating farmer innovation.

Ryan and Gross (1943) are credited for having invented the diffusion of innovations, which later became the most popular field of social science research, largely through the tireless efforts of the late Everett Rogers (e.g. 1995). The invention at that time of diffusion as an autonomous multiplier of extension impact was no accident. Farmers in the Mid-Western states of the US, such as Iowa, had developed into homogeneous populations of small firms all producing for a single unified market. The introduction of hybrid maize in the early 1940s allowed early adopters among them to increase their productivity when overall prices where still determined by the technology used by the majority. Hence they could capture a windfall profit. Soon, however, the rapid spread of hybrid maize to other farmers started to exert downward pressure on prices. Farmers who had not adopted yet saw their incomes drop and had to follow suit. Hence the market began to propel the diffusion process.

Ryan and Gross were the first to study it. They compared the characteristics of farmers who adopted earlier with those who adopted later and they observed the bell-shape of the diffusion curve as the new technology spread in the farmer population. Agricultural economists studied the same process and Cochrane (1958) coined the term "agricultural treadmill" to describe it. Diffusion, the treadmill, research-based technology development as a driver of farm innovation and extension as a delivery mechanism of such technology to farmers so as to feed the diffusion process; all these notions were developed at that time.

Evenson et al. (1979) observed very high rates of internal return to investment in agricultural research and extension. In Europe during the 1960s, Sicco Mansholt, as Agricultural Commissioner of the European Union made the treadmill and diffusion the cornerstone of his agricultural policy, leading to vast efficiency gains, loss of employment, scale enlargement, and cheap food, and later to mass externalisation of environmental costs, scandals, the destruction of age-old landscapes and the virtual extinction of whole farm industries. The current EU commission still pursues "competitiveness of European agriculture" as the main goal of its agricultural R&D.

A global treadmill is the cornerstone of international agreements about agricultural development even if it pits farmers with very different levels of science input, capitalisation, etc., against each other. The Green Revolution saw the application of the same ideas by people like Norman Borlaug who grew up with them in the US.

The problem is they do not work in situations of high diversity and high uncertainty, where institutional supports and markets have not developed, or where market opportunities are captured by those who, either locally or abroad, can produce more efficiently and with less risk and higher use of inputs (for example, a highly variable rainfall makes it risky to invest heavily in fertilisers). These conditions pertain in most of Africa. This does not mean that diffusion cannot occur in such conditions. Farmers in South-western Nigeria, Ivory Coast and Ghana have developed cocoa as a major industry in the early half of the last century without help from agricultural research or extension. Maize, haricot beans, tomatoes, chillies and many other Latin American crops had diffused in Africa long before the first formal development interventions were undertaken. In modern times, horticulture has spread in a similar manner in Kenya, with little external support or donor investment. A trader distributing seeds and offering to buy the produce has worked wonders. But so far, the agricultural treadmill has not been established in most of Africa and market-propelled productivity increase has occurred only to a very limited extent.

African agriculture is called "stagnant" for this reason (e.g. 136). But anyone who studies African agriculture on the ground soon discovers its incredible dynamism and the innovative efforts of African rural households to adapt and capture opportunity (e.g. 130). It is therefore better to say that the dynamism of local farming and the efforts of national and international agricultural research organisations have so far failed to meet. They have not learned to "dance". This is partly due to the fact that framework conditions for agricultural development have not been in place. African national and local governments have raised revenue from agriculture ever since colonial times because agriculture is often the only source of income. Such (often "informal") revenue collection takes place through roadblocks, creaming off the price a country receives for its export commodities, etc. High diversity, lack of infrastructure, absence of a single unified market, lack of political influence on the part of farmers, import of cheap foodstuffs (for example, the EU "dumps" subsidised milk powder in many African countries, but in addition, European farmers are more efficient than local farmers after many years of state supported treadmill processes) and many other conditions mitigate against rapid installation of treadmill conditions (e.g. 249; 136). In other words, simply relying on technology development or even on "bottom-up" farmer organisation will probably not be enough. A serious effort to improve institutional supports and create conducive policy conditions ("top-down") is necessary before dynamic farmers and agricultural research can learn to dance together (259). So far, it has only been possible in small-scale pilot projects, in which framework conditions were artificially created, to "capture" farmer innovativeness and achieve rapid increases in productivity. However, when it comes to scaling up or replicating the pilots through existing governance structures, and through relying on existing input and produce markets, the achievements often collapse (190; 16; 243; 136).

IPM FFSs developed in response to second-generation problems of the Green Revolution, such as pest resistance and resurgence, human poisoning and environmental pollution, that resulted from reliance and dependence on pesticides. That does not mean that the FFS cannot be effectively applied to good effect in the complex conditions of African livestock farmers. But its use should be carefully contextualised, and based on a thorough understanding of the ecological, political and cultural diversity involved. Easy assumptions about homogeneous recommendation domains based on only climatological and ecological conditions should be avoided. And making assumptions about farmers' motivations (e.g. assuming that they are driven by a monetary cost/benefit calculus) is a sure way to fail.

Given these caveats, FFSs can also be very effective in stimulating farmer innovation by small-scale livestock farmers. The FFS provides the music that allows formal agricultural research and smallholder livestock farmers to dance effectively. More concretely, FFS can stimulate innovation in the following ways:

- Carry out research with farmers to develop technologies that are based not only on sound science but that also work in farmers' conditions (markets, climate, labour availability, access to land, etc.) and that are acceptable to local farmers in terms of their purposes and culture (e.g. 42 for Zanzibar). In other words, FFS allow farmers and researchers together to make the irrevocable pre-analytic choices that determine the outcome of research (249).
- Establish effective linkages between research and farming communities by creating Participatory Learning and Action Research (PLAR) groups of men and women farmers who are elected by rural communities (e.g. 67).
- Strengthening farmer leadership and organisation so as to increase the effectiveness of farmer interaction with research and technology development, and with the agencies that can create the conditions for the effective use of the outcomes of research.

Only in rare circumstances can FFS be expected to stimulate wide-scale diffusion of specific component technologies. Rogers (1995) provides research-based information on the attributes of innovations that affect their ease and speed of diffusion. These are visibility, (lack of) complexity, divisibility and relative advantage. More complex and invisible innovations, such as bookkeeping, agro-ecosystem analysis, do not diffuse easily, even in treadmill conditions where their relative advantage is beyond doubt. This leaves open the question how the beneficial impact of FFS on participating farmers can be scaled up beyond the relatively small numbers that can be reached directly through FFS. At the time of writing this question has not been answered. In countries such as India and Pakistan, where state and provincial governments have become convinced of the very beneficial effects of cotton IPM-FFSs on participating farmers as a result of successful pilot projects implemented by a FAO Programme, programmes to mass implement FFS on a large scale are underway. The outcome is by no means certain. The experience so far is that too many key characteristics of the FFS erode during mass replication for the benefits to be sustained (249; 249a; 259).

8. How does/can an FFS fit into an innovation system approach?

This section discusses how an FFS fits into an innovation systm approach. How can FFS be used as a better tool or entry point?

The linear model of technology transfer, and the extension approaches based on it, have been widely rejected (154; 49; 49a; 243). In its place first came the Agricultural Knowledge and Information System or AKIS that applied theories about human activity systems (52) to agricultural development (243, 289). Instead of innovation being the end-of-pipe result of a linear process, innovation became widely regarded as the emergent property of the interaction among relevant actors, such as farmers, extension and research. This approach fitted well with the experience of countries such as the US, where land grant universities had created effective systems of education, research and extension in close collaboration with influential farmers (128), and the Netherlands where the "triptych" of research, education and extension (and highly organised farmers) was widely credited for the phenomenal productivity of agriculture achieved in that country. It soon became evident, however, that one cannot limit the actors essential for innovation to research, extension education or farmers. Even if one looks only at knowledge and information, it is obvious that many other actors, such as salesmen, pesticide dealers, feed companies and bookkeepers play important roles. This becomes even clearer if one begins to identify the actors that are required to create other than cognitive change, i.e. input distribution, market development and regulation, land tenure courts, etc. Typically, in the Netherlands land development since the 1960s has lowered ground water tables by 50cm and increased the growing season by two months. The focus on the "triptych" of research, extension and education as the source of success obscured the essential contribution of the millions that were invested in land development.

This realisation led to the emergence of the notion of an innovation system, i.e. the set of actors that, together and in interaction, can, under certain conditions, lead to concerted action or synergy with respect to generating innovation (181). Engel and Salomon (1997) speak of an "innovation theatre" in which actors improve their collective innovative performance. The notion of an innovation system begs various questions with respect to the nature of the agents involved, the scale at which they operate, the way they interact, the way the interaction can be facilitated, the change of the innovation system over time, and how innovation systems nest in higher level systems.

In sections 6 and 7 we have contextualised small-scale livestock farming as usually not fitting the model of the agricultural treadmill and we have emphasised that the institutional and policy supports, including markets, required are often not in place. This means that creating effective innovation systems is a key prerequisite before any purely technical research can make a useful contribution. Many observers agree that small-scale farmers can greatly increase their productivity with their currently existing technology if they are provided with better chances. Unfortunately, developing innovation systems requires insight into institutional development. It is our experience that such insight is in short supply. Technical scientists have usually not been trained in this respect, while economists all too often assume that liberalisation of the market is enough to get the innovation system going.

Box 5. Experiential Learning Forums in the cotton marketing supply chain in Benin.

The idea to use FFS with other actors than farmers is at an early stage at the moment with for instance a specific proposal to apply it to the cotton supply marketing chain in Benin. The proposal calls these field schools "Experiential Learing Forums". The idea is that the interdependent chain actors (ginneries, pesticide salesmen, transports, farmer unions, producer organisations, etc.), systematically engage in shared learning around concrete issues that arise so as to make Benin's cotton more competitive on the world market (135a). The idea is to learn from concrete "socio-technological objects" and issues. This approach has been inspired by research in the Netherlands with water conservation, which showed that not only farmers and field-level workers needed to learn how to manage water conservation at the field level, but that the multiple agencies involved needed to learn to cooperate and create the conditions for the field-level operations to succeed (146). The work of Wenger (1998) works with similar ideas.

The FFS approach can be used to great advantage to develop the innovation system. But an adjustment to the model is required. Instead of working with FFS composed of farmers, it will be necessary to create nested platforms for learning at multiple levels (143; see also the example in Box 5). The platforms will be composed of the diverse actors who are considered key players required to start up an innovation system in a given "theatre of innovation". It is essential to invest in investigations that would identify potential "theatres of innovation" with regards to an industry, crop, sector or production area, and that would establish who would be the essential actors involved. Existing methodologies that seem useful in this regard are RAAKS (78), stakeholder analysis (117), and platforms for resource negotiation (242). Of course, developing an innovation system is also very much a question of the actors themselves deciding on ways forward. But starting up innovation systems seems to require a facilitating role that so far has not been taken up by CGIAR or any NARS. It is still difficult to find funds for investment in something as intangible as interaction and its facilitation. Even more elusive are funds for experimentation with the facilitation of innovation systems and for the evaluation of such experiments. But there is no doubt that organisations such as ILRI could play an important role here.

With the publication of the Millennium reports (280) and the renewed pledge to invest in poverty reduction, especially in Africa, the dominant question has been whether more funds without some strategy for spending it other than more-of-the-same could be useful. For example, calls for more investment in agricultural research has led to the observation that, so far, agricultural research has not been able to have much impact on "getting the wheels of agriculture moving" (a battle cry first launched in the seventies). It is our conviction that investment in the development of innovation systems would at least be a new avenue that merits serious experiment. The FFS model and its expansion to include nested platforms for learning at multiple scales comprising actors who are deemed essential for the emergence of the synergy that represents innovation, is an excellent place to start. The cost effectiveness of an expensive thing that works is always better than cheap more-of-the-same that so far has had little impact.

Perhaps less speculative is the effect that FFS can have in terms of empowering farmers. It is a general observation that compared to industrial agricultures, small-scale livestock farmers have very little countervailing power to pull down services, affect the agendas of research, and influence policies that affect them. The usual inclination to strengthen the intervention power of development agencies *vis-à-vis* farmers seems misplaced. Increasing the countervailing power of farmers seems a more direct route to development. In this light, it is a high priority to empower farmers, to strengthen their organisations and their understanding of how they are being cheated by governments, commercial agents, the dumping of cheap foodstuffs by industrial countries, etc. The FFS has proven time and again that it is as no other tool capable of empowering poor farmers and rural women, even in such places as Bangladesh, where women's status has traditionally been very low (see section on Human and Social Impact). Of course this tendency of empowering participants can make them unpopular with politicians, local governments, public and private development agents, and irrigation authorities, as happened in the Gezira Scheme in the Sudan when FAO-supported experiments with FFS led to farmer protest against strict rules and regulations (148).

9. How can research organisations, including ILRI, interact with FFS to increase the efficiency of their innovation systems?

This section deals with the question "how research organisations, such as ILRI, can interact with FFS to increase the efficiency of their innovation systems?"

Of course, research organisations do not "have" innovation systems. At best they are part of them and/or facilitate them, at least within the conceptual framework laid out above. Hence the question must be reformulated: how can research organisations such as ILRI play effective roles as actors in innovation systems and stimulate their emergence and development?

A statement that should adorn the office of every DG of a research organisation is "Farmers have veto power". A key power small farmers have is the decision NOT to adopt the technologies that research organisations deliver. Usually they make use of that power very frequently. Mutimba (1997) documented how, and for which very good reasons from their point of view, Zimbabwean farmers had for twenty years refused to adopt the technologies promoted by AGRITEX. The Cocoa Research Institute of Ghana has observed that farmers have only adopted about 3% of the technologies it has developed (18). On the whole, public agricultural research has had very limited impact on agriculture in Africa. Important developments, such as the emergence of the oil palm fallow that allows permanent cultivation on the densely populated Adja Plateau in Benin (41), and the initial discovery that Asian (Riza sativa) and African (Riza glabberima) rice could be hybridised (now the basis for WARDA's Nerica varieties), is more often than not the work of farmers themselves. To all intents and purposes, they can usefully be seen as active experimenters who have to live by the results.

This veto power makes farmers comparable to consumers or customers of commercial organisations. Such organisations spend a great deal of time and effort to understand their customers, to segment them into homogeneous categories, to analyse markets, test and adapt products and to advertise their products and services. Agricultural research organisations invest very little in these kinds of activities. Developing nice brochures for donors seems as far as they will go. Research organisations must invest a great deal more in understanding their clients, in interacting with client groups and in giving them a say in the programming of research. This seems a minimal requirement for agricultural research organisations to be able to play useful roles in innovation systems.

A number of methodologies for doing the above has been around for decades but somehow have never become mainstream because of a number of factors including: (a) the lack of countervailing power on the part of farmers, (b) the dominance of technical thinking (focus on the best technical means for assumed human purposes), and (c) economic thinking (belief in rational choice by a perfectly informed farmer in a free market). Important methodologies include Farming Systems Research (e.g. 59), Participatory Learning and Action (e.g. 227); Participatory Technology Development (e.g. 145), diagnostic studies to make pre-analytic choices together with farmers (249), Farmer Research Groups (42), etc. However, none of these methodologies can create political will. Sherwood (in prep.) has established for Ecuador that a popular and empirically well-grounded movement to ban pesticides in potatoes because of health and ecological reasons was easily undermined when the pesticide industry systematically influenced senior politicians. It is to be hoped that the pressure on the industrial world posed by the millions of rural poor in the low potential areas of the developing world can instil new urgency. Assuming political will, we propose that agricultural research organisations in the developing world invest heavily in "marketing", i.e. in creating effective linkages with rural communities, in learning about them, in engaging with their problems and in focusing on the small windows of opportunity that they have.

Mounting an FFS programme seems to be one of the best ways for agricultural research to learn with farmers how best to serve farmers. It is a way to learn to dance with them and to capture their incredible innovativeness and dynamism. It is also a way to learn to take the viewpoint of small farmers, to stimulate other essential actors to play their role and so to help facilitate the emergence of innovation systems. Meanwhile, an FFS programme can help develop farmers' influence and activism in the innovation system.

In following this approach, research organisations are often limited by their mandates. It is difficult for a livestock institute, for example, to develop village drinking water supplies or engage in mother and health care. Farmers are not unreasonable, however. There is much room for negotiation of an area of collaboration that is beneficial for both parties (e.g. 18). For example, the FAO IPM in cotton programme in Asia established FFS for women in Bangladesh who, as a rule, are not engaged in cotton production. When asked, the women were not worried about this. FFS participation had given them so many skills including speaking in public, organisation of activities, and experimentation, that they felt they had benefited a great deal. Of course, this is not to say that it might have been better to design an FFS curriculum that focused on women's interests to begin with. What the example does show, however, is the fact that participation in an FFS imparts many other skills other than the strictly technical. That is why a focus on *process* and its facilitation is crucial in an FFS. As soon as an official stands up in front of an FFS group to deliver the cherished technical message of the institute, the FFS becomes an expensive form of technology transfer.

10. What researchable questions remain to be answered in relation to livestock FFS?

This section deals with the researchable question in relation to livestock FFS that remain to be answered.

Through a Kenyan project, a research project with elements of capacity building and development, (as described in Box II.2, Appendix II) ILRI adapted and tested the FFS approach for livestock, specifically for animal health and production, focusing on smallholder dairy farmers. After this first pilot project ILRI has supported implementation of a range of livestock FFS interventions by other organisations in nine other countries, often in close collaboration with FAO. As a result of the negative World Bank papers by Feder et al., ILRI management commissioned a position paper, of which this review is an important component, to enable them to come to a conclusion as to what role, if any, ILRI should play in regard to FFS. There are researchable issues that ILRI could usefully address. There is also the need to balance ILRI's involvement in research and capacity building - and to identify alternative suppliers that may be better placed to undertake such functions. For that reason the authors of this report were asked to indicate which "research" questions in relation to livestock FFS remain to be answered. These questions have been formulated as follows:

- What has been the impact (economic, social, production, environmental and empowerment) of livestock FFS pilot projects implemented by ILRI and other organisations, and how can impact assessment be improved? ILRI should facilitate another organisation to carry out this research[23], for instance the International Food Policy Research Institute (IFPRI)[24] or Wageningen Agricultural University and Research Centre[25]. Impact should be assessed at different levels: individuals, groups, networks, district, national, global and other actors/stakeholders. This impact study has already been commissioned by ILRI as part of the position paper and is currently being finalised.
- Which factors have led to success or failure of the livestock FFS approach?
- What are enabling factors for scaling-up, institutionalising and mainstreaming livestock FFS approaches at national levels?
- Which innovations or further adaptations of the livestock FFS approach are necessary? So far the livestock FFS approach (and curriculum) ILRI has developed is largely focused on animal health and production – there is need for a broader look at livestock issues. For instance, there is a need for improving crop-livestock integration in the FFS approach; also needed is an analysis for more effective and efficient links between crop, soil and animal productivity. This research requires an exploration of contexts in which livestock issues and problems can potentially be addressed through local learning processes by means of the FFS. The exploration is followed by pilot projects in prospective situations. For instance, how can the livestock FFS approach be adapted to agro-pastoral and pastoral systems, through so called Herder Field Schools. Or, how can the FFS model serve in resolution of conflict over use of land and water between pastoralists and agriculturalists. This research is experiential in character; it pilots an approach for eventual up-scaling by NGOs, FAO or national governmental institutions. For efficient and effective up-scaling, it is essential that collaboration with, and involvement of, relevant actors is initiated from the outset of such a research project.
- What is the potential of the livestock value chain (milk, livestock for meat, fodder, etc.) for market opportunities for FFS district networks?

Most of these research questions have a policy oriention, i.e. their outcome can have an influence on policy processes – it is therefore important to include policy makers from the outset to internalise the process. Based on the answers obtained to these research questions, guidelines could be developed for scaling-up, institutionalising and mainstreaming livestock FFS approaches.

Apart from research questions, ILRI has a clear role as a resource organisation in support of scaling-up, institutionalising and mainstreaming livestock FFS. Research staff from ILRI should serve as resource

[23] To prevent an internal bias.
[24] IFPRI is currently planning a large impact study of FFS in Kenya, Uganda and Tanzania.
[25] WUR has extensive experience with impact studies on FFS (33;173; 173a)

persons in curricula development, training of facilitators, training of trainers and for study tours. Networking and knowledge/information sharing is also an activity ILRI should play in close collaboration with the Global Farmer Field School Network and Resaource Centre (FFSnet; http://www.farmerfieldschool.net/). ILRI should take the lead in developing the livestock component of FFSnet. Specifically a livestock network and knowledge capacity at all levels (local – national – global) could be created by ILRI to effectively scale-up, institutionalise and mainstream livestock Farmer Field Schools (dairy), Herder Field Schools (agro-pastoralists and pastoralists) – assuming the approach is successful -- and integration of livestock issues in FFSs on agricultural crops. At district and national levels this could be piloted in the context of agricultural and livestock extension in Kenya. This is in line with support to the institutionalisation of Farmer Field Schools that is being spearheaded by FAO-Kenya. Concrete specific objectives for this could be:

- Ensure that livestock research outcomes are effectively translated into user-friendly information for the beneficial use of service providers in their work as Livestock Farmer Field School (LFFS) and Herder Field School (HFS) facilitators
- Share LFFS and HFS experiences and lessons learnt at all levels (local – national – global)
- Networking and coordination for increased impact and effeciency, and quality control among existing and new LFFS and HFS initiatives
- Ensure livestock training materials, learning exercises, lessons learnt and experiences are readily available and updated
- Support and strengthen the Kenyan FFS Network/Secretariat, in line with future FFS instutionalisation in Kenya, in the area of livestock and in the context of scaling out the FFS approach at national level, particularly through mainstream national agricultural development programmes – Kenya Agricultural Productivity Programme (KAPP), Njaa Marafuku Kenya (NMK) and the National Agricultural and Livestock Extension Programme (NALEP)
- Strengthen the capacity and ability of FFS actors in Kenya to address rural poverty through experiential learning and action on livestock health, production and development.

11. References

1. Abdelhadi, A. W., H. S. Adam, Mohamed A. Hassan and Takeshi Hata, 2004. Participatory management: Would it be a turning point in the history of the Gezira scheme? Irrigation and Drainage 53-4: 429 - 436.
2. ADDA, 2002. IPM Farmer Training 2nd Phase, Participatory Farmer Training in Vegetable Production in Hanoi – Based on the IPM Concept. Unpublished proposal.
3. Adenya, E. (compiler), 2005a. Progress Report Sept 2004 – Jan 2005. Kenya Junior Farmer Field and Life Schools Pilot Program in Bondo District. Special Programme on Food Security.
4. Adenya, E. (compiler), 2005b . The Bondo Junior Farmer Field and Life Schools. A Back to the Office Report on the Social Animation Training. 15 December – 17 January 2005. Special Progamme on Food Security.
5. AGRIDAPE, 2003. Les champs-écoles à l'oeuvre! AGRIDAPE – Revue sur l'agriculture durable à faibles apports externs. 19-1: 1-36.
6. Alamu, S., 2005. Caura Valley Integarated Development Initiative: sensitizing stakeholders to IPM. Caura Valley Farmers Association, Trinidad and Tobago. 2 pp.
7. Alemán Santillán, T., F. Guevara Hernández, T. Fuentes Pantgay, S. Madrigal and R. Vega González, 2003. ECAs a la Mexicana: facilitadores para la innovación tecnológica de la agricultura campesina. LEISA Revista de Agroecologia 19-1: 53-56.
8. Almanza, J., M. Salazar and E. Gandarillas, 2003. Empoderamiento de la investigación y extensión participativa por agricultores locales. LEISA Revista de Agroecologia 19-1: 37-39.
9. Amarasinghe, L., and G.W. Liyanage, 2001. Country Report – Sri Lanka. Prepared for the meeting of the Programme Advisory Committee (PAC), Ayutthaya, Thailand, November 2001.
10. Anandajayasekeram, P., B.A.M. Mweri, O.J. Zishirir, W. Odogola, M. Mkuchu and M. Phiri, 2001. Farmer Field Schools: Synthesis of Experiences and Lessons from FARMESA member countries. FARMESA, Harare, Zimbabwe.
11. Anderson, J. R., and G. Feder. 2003. Rural Extension Services. Policy Research Working Paper 2976. The World Bank, Washington DC, USA.
12. Anonymous, 2004a. Highlights of IPM activities in Cambodia. 22 April 2004.
13. Anonymous, 2004b. Summary Proceedings of the Garbsen III Workshop on: "Impact Assessment of Farmer Field Schools". Garbsen, Germany, July 21-23, 2004.
14. Argyris, C., and D.A. Schön, 1996. Organisational Learning (II), Theory, Method and Practice. Addison Wesley, Reading (Mass.), USA.
15. Asiabaka, C., 2002. Promoting Sustainable Extension Approaches: Farmer Field School (FFS) and its role in sustainable agricultural development in Africa. CODESRIA-IFS Sustainable Agriculture Initiative Workshop, Kampala, Uganda, December 15-16 2002. 7 pp.
16. Ascroft, J.R., N. Röling, J. Kariuki, and F. Wa Chege, 1973. Extension and the forgotten farmer. Bulletin van de Afdelingen Sociale Wetenschappen, no 37. Wageningen Agricultural University, Wageningen, The Netherlands.
17. ASPS, 2003-2005. Web site of the Vietnam – Denmark Agricultural Sector Support Programme. http://www.asps-vietnam.org/
18. Ayenor, C. K., N.G. Röling, B. Padi, A. van Huis, D. Beng-Ofori, and P.B. Atengdem, 2004. Converging Farmers' and Scientists' Perspectives on Researchable Constraints in Organic Cocoa Production in Ghana, Results of a Diagnostic Study. Netherlands Journal of Life Sciences (NJAS) 52-3/4: 261-284.
19. van den Ban, A.W., and H.S. Hawkins, 1996. Agricultural Extension. 2nd edition. Blackwell Science, Oxford, United Kingdom. 294 pp.
20. van den Ban, A.W., 1999. Agricultural development: Opportunities and threats for farmers and implications for extension organizations. J. Agr. Educ. Ext. 6-3: 145-156.
21. van den Ban, A.W., 2000. Different ways of financing agricultural extension. AgREN Network Paper 106b.

22. van den Ban, A.W., 2004. World trend in agricultural extension. Paper for: International Seminar on Best Practices in poverty alleviation trough education in the next century, Suwon, Republic of Korea, October 2004

22a. Banu, L.J., and B. Bode, 2002. CARE Bangladesh's FFS Approach: New Frontiers in Farmer Empowerment. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

22b. Barrera, V., L. Escudero, G. Norton and S. Sherwood. 2001. Validación y difusión de modelos de manejo integrado de plagas y enfermedades en el cultivo de papa: Una experiencia de capacitación participativa en la provincia de Carchi, Ecuador. Revista INIAP 16: 26-28.

23. Bartlett, A., 2004. Entry points for empowerment. A report for CARE Bangladesh. 69 p.

24. Bartley, D.M., B. Nyandat and D. Duveskog, 2004. Fishery based food security field schools: Bondo district, Lake Victoria, Kenya. FAO Aquaculture Newletter 31: 4-10.

25. Barzman, M. and L. Das, 2000. Ecologising rice-based systems in Bangladesh. ILEIA Newsletter 16-4: 16-17.

26. Barzman, M. and S. Desilles, 2001. Diversifying Rice-Based Farming Systems and Empowering Farmers in Bangladesh Using the Farmer Field School Approach. In: Uphoff, N. (Ed.). Agroecological innovations: Increasing food production with participatory approaches. Earthscan Publications, London.

27. Bayer, W. and A. Waters-Bayer. 2002. Participatory Monitoring and Evaluation (PM&E) with pastoralists: a review of experience and annotated bibliography. ETC, Leusden, and GTZ, schborn.

28. Becker, H.A., and Vanclay, F., 2003. The international handbook of social impact assessment. Elgar, Cheltenham. 326pp.

29. van Beek, C.L., A. de Jager, D.D. Onduru and L.N. Gachimbi, 2004. Agricultural, Economic and Environmental Performance of Four Farmer Field Schools in Kenya. INMASP Kenya Report No. 18. http://inmasp.nl/

30. van den Berg, H., H. Senerath and L. Amarasinghe, 2001. Farmer Field Schools in Sri Lanka: assessing the impact. Pesticides News 61: 14-16.

31. van den Berg, H., H. Senerath and L. Amarasinghe, 2002. The impact of participatory IPM in Sri Lanka. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

32. Van den Berg, H. and Knols, B.G.J., 2006. The farmer field school: A method for enhancing the role of rural communities in malaria control? *Malaria Journal*, 5, 3.

33. van den Berg, H., 2004. IPM Farmer Schools: A synthesis of 25 impact evaluations. Wageningen. University. 53 pp.

34. Bicalho Schlottfeldt, C., 2002. Projeto "Capacitação Participativa de Agricultores Brasileiros de Algodão" - Relatório Final. MAPA/FAO, Brasilia, Brazil. 31 p.

35. Biekienga, I.M., B. Diarra, A. Gassama, A. van Paassen and H. van der Valk (2005). Programme sous-régional de formation participative en gestion intégrée de la production et des déprédateurs à travers les champs-écoles des producteurs pour le Burkina Faso, le Mali et le Sénégal (GCP/INT/813/NET). Mission d'évaluation (29 juillet – 24 août 2004), Global IPM Facility.

36. Binamira, J., 2001. Kasakalikasan: The Philippine National IPM Program. Philippine Country Report prepared for the meeting of the Programme Advisory Committee (PAC), Ayutthaya, Thailand, November 2001.

37. Bingen, J., 2003. Pesticides, Politics and Pest Mnagaement: Toward a Political Economy of Cotton in Sub Saharan Africa. In: B.I.Logan and W.G. Moseley (eds.). African Environment and Development: Rhetoris, Programs, Realities. Ashgate Publishers, Burlington VT. pp. 111-126

38. Bos, A.H., 1974. Oordeelsvorming in groepen. Published doctoral dissertation Wageningen Agricultural University.. Veenman Wageningen, The Netherlands.

39. Braun, Ann R., G. Thiele and M. Fernández, 2000. Complementary platforms for farmer innovation. ILEIA Newsletter 16-2: 33-34.

40. Braun, Ann R., G. Thiele and M. Fernández, 2000. Farmer field schools and local agricultural research committees: complementary platforms for integrated decision-making in sustainable agriculture. AgREN Network Paper No. 105. AgREN/ODI, London, UK. 16 pp.

41. Brouwers, J. H.A.M., 1993. Rural people's response to soil fertility decline. The Adja case (Benin). Published Ph.D thesis. Wageningen. WUR. 157 pp.

42. Bruin, G.C.A. and F. Meerman, 2001. New ways of developing agricultural Technologies: the Zanzibar experience with participatory Integrated Pest Management. WUR/CTA, Wageningen, Netherlands. 167 pp.

43. Buck, A., 2001. Participatory evaluation of farmers' perceptions about impact from Farmer Field Schools - Case study Province San Miguel, Peru. MSc. Thesis Technical University of Munchen. 69 pp.

44. Candler, W., and N. Kumar, 1998. India: The Dairy revolution - The Impact of Dairy Development in India and the Worldbank's Contribution.

45. Capra, F., 1996. The Web of Life: A New Synthesis of Mind and Matter. Harper Collins Publishers, London, United Kingdom.

46. Catley, A., T. Leyland, J.C. Mariner, D.M.O. Akabwai, B. Admassu, W. Asfaw, G. Bekele and H.Sh. Hassan, 2004. Para-veterinary professionals and the development of quality, self-sustaining community-based services. Rev. sci. Tech. Off. Int. Epiz. 23-1: 225-252

47. Chhaya, O., J. du Guerny, R. Geeves, M. Kato and Lee-Nah Hsu, 2004. Farmers' Life School manual. UNDP/FAO/WE, Bangkok, Thailand. 52 pp.

48. Chambers, R., 1983. Rural Development: putting the last first. Longman, Harlow, United Kingdom.

49. Chambers, R. and Jiggins, J. 1987a. Agricultural research for resource-poor farmers. Part I: transfer of technology and farming systems research. Agricultural Administration and Extension 27: 35-52.

49a. Chambers, R. and Jiggins, J. 1987b. Agricultural Research for Resource-Poor Farmers. Part II: A Parsimonious Paradigm. Agricultural Administration and Extension 27:109-128

50. Chanakya, H.N., S.T. Somashekar Reddy and P Balachandra, 2004. A participatory quasi-quantitative method to assess impact of IPM-FFS.

51. Chanthakomut, Banharn. 1999. A visit with spiders. Lessons in the rice field. The Thai Education Foundation, Bangkok, Thailand.

52. Checkland, P., 1981. Systems Thinking, Systems Practice. John Wiley, Chicester, United Kingdom.

53. Chiwona-Karltun L., P. Kambewa, M. Yajima, N.M. Mahungu and J. Jiggins, 2005. Market-Oriented Responses among Cassava Farmers in Domasi, Malawi. Paper presented at the IFPRI International Conference entitled "HIV/AIDS and Food and Nutrition Security: from evidence to action", 14-16 April, 2005, Durban, South Africa.

54. Chung, P., 2004. Farmer Field Schools: Promising potential for IPM adoption in Jamaica and the Caribbean. RADA, Kingston, Jamaica. 2 pp.

55. CIAT, 2005. Annual Report 2004 - Africa: Bean Entomology. CIAT, Cali, Colombia. pp. 181-183.

56. CIP/PRGA, 2003. Impact evaluation of participatory development of integrated insect and disease management (IPM) for the potato crop in San Miguel, Peru. Report to the Participatory Research and Gender Analysis Program. CIP/PRGA, Lima, Peru. 39 pp.

57. CIP-UPWARD, 2003. Farmer Field Schools: From IPMN to Platforms for Learning and Empowerment. International Potato Center – Users' Perspectives With Agricultural Research and Development, Los Banos, Laguna, Phillippines. 87 pp.

58. Cochrane, W.W., 1958. Farm Prices, Myth and Reality. Univ. of Minnesota Press, Minneapolis, USA.

59. Collinson, M. (Ed.), 2000. A History of Farming Systems Research. Rome, FAO, and Wallingford, CABI Publishing. 432 pp.

60. CWFS, 2001. Community IPM and Women: a Review of the Development and Integration of Gender into the Vietnam Community IPM Programme. Hanoi, Vietnam. Version 1.

61. Dalsgaard, J.P.T., Thai Thi Minh, Vo Ngan Giang, and J.C Riise, 2005. Introducing A Farmers' Livestock School Training Approach Into The National Extension System In Vietnam**.** AGREN Network Paper No. 144.

62. Dangbegnon, C., 1998. Platforms for Resource Management. Case studies of success or failure in Benin and Burkina Faso. Published doctoral dissertation. Wageningen Agricultural University, Wageningen, The Netherlands.

63. DANIDA/DAALI, 2004. Integrated Pest Management Farmer Training Project Cambodia Phase II - Annual Report 2003.

64. DANIDA/DAALI, 2005. Integrated Pest Management Farmer Training Project Cambodia Phase II - Annual Report January-December 2004.

65. Darré, JP., 1985. La Parole et la Technique. L'univers de pensee des eleveurs du Ternois. l'Harmattan, Paris, France.

66. Defoer, T., and A. Budelman (Eds.), 2000. Managing Soil Fertility in the Tropics. A Resource Guide for Participatory Learning and Action Research. Vols 1-5. KIT Press, Amsterdam, The Netherlands.

67. Defoer, T., 2002. Moving Methodologies. Learning about integrated soil fertility management in sub-Saharan Africa. Published doctoral dissertation. Wageningen Agricultural University, Wageningen, The Netherlands.

68. Dilts, 2001. Scaling up the IPM Movement. LEISA Magazine 17-3: 18-21

69. Djeddah, C., 2005. Junior Farmer Field and Life Schools: Empowering orphans' and vulnerable children. Draft Concept Note. FAO, Rome, Italy. 13 pp.

70. DNFE, 2001. Country Report – Thailand: Department of Non-Formal Education. Prepared for the meeting of the Programme Advisory Committee (PAC), Ayutthaya, Thailand, November 2001.

71. DoAE, 2001. Country Report – Thailand: Department of Agricultural Extension. Prepared for the meeting of the Programme Advisory Committee (PAC), Ayutthaya, Thailand, November 2001.

72. Douthwaite, B. 2002. Enabling Innovation. A Practical Guide to Understanding and Fostering Technological Change. ZED Books, London and New York. 266 pp.

73. van Duuren, B., 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.

74. Duveskog, D., C. Mburu and W. Critchley, 2002. Harnessing indigenous knowledge and innovation in Farmer Field Schools. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

75. Duveskog, D., 2004. The power of knowledge: From water harvesting plots to farmer empowerment. FAO, Nairobi, Kenya.

76. EFARP, 2004. EFARP Programme Completion Report: May 1989 - June 2004. Egypt – Finland Agricultural Research Project. 44 pp.

77. El Bouhssini, M., R. Canhilal and A. Aw-Hassan, 2002. Integrated Management of Sunn Pest: A Safe Alternative to Chemical Control. ICARDA Caravan 16. ICARDA, Aleppo, Syria (http://www.icarda.cgiar.org/Publications/Caravan/caravan16/focus/integrate.htm)

78. Engel, P.G.H. and M. Salomon, 1997. Facilitating Innovation for Development. A RAAKS Resource Box. KIT, Amsterdam, Netherlands.

79. Eyasu, E., 2002. Literature review on expericnes with Farmers' Field Schools in Ethiopia. INMASP, Ethiopia Report No. 1. http://www.inmasp.nl

80. Eveleens, K, J. Jiggins and Kim Luan Soon (Eds.), Forthcoming 2005. A History of IPM Farmer Field Schools in Asia (working title). FAO, Bangkok, Thailand.

81. Evenson, R.E., P.E. Waggoner and V.W. Ruttan, 1979. Economic Benefits from Research: An Example from Agriculture. Science 205-14: 1101-1107.

82. FAO, 1998a. Community IPM: Six cases from Indonesia. 260 pp.

83. FAO, 1998b. Community IPM: Six cases from Indonesia. Annex I: IPM sub-district summaries, 54 pp.

84. FAO, 2000-2004. Web site of the FAO-EU Integrated Pest Management Programme for Cotton in Asia. http://www.cottonipmasia.org/

85. FAO, 2001a. Intercountry Programme for the Development and Application of Integrated Pest Control in Vegetables in South and Southeast Asia – Phase I: Project Findings and Recommendations. Terminal Report GCP/RAS160/NET and GCP/RAS/168/AUL. FAO, Bangkok, Thailand. 62 pp.

86. FAO, 2001b. The Mid-Term Review of the Global IPM Facility. FAO, Rome, Italy

87. FAO, 2002. The FAO Inter-Country Programme to Strengthen IPM Training and Sustain IPM Practices among Vegetable Farmers in South and Southeast Asia. Project Document - Phase II of the Vegetable-IPM ICP. FAO, Bangkok, Thailand. 45 pp.

88. FAO, 2004. Benefits from Farmer Education: Impact of IPM-FFS in Cotton in Asia. Cotton IPM Newsletter No. 5, August 2004. FAO, Bangkok, Thailand.

89. FAO, 2005a. Training HIV/AIDS orphans in sub-Saharan Africa: Field schools fight hunger and poverty with farming know-how and life skills. FAO News story, 9th May 2005. http://www.fao.org/newsroom/en/news/2005/102183/index.html

90. FAO, 2005b. Las Escuelas de Campo para Agricultores (ECAs) en el PESA-Nicaragua: Una experiencia participativa de extension para contribuir a la seguridad alimentaria y nutricional en Nicaragua. FAO-Nicaragua, Managua, Nicaragua.

91. FAO, 2005c. Kenya Farmer Field School Networking and Coordination Workshop (2005). Blue Post Hotel, Thika, Kenya. 4-5 May 2005. FAO, Nairobi, Kenya. 23 p.

91a. FAO/SAFR, 2005. Inventory and evaluation of Farmer Field Schools in Zimbabwe. Working Document. FAO Sub-Regional Office for Southern and East Africa. Harare, Zimbabwe. 79 p.

92. FAO/IIRR, forthcoming 2006. Discovery-based Learning on Land and Water Management – A Practical Guide for Farmer Field Schools. FAO, Rome, Italy.

92a. Fakih, M., 2002. Gender mainstreaming in IPM. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

93. Fakih, M., T. Rahardjo and M. P. Pimbert, 2003. Community Integrated Pest Management in Indonesia. IIED/IDS, Brighton, United Kingdom. 162 pp.

94. Feder, G., R. Murgai and J. Quizon, 2003a. Sending farmers back to school: The impact of Farmer Field Schools in Indonesia. World Bank Policy Working Paper No. 3022. World Bank, Washington.

95. Feder, G., R. Murgai and J.B. Quizon, 2004a. Sending farmers back to school: The impact of Farmer Field Schools in Indonesia. Review of Agricultural Economics 26-1: 45-62

96. Feder, G., R. Murgai and J.B. Quizon, 2004b. The Acquisition and Diffusion of Knowledge: The Case of Pest Management Training in Farmer Field Schools, Indonesia. Journal of Agricultural Economics 55-2:217-239.

97. Fernandez, M.E., 1988. Technology Domains of Women in Mixed farming Systems of Andean Peasant Communities. In: S.V. Poats, M. Schmink, and A. Spring (Eds). Gender Issues in Farming Systems Research and Extension.. Chapter 15. Westview Press, Boulder and London, United Kingdom. p. 212-221.

98. FIELD. 2001. Picturing Impact: Participatory Evaluation of Community IPM in Three West Java Villages. A Study produced by FIELD in cooperation with Indonesian IPM Farmers' Association, Ciamis District Agriculture Services, and FAO Regional programme for Community IPM. Jakarta, Indonesia.

99. Fierro Guzmán, L.H., 2003. Organización de productores en Colombia a través de las Escuelas de Campo de Agricultores. LEISA Revista de Agroecologia 19-1: 12-13.

100. van de Fliert, E., K. van Elsen and F. Nangsir Soenanto, 1993. Integrated rat management: A community activity. Results of a pilot programme in Indonesia. FAO Plant Protection Bulletin 41-3.

101. van de Fliert, E., 1993. Integrated pest management: Farmer field schools generate sustainable practices. A case study in Central Java evaluating IPM training. Wageningen Agricultural University Papers 93-3. Wageningen, Netherlands. 304 p.

102. van de Fliert, E., J. Pontius and N. Röling, 1995. Searching for strategies to replicate a successful extension approach: Training of IPM trainers in Indonesia. European Journal of Agricultural Education and Extension 1-4: 41-64. http://library.wur.nl/ejae/v1n4-3.html

103. van de Fliert, E., 2000. Stepping Stones and Stumbling Blocks in Capacity Development of Sweetpotato ICM Farmer Field School Facilitators. Paper presented at the UPWARD Conference "Capacity Development for Participatory Research", Beijing, 19-22 September, 2000. CIP, Bogor, Inodnesia. 12 pp.

104. van de Fliert, E., N. Johnson, R. Asmunati and Wiyanto, 2001. Beyond Higher Yields: The Impact of Sweetpotato Integrated Crop Management and Farmer Field Schools in Indonesia. In: CIP, Scientist and Farmer: Partners in research for the 21st century. Program Report 1999-2000: 331-342. CIP, Lima, Peru.

105. van de Fliert, E., R. Dilts and J. Pontius, 2002a. Farmer research teams, farmer field schools, and community IPM. Different platforms for different research and learning objectives. In: C. Leeuwis and R. Pyburn (Eds). Wheelbarrows Full of Frogs. Koninklijke van Gorcum, Assen, Netherlands. pp. 121-134.

106. van de Fliert, E., G. Thiele, D. Campilan, O. Ortiz, R. Orrego, M. Olanya and S. Sherwood, 2002b. Development and linkages of farmer field schools and other platforms for participatory research and learning. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

107. van de Fliert, E., Ngo Tien Dung and H. Widagdo, 2003. Multiple learning cycles towards independent IPM implementation, problem solving and dissemination by farming communities. Discussion Paper.

108. van de Fliert et al., 2004.

109. Friis-Hansen, E., C. Aben and M. Kidoid, 2004. Smallholder agricultural technology development in Soroti district: Synergy between NAADS and farmer field schools. Uganda Journal of Agricultural Sciences 9: 250-256.

110. Gallagher, K.D., 2002. Self-financing access to new technologies: East African farmer innovations. SDI 7– 23/1

111. Gallagher, K.D., 2003. Fundamental elements of a farmer field school. LEISA Magazine 19-1: 5-6.

112. Geeves, R. 1999. Environmental and life skills education for children from rural communities through IPM student field schools. Paper presented to Second National Socio-cultural Research Congress. 3-5 February, Phnom Penh, Cambodia.

113. Gigerenzer, G. and P.M. Todd, 1999. Fast and Frugal Heuristics: The Adaptive Toolbox. Chapter 1. In: Gigerenzer, G., P. M. Todd, and the ABC Research Group. Simple Heuristics that Make us Smart. Oxford University Press, New York and Oxford. pp. 3-34.

114. Gill, B., 2004. Evaluating the success of farmer field schools in Senegal. Pesticide News 64: 16-17.

115. Godtland, E., E. Sadoulet, A. de Janvry and R. Murgai, 2004. Testing the Impact of Farmer-Field-Schools on Knowledge: An Empirical Study of Potato Farmers in the Peruvian Andes. Economic Development and Cultural Change 53-1: 63-92.

116. Godtland, E., E. Sadoulet, A. de Janvry, R. Murgai and O. Ortiz, 2003. The Impact of Farmer-Field-Schools on Knowledge and Productivity: A Study of Potato Farmers in the Peruvian Andes. Department of Agricultural and Resource Economics, UCB. CUDARE Working Paper 963.

117. Grimble, R. and K. Wellard, 1996. Stakeholder methodologies in natural resource management: a review of principles, contexts, experiences and opportunities. Agricultural Systems 65-2: 173-193.

118. Groeneweg, K., A.W. Versteeg y J. ChavezTafur, 2004. "Más nos han enseñado, muchos hemos aprendido". FAO, Lima, Peru.

119. du Guerney, J. 2001. Report on the Review Mission of the UNDP/FAO/HIV Community IPM Project. 5-15 March, Phnom Penh.

120. Guevara, F., T. Alemán, T. Fuentes and S. Sánchez, 2003. Capacidades locales en la generación y difusión del conocimiento agrícola: explorando la metodología ECA. LEISA Revista de Agroecologia 19-1: 8-9.

121. Gustafson, D.J., 2004. Supporting the Demand for Change: Recent Project Experience with Farmer Learning Grants in Kenya. In: Rivera, W., and G. Alex. Demand-Driven Approaches to Agriculture Extension. Agriculture and Rural Development Discussion Paper 10. World Bank, Washington, USA.

122. Hakiza, J.J., R. Kakuhenzire, P. Kankwatsa, G. Arinaitwe, D. Rukuba and B.F. Ngombi, 2003. Dissemination of knowledge and skills of potato management through farmer field schools in Uganda. Uganda Journal of Agricultural Sciences 8: 443-448.

123. Hakiza, J.J., W. Odogola, J. Mugisha, A.R. Semana, J. Nalukwago, J.R. Okoth and Adipala Ekwamu, 2004. Challenges and prospects of disseminating technologies through farmer field schools: Lessons learnt based on experience from Uganda. Uganda Journal of Agricultural Sciences 9: 250-256.

124. Hall, M., J. Dixon and A. Gulliver, with D. Gibbon (Eds.), 2001. Farming Systems and Poverty. Improving Farmers' Livelihoods in a Changing World. Washington D.C., World Bank, Rome. FAO. 412 p.

125. Hall, A.J., B. Yoganand, R.V. Sulaiman, Rajeswari Raina, C.S. Prasad, Guru C. Naik and N.G. Clark, 2004. Innovations in Innovation: reflections on partnerships, institutions and learning. In: Innovations in Innovation, 2004. Crop Post-Harvest Programme South Asia (CPHP), International Crops Research Institute for the Semi-arid tropics (ICTISAT), National Centre for Agricultural Economics and Policy, India.

126. Hamid, A., and A. Poswal, 2000. Insecticide-free cotton is feasible and profitable. Pesticide News 49: 9.

127. Haiyang, W., 2002. Farmer Field Schools in China Experience in Huoshan County with the China Netherlands Poverty Alleviation Project. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

128. Havelock, R.G., 1986. Modelling the knowledge system. In: Beal, G.M, W. Dissanayake, and S. Konoshima (Eds). Knowledge, Generation, Exchange and Utilisation. Boulder (Co), Westview, United Kinddom. Pp. 77-105

129. Heong, K.L., M.M. Escalada, N.H. Huan and V. Mai, 1998. Use of communication media in changing rice farmers' pest management in the Mekong Delta, Vietnam. Crop Protection 17: 413-425.

130. Hounkonnou, D., 2001. Listening to the Cradle. Local Dynamics for African Rennaissance: Case Studies from Benin and Ghana. Published Doctoral Dissertation. Wageningen Agricultural University, Wageningen, The Netherlands.

131. Hounkonnou, D., S.K. Offei, N.G. Roling, R. Tossou and A. van Huis, 2004. Diagnostic studies: a research phase in the Convergence of Sciences programme. Wageningen Journal of life sciences 52-3/4: 209-448.

132. Hughes, O. and J.H. Venema (eds), 2005. Integrated soil, water and nutrient management in semi-arid Zimbabwe. Farmer Field Schools Facilitators' Manual, Vol 1. FAO, Harare, Zimbabwe.

133. Hutchins, E., 1995. Cognition in the Wild. The MIT Press, Cambridge (Mass.), USA.

134. IFAD, 2005. Report and Recommendation of the President to the Executive Board on Proposed Financial Assistance to the Republic of Rwanda for the Support Project for the Strategic Plan for the Transformation Of Agriculture (PSTA). IFAD, Rome, Italy. 12 p.

135. IITA, 2005. An initial assessment of the producer costs and benefits of Farmer Field School training. STCP Impact Brief No. 3. IITA, Yaounde, Cameroon.

135a INREF, 2005. Experiential Learning Forums as a tool for capacity building among stakeholders in cotton chains in West Africa. Report of an INREF Workshop. 10-11 March 2005, Wageningen, The Netherlands. WUR/INREF, Wageningen, The Netherlands.

136. Inter Academy Council, 2004. Realising the Promise and Potential of African Agriculture. Science and Technology Strategies for Improving Agricultural Productivity and Food Security in Africa. Inter-Academy Council, Amsterdam, Netherlands.

137. IPPHTI, 1999. The Indonesian IPM Farmers' Congress. 16-21 July, Yogyakarta, Indonesia.

138. Ison, R. and D. Russell, 2000. Agricultural Extension and Rural Development. Breaking out of Traditions. CUP, Cambridge, UK. p. 239

139. Jatiket, M., 2001. Ecological Learning in Rural Schools. Toxic Trail: http://www.communityipm.org/ToxicTrail.htm

140. Jiggins, J., 1983. Poverty-Oriented Rural Development: Participation and Management. Review article. Development Policy Review 1: 219-252.

141. Jiggins, J., 1993. From technology transfer to resource management. In: M.J.Baker (Ed.) Grasslands for Our World. SIR Publishing, Wellington. pp. 184-191.

142. Jiggins, J., 2001. Inter-active RD&E. Livestock Production Science 72: 25-36.

143. Jiggins, J., 2003. Key Informant Study. Final Report InterReg Project Water Management in het Benelux Middengebied. Wageningen: University: CIS/WUR. See also: WUR/CIS, Wageningen, The Netherlands. (http://www.waterconservering.nl)

144. Jiggins, J., with P. Maimbo and M. Masona. 1992. Breaking New Ground: Reaching out to Women Farmers in Western Zambia. SEEDS. New York. The Population Council. 21 pp.

145. Jiggins, J., and H. de Zeeuw, 1992. Participatory Technology Development in Practice: process and methods. In: Reijntjes, C., B. Haverkort and A. Waters-Bayer (Eds.). Farming for the Future: an introduction to LEISA. Macmillan. pp. 135-161.

146. Jiggins, J., and N. Röling, 2003. Key Informant Study. Report on the 2nd Generation Water Conservation Project in North Brabant and Limburg. Unpublished report to the Project Co-ordination Committee. WUR/CIS, Wageningen, The Netherlands. (http://www.waterconservering.nl)

147. Jiggins, J., G. Governatori and P.P. Roggero, 2005. Integrated Pest Management for Western Corn Rootworm in Central and Eastern Europe. GTFS/RER/017/ITA Project. Mid-Term Review. 4-20 July 2005. FAO, Rome, Italy.

148. Khalid, A., 2002. Assessing the Long-Term Impact of IPM Farmer Field Schools on Farmers' Knowledge, Attitudes And Practices. A Case Study From Gezira Scheme, Sudan. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

148a. Khan, M.A., I. Ahmad and G. Walter-Echols, 2005. Impact of an FFS-based IPM approach on farmer capacity, production practices and income: evidence from Pakistan. In P.A.C. Ooi, S. Praneetvatakul, H. Waibel, & G. Walter-Echols (Eds.), The Impact of the FAO-EU IPM Programme for Cotton in Asia (pp. 45-60). Hanover, Germany: Pesticide Policy Project Publication Series, Special Issue No. 9.

149. Khanal, R., 2004. Integrating HIV/AIDS in Farmer Field School: a need for inter-disciplinary effort for future intervention. CARE Nepal Newsletter 9-1: 47-49.

150. Khisa, G. and E. Heineman, 2004. Farmer Empowerment through Farmer Field Schools: A Case Study of IFAD/FAO IPPM FFS Programme in Kenya. Paper presented at the Nepad-IGAD Conference on Agricultural Successes in the Greater Horn of Africa, Nairobi, Kenya, 22-25 November 2004. 13 pp.

151. Kimani, M. and A. Mafa, 2002. The East African Sub-Regional Pilot Project for Farmer Field Schools Integrated Production and Pest Management (IPPM FFS), Kenya - Case Study Report. Options fro Supporting On-farm Conservation in Eastern and Southern Africa. 21 pp.

152. Kingsley, M.A. and S.S. Siwi, 1996. Update on Women Farmers' Access to IPM Activities. Gender Study I Update Report. Internal report. Indonesian National IPM Program/MoA/FAO, Jakarta, Indonesia.

153. Kingsley, M.A., and S.S. Siwi, 1997. Gender Study II: Gender Analysis, Agricultural Analysis, and Strengthening Women's Leadership Development in the National IPM Program. Indonesian National IPM Program/MoA/FAO, Jakarta, Indonesia.

154. Kline, S. and N. Rosenberg, 1986. An Overview of Innovation. In: R. Landau and N. Rosenberg (Eds.). The Positive Sum Strategy. Harnessing Technology for Economic Growth. National Academic Press, Washington (DC), USA. Pp. 275-306.

155. Kooistra, K., F. Mancini and A. Termoshuizen, 2005. Environmental Impact Assessment of cotton cultivation in Central India. Submitted to *Agriculture, Ecosystems and Environment.*

156. Kristjanson, P., A. Krishna, M. Radeny and W. Nindo, 2004. From poor to well-off: Livestock can make a difference. 'TOP STORIES' FROM THE ILRI WEBSITE: Better lives through livestock. http://www.ilri.org/ILRIPubAware/ShowDetail.asp?CategoryID=TS&ProductReferenceNo=TS_040716_001

157. Kuipers, A., K. de Grip and P.J. Galema, 2003. Knowledge transfer in Dutch animal production: the environmental case. Presentation at the European Association for Animal Production Annual Meeting, Rome, 31 August 2003.

158. Kuiseu, J., M. Thiam and A. Thiam, 2003. Senegal cotton farmers learn to cut chemical costs through IPM. Pesticide News 62: 8-9.

159. Larsen, E.W., M.L. Haider, M. Roy and F. Ahamed, 2002. Impact, sustainability and lateral spread of integrated pest management in rice in Bangladesh. Document SPPS 73. Department of Agricultural Extension/DANIDA.

160. LEARN@Paris (Eds.), 2000. Cow Up a Tree. Knowing and Learning for Change in Agriculture in Industrial Countries. INRA Editions, Paris, France.

161. Leeuwis, C., 1993. Of Computers, Myths and Modelling. The social construction of diversity, knowledge, information and communication technologies in Dutch agriculture and agricultural extension. Wageningse Sociologische Reeks. Published Doctoral Dissertation. Wageningen Agricultural University, Wageningen, The Netherlands.

162. Leeuwis, C. and Pyburn, R. (Eds), 2002. Wheelbarrows Full of Frogs. Koninkijke van Gorcum, Assen, The Netherlands. 479 pp.

163. Leeuwis, C. with contributions from A. van den Ban, 2004. Communication for Rural Innovation. Rethinking Agricultural Extension. 3rd edition. Oxford. Blackwell Publishing Ltd., UK.

164. LEISA, 2003a. Learning with Farmer Field Schools. LEISA – Magazine on Low External Input and Sustainable Agriculture. 19-1: 1-36.

165. LEISA, 2003b. Aprendiendo can las ECAs. LEISA – Revista de Agorecología. 19-1: 1-87.

166. Lepore, E. and Z. Pylyshyn (Eds.), 1999. What is Cognitive Science? Blackwell, Oxford, UK.

167. Lhamo, D., 2004. Farmer Field School in Darla. RNR Newsletter XIX-103: 10.

168. Lopez, V. and M. Kairo, 2005. Introduction to Farmer Participatory Approaches to Integrated Pest and Crop Management. CABI-CLARC, Curepe, Trinidad and Tobago. 5 pp.

169. Luther, G.C., C. Harris, S. Sherwood, K. Gallagher, J. Mangan and K. Touré Gamby, 2005. Developments and Innovations in Farmer Field Schools and Training of Trainers. In: Norton, G.W., E.A. Heinrichs, G. C. Luther and M.E. Irwin. Globalizing Integrated Pest Management - A Participatory Research Process. Blackwell Publishing, Iawa, USA. pp. 159-190.

170. MAGFOR, 2004. Notas de Políticas para el Desarrollo Agropecuario y Rural Productivo 2004-2008. (Segunda Versión). Dirección General de Política Agropecuaria y Forestal, Managua, Nicaragua.

171. Makhdum, A.H., M.A. Poswal, A.N. Khan, F. Hamid and G. Ali, 2002. Monitoring and Evaluation Protocol for Follow up and Practicing Farmer Field School Activities in Pakistan. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

172. Mancini, F., 2006. Impact of integrated pest management farmer field schools on health, farming systems, the environment, and livelihoods of cotton growers in Southern India. Published doctoral dissertation, Wageningen University, the Netherlands.

173. Mancini, F., A.H. Van Bruggen, J.L. Jiggins, A.C. Ambatipudi and H. Murphy, 2005. Acute pesticide poisoning among female and male cotton growers in India. Int J Occup Environ Health 11-3: 221-32.

173a. Mancini, F., A.H.C. van Bruggen and J. Jiggins, 2005. Evaluating cotton Integrated Pest Management (IPM) Farmer Field School Outcomes using the Sustainable Livelihoods Approach in India. Submitted to Experimental Agriculture

174. Mangan, M.S., 1997. Rice ecosystem concepts of Chinese farmers before and after Farmer Field School training. ME Dissertation. Murdoch University, WA, Australia.

175. Mangan, M.S., 1997. Chinese rice farmers: The new IPM experts. LEISA 13-4: 14-15.

176. Mangan, J., and M.S. Mangan, 1998. 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.

177. Maturana, H.R. and F.J. Varela, 1987/1992. The Tree of Knowledge, the biological roots of human understanding. Shambala Publications, Boston (Mass.), USA.

178. Medina, J. R., and D. P. Callo (Eds.), 1999. Empowering Farmers: The Philippine National Integrated Pest Management Programme. Second Edition. SEAMEO Regional Center for Graduate Study and Research in Agriculture, College, Laguna, Philippines. 146 pp.

179. Meijerink, G., H. Smolders, Sokha Sours and Sovann Pou, 2005. Recovering biodiversity knowledge. LEISA Magazine 21-2: 24-25.

180. Meir, C. and S. Williamson. 2005. Farmer Decision-making for Ecological Pest Management. Chapter 6. pp. 83-96. In: Pretty, J. (Ed.). The Pesticide Detox. Earthscan Publications Ltd, London, UK. 294 pp.

181. Merrill Sands, D. and D. Kaimowitz, 1989. The Technology Triangle: Linking Farmers, Technology Transfer Agents and Agricultural Researchers. ISNAR, The Hague, The Netherlands.

182. van Mele, P., Salahuddin, A. and Magor, N. (Eds), 2005. Innovations in Rural Extension: Case Studies from Bangladesh. CABI Publishing, Wallingford, UK. 330 pp.

183. Miagostovich, M. (Ed.), 2000. Farmers' Forest Management Schools. Rural Learning Networks; Bulletin No. 7. RECFTC, Bangkok, Thailand. 15 pp.

184. Miagostovich, M., 2004. Forest management learning groups: building forest users' capacity to develop silvicultural practices to address local needs. Unasylva 216: 46-49.

185. Minjauw, B., H.G. Muriuki and D. Romney, 2002. Development of the Farmer Field School Methodology for Smallholder Dairy Farmers in Kenya. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

186. MMWP, 2004. The Pilot Farmer Field School Programme: Report of the FFS Specialist, Bjorn Jensen. Wang Watershed Management Project. WWMP Document No. 71.

187. 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.

188. Kingsley, M.A. and Sri Suharni Siwi, 1998. Toward Gender-Sensitive Community IPM: Guide for Activities with Women and Men Farmers. UTF/INS/072/INS. Indonesian National IPM Program. Ministry of Agriculture. FAO Technical Assistance. Jakarta, Indonesia.

189. Morales-Abubakar, A.L., and T. Hossain, 2002. The State of Farmer Education in IPM Farmer Field Schools (FFS) and Follow-up Activities for FFS Graduates in Bangladesh. State of IPM in Bangladesh. Report for the Integrated Pest Management Programme for Cotton in Asia (GCP/RAS/164/EC).

190. Morss, E., 1976. Strategies for Small Farmer Development: an Empirical Study of Rural Development Projects. Westview Press, Boulder (Co), USA.

191. Mureithi, J.G., F.M. Murithi, C.C. Asiabaka, J.W. Wamuongo, L. Mose and B.A.M. Mweri, 2002. Methodology development for participatory monitoring and evaluation of farmer field school approach for scaling up the adoption of agricultural technologies. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

192. Mutandwa, M., and J.F. Mpangwa, 200X. An Assessment of the Impact of of Farmer Field Schools on Integrated Pest Management Dissemination and Use: Evidence from Smallholder Cotton Farmers in the Lowveld Area of Zimbabwe. Journal of Sustainable Development in Africa 6-2.

193. Mutimba, J.K., 1997. Farmer Participatory Research. An analysis of resource-poor farmer involvement in, and contribution to, the agricultural research process in Zimbabwe.. Unpublished doctoral dissertation. Available from Wageningen Agriculrural University, Dept. of Communication and

Innovation Studies, as publication of the Zimwesi Project. University of Zimbabwe (Faculty of Agriculture), Harare, Zimbabwe.

193a. NAESC, 2003. Report on impact assessment of China/EU/FAO cotton IPM program in Shandong Province, P.R. China. Report prepared for the National Agro-technical Extension and Service Center, Ministry of Agriculture, Beijing.

194. NARC, 2004. Impacts of the Group FFS Activities on the Organizational Capacities of the Farmers: Evidence from Pakistan. GCP/PRAS/164/EC: Impact Study of IPM in Pakistan. NARC, Islamabad Pakistan.

195. Nathaniels, N.Q.R., 2005. Cowpea, Farmer Field Schools and Farmer-to-Farmer extension: A Benin Case Study. AgREN Network Paper 148. 15 pp.

196. Network for Smallholder Poultry Development, 2003. Web site of Network for Smallholder Poultry Development. http://www.poultry.kvl.dk/

197. Nurse, M., Hem Tembe, Dinesh Paudel and Usha Dahal, 2004. From Passive Management to Health and Wealth Creation from Nepal's Community Forests: Experiences with the Community Forest Management School Approach in Ramechhap, Okhaldhunga and Dolakha Districts of the Middle Hills of Nepal. Paper presented at the Fourth National Workshop on Community Forestry, 4-6 August 2004, Kathmandu, Nepal. 13 pp.

198. Ochoa, M., 2003. Escuela de Campo en Agroforestería: una experiencia en Imbabura, Ecuador. LEISA Revista de Agroecologia 19-1: 18-19.

199. Odogola, W., J. Aluma, K.J. Sentengo, J. Asega and J. Mugerwa, 2003. Farmer Field Schools approach, a viable methodology for technology development and transfer. Uganda Journal of Agricultural Scinces 8: 427-442.

200. Oji, F.L., 2003. Farmer field school: an IPM training and extension model for pests management. Paper presented at the 3rd International Bemisia Workshop, Barcelona, Spain, 17-20 March 2003.

201. Olanya, O.M., R. O.M. Olanya, R. El-Bedewy, P.T. Ewell, J.J. Hakiza, F. Alacho, B. Ngombe, B. Kassa, G. Woldegiorgis, A. Mela, O. Ortiz and R. Nelson. Integrated management of late blight through farmer field school: Achievements and constraints in Uganda and Ethiopia. African Potato Association Conference Proceedings, Vol. 5. pp. 337-345.

202. Okoth, J.R., G.S. Khisa and J. Thomas, 2002. The Journey towards Self-financed Farmer Field Schools in East Africa. Paper presented at International Learning Workshop on Farmer Field Schools (FFS): Emerging Issues and Challenges, 21-25 October 2002, Yogyakarta, Indonesia.

203. Okoth, J.R., G.S. Khisa and J. Thomas, 2003. Towards a holistic Farmer Field School approach for East Africa. LEISA Magazine 18-3: 18-19.

204. Ooi, P.A.C., 1998. Beyond the Farmer Field School: IPM and Empowerment in Indonesia. Gatekeeper Series No. 78. IIED, London. 12 pp.

205. Ooi, P.A.C., 2003. IPM in Cotton: Lessons from Rice IPM. In: Mew, T.W., D.S. Brar, S. Peng, D. Dawe, and B. Hardy (Eds.). Rice Sciences: Innovations and Impact for Livelihood. IRRI, Los Banos, Philippines. p. 919-926.

206. Ooi, P.A.C., G. Walter-Echols, Dai Weidong, A.L. Morales-Abubakar, Lim Guan Soon, Palaniswamy Pachagounder, Manzoor H. Soomro, Cesar Galvan, F. Mancini, R. Petersen and K. Kamp, 2004. Environmental Education for Farmers. FAO-EU IPM Programme for Cotton is Asia. FAO, Bangkok, Thailand. 62 pp.

207. Orrego, R., J.J. Heath, J. Tenorio, C. Valencia, J.A. Landeo, M. Upadhya, K.A. Garrett, N. Zuñiga, A. Mendoza, A. Parraga, L. Cotrina, E. Roncal, M.A. Pacheco, O. Ortiz and R.J. Nelson, 2000. Evaluation of Potato Genotypes Through Pilot-Scale Farmer Field Schools in the Peruvian Andes. In: CIP. CIP Program Report 1999 – 2000. CIP, Lima, Peru. pp. 225-237.

208. Orr, A. 2003. Integrated Pest Management for Resource-Poor African farmers: Is the Emperor Naked? World Development 31-5: 831-845.

209. Orr, A., and Ritchie, J.M., 2003. Learning from failure: smallholder farming systems and IPM in Malawi. Agricultural Systems 79: 31-54.

210. Ortiz, O., 2004. Analisis comparativo de las modalidades de assistencia tecnica del INTA – Enfoques y modules de extension, estructuras de cosots y beneficios generados. Informe Final. FAO-Nicaragua, Managua, Nicaragua. 95 p.

211. Ortiz, O., K.A. Garrett, J.J. Heath, R. Orrego, and R.J. Nelson, 2004. Management of potato late blight in the Andean highlands: Evaluating the benefits of Farmer Participatory Research and Farmer Field Schools. Plant Disease 88: 565-571.

212. Ortiz, R., 2004. Análisis comparativo de las modalidades de asistencia técnica del INTA: Enfoques y modelos de extensión, estructuras de costos y beneficios generados. Informe final. FAO-Nicaragua, Managua, Nicaragua. 95 pp.

213. Pachagounder, P., et al., 2002. State of IPM in India. Report for the Integrated Pest Management Programme for Cotton in Asia (GCP/RAS/164/EC).

214. Page, S.L.M., 2001. Organic cotton to mitigate the impact of HIV/AIDS. LEISA Magazine 17-1: 28-29.

215. Page, S.L.M. and M. Davies, 1999. Farmer field schools as support groups for AIDS widows and other marginalised smallholder farmers in Zimbabwe. In: Mutangadura, G., H. Jackson and D. Mukurazita. AIDS and African Smallholder Agriculture. SAfAIDS.

215a. Palis, F.G., Z.M. Sumalde and M. Hossain, 2004. Assessment of Rodent Control Projects in Vietnam: Adoption and Impact. Impact Assessment Series No. 24. ACIAR, Canberra, Australia. 64 p.

216. Paredes, M. (in prep.). Study of styles of farming in Carchi, Ecuador. Published doctoral dissertation. Wageningen University and Research Centre, Wageningen, The Netherlands.

217. Pearson, C.J. and Ison, R. 1997. Agronomy of Grasslands Systems. 2nd. edition.. CUP, Cambridge, UK. 222 pp.

218. PEDIGREA, 2003-2005. Participatory Enhancement of Diversity of Genetic Resources in Asia web site. http://www.pedigrea.org/

219. PEDIGREA, 2005 Forthcoming. Enhancing the Farmers' Role in Crop Breeding - A Guide on How to Develop and Conduct Participatory Plant Breeding in Farmer's Field Schools. CGN/WUR, Wageningen, The Netherlands.

220. Phoumavong, P. and S. Inthavong, 2001. The National IPM Program in the Lao PDR: a review of IPM activities for the period 1999-2001 and future plans and priorities – Country Paper: Lao PDR. Prepared for the meeting of the Programme Advisory Committee (PAC), Ayutthaya, Thailand, November 2001. 5 pp.

221. Pimentel, D., 2005. Environmental and Economic Costs of the Application of Pesticides, Primarily in the United States. Environment, Development, and Sustainability 7-2: 229-252.

222. Pincus, J., 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, Bangkok, Thailand.

223. van de Pol, J. and Solaiman Mohamed Solaiman Awad, 2002. The FFS approach in the Arab world: the Egyptian experience. International Learning Workshop on Farmer Field Schools: Emerging issues and challenges, 21-25 October 2002, Yogyakarta, Indonesia.

224. Pontius, J., R. Dilts and A. Bartlett (Eds.), 2002. Ten Years of IPM Training in Asia - From Farmer Field School to Community IPM. FAO, Bangkok. 106 pp. http://www.fao.org/docrep/005/ac834e/ac834e00.HTM

225. PPD, 2001. Country Report – Vietnam. Prepared for the meeting of the Programme Advisory Committee (PAC), Ayutthaya, Thailand, November 2001.

226. Praneetvatakul, S. and 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.

226a. Pretty, J., 1994. Alternative Systems of Inquiry for Sustainable Agriculture. IDS Bulletin 25-2: 37-49

227. Pretty, J, I. Guijt, J. Thompson and I. Scoones, 1995. A Trainer's Guide for Participatory Learning and Action. IIED, London, UK.

228. Pretty, J. and H. Waibel, 2005. Paying the Price: The Full Cost of Pesticides. 39-54, chapter 3. In: Pretty, J. The Pesticide Detox. Earthscan, London, UK.

229. Price L.L., 2001. Demystifying farmers' entomological and pest management knowledge: A methodology for assessing the impacts on knowledge from IPM-FFS and NES interventions. Agriculture and Human Values 18-2: 153-176.

229a. Pumisacho, M. and S. Sherwood (Eds.), 2000. Learning tools for facilitators: Integrated crop management of potato [in Spanish]. INIAP/CIP/IIRR/FAO. 188 pp.

230. Puyun, Yang, Lim Guan Soon, Chen Shengdou, Yan Su, Chen Zhiqun and Guo Rong, 2002. Integrated Pest Management in China - Towards farmer field schools. Report on the State of IPM in China for Integrated Pest Management Programme for Cotton in Asia (GCP/RAS/164/EC).

231. Quizon, J, G. Feder and R. Murgai, 2001. Fiscal sustainability of agricultural extension: The case of the Farmer Field School approach. Journal on International Agricultural and Extension Education 8: 13-24.

232. Ramroop, D.V., 2005. Training of Trainers – Trinidad and Tobago. MALMR, Trinidad and Tobago. 6 pp.

233. Rahadi and H. Widagdo, 2002. Applying the Farmer Field School approach to farmer-based advocacy in Indonesia. International Learning Workshop on Farmer Field Schools: Emerging issues and challenges, 21-25 October 2002, Yogyakarta, Indonesia.

233a. Rahman, A.M.A., 2003. Farmer Field Schools (FFSs) in the Sudan: Past, present and future. AgREN Newsletter 48: 5

234. Riise, J.C., A. Permin, C.E.S. Larsen and A. Idi, 2004. 'Optimising appropriate technology transfer to small producers', Paper No. 1386, Proceedings of the World Poultry Congress. Istanbul, 8–12 June 2004. Website: www.wpc2004.org

235. Rivera, W.M., and S.G. Schram, 1987. Agricultural Extension Worldwide. Beckenham, Croom Helm Ltd., Kent, UK. 294 pp.

236. Rivera, W., and G. Alex, 2004. Demand-Driven Approaches to Agriculture Extension. Agriculture and Rural Development Discussion Paper 10. World Bank, Washington, USA.

237. Rivera, W.M. and G. Alex, 2004. The Continuing Role of Government in Pluralistic Extension Systems. International Journal of Agricultural Education and Extension 11-2: 41-52

238. Roep, D., and R. De Bruin, 1994. Regional Marginalisation: Styles of Farming and Technology Development. In: van der Ploeg, J.D. and A. Long (Eds.). Born from Within. Practice and Perspectives of Endogenous Rural Development. Van Gorcum, Assen, The Netherlands. Pp. 217-227

239. Rogers, E.M., 1995. Diffusion of Innovations. Fourth Edition. Free Press, New York, USA.

240. Rola, A.C., S.B. Jamias, and J.B. Quizon, 2002. Do farmer field school graduates retain and share what they learn?: an investigation in Iloilo, Philippines. Journal of International Agricultural and Extension Education 9: 65-76.

242. Röling, N., 1994. Platforms for decision making about eco-systems. In: Fresco, L.O., Stroosnijder, L., Bouma, J. and Van Keulen, H. (Eds.). Future of the Land: Mobilising and Integrating Knowledge for Land Use Options. John Wiley and Sons, Chicester, UK. pp. 386-393

243. Röling, N., 1998. Extension Science. Cambridge University Press, Cambridge, UK. 233 pp.

244. Röling, N., 2002. Beyond the Aggregation of Individiual Preferences. Moving from multiple to distributed cognition in resource dilemmas. In: Leeuwis, C. and R. Pyburn (Eds.). Wheelbarrows Full of Frogs. Social Learning in Natural Resource Management. Koninklijke Van Gorcum, Assen, The Netherlands. pp. 25-28.

245. Röling, N.G., 2002. Issues and Challenges for FFS: An Introductory Overview. International Learning Workshop on Farmer Field Schools: Emerging issues and challenges, 21-25 October 2002, Yogyakarta, Indonesia. 28 pp.

246. Röling, N. and J. Jiggins, 1994. Policy paradigm for sustainable farming. European Journal of Agricultural Education and Extension 1-1: 23-44.

247. Röling, N.G. and Jiggins, J. 1998. The ecological knowledge system. Chapter 16. pp. 283-311. In: Röling, N.G., and M.A.E. Wagemakers (Eds). Facilitating Sustainable Agriculture. CUP, Cambridge, UK. 318 p.

247a. Röling, N.G., and M.A.E. Wagemakers (Eds), 1998. Facilitating Sustainable Agriculture. CUP, Cambridge, UK. 318 p.

248. Röling, N.G. and Jiggins, J., 2004. Curriculum Development for Farmer Field Schools: vulnerabilities and remedies. Draft report for FAO/EU IPM Programme for Cotton in Asia (ALA/96/04)(GPC/RAS/164/EC). 21 pp.

249. Röling, N., D. Hounkonnou, S. Kwame Offei, R. Tossou and A. Van Huis, 2004. Diagnostic Studies. Linking Science to Farmers' Innovative Capacity. Case Studies from Benin and Ghana. Introduction to Special Issue of the Netherlands Journal of Life Sciences (NJAS) 52-3/4: 211-235.

249a. Röling, N.G., and J. Jiggins, in prep.

250. Rijpma, J., J. Bakkeren and I. Haque, 2003. Combining Block Demonstration and FFS approaches in soil fertility management: Experiences from Bangladesh. AgREN Newsletter 48: 17.

251. Rusike, J., D. Masendeke, S.J. Twomlow and G.M. Heinrich, 2004. Impact of Farmer Field Schools on adoption of soil water and nutrient management technologies in dry areas of Zimbabwe. Global Theme on Agro-ecosystems, Report no. 12. ICRISAT, Bulawayo, Zimbabwe. 36 pp.

252. Ryan, B. and N. Gross, 1943. The Diffusion of Hybrid Seed Corn in Two Iowa Communities. Rural Sociology 8: 15-24.

252a. Sakhan, N., and N. Chhay, 2001. Country Report – Cambodia. Prepared for the meeting of the Programme Advisory Committee (PAC), Ayutthaya, Thailand, November 2001.

253. Sarukhanyan, N., 2003. Farmer Field School for Integrated Pest Management. In: Brent C. Trela, B.C., and A. Khudaverdyan (Eds.). Growing Quality Grapes to Produce Quality Wines in Armenia. Conference Proceedings. USDA-MAP/AAA, Yerevan, Republic of Armenia.

254. Scarborough, V., S. Killough, D.A. Johnson and J. Farrington, 1997. Farmer-led extension. Concepts and practices. Intermediate Technology Publications on behalf of ODI, London, UK. 214 pp.

255. Schmidt, P., J. Stiefel and M. Hürlimann, 1997. Extension of complex issues: success factors in integrated pest management. Swiss Center for Agricultural Extension, Lindau, Switzerland.

256. Schuhbeck, A., 2005. Potential and Perspectives of Farmer Field School approaches in Papua New Guinea: Technical Report on the PNG – Vietnam Information Exchange. FAO/DED. 18 pp.

257. Shepard, B.M., E.F. Shepard, G.R. Carner, M.D. Hammig, A. Rauf and S.G. Turnipseed, 2001. Integrated pest management reduces pesticides and production costs of vegetables and soybeans in Indonesia: Field studies with local farmers. Journal of Agromedicine 7-3: 31-66.

258. Sherwood, S., R. Nelson, G. Thiele and O. Ortiz, 2000. Farmer Field Schools for ecological potato production in the Andes. ILEIA Newsletter 16-4: 24-25.

259. Sherwood, S. (in prep.) Manufactured Risk in Potatoes: Macro Factors Impacting on the Persistence of Pesticide Use in Carchi, Ecuador (preliminary title). Published Doctoral Dissertation. Wageningen University and Research Centre, Wageningen, The Netherlands.

260. 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.

261. Singh, H.B., 2002. Farmer Field School in Community Forest Management in Nepal an approach to group learning and experimentation by Forest User Groups. International Learning Workshop on Farmer Field Schools: Emerging issues and challenges, 21-25 October 2002, Yogyakarta, Indonesia.

262. Sinzogan, A.A.C., A. van Huis, D.K. Kossou, J. Jiggins and S. Vodouhé, 2004. Farmers'Knowledge and Perception of Cotton Pests and Pest Control Practices in Bénin: Results of a Diagnostic Study. Netherlands Journal of Life Sciences (NJAS) 52-3/4: 285-304.

263. Smits, R., and S. Kuhlmann, 2004. The rise of systemic instruments in innovation policy. Int. J. of Foresight and Innovation Policy 1-1/2: 4-32.

264. Snapp, S., and E. Minja, 2003. Integration of Integrated Pest Management in integrated crop management: Experiences from Malawi. In: Maredia, K.M., D. Dakouo and D. Mota-Sanchez. Integrated Pest Management in the Global Arena. CABI, Wallingford, United Kingdom.

265. Sokunthea, N., 2002. The Empowerment of ….. Farmer Life Schools. Project Mobilization and Empowerment of Rural Communities Along the Asian Highway (Route 5) in Cambodia to Reduce HIV Vulnerability (UNDP-FAO/RAS/97/202). Srer Khmer, Phnom Pennh, Cambodia. 33 pp.

266. Sones, K.R., D. Duveskog and B. Minjauw (Eds.), 2003. Farmer Field Schools: the Kenyan experience. Report of the Farmer Field School stakeholders' forum held 27th March 2003 at ILRI, Nairobi, Kenya. FAO/KARI/ILRI, Nairobi, Kenya.

267. SSMP, 2002. Sustaining soil fertility: useful practices and methods in hill agriculture. LEISA Magazine 18-3: 20-21.

268. Steinfield, H., C. de Haan and H. Blackburn, 1997. Livestock-Environment Interactions: issues and options. European Commission, Brussels, Belgium.

269. Sulaiman, R.V., and A. Hall, 2004. Towards Extension-plus: Opportunities and Challenges. Policy brief 17. NCAP, New Delhi, India.

270. Sutarto Alimoeso, M.M., Nasikin, M.M. and N. Wienarto, 2001. Country Report – Indonesia. Prepared for the meeting of the Programme Advisory Committee (PAC), Ayutthaya, Thailand, November 2001.

271. Swanson, B.E., 2004. Extension strategies for poverty alleviation in a global economy. Paper presented at International Seminar on: "Best Practices in Poverty Alleviation through Education for the New Century". Rural Development Administration, Republic of Korea.

272. Tecklenburg et al., 2002.

273. The Field Alliance, 1999-2002. Web site for Community Integrated Pest Management. http://www.communityipm.org/

274. Thiele, G., R. Nelson, O. Ortiz, and S. Sherwood, 2001. Participatory research and training: ten lessons from the Farmer Field Schools (FFS) in the Andes. Currents: 4-11.

275. Thiele, G., Ann R. Braun and E. Gandarillas, 2005. Farmer field schools and CIALS as complementary platforms: new challenges and opportunities. In: Gonsalves, J., T. Becker, Ann R. Braun, E. Campilan, H. De Chavez, E. Fajber, M. Kapiriri, J. Rivaca-Caminade and R. Vernooy. Participatory Research and Development for Sustainable Agriculture and Natural Resource Management: A Sourcebook. CIP-UPWARD/IDRC/IFAD, Laguna, Philippines.

275a. Torrez, R., J. Tenorio, C. Valencia, R. Orrego, O. Ortiz, R. Nelson, and G. Thiele, 1999a. Implementing IPM for late blight in the Andes. Impact on a Changing World. Program Report 1997-98. CIP, Lima, Peru. pp. 91-99.

275b. Torrez, R., A. Veizaga, E. Macías, M. Salazar, J. Blajos, A. Gandarillas, O. Navia, J. Gabriel and G. Thiele, 1999b. Capacitación a agricultores en el manejo integrado del tizón de la papa en Cochabamba. Fundación PROINPA, La Paz, Bolivia.

276. Tripathi, S., and S. Wajih, 2003. The greening of self-help groups. LEISA Magazine 19-1: 24-25.

277. Tripp, R., M. Wijeratne and H. Piyadasa, 2005. What Should We Expect From Farmer Field Schools? A Sri Lanka Case Study. World Development 33-10: 1705-1720.

278. Tripp, R., M. Wijeratne, and H. Piyadasa, 2005/forthcoming. After School. Farmer Field Schools in Southern Sri Lanka. Chapter 7 of a planned volume on Low Input Agriculture. Earthscan, London, UK.

279. Umali, D.N., G. Feder and C. de Haan, 1994. Animal Health Service: Finding the balance between public and private delivery. *The World Bank Research Observer 9-1.*

280. UN Millennium Project, 2005. Investing in Development: A Practical Plan to Achieve the Millennium Development Goals. UN Millennium Project, New York, USA. 329 p.

281. Uphoff, N. (Ed), 2002. Agroecological Innovations. Increasing Food Production with Participatory Development. Earthscan Publishing Ltd., London, UK. 306 pp.

282. URT, 2004. Tanzania Agricultural Services Support Programme - Programme Document and IFAD Appraisal Report, Working Paper Supplement I: Farmer Empowerment. 82 pp.

283. van Veldhuizen, L.V., Waters-Bayer, A., Killough, S., Espineli, M., and Gonsalves, J. 2002. Institutionalising Farmer Participatory Research. Lessons from a comparative study. In: Leeuwis,

C., and R. Pyburn (Eds.). Wheelbarrows Full of Frogs. Koninklijke van Gorcum, Assen, Netherlands. pp. 375-387

284. Van der Ploeg, J.D., 1994. Styles of Farming: an introductory note on concepts and methodology. In: Van der ploeg, J.D., and A. Long (Eds.). Born from Within: Practice and perspectives of endogenous development. Koninklijke van Gorcum, Assen, Netherlands. pp. 7 – 30.

285. Vijayalakshmi, B., G. Ravi Kumar, S. Pattabiraman and Daniel Anand Raj. Sustaining the Farmer Field School (FFS) Process – AME Foundation experiences from Tamilnadu.

286. Vuthang, Y., 2002. Farmer Empowerment through Farmer Life School, adapted from Farmer Field School Approach. International Learning Workshop on Farmer Field Schools: Emerging issues and challenges, 21-25 October 2002, Yogyakarta, Indonesia.

287. Wolf, S.A. 1998. Privatization of Information and Agricultural Industrialization. CRC Press Ltd., Boca Raton, Florida, USA. 299 pp.

288. World Education/Cambodia, 2000.

289. Wilson, K. and G. Morren, 1990). System approaches for improvement in agriculture and resource management. Macmillan, New York, USA.

290. Winarto, Y.T., 2003. Farmer field school, farmer life school and farmers club for enriching knowledge and empowering farmers: A case study from Cambodia. Paper presented at the International Symposium "Alternative Approaches to Enhancing Small-Scale Livelihoods and Natural Resources Management in Marginal Areas - Experience in Monsoon Asia", 29 - 30 October 2003, Tokyo, Japan.

290a. WWMP, 2004. The Pilot Farmer Field School Programme. Wang Watershed Management Project, ALA/97/50. WWMP Document No. 7.

291. Yadav, B.P., 2005. Review of Vegetable IPM activities through Farmers' Field School (FFS) in Nepal. In: Z. Singh, Z., P.J. Batt and R. Murray-Prior (Eds.). ISHS Acta Horticulturae 672: IV International Symposium on Horticultural Education, Extension and Training. http://www.actahort.org/books/672/672_48.htm.

292. Yajima, M., L. Chiwona-Karltun, P. Kambewa, A. van Huis and J. Jiggins, 2005. Learning about cassava in an HIV/AIDS affected area of Malawi. Paper presented at the 8th Oxford Conference on Learning and Development. 13-15 September 2005, Oxford, UK.

293. Yech, P., 2003. Farmer life schools: Learning with Farmer Field Schools. LEISA Magazine 19-3: 11-12.

294. Yongfan, P. and C. Zhiqun, 2001. Country Report – China. Prepared for the meeting of the Programme Advisory Committee (PAC), Ayutthaya, Thailand, November 2001.

295. Zake, J., C. Walaga and A. de Jager, 2005. Brining farmers together. LEISA Magazine 21-2: 26-27.

296. Züger, R., 2004. Impact Assessment of Farmer Field Schools in Cajamarca, Peru: An Economic Evaluation. Social Sciences Working Paper 2004-1. International Potato Center, Lima, Peru.

Appendix I. Short description of the FFS Approach[26]

In general, Farmer Field Schools (FFS) consist of groups of people with a common interest, who get together on a regular basis to study the *"how and why"* of a particular topic. The topics covered can vary considerably - from IPM, organic agriculture, animal husbandry, and soil husbandry, to income-generating activities such as handicrafts. The FFS, however, are particularly suited for field studies, where specific hands-on management skills and conceptual understanding (based on non-formal adult education principles) is required. So what are the essential elements of a FFS? Below is a list of elements that commonly appear in successful FFS programmes:

The group. A group of people with a common interest form the core of the FFS. The group may be mixed with men and women together, or separated, depending on culture and topic. The group could be an established one, such as a self-help, women's, or youth group. Participatory technology groups, for example, sometimes undertake a season of study in FFSs before starting their research. The FFS tends to strengthen existing groups or may lead to the formation of new groups. Some FFS groups do not continue after the study period. The FFS is not developed with the intention of creating a long-term organisation - although it often becomes one.

The field. FFSs are about practical, hands-on topics. In the FFS, the field is the teacher, and it provides most of the training materials like plants, pests, soil particles and real problems. Any new "language" learned in the course of study can be applied directly to real objects, and local names can be used and agreed on. Farmers are usually much more comfortable in field situations than in classrooms. In most cases, communities can provide a study site with a shaded area for follow-up discussions.

The facilitator. Each FFS needs a technically competent facilitator to lead members through the hands-on exercises. There is no lecturing involved, so the facilitator can be an extension officer or a Farmer Field School graduate. Extension officers with different organisational backgrounds, for example government, NGOs and private companies, have all been involved in FFS. In most programmes, a key objective is to move towards farmer facilitators, because they are often better facilitators than outside extension staff - they know the community and its members, speak a similar language, are recognised by members as colleagues, and know the area well. From a financial perspective, farmer facilitators require less transport and other financial support than formal extensionists. They can also operate more independently (and therefore cheaply), outside formal hierarchical structures.

All facilitators need training. Extension facilitators need season-long training to (re)learn facilitation skills, learn to grow crops with their own hands, and develop management skills such as fund-raising and development of local programmes. Computer literacy is often included in the training of facilitators, especially for preparing local training materials, budgets and project proposals. Email is also becoming more widely available. Once the facilitators have completed their training and are leading the FFS process, it is easy to identify capable farmers who are interested in becoming facilitators. Farmer Field School graduates are usually given special farmer facilitator training (10-14 days) to improve technical, facilitation and organisational skills.

The curriculum. The FFS curriculum follows the natural cycle of its subject, be it crop, animal, soil, or handicrafts. For example, the cycle may be "seed to seed" or "egg to egg". This approach allows all aspects of the subject to be covered, in parallel with what is happening in the FFS member's field. For example, rice transplanting in the FFS takes place at the same time as farmers are transplanting their own crops - the lessons learned can be applied directly. One key factor in the success of the FFS has been that there are no lectures – all activities are based on experiential (learning-by-doing), participatory, hands-on work. This builds on adult learning theory and practice. Each activity has a procedure for action, observation, analysis and decision making. The emphasis is not only on "how" but also on "why". Experience has shown that structured, hands-on activities provide a sound basis for continued innovation and local adaptation, after the FFS itself has been completed. It is also one of the main reasons that farmer facilitators can easily run FFSs - once they know how to facilitate an activity, the outcomes become obvious from the exercise itself.

[26] Adapted from Gallagher (2003).

Activities are sometimes season-long experiments – especially those related to soils or plant physiology (for example soil or variety trials, plant compensation trials). Other activities in the curriculum include 30-120 minutes for specific topics. Icebreakers, energisers, and team/organisation building exercises are also included in each session. The curriculum of many FFSs is combined with other topics. In Kenya, for example, the FFSs follow a one-year cycle including cash crops, food crops, chickens or goats and special topics on nutrition, HIV/AIDS, water sanitation and marketing. FFSs for literacy are also promoted where there is a need.

The programme leader. Most FFS programmes exist within a larger programme, run by government or a civil society organisation. It is essential to have a good programme leader who can support the training of facilitators, get materials organised for the field, solve problems in participatory ways and nurture field staff facilitators. This person needs to keep a close watch on the FFSs for potential technical or human relations problems. They are also the person likely to be responsible for monitoring and evaluation. The programme leader must be a good leader and an empowering person. He or she is the key to successful programme development and needs support and training to develop the necessary skills.

Financing. FFSs can be expensive or low-cost, depending on who implements them and how they are conducted. Due to high allowances, transportation costs and several layers of supervision programmes can end up being expensive (about US$30-50 per farmer). Obviously, the greater the distance that facilitators need to travel to get to the field, the higher the cost of transport. Transport is one of the biggest costs in any extension programme. However, in FFS programmes training is a key recurrent component, which takes up a large portion of the budget. When the FFS is carried out by local organisations and farmer facilitators, initial start-up costs may be moderate, but the running costs will be much lower (about US$1-20 per farmer). A trend in East Africa is to manage small commercial plots alongside the FFS study plots, so that the FFS can actually raise more funds than it uses for inputs and stationery. In some cases in East Africa farmers have also cost-shared training expenses by buying their own exercise books, offering training sites and other locally available training materials (e.g. planting materials and labour).

Appendix II. Global Status of Farmer Field Schools

Asia

Over two million rice farmers in Asia and Southeast Asia participated in rice Integrated Pest Management Farmer Field Schools (IPM-FFS) between early 1990, when the first FFS was conducted in Indonesia, and the end of 1999. During those 10 years, farmers, agriculture extension field workers, plant protection field workers and NGO field workers learned how to facilitate the FFS approach and conducted over 75,000 Farmer Field Schools. Farmers who have participated in field schools have reduced their use of pesticides, improved their use of inputs such as water and fertiliser, realised enhanced yields and obtained increased incomes. From the beginning they moved into other crops and wider ranging activities related to their agro-ecosystems. IPM alumni are in the forefront of establishing agricultural systems in their villages and promoting food security for themselves, their children and generations to come (224). Other major large-scale programmes in Asia that followed and built on the Rice-IPM programme are the Vegetable Integrated Pest Control Inter-country Programme (IPM-ICP), the FAO-EU IPM Programme for Cotton in Asia (206) and Participatory Enhancement of Diversity of Genetic Resources in Asia (PEDIGREA) project (218; 179).

The "Intercountry Programme for the Development and Application of Integrated Pest Control in Vegetables in South and South-East Asia" initially started in 1996 in Bangladesh, Lao PDR, the Philippines and Vietnam. In 1997, a further three countries joined the programme, namely Cambodia, Indonesia and Thailand (85). Phase I of this Inter-Country Programme (ICP) focused on enhancing the capacity of governments and NGOs to implement training programmes in the seven countries using the Training of Trainers (ToT) and Farmer Field School (FFS) approach. More than 600 trainers and 30,000 farmers have been trained since the beginning of Phase I. Phase II (2002-2006) of the ICP has expanded to China and has more emphasis on vegetable IPM farmer training and participatory research in five countries in the Greater Mekong Sub-Region, with a sharper focus on major crops and pests. Specifically the programme will: 1) strengthen and expand the capability of government agencies and NGOs to carry out IPM training and continuing field activities, 2) create and strengthen groups of smallholder farmers so that they can take collective action in support of ecologically-based vegetable production and marketing, and 3) institute sustainable arrangements for the solution of technical problems. Phase II of the project is more sensitive to quality control of participatory training and research activities, gender, impact assessment and regional issues (87). The project provides advice, organise training, arrange exchanges of expertise, and fund field studies and follow-up activities in the field. These activities are being carried out in close collaboration with other regional, national and local IPM-related projects funded by governments, donor agencies and NGOs.

The five-year (1999-2004) FAO-EU IPM Programme for Cotton in Asia had the objective to empower farmers in a cotton-based production system, through observation and experimentation, to solve pest and other production problems in their own fields. This development objective effectively shifted the emphasis from cotton production to human resource development and more accurately reflected what the programme was actually trying to achieve in the field. Over the five-year period the programme implemented 2,114 FFS (53,725 graduates) in five countries - Bangladesh, China, India, Pakistan, Philippines and Vietnam (206). Impacts of the programmes included (206):

- Improved farmer livelihoods and reduced poverty;
- Reduced environmental risks and increased biodiversity;
- Reduced suffering from pesticide poisoning;
- Strengthened farmer's human and social capacities.

A recent development in SE Asia has been the adaptation of the FFS approach for recovering biodiversity knowledge (218; 179) as part of the regional Participatory Enhancement of

Diversity of Genetic Resources in Asia (PEDIGREA) project in Cambodia, Indonesia and Vietnam. In the last decades of the twentieth century farming systems in Southeast Asia have experienced a strong genetic erosion. The need to increase productivity to meet the demands of a growing population was met by the development of new varieties of major crops by the public and commercial sector, and by the promotion of western breeds of farm animals, resulting in the neglect of traditional varieties and breeds, and in the neglect of vegetable crops of regional importance. The genetic erosion has considerably narrowed crop and animal diversity and affected the genetic base that is needed to cope with future demands due to new biotic and abiotic stresses, climate change, and consumer preferences, and that forms an intrinsic part of farmers' cultures. Together with the genetic erosion of crops and farm animals, erosion of farmers' knowledge and farmers' culture occurred. The dependence of farmers on external inputs (seeds, fertilisers, pesticides, animal stock) strongly increased. The PEDIGREA project works on the premise that farmers themselves can manage and develop the genetic diversity that is suited to local conditions. To this end the project relies on the participatory methodologies developed in the Farmer Field School (FFS) approach of the Integrated Pest Management strategies applied in the region in the last two decades. At the same time, the project shall build on the comparative advantages of all key actors in the management of genetic resources, including those from the public sector. The availability of genetic resources, including products of pre-breeding and breeding lines, is extremely important in the success of the FFS. This implies that the approach ensures recognition of and attribution to plant breeders and their institutions regarding the results of participatory plant breeding. As a result of the PEDIGREA pilot project in Cambodia, Indonesia and Vietnam a FFS field guide is being prepared (219).

Indonesia is where the FFS approach originated and the country which developed the largest country programme as part of the Asian Regional Rice-IPM programme with more than a million farmers trained (Table II.1). When the National IPM Programme was established in 1989, the goals were to increase capacity of farmers and field workers to make sound field management decisions based on IPM principles. The motto at that time was "IPM as a human resource development programme at farmer level". In 1994, the Minister of Agriculture established a new decree, which very clearly stated that IPM is an ecological approach and farmers themselves are the subject and the central focus of IPM development. The Minister banned 21 active ingredients of pesticide through a sunset clause in 1996. After more than 10 years of the implementation of the donor-supported Indonesian National IPM Programme between 1989-1999, the Minister of Agriculture sent letters to the to the governors at the province and heads of regency (Bupati) at the district in 12 rice-bowl provinces, asking them to provide continued support to the IPM farmer field activities. Local government budget support provided to IPM field training activities can be traced back to the year 1991, the early period of the National Program. Now, the role of district governments in supporting farmer activities has become even more important than before because of the full implementation of decentralization in years 2000-2001 (270).

In 1999 the Indonesian IPM Farmer Association was established by 461 farmer representatives from 11 project-provinces. Since then local IPM farmer associations have been conducting their own congresses at provincial and district levels. They have chosen their coordinators and management teams and develop action plans. These associations usually receive strong support from local governments. The governors and heads of districts (Bupati) not only provide some budgets, but they come to the congresses and hold discussions with farmers (270).

In summary, there is a broad range of community-based IPM field activities organised or assisted by different institutions and partners. Some players are as follows:

- Ministry of Agriculture's IPM Small-holders Estate Crops Project assisted by Asian Development Bank;
- Local governments' IPM programmes at districts and provinces;

- The Indonesian IPM Farmer Associations/Networks field activities in 10 provinces supported by local governments, NGOs and FAO Community IPM;
- Community-based IPM/sustainable/organic agriculture programmes organised by NGO networks, e.g. World Education, OXFAM, CRS Indonesia, FADO, JAKER PO (Organic Farming Network), LPTP, Gita Pertiwi, Duta Awam, and other Indonesian NGOs;
- Farmer training in field school model to control cocoa pod-borer infestation by ACDI-VOCA in Sulawesi;
- FAO Community IPM Programme.

Over time, the emphasis of the Indonesian IPM programme shifted towards community organisation, community planning and management of IPM, and became known as Community IPM (CIPM). Fakih et al. (2003) assessed the extent to which Community IPM has been institutionalised in Java (Indonesia). The dynamics of institutionalising people-centred and participatory processes were found to be closely dependent on the following mutually reinforcing factors:

- Enabling national policy decisions by the state were complemented by farmer led attempts to contest and shape policies from below.
- Actors with emancipatory values, attitudes and behaviours championed the cause of FFS/CIPM.
- Farmer centred learning and critical education promoted ecological knowledge for sustainability, both among farmers and those who work with them.
- Enabling organisations that emphasise farmers' abilities, promote organisational learning and which are flexible in their structure and procedures.
- The existence of safe spaces where farmers can get together, share problems and decide on action. Linking together these safe spaces and local groups into broader federations has helped farmers capture power back from centralised, top-down agencies.
- A context in which farmers have some control over funding decisions and allocations made by local, national or international funding bodies.

Following Indonesia, Vietnam started an IPM-FFS programme in 1992, initially with a rice programme, but quickly followed by a vegetable (1995), cotton (2000), seed (2002) and livestock (2002) programme (all funded by different donors; see Table II.1 and Sub-Table II.1V). After a 10 year period of IPM-FFS programmes (225; 224), FFS in Vietnam diversified to seed and livestock FFS as part of DANIDA's Agricultural Sector Programme Support (17; 61).

Box II.1 Introducing Farmer Livestock Schools in Vietnam (61).

A new livestock extension approach for training of trainers (TOT) and smallholders in Farmer Livestock Schools (FLivS) is gradually being introduced to the national extension system in Vietnam. The approach combines experiences from Farmer Field Schools in crops, with other practical, group and field-based, interactive learning methods. Although the new concept is substantially different from the traditional extension method it has, after initial scepticism and reluctance, been embraced by local institutions. Curricula and training manuals on pig semi-scavenging chicken and duck production have been developed and tested in ToT courses, and FLivS are now underway in pilot communes with around 1000 predominantly poor, small-scale farmers. Finding ways to introduce new development concepts and methods and gradually alter the perceptions, attitudes, and behaviour of the individuals and institutions involved has proven to be the key challenge and a precondition for success. Patience and perseverance combined with long-term commitment to the programme from both government and donor is helping facilitate the on-going change process. Broad stakeholder involvement in, commitment to and ownership of process and product are prerequisites for sustaining and expanding the programme. Despite having made significant headway by introducing a farmers' needs-based approach into a top-down extension system, considerable challenges remain in the further development and mainstreaming of a truly participatory, costeffective and sustainable training programme, and in integrating FLivS activities into a broader framework for small livestock micro-enterprise development.

In the Philippines, "Kasakalikasan", the local name for the Philippine Integrated Pest Management (IPM) Programme, was launched by President Fidel Ramos in 1993 to train farmers and empower them to become experts in their own fields by developing their ability to make critical and informed decisions, and to make crop protection systems more productive, profitable and sustainable. Its aim was to make IPM the standard approach to crop husbandry and pest management in rice, maize and vegetable production in the Philippines (36). Kasakalikasan has trained more than 520,000 farmers in FFS-IPM (Table II.1) and since 2001 the programme has expanded to nutrition, health and agro-forestry, among other topics. A study by Medina and Callo (1999) assessed the impact of IPM in the Philippines and identified areas that could improve and sustain Kasakalikasan. They also sought to determine the status of Kasakalikasan's implementation and impact of Farmer Field Schools (FFS) on farmer-participants. The majority of FFS farmers applied the IPM principles they have learned in the FFS such as the use of appropriate varieties and sound management practices like proper land preparation, water, nutrient, insect pest and weed management. Results have indicated that the participatory, experimental, and discovery-based learning technique used by Kasakalikasan was effective in enhancing farmers' ecological knowledge. Likewise, insecticide use was significantly reduced in all programmes.

China has been involved in IPM-FFS programmes since 1993 through implementation by the National Agro-Technical Extension and Service Center (NATESC) of the MoA. Large programmes (although smaller than in Indonesia, Philippines and Vietnam) were on rice, cotton and vegetables (Table II.1). In 1993 China joined the FAO Inter-Country IPM Programme for rice. So far, more than 20 ToTs and 30,000 FFSs in rice were carried out: in total over 600 facilitators and 100,000 farmers were trained in Sichuan, Hubei, Hunan, Henan, Anhui, Zhejiang and Guangdong provinces (230). Between 2000 and 2004 cotton IPM-FFS was introduced in China as part of the FAO-EU IPM Programme for Cotton in Asia (230; 206) and since 2002 vegetable IPM-FFS as part of the FAO regional Vegetable-IPM programme (85); local government funding (NATESC, Yunnan Agricultural Bureau and Beijing Agricultural Bureau) has also started funding vegetable IPM-FFS from 2004 onwards.

In India the FAO Inter-Country IPM Programme for rice started in 1994, followed by the FAO-EU IPM Programme for cotton in Asia between 2000-2004 (206), and since then more than 8,700 FFS have run in 28 states of India (213; 206). Realizing the effectiveness of FFS and the economic and social benefits to resource-poor farmers, the state governments of Andhra Pradesh, Karnataka and Maharashtra have taken steps to institutionalise the IPM-FFS model for cotton and other crops in their mainstream extension. From 2004 onwards, the state governments modified the existing extension approach from "demonstrations" to FFS so as to enable farmers to evaluate technologies by themselves (213; pers. comm. Palaniswamy Pachagounder). In addition in 2005 the Technology Mission on Cotton (TMC) instructed the state governments to undertake Training of Facilitators (ToF) and FFS instead of "demonstrations", which has resulted in more state governments taking on the approach (pers. comm. Palaniswamy Pachagounder). Some NGOs, other development agencies and farmer associations/clubs have also inducted IPM in their activities. Others have adopted the FFS approach for educating farmers on water and soil conservation (213).

Since 1994 in Bangladesh FAO, UNDP, EU, DANIDA, ADB and DFID provided both financial and technical support to FFS programmes, training a pool of more than 5,300 FFS trainers and facilitators (Table II.1) from the Department of Agricultural Extension (DAE), NGOs (mainly CARE-Bangladesh) and selected farming communities. More than 600,000 farmers were trained in season long FFS, most of which were on rice (Table1). CARE adapted the Farmer Field School beyond rice-fish cultivation to achieve farmer empowerment (22a); not just the technology was changed, a number of other major modifications were made, as described by Bartlett (2004):

- The duration of the original FFS in South-East Asia is approximately 4 months, covering a single cropping season. This allows the participants to study all aspects of crop husbandry, from land preparation to harvest. In Bangladesh, CARE's FFS have a duration of at least 18 months and – in the case of the SHABGE project – have been as long as 30 months. This has allowed CARE to increase the number of technologies that are being studied or demonstrated. One interesting consequence of the extended duration is that the term "Farmer Field School" now applies to the group of people who attend the meetings, rather than to the learning process. For CARE staff, the FFS is a farmer group or organisation rather than an activity.

- While the duration of the FFS has been increased by CARE, the intensity has been reduced. In the classical rice FFS sessions take place every week, while in CARE projects they take place once every two weeks at the outset, extending to once every month in the second year. Also, the length of the CARE sessions is less than sessions conducted in other countries, with very little time being spent on experiential learning, i.e. on the process of making field observations and analysis of the data that has been collected.
- In recent years, CARE has added a number of other activities to the FFS, including marketing and organizational development. These issues are studied in sessions facilitated by CARE staff. While marketing initiatives and organizational development have been important outcomes of FFS in some other countries, these developments take place *after* farmers graduate from the FFS.

As a result of these changes, some outside observers have questioned whether or not the term "Farmer Field School" should be used to describe what CARE is doing. Whatever they are called, the activities being organised by CARE are clearly *not* an entry point of the kind that is described in previous sections of this report. The CARE Field School is not a starter for a development process that involves a transformation in the relationship between outsiders and members of the community. Instead, the CARE Field School is a complete development package - entrée, main course and dessert – delivered by CARE staff (23).

Sri Lanka started FFS activities in rice-IPM in 1995, which were coordinated by the Department of Agriculture (DoA) in collaboration with FAO. The National IPM programme operates through the Provincial Councils, the Mahaweli Authority of Sri Lanka (MASL)[27] and local NGOs. In addition to project funding from Australia, Norway and UNEP, several provinces and MASL contribute agricultural funds towards FFS and follow-up activities (9; Table II.1). Various NGOs have also been actively implementing FFS. One innovation to the FFS approach developed in Sri Lanka is the incorporation of Integrated Vector Management into IPM training and community programmes. Farming decisions made in rice (e.g. regarding early-season spraying or alternate wet-dry irrigation) also affect mosquito vectors of human diseases, which breed in wetland rice (32).

In Cambodia the national IPM programme started FFS activities in 1996 in rice, which was quickly followed in vegetables in 1997. The programme has received funding support for the implementation of activities from FAO, donors, NGOs and other international organisations (Table II.1). Many other projects have adopted the FFS farmer-centred learning model pioneered in Cambodia by IPM (252a). An important FFS innovation developed in Cambodia is the "Farmer Life School" (252a; 286; 293; 290), an important follow up activity to IPM-FFS. Farmer Trainers represent a new network of civil society actors. These are independent farmers not merely functionaries of the National IPM programme. They are essential for the implementation of IPM. Without them FFS are not sustainable activities beyond the limits of the resources of the project. In recognition of the fact that production is not constrained primarily by a lack of technology but poverty and lack of access to information and resources the training skills of IPM farmer trainers are being utilised to conduct "human ecology". This implies that the farmers themselves analyse their social systems based on their understanding of ecology and their place in the ecosystem. This has led to the innovation of Farmer Life Schools (FLS) where farmers conduct their own social analysis of their farming system. In the FLS all aspects of farming life are examined in much the same way that farmers examine the

[27] The Mahaweli Authority of Sri Lanka (MASL) has been responsible from around 1979 for the development of water resources in the Mahaweli river basin and the adjacent basins for irrigation and hydropower facilities, along with related settlement based services.

ecology of their crop. These FLS are run by IPM Farmer Trainers in a new civil society network.

Pakistan, in contrast to most other Asian FFS programmes, started a pilot with cotton IPM-FFS with AsDB funding in 1997 (171). This pilot was expanded with the FAO-EU IPM Programme for Cotton in Asia (2000-2004). As of 2004 the two main cotton producing provinces, Sindh and Punjab, have embraced IPM FFSs as the dominant interface between government and farmers. FFS fills a need that regular extension apparently has not been able to satisfy. Senior officials have acknowledged IPM-FFS as an approach that is able to enlist farmers in rural development programmes. Therefore, Sindh Province has included FFS expertise in the job description of its agricultural officers, and Punjab has launched a major programme expansion initiative to conduct 3,500 year-long FFSs in cotton-wheat management over the next 4 years (206). The FAO-EU Programme helped establish a strong National IPM Programme, which not only became the joint implementing unit for the EU and AsDB funded projects, but also addressed pesticide policy issues with ministerial decision-makers. Despite a powerful pesticide industry, the country has embarked upon its own National IPM Project that will cover four provinces and last five years. This project will be entirely funded from national and provincial sources (206). NGOs and international agencies such as CABI Bioscience, World Wildlife Fund, Caritas, PLAN Pakistan, and local welfare associations became active partners in the implementation of FFS. To encourage women's participation, an AGFUND initiated project on "Pesticide Risk Reduction for Women in Pakistan" focused on training female facilitators to reach rural women in the traditional, gender-segregated society through *Women Open Schools*. Emphasis was on the toxicity and health risks of pesticides, but other elements in the cotton-based farming systems were also included. Significant social mobilisation and empowerment was evident from the formation of officially registered farmer alumni associations and associations of IPM facilitators offering facilitation services and farmer club support (206). CABI introduced and tested a basic livestock management curriculum in FFS in 2001 with the technical assistance of the Livestock Extension Department (pers. Comm. Janny Vos).

In Laos PDR FFS activities started as part of the FAO Regional Programmes for the Development of Integrated Pest Management in Rice and Vegetables in 1997. Various international NGOs have also supported and enriched the work of the National IPM Programme, such as OXFAM-Belgium, SEARICE, CIDSE, Village Focus and GAPE. The Lao Government recognises the National IPM Programme as a key Government extension and education activity. In particular, it recognises the farmer-education nature of the programme, demonstrated by the absorption of the National IPM Programme by the established National Agriculture and Forestry Extension Service (220). However, Lao Government support has so far not been translated in financial support for FFS-implementation as part of the regular Government programmes and budgets.

Thailand started an FFS-IPM programme in 1998 implemented through the Institute for Biological Agriculture and Farmer Field Schools (IBAFFS), which was established in 1999 under Royal Initiative by His Majesty the King of Thailand. Both the FAO Community and Vegetable IPM Programmes and DANIDA have provided technical and financial support to the work of IBAFFS, but the great majority of programme funding is from the Thai Government (71). In parallel the Department of Non-Formal Education (DNFE) of the Ministry of Education (MoE), with support from the Thai Education Foundation (TEF) and the FAO Community IPM Programme, has supported the development of an IPM programme in Thailand. With a strong interest in the learning processes of IPM that corresponds with the DNFE educational principal of "Khit-pen", and a content that is responsive to a majority of DNFE adult students and farmers, DNFE has been providing continuing commitment and effort at all levels to institutionalise the IPM programme (70). Following this innovation of the Student Field School in Thailand, other countries in Asia thereafter pioneered with the same concept of a more flexible school curriculum (139).

Nepal started off in 1998 with IPM-FFS in rice and has since developed a wide range of FFS topics, implemented by many partners and donors (Table II.1). FFS Innovations from Nepal include HIV/AIDS by CARE-Nepal (149), Farmers' Forest Management Schools (261; 197), FFS pilots on the System for Rice Intensivation (CIIFAD web site) and soil fertility (267). The NGO sector, especially CARE-Nepal and World Education, have increasingly played a key role in the implementation and diversification of the FFS approach in Nepal. Through World Education more than nine local NGOs/CBOs are involved in carrying out FFS in more than 12 districts. NGOs have the potential to expand the scale of FFS in Nepal, as they can effectively reach disadvantaged groups and reach out into remoter parts of the country. The country currently counts 221 FFS trainers and 398 farmer facilitators in 55 districts (out of 75 districts). Since 1998 altogether 2282 FFS were implemented of which approximately 65% (1500) are still active (pers. comm. Ganesh Kumar). The success of the IPM programme in rice over the last 5-7 years has resulted in a demand for IPM in other crops as well. Preliminary results indicate pesticides use reduced by up to 40% in FFS areas. His Mayesty's Government of Nepal has decided to make IPM one of the "Pillars of Agriculture" and expand it through out the country and cover all priority crops (pers. comm. Ganesh Kumar).

In Bhutan the FFS approach was introduced in 2004 in the Wang Watershed Management Project with EU support. After a first ToT, 11 FFSs were initiated in cabbage and chilli ICM. There is no doubt that the FFS approach has been welcomed in Bhutan by extensionists (167) as well as by the farmers and FFS appears to have great potential for becoming an integrated part of the extension service with DoA (290a).

Papua New Guinea is considering starting FFS implementation after a study tour in 2004 to Vietnam and a follow-up "lessons learnt" workshop (256).

Sub-Saharan Africa

In 1993 Sudan became the first African country to apply the FFS approach, modify it to suit the socio-economic structure of the rural community, evaluate and present it as a model that can easily be assimilated and adopted by small-scale farmers both throughout Sudan and in other African countries (233a). In the Sudan vegetable farmers have made irrational use of pesticides, resulting in risks for health and environmental hazards (233a), which resulted in a three-year (1993-96) FAO-supported project on the development, implementation and validation of IPM on vegetables. Many evaluation studies indicated the successful performance and positive results of FFSs in the Sudan (233a). Therefore, in the 1996/1997 growing season, after the termination of international assistance, the FFSs approach became a national policy in order to sustain the success of the schools. However, over the last five years the majority of the FFSs were terminated, particularly in Gezira State. Reasons for this included lack of financial support, lack of transportation and lack of adequate training for trainers (233a). Farmers were empowered, which led farmers' protest against rules and regulations, which was why the approach was unpopular with politicians, local government, private development authorities and irrigation authorities. In 2004 FAO was contracted by the European Union to formulate the Sudan Productive Capacity and Recovery Programme, which recommended the need to reintroduce the FFS approach as a successful learning model in eight different projects in North and South Sudan (pers. comm. Arwa Khalid). The expected number of FFS per project is 125, which will lead to 1,000 FFS formed all over Sudan.

FAO's introduction of the FFS approach in eastern and southern Africa was in Zimbabwe through a FAO-supported project on Integrated Pest and Production Management[28] (TCP/ZIM/6712), which started in 1997 with the aim to provide education programmes to farmers in communal and resettlement areas of Zimbabwe. After this first project adaptations from Zimbabwe FFS projects included organic cotton (214), integrated soil, water and

[28] IPPM is a term developed by the Zimbabwe IPPM programme to highlight the importance of production and pest management balance. The term is now widely used in African IPPM programmes. The four principles of IPPM are: 1) cultivation of a healthy soil and crop; 2) conservation of natural enemies; 3) observation of fields; and 4) farmers becoming expert IPPM practitioners.

nutrient management, Junior Farmer Life and Field Schools, dry season feeding of livestock, poultry and agribusiness (pers. comm. Jan Venema and Dave Masendeke;).

In Kenya the Special Programme for Food Security (SPFS) first introduced the Farmer Field School (FFS) approach on a small-scale in 1995 with an initial focus on Integrated Pest Management (IPM). Since 1995, the FFS approach has been tested and adapted for farmer driven learning for a range of crop and livestock enterprises and has increasingly been applied as a training tool for agricultural topics in general rather than just for IPM. In 1999, FAO's Global IPM Facility launched an East African pilot project for FFS on IPPM covering three districts in western Kenya (203; 151; 150). With IPPM as the entry point, the FFSs have included other aspects that have a bearing on production and livelihoods in general. Improved resources management issues as well as financial management are recognised as important components for capacity building (266). Major FFS activities in Kenya (see Sub-Table II.1K and 91 for an overview) are currently being implemented through many development programmes including:

- The UNDP funded FAO PFI-FFS project was started in 2001, including Field Schools on a range of topics, as diverse as bee keeping and soil management (74).
- ILRI initiated a Livestock FFS project with DFID Animal Health Programme funding, adapting FFS methodology to production issues of smallholder dairy production (185). See also Box II.2.
- In 2002 a FAO Technical Cooperation Project in Bondo District developed the Food Security Field School model, where health, nutrition and other topics closely related to farmers' livelihoods have been addressed in the FFS activities.
- Through support from JICA starting in 2003, the GoK Forest Department has been piloting Farm Forestry Field Schools where crop production and forestry establishment have been addressed in an integrated manner.
- FAO, through funding from the Netherlands, has supported the development of soil and water specific FFS tools and exercises (75) and established activities in three provinces in Kenya.
- DANIDA's Agricultural Sector Programme adopted the FFS approach as the main tool of extension in its programme in four districts in Kenya and has been working closely with MOA in the establishment of a large number of FFS groups in varying topics.
- EU-funded project "Farming in Tsetse controlled areas" (FITCA) will receive capacity building and technical support from ILRI for the successful implementation of FLivS.

Box II.2 Development of FFS methodology for smallholder dairy farmers in Kenya (185).

Minjauw et al. (2002) reports that the FFS methodology needs to be developed for similarly complex situations like animal health and production where responses to interventions may not be as fast. In a study in Central and Rift Valley Provinces of Kenya, approximately 90% of rural households were agricultural and of these 73% had dairy cattle. In the DFID bilaterally funded Smallholder Dairy Project (SDP) characterisation and longitudinal monitoring of smallholder dairy farms has confirmed that in Rift Valley Province, smallholder farmers consider endemic diseases, particularly tick-borne diseases (TBD), and inadequate supplies of feed resources the
major constraints to increased dairy production. The livestock FFS project started in April 2001 and funded by the DFID Animal Health Programme and FAO, is adapting and testing the FFS methodology for animal health and production, focusing upon smallholder dairy farmers. Ten pilot FFS were established in five different agro-ecological zones in Central, Rift Valley and Coastal Provinces of Kenya. Implementation of these FFS is allowing adaptation of agro-ecological system analysis (AESA) with the animal as a focal point and development of participatory technology development (PTD) to address livestock related issues. Approaches and methods to test and introduce integrated methods to control tick-borne diseases and helminth infections and to improve animal husbandry practices and the efficiency of utilization of available feed resources within the crop-dairy system are being developed.

Up to 2005, more than 2500 FFSs have been implemented in Kenya in about 25 districts. The numbers of FFSs, the diversity of topics, and FFS innovations makes Kenya a leading country in Africa for FFS development and Kenyan expertise is increasingly drawn upon for the development and back-stopping of similar programmes elsewhere. With Kenya's programme to address the Millennium Development Goals on hunger and poverty (280) a mainstream national food security programme will be using among other approaches, the FFS approach. This ten year initiative "Njaa Marafuku Kenya" started mid 2005 and will cover 50 districts. Through this initiative GoK will become the largest funder of FFS activities in Kenya, which demonstrates the commitment by the Government to scale-up FFS development.

In Tanzania the Farmer Field School concept was first introduced in Zanzibar in 1997 in IPM activities on rice, banana, cassava and vegetable production. Thereafter FFS was introduced on the mainland in 1998 after four extension officers from Mbinga, Mbeya and Arusha were trained as senior trainers during a season-long training of Farmer Field Schools on cotton in Zimbabwe. Since 1999 a number of agricultural programmes and projects in Tanzania have implemented the FFS methodology as a means to deliver advisory services to farmers. Major FFS activities in Tanzania are currently being implemented through many development programmes including (also see Sub-Table II.1T):

- Integrated Pest Management Farmers Field Schools in Zanzibar. In 1994, the project "Strengthening the Plant Protection Division of Zanzibar" started an IPM programme with the main objective to improve agriculture production in an economic, acceptable and ecologically sound way using Farmer Research Groups (FRG). FFSs were introduced in the project in 1997 to enhance the farmers' active involvement in development and adoption of improved practices. The approach developed a methodology combining Participatory Technology Development (PTD) and FFS, using Participatory Rural Appraisal (PRA) to identify farmers' priority problems (42). This project was followed by two FAO projects, one on IPPM and the other on Food Security.
- In the Special Programme for Food Security (SPFS) the FFS approach was first introduced in 2001 in Kilombero and Morogoro districts on rice production and later expanded to three districts (Kilosa, Korogwe and Iringa) on rice and maize production.
- As part of the Pilot Initiative on Extension Management (NAEP-II) the Farmer Field School concept was introduced from 1999 onwards as one approach under the pilot initiatives component of the Second National Agricultural Extension Project (NAEP II).

- FFS-IPPM programme in Kagera Region. This FFS programme started its activities in Kagera Region in 2000, initially with the intention to support a community study of bananas and mosaic-resistant cassava through the FFS group extension approach towards achieving food security and poverty alleviation. Following increased farmer demands the programme has undergone considerable diversification and the FFS approach has now been applied to other crops and also to livestock. The programme is currently operational in two districts of Kagera region, Muleba and Bukoba (203). Apart from a development focus, the programme also had a pilot study focus to test some methodologies for delivering extension services, which is reflected in an additional pilot under NAEP-II by the government.
- Through the TUMA-UMA Project the FFS approach was introduced in 2002 in Kasulu District and expanded to Kigoma District in 2004.
- In 2005 the Agricultural Services Support Programme (ASSP) through a farmer empowerment component will mainstream, institutionalise and scale-out FFS approaches and principles, among other approaches (282).
- The DANIDA-funded Agricultural Sector Programme Support (Phase II) will further scale-out FFS in Mbeya and Iringa Regions between 2005-2007 to reach some 80,000 farmers (pers. comm. Flemming Olsen).
- The IFAD-supported Pastoral and Agro-pastoral Livestock Development Programme (PAPLIDEV) is considering implementing Farmer Livestock Schools (FLivS) within the Smallstock Livestock Initiative (pers. comm. Ides de Willebois and Michele Nori).
- EU-funded project "Farming in Tsetse controlled areas" (FITCA) will receive capacity building and technical support from ILRI for the successful implementation of FLS.

Uganda introduced the FFS approach in 1999 in the context of the FAO/IFAD East African pilot project for FFS on IPPM (203; 202), after a brief small-scale FFS pilot by the FARMESA project in 1996 (199). Another major FFS project, supported by IFAD and implemented by CIP and NARO, focused on farmers' learning about late blight management in potatoes (122). As a consequence of its success in Uganda the approach was taken up by other partners and donors (Table II.1); with the introduction of National Agricultural Advisory Services (NAADS) in Uganda FFS became a major approach as they were found to be the best farmer groups within a number of networks for technology development and marketing (109). Despite its success in Uganda (109; 123) the approach has not yet been fully accepted within the NAADS programme. EU-funded project "Farming in Tsetse controlled areas" (FITCA) will receive capacity building and technical support from ILRI for the successful implementation of FLS.

In Ethiopia IPM-FFSs were introduced by Save the Children-UK (SC-UK) and the Bureau of Agriculture and Rural Development (BoARD) in 1999 in the highland cereal farming area (Sub-Table II.1E2), which was studied by Eyasu (2002) in preparation of the INMASP project, which started in 2002 in Woisha catchment of Kindo Koisha district of Wolaita zone. The INMASP project, a regional project with Kenya and Uganda, uses the FFS approach to study nutrient monitoring. In 2002 SC-UK and BoARD through two other projects diversified their FFS from IPM to ICM, water harvesting, soil fertility management and varietal testing, among other topics (see Sub-Table II.1E2). A multi-country project on integrated management of late blight in potato also included FFS in Ethiopia (201).

In Zambia the FFS approach was introduced through an FAO-supported IPPM project (TCP/ZAM/8924) between 1999-2001 with up to 60 season-long trained core trainers and 60 FFSs. In Zambia the FFS approach has also been taken-up by a GEF-WB project, "Sustainable Land Management in the Zambian Miombo Woodland Ecosystem". Recently, in 2004 pilot Farmer Field and Life Schools were started through a FAO/WFP supported project (TCP/ZAM/3001) "Strengthening Institutional Capacity in Mitigating HIV/AIDS Impact on the Agriculture Sector". So far this project has one Junior Farmer Field and Life School (JFFLS) with 30 children most of whom are orphans and one Adult Farmer Field and Life School comprising 30 adults from households affected by HIV/AIDS. This project has attracted keen interest since the United Party for National Development (UNPD)[29] even mentions, "introducing farmer field schools (FFS) to promote socio-economic based literacy programmes", on its web site (section on agriculture).

In Malawi the concept of FFS approach was introduced in the late 1990s to the Ministry of Agriculture and Irrigation when five core trainers from the Ministry attended training in Zimbabwe and Ghana in the 1997-98 planting season (but as of 2005 only two remain in the Ministry). Later in 2001, FFSs was implemented in bean IPM promotion with support of CRSP. At the same time CIAT used a modified FFS approach, i.e. farmer research group (FRG), to reach out to farmers with traditional and improved pest management technologies for beans (55). Another FFS project by World Relief started in 2003 in central Malawi on various topics related to sustainable agriculture and food security. Also in 2003, a season-long Training of Trainers (ToT) funded by the FAO and IFAD was held in Salima, involving 30 agricultural extension staff in groups of six participants each, with five pilot FFSs conducted, facilitated by the three trainers then remained. A number of authors (209; 264; 208), based on their experiences in IPM in Malawi, have cautioned against an overly enthusiastic rush into FFS. They have argued that subsistence farmers do not prioritise pest and disease problems, and query the wisdom of working on soil fertility management where labour availability is a problem (53). Recently however, there is an increasing interest in the FFS approach by the international NGOs (such as Save the Children in Dedza, World Vision International) and researchers working in Malawi, with whom the two remaining core trainers collaborate (pers. comm. Midori Yajima). In addition, an FFS project on cassava and food security is currently under development in the southern region (53; 292).

Following the successful implementation of the FFS approach in East Africa, FAO introduced FFS in Mozambique in 2001 through a South-South Cooperation Project (UTF/MOZ/068/MOZ) in the Zambezia province, which will end in December 2005. Following its success, the first project is being scaled-up through PAN II (GTFS/MOZ/076/ITA), the National Programme for Food Security, which is expected to facilitate the establishment of 1,600 Farmer Field Schools benefiting 40,000 families in 12 districts of three provinces between 2004 and 2008 (pers. comm. Eugenio Macamo). The programme aims to institutionalise the FFS approach within the government extension system in order to increase the impact of extension on food security and agricultural productivity among poor households and especially women. Mozambique also piloted four JFFLS in 2003/4, targeting a total of 100 orphans and other vulnerable children. The approach proved to be successful and in 2005 expanded with another 24 schools (pers. comm. Esther Wiegers).

In the DPR Congo FFS activities started in 2002 with cassava as entry point, due to the dramatic decrease in production, partly caused by the cassava mosaic virus. Through emergency projects FAO started providing healthy planting material to farmers and, in order to make sure that they would know how to make best use of the healthy planting materials and get the knowledge/skills to improve cassava production, FFSs were implemented. As potential future FFS trainers and facilitators were scarce due to the existing conflict, it was decided to work directly with farmer facilitators. After the first round of cassava FFS the groups wanted to continue with other crops in their system, which transpired with groundnut, maize and cowpea (pers. comm. Marjon Fredrix). After the initial pilot programme (TCP/DRC/2907) various other FAO and other projects scaled-up FFS up to a total of 357 FFS by 2005 (see Sub-Table II.1D).

In Madagascar four organisations, Catholic Relief Services (CRS) Madagascar, Programme Eco-Regional Initiatives (ERI), Programme SAHA of Intercoopération Suisse and FAO) - have recently signed an memorandum of understanding to collectively apply, improve and implement the Farmer Field School Approach. All of these organisations have implemented a number of FFS in previous years; major activities will start in 2006.

[29] A political party in Zambia

Without going through IPPM-FFSs, Namibia started directly with Junior Farmer Field and Life Schools (JFFLS). Two pilot JFFLS were established in 2004 by FAO and WFP as a response to problems brought by the advent of HIV/AIDS. The basis of these schools is that young people get assistance in taking charge of their own future instead of being a drain on the community. They are empowered to handle their future, improve their livelihoods and become able agents of their own change. After the pilot, six JFFLS were established this year and another eight will start at then end of this year.

Angola is the last country in East and southern Africa that has taken on the FFS approach. In Angola the Danish Refugee Council (DRC) is planning to support FFS in Uige Province, Northern Angola, starting this year (2005). DRC is in the process of developing a transition strategy for Northern Angola from humanitarian assistance to Integrated Development Programmes (IDPs) to support sustainable development among the resettled farmers. This year 13 facilitators will be trained and 20 FFSs set-up (pers. comm. Esbern Friis-Hansen).

In Rwanda the "Support Project for the Strategic Plan for the Transformation of Agriculture (PSTA)", with IFAD funding, will develop a new system of extension services based on FFSs (134). Outsourcing and the tripartite partnership between the farmers, extension services and agricultural research institutions will allow the farmers to own, operate and manage this transformation process with the active participation of partners.

In West Africa, Ghana was the first country to start an FFS programme with a ToT on rice with representatives from various West African countries. West Africa has several regional IPPM-FFS programmes; a three-country IPPM programme has been on-going in Senegal, Mali and Burkina Faso since 2001 through bilateral funds from the Government of the Netherlands. Approximately 20,000 farmers were trained during the first phase. This programme focuses on rice, vegetables and cotton, with different degrees of emphasis depending on the country. A second phase of this programme, with a target of 80,000 farmers in four years, will continue the programme for another four years with expanded activities to include Cape Verde and Benin (35). In conjunction with this West African IPPM programme, a Global Environmental Facility (GEF) co-financed project has been formulated for a six-country programme for 2005-2009 that aims to work with communities to expand awareness of the problems of water pollution, water-borne diseases (malaria, schistosomiais) and to promote alternative production and protection practices using FFS approaches. Water, sediments and biotic sampling will take place in 30 irrigated perimeters in six countries. Results from the analyses, together with hydrological and pesticide-fate models based on GIS data will be used to raise awareness of critical pesticide pollution problems at local, national and international levels. The involved countries are Guinea, Senegal, Mauritania, Mali, Niger and Benin. This project will train 150 government trainers, 300 farmer trainers and 30,000 farmers by 2009.

A second regional ICPM-FFS is organised around cocoa and implemented by IITA in collaboration with national institutions in Ivory Coast, Ghana, Nigeria and Cameroon. This programme has trained between 20 and 45 extensionists and farmers as FFS facilitators and implemented between 50 and 125 FFSs in each participating country (see Sub-Table II.1S; pers. comm. Sonii David). An initial assessment of the programme (135) indicates that ICPM-FFS appears to be ideally suited to the needs of smaller cocoa producers with surplus labour and cash constraints, and should therefore be considered in rural poverty reduction strategies.

In PRONAF, a third regional project also with IITA, FFS were introduced as a potential alternative and effective approach for cowpea technology transfer in Benin, Burkina Faso, Ghana, Mali, Niger, Nigeria and Senegal. Training of MTs was conducted in collaboration with the Ghana National IPM Programme and the FAO Global IPM Facility. In 2000, pilot FFS led by these MTs, drawn from the national extension and research services, began implementing FFS. After an evaluation of Phase I (195), phase II of PRONAF was launched in 2003 targetting fewer countries (Benin, Burkina Faso, Mali, Niger and Nigeria) and emphasizing stronger interaction between diverse stakeholders and development actors.

In Cameroon, in addition to the above-mentioned regional cocoa project, a FAO-supported project with FFS on cassava (TCP/CMT/2902) started in 2003 with 10 FFS so far; this project will also be expanded through the IFAD-supported National Root Crops Development Programme (pers. comm. Jacob Ngeve). Another FAO TCP project (Training of Women Farmers in the Integrated Production and Pest Management for the sustainable production of Cowpeas) on IPPM training of women farmers in cowpea production has been implemented in Maroua in northern Cameroon. This project involved training of 20 extension agents as IPPM Trainers and 80 women farmers in 4 FFS (pers. comm. Anthony Youdeowei).

Sierra Leone has started Farmer Field Schools through a large-scale FAO-supported programme. This Special Programme for Food Security project held a ToT in August 2003 and has since trained 240 facilitators, implemented 736 FFSs involving 18,400 graduates. The project target is 210,000 farmers by 2006 (pers. comm. Andrew Macmillan).

In the Gambia the International Trypanotolerant Centre (ITC) with support of ILRI started a project with Livestock Field Schools in 2003. A ToT was held in July 2003 for 20 participants and ITC is now testing the methodology with small ruminant farmers with ILRI support (pers. comm. Bruno Minjauw). In 2004 the Gambia has now also started an FAO-supported IPPM-FFS project (TCP/GAM/3001), which specifically supports women farmers.

In 2004 in Nigeria the Global IPM Facility of FAO initiated the implementation of IPPM training for FFS for small holder farmers in sustainable legumes and cereals production in Kano State. This project trained 25 extension agents as IPPM Trainers and 100 farmers, most of whom were women farmers. A follow up IPPM/FFS activity in six villages was conducted during which an additional 251 farmers have been trained in sustainable legume and cereals production. The Government of Kano State has been highly impressed by the impact of this training on the small holder farmers who have strengthened their capacity to understand and identify the agro-ecological factors influencing crop production and the implications of overuse and misuse of chemical pesticides. A new Universal Trust Fund (UTF) project has been developed to train 325 IPPM/FFS Trainers and 7500 farmers; this programme will also be supported by the Kano State Government. A similar UTF project has also been formulated for Bayelsa State in the Niger Delta to involve 300 Trainers and 25,000 smallholder farmers. This project is scheduled for implementation from January 2006 onwards (pers. comm. Anthony Youdeowei).

Currently underway in Burkina Faso is an Integrated Production Systems pilot programme. The programme seeks to diversify cereal/cotton systems with attention to leguminous green-manure cover crops, zero-till methods, silage and small-ruminant production and “living fences”. Prior experience in the farming and researcher community is being transformed with the assistance of experienced FFS trainers, with the objective of developing an FFS curriculum for integrated cotton production systems.

The Pesticide Action Network (PAN) implemented a three-year (2000-2003) cotton-IPM-FFS programme in Southern Senegal with 20 FFS, training nearly 600 farmers (158; 114).

Likewise, Togo also started a FAO-supported FFS project (TCP/TOG/3001) in 2004. However, in contrast to most FFS projects in West Africa, which have a pest management focus, this project focuses on soil fertility for improved food security.

South and Central America, and the Caribbean

Introducing FFS to Latin America required more than just a re-writing of extension manuals. Partner organizations were generally hesitant to blindly accept external ideas, but they were willing to explore common principles among successful IPM work and to adapt local methods. The result was an improved approach for the region (169). CIP and its institutional partners in Bolivia and Peru started, in 1997, to experiment with more participatory approaches, incorporating some elements of the FFS approach, but not the Agro-ecosystem

Analysis (AESA)[30]. CIP has promoted the FFS approach through a project financed by IFAD (International Fund for Agricultural Development) in six different countries, including Bolivia and Peru. In each country a national research institute and an NGO, or other extension organization, has been included. In 1999, to support this project, the Global IPM Facility organised a three-month course to train FFS facilitators in Ecuador, Bolivia and Peru. These facilitators then returned to their work places and implemented the FFS, incorporating other important elements of the Asian model, such as the Agro-ecosystem Analysis. Although many of the fundamental principles have been the same, each country has had its own strategy of implementation, depending on the demands of the farmers and the unique institutional and organizational setting (169).

In Peru, the NGO CARE has been responsible for the first implementation of FFSs with funding through CIP. CIP took the leadership in the development of the training curriculum, in delivering clones and cultivars of potatoes, and in monitoring the data generated by the participatory research. In these FFS, participatory research has almost the same weight as training. The concept of PR-FFS (Participatory Research - Farmer Field Schools) has also been used to give the idea of a hybrid of the FFS with participatory research. The farmers have carried out research into the use of cultivars or advanced clones with different degrees of resistance and high, middle and low intensity of fungicide use, assessing the clones and cultivars by late blight resistance and other qualities. In Peru, the FFS have also been useful in promoting IPM, in evaluating and disseminating cultivars with resistance, and in generating new information about the efficiency of resistance under different agro-ecological conditions. Here, each FFS lasts for two or three years, with emphasis on research during the first cycle and with a successive transference of responsibility and ownership to the farmer group subsequently (169). More recently, from 2000-2004 FAO established a US$2 million national IPM-FFS programme in 13 departments of Peru, effectively scaling-up FFS-IPM throughout the country. Due to a lack of a governmental extension service the project trained employed extension workers in national NGOs, SENASA, INIA, Caritas, CARE, farmer organisations, and unemployed ex-government workers and farmers. Many of the NGOs, government organisations and farmers organisations continue implementing FFS after the project was closed in 2004 (pers. comm. Kim Groeneweg).

In Bolivia, the PROINPA Foundation and the NGO ASAR have taken the lead in the design of the training curriculum. Both institutions, in close coordination, have promoted FFS in different communities. PROINPA has usually taken the responsibility for the research activities and provision of genetic material, and ASAR for the multiplication of seeds of resistant cultivars and the replication of the experience in other places (169). Since 1999 PROINPA has held various training courses on FFS and has disseminated the methodology to university students (postgraduate and undergraduate). PROINPA also complement FFS activities with Local Agricultural Research Committees (CIALs); CIALs are groups of local agricultural researchers that work with communities searching for determined agricultural problems. CIALs and FFSs implemented in communities have shown high complementarities towards a higher sustainability of community actions in health and research. As a result the FFS methodology has been adapted to the actual needs of the Bolivian system for technological innovation (SIBTA) and many SIBTA projects now use elements of FFS. SIBTA actually requests projects to use FFS in its capacity building projects (pers. comm. Edson Gandarillas).

In Ecuador, CIP and INIAP have promoted the FFS in the most important potato producing provinces through a network of local institutions. As a result of the recent decentralization of the state, much of the agenda of agricultural development has been placed in the hands of local governments, the NGOs and the communities themselves. CIP, INIAP and the Ministry of Agriculture are trying to develop and institutionalise an extension approach based on the farmers and on participatory research methodologies, establishing an effective mechanism of

[30] AESA is the process during which participants of the FFS observe and analyze the field situation, based on which they make the proper management decisions.

communication between the local institutional actors and the scientists. The strategy has been to first increase the local agricultural knowledge through FFS and subsequently support the local process of technological development with participatory research groups such as Local Agricultural Research Committees (called CIALs from the name in Spanish), including FFS graduates, research institutions and universities (169).

In Brazil FAO introduced the approach through a TCP project (TCP/BRA/8924), which implemented FFS on cotton IPM between 1999 and 2001 in six states (34). This project reached a total of 1,600 farmers through 89 FFSs in two years (Table II.1).

FFS have also spread to Colombia in 2000, with the leadership of CORPOICA and FEDEPAPA, specifically on potato IPM (99).

In Mexico, the FFS approach was introduced by the national NGO RED A.C., which launched a pilot project in 2001 with some universities, farmer organisation, other NGOs and the Chiapas Regional Government (120). Initial support to this project was provided by the Rockefeller Foundation for the training activities, yet all implementing institutions provide their own funding to support FFS implementation (pers. comm. Francisco Guevara). The success of the approach in Mexico inspired INIFAP and WB to start a large-scale project in 2003 in Oaxaca using it as a transfer of technology strategy[31].

In Central America Farmer Field Schools were introduced in El Salvador and Nicaragua in 2000 with the leadership of Zamorano through the IPM Programme in Central America (PROMIPAC) with support from COSUDE (210). The first ToT, supported by FAO's Global IPM Facility and master trainers from Bolivia and Ecuador, trained 28 trainees from Honduras, Nicaragua and El Salvador. In the years 2001 and 2002 in Nicaragua 85% of the FFS were implemented by NGOs, while in El Salvador this was 40%.

In Nicaragua, in addition the World Bank funded Agricultural Technology and Rural Technical Education Project identified FFS as a method that could easily be transferred (through training) to farmer facilitators. The rural education component of this piloted FFS with support from PROMIPAC and FAO-Nicaragua and implemented 15 FFS in 2002-3 (210). Based on the above experience, the Ministry of Agriculture and Forestry (MAGFOR) has incorporated FFS in the agricultural sector main policy (170; 210). Based on this policy change and the interest that exists in the national institutions involved (INTA and SETAC), they now plan to incorporate FFS on a larger scale and are looking at how to incorporate it into the technical education curricula. FFS was introduced as a "rapid results" activity of the Agricultural Technology and Rural Technical Education Project and was deemed so successful that it is now a key area for a project that was formulated with FAO to support the Agricultural Technology and Rural Technical Education Project. This project, which is part of the FAO Special Programme for Food Security, started FFS implementation in 2003 in three pilot areas with a more integrated curriculum for sustainable rural development, such as sustainable soil and water management, marketing and business development and (210; 90).

In Guatemala, World Neighbours has taken the lead to promote the FFS approach from 2004 onwards with a ToT in organic coffee production and transformation. From the ToT various small initiatives with few FFSs were started in various districts and with involvement of various partners (see Sub-Table II.1G). Currently WNG is developing another ToT on sustainable poultry in collaboration with VSF (pers. comm. Larry Paul).

In the Caribbean an IPM-FFS project was started with EU funding in 2002 with support from CABI and FAO in six countries, namely Dominica, Dominican Republic, Haiti, Jamaica, Suriname and Trinidad and Tobago. The project consisted of three phases: I) Training of Master Trainers (MT), II) Training of Facilitators, and III) Planning and Implementation of

[31] The FFS approach, as developed in Aisa and adapted elsewhere, was not developed as a linear Transfer of Technology strategy. Rather, it opted for adaptations of available successful technologies. Despite this, there have been projects and organisations that took advantage of the success of the FFS approach by adopting the approach for linear Transfer of Technology.

Farmer Field Schools. Phases I and II were successfully completed in the participating countries (168). Phase III was not funded through the EU-sponsored programme that ended in December 2003. As a consequence the implementation of FFS has only started in a few of the participating countries. Dominica was one of two countries that forged ahead with FFSs after the completion of the ToT, which has trained extension officers in all agricultural regions except the west. In Trinidad and Tobago the two MTs have been providing technical and logistical support to the 14 extension facilitators who participated in the ToT in Trinidad (232; 6). In Haiti the political upheaval took its toll on planned FFS activities, which never got off the ground after completion of the ToT due to unavailability of funds for FFS implementation (pers. comm. Rodnez Pierre). However, since early 2005 the FAO-supported/CIDA-funded Marmelade Rural Development Project has started one FFS (pers. comm. Rodnez Pierre). The Dominican Republic also underwent another kind of political upheaval with a change of party during Presidential elections and replacement of top officials in Government. While there continues to be a lot of interest in Farmer Participatory approaches, there was no follow up with FFS. In Jamaica the ToT was a resounding success with a very positive response from farmers and extension. However, follow-up has been difficult because senior officials in the MoA, particularly policy makers, feel that FFS is too time-consuming and want an assessment of the methodology before investing any more (pers. comm. Vyju Lopez; 54). They are also looking at ways and means for adapting FFS to suit their situation.

In Suriname implementation of FFS moved to rice and aquaculture with support through a FAO TCP project, which is a joint regional project with Guyana that started in 2004 and supports the diversification component of the Regional SPFS. Diversification of rice farming systems, through aquaculture, has the potential to contribute to the livelihoods of farming communities through improved food security, income and nutrition. Profitability from rice farming in Guyana and Suriname has been declining with the increasing cost of cultivation and declining international prices for rice. The increasing use of chemicals (insecticides, herbicides, molluscicides for snail control, etc.) over time has resulted in additional input costs, as well as increased threats to the environment and human health, with questionable corresponding returns in yield increases. In view of this situation, rice farmers have been looking for ways to reduce input costs in paddy cultivation and to introduce other crops into the farming system. Aquaculture has been recognised as one of the diversification crops for inclusion in the rice farming systems; however, significant use of crop-protection chemicals in close proximity will threaten fish production in the rice fields or adjacent pond areas. The project aims to provide technical support to address these constraints. To date, 16 trainers (12 from Guyana and 4 from Suriname) and some 50 farmers have been trained. To date, 16 trainers (12 from Guyana and 4 from Suriname) and some 50 farmers have been trained. The principal output has been the development and field testing of an FFS-based curriculum for rice-fish and aquaculture methods. The curriculum is being translated into French for subsequent use in West African FFS programmes under the GEF and Netherlands-funded programs.

North America

In the USA Heifer International has recently started using the FFS methodology to work with immigrant farmers with a focus on horticultural crops (pers. comm. Michael McGuire).

Near East and North Africa

In the Near East and North Africa Farmer Field Schools were first introduced in Egypt in 1996. An often-heard statement about the Egyptian Farmer Field Schools is that they are "not real FFSs". In 1996 and 1997 two Egyptian-German projects (IPMP and CSPP) started implementing IPM-FFSs in Egypt on cucumber, tomato, citrus, mango and cotton. Although these projects used FFS concepts as originally developed in Asia, several modifications were made, to allow the approach to succeed within the context of the Egyptian-Arabic culture. Soon after introduction, the FFSs were renamed Farmer Learning Groups (FLGs). The FLG approach contributed considerably to the new extension methodology. However, some original aspects related to the FFS approach were dropped during the modification process. The FLG sessions turned into discussion sessions with relatively small groups of farmers, while sessions rarely lasted more than two hours. In 1999, Egyptian-Dutch projects in Fayoum started to organise pilot FFSs, again based on the Asian concept, but using the experience of the Egyptian-German projects. In 2001, the Fayoum IPM Project (FIPMP) started an FFS implementation programme in which 1,500 FFSs were planned over a four-year period. The FFSs curriculum focused on IPM, but was placed in a broad range of crop management topics. Field-crop FFSs lasted for one year, following a cropping cycle of two or three crops. Fruit-tree FFSs had a less intensive 2-year programme. Separate FFSs were held for women farmers (223). The Egypt-Finland Agricultural Research Project (EFARP) benefited from the Egyptian-German experience and started implementing FFS on animal production in 1999 (223), which was successfully implemented until 2004 (76). Following the introduction of Land and Water Management FFS in East Africa, FAO also initiated the start of a soil management FFS project in Egypt in 2003, implemented by the Executive Authority for Land Improvement Projects (EALIP) of the Ministry of Agriculture and Land Reclamation.

In 2003 ICARDA started a regional FFS project in Syria, Iran and Turkey to extend IPM options for Sunn Pest[32] management in wheat and barley (77).

In Kyrgyzstan the FFS approach was introduced in 2003 for cotton through a season-long ToT with four associated FFSs. The next year another ToT was held on cotton, this time in association with 11 FFSs, and also a ToT on potato in association with 4 FFS. In 2005 training has continued in both crops, as well as in vegetables (pers. comm. Kees Eveleens).

Uzbekistan introduced the FFS approach through a FAO-supported (non-IPM) project, of which the FFS component started in 2004 to train extension staff in appropriate and integrated low-cost, low-risk management techniques for rehabilitation and enhancement of the productivity of salt-affected and gypsiferous irrigated lands.

A two year regional IPM project in the Near East started in 2004 with funding from the Italian Government with the goal of developing an integrated crop and pest management strategy adapted to local ecosystems to achieve high quality production in fruits and vegetables compatible with export standard requirements to target European markets. The project involves six countries, namely Egypt, Iran, Jordan, Lebanon, Palestinian Territory (Gaza and the West Bank) and Syria and is expected to strengthen and establish the Farmer Field School (FFS) approach, as an extension methodology to promote the transfer of IPM technology to farmers in the Near East Region. The intention of a Regional IPM Programme in the Near East in the long run is to develop agricultural practices, which will reduce environmental and health risks through reduced use of pesticides and provide better access to local and international markets. The initial two year duration of the project is meant to validate the FFS as extension methodology in Syria, Jordan, Palestine and Lebanon and strengthen it in the remaining two countries, Iran and Egypt, and furthermore to develop experiences and generate outputs anchored in a sound understanding of the regional agro-ecology and in line with the forthcoming EU and WTO trade challenges (such as reduced pesticide residues in vegetables). Up to 324 FFS will be implemented over the 2-year period in the participating countries. The limited period of two year justifies that the current project is seen as a "pilot phase". Expansion of the approaches and capitalisation on investments in human resources can only be expected during an extension phase (Phase II) of the project activities.

---

[32] Sunn Pest is one of the most serious pests of wheat and barley in West Asia, where over US$42 million is spent for its control. Yield loss from its damage is commonly estimated at 20-30% in barley and 50-90% in wheat. This insect damages these crops by feeding on leaves, stems and grains. During feeding they also inject chemicals that greatly reduce the baking quality of flour made from damaged wheat. If 2-3% of the grain is damaged, entire lots may be ruined because the flour will be unpalatable and the bread won't rise. Heavy attack causes wheat stems to break before harvest.

Another FAO-supported regional project that started in 2004 in Algeria, Egypt, Ethiopia, Morocco, Sudan, Syria and Tunisia on training in management of a parasitic weed, Orobanche, in leguminous crops. Several options for control have been tested in different countries, but none have given adequate results. Therefore it is evident that an integrated approach will be needed in the medium term and for that reason the FFS approach was chosen for training and developing an IPM strategy. In each of the participating countries a ToT has been organised for between 15-25 technicians and between two to five FFSs have been implemented in each country.

Eastern Europe

In Central and Eastern Europe the FFS approach was first introduced in 2003 through a regional project on IPM for maize in seven countries, namely Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Romania, Serbia and Montenegro and the Slovak Republic, with the aim of supporting farmers' management of an integrated pest, the Western Corn Rootworm, by means of IPM, and to explore the contribution of FFSs in strengthening farmers' capacity to manage and develop their famring systems in the CEE context. ToTs and FFSs have been implemented in all countries. A particular point of interest is the various ways in which each country is seeking to develop the institutional capacity to sustain the FFSs in the difficult conditions of the "tranisition states" of CEE. Innovative elements include the strongly developing role of FFS participants and alumni in pest-related risk management at enterprise and community levels by means of risk mapping, the development of FFSs for agricultural secondary school students, and the use by farmers of the FFSs for testing innovation in their farming systems to meet the changing market conditions, for strengthening farmers' control over "farm to fork" enterprise chains, and for area-wide agro-environmental development.

In Armenia the FFS approach was introduced by the USDA Marketing Assistance Project with a successful pilot FFS in 2003 (253). This triggered the establishment of a local NGO, which now coordinates a number of FFS projects in Armenia. As the activities of FFS groups are considered successful and effective the NGO has planned to expand the FFS approach in Armenia (pers comm. Nune Sarukhanyan). An FAO-supported project has also started an FFS project on rodent control in 2004 and will train 40 extension and plant production staff of the MoA and some 600 farmer trainers, who in turn will train about 36,000 farmers in effective rodent control.

Table II.1. Characteristics about the implementation of FFS in each country for the period 1989-2005.

No	Country	Lead Institutions	Main Donors	Start Year	FFS topics	Facilitators/ Trainers	Farmers trained	FFS	Contact person
1	Algeria	ITGC, INRAA	FAO	2004	IM of Orobanche in leguminous crops	25	74	4	Souhila Aouali, saouali@yahoo.fr
2	Angola	DRC, DIIS	DRC	2005	IPM, ISNM, cassava	-	-	-	Esbern Friis-Hansen, efh@cdr.dk
3	Armenia	Green Lane AA NGO, AAA, MoA	USDA, Project Harmony, FAO, Green Lane AA NGO, various cooperatives and local NGOs	2004	grapes, vegetables (onions, pepper, lettuce), peach, apple, potato, cabbage, rodent control	13	110	14	Nune Sarukhanyan, ags@usda.am or nune_sarukhanian@yahoo.com
4	Bangladesh	DAE, FAO, CARE-Bangladesh, CDB, AID-Comilla	UNDP, Netherlands, Australia, DANIDA, DFID, EU, AsDB, SDC, CARE-Bangladesh	1994	IPM in rice, rice-fish, vegetables and cotton, soil fertility, homestead gardening	~ 20,000	~ 650,000	~ 31,000	
5	Benin	IITA, INRAB, VECO	SDC, IFAD	2000	cowpea, soja, vegetables, rice	125	~ 1500	80	Brice Gbaguidi, b.gbaguidi@cgiar.org
6	Bhutan	Horticultural Division/DoA/MoA, NBC/MoA	EU	2004	ICM for cabbage and chili	15	176	11	Karma Dorji, karma_d@moa.gov.bt
7	Bolivia	PROINPA, ASAR	FAO, GoB, DANIDA, Netherlands, DFID, USAID, BID, COSUDE	1999	potato, onion, pepper, beans	175	~5,000	~100	Edison Gandarillas, egandari@proinpa.org
8	Bosnia-Herzogovina	MAWMF, FAO, Agro net	Italy, EU	2003	IPPM for maize and vegetables	23	260	24	Nedzad Karic, nkaric@bih.net.ba or Jozsef Kiss, jozsef.kiss@mkk.szie.hu
9	Brazil	MAPA, MDS, EMBRAPA, FAO	FAO	1999	IPPM for cotton	160	1,614	89	Clarissa Adami, clarissa.adami@fao.org.br
10	Bulgaria	MAF, FAO	Italy	2003	IPPM for maize	9	110	10	Krassimira Kokoranova, kokoranova@mail.bg or Jozsef Kiss, jozsef.kiss@mkk.szie.hu
11	Burkina Faso	FAO, IITA	Netherlands, SDC, IFAD	2001	rice, vegetables, cotton, IPPM, cowpea, soja	> 217[33]	> 6,523[28]	360	William Settle, william.settle@fao.org and Diasso Gabriel, diassogabriel@yahoo.fr

[33] based on data for the FAO-IPPM programme up to February 2005 (FAO Quarterly Report, February 2005)

No	Country	Lead Institutions	Main Donors	Start Year	FFS topics	Facilitators/ Trainers	Farmers trained	FFS	Contact person
12	Cambodia	DAALI, PDAFF, MoE, Srer Khmer, FAO, World Education, CABI	DANIDA, World Bank, UNDP, AusAID, EU, Norway, World Education, Asia Foundation, Norwegian People's Aid, Handicap International	1996	IPM, rice, rice-fish, vegetables, human life, HIVAIDS, mung bean, maize, food security	~ 2,950[34]	~ 92,000[28]	> 1,550[35]	Ngin Chhay, chhay.ipm@online.com.kh
13	Cameroon	MARD, IARD, FAO, IITA	FAO, IFAD, USAID, WCF	2003	Cocoa IPPM, cassava, cowpea	58	nda	64	Jacob Ngeve, jmngeve2000@yahoo.fr
14	China	NATESC/MoA, Provincial PPS, FAO	GoC, Netherlands, Australia, EU, Norway, NATESC/MoA, Provincial Governments, AsDB	1993	rice, vegetables, cotton, maize, tea, citrus, chrysanthemum, melon, peanut	~ 2,500[36]	~130,000[30]	~ 4,000[30]	Yang Puyun, yangpy@agri.gov.cn
15	Colombia	CORPOICA, FEDEPAPA	nda	2000	IPM for potato	20	nda	> 25	
16	Croatia	MAF, FAO	Italy	2003	IPPM for maize	11	170	14	Renata Bazok, rbazok@agr.hr or Jozsef Kiss, jozsef.kiss@mkk.szie.hu
17	Dominica	CABI, CARDI	EU	2002	cabbages, tomato, maize, string beans	12	67	6	Naomi Commodore, naomi_commodore@yahoo.co.uk
18	Dominican Republic	CABI	EU	2002	tomato	8	10	1	Vyjayanthi (Vyju) Lopez v.lopez@cabi.org
19	DR Congo	FAO, CABI, local NGOS, ONC, BDDC, IITA	FAO, Belgium, EU, CFC, Caritas	2002	legumes, cassava, coffee, groundnut, maize, cowpea, rice	848	11,281	357	Koko Nzeza, faoffs.rdc@ic.cd or ckokonzeza@yahoo.fr
20	Ecuador	MAG, FAO, CIP, INIAP, MACRENA, WN, indigenous organizations	FAO, COSUDE/FORTIPAPA, USAID, municipalities, provincial councils	1999	IPM, agroecology, potato, quinoa, tomato, field bean, cacao, coffee, onion, agroforestry, pastures	nda	nda	nda	Stephen Sherwood sherwood@uio.satnet.net, Manuel Pumisacho, Pumisacho@fpapa.org.ec
22	El Salvador	PROMIPAC, CENTA	COSUDE	2000	IPM/ICM in vegetables, maize and beans	127	2,387	127	Jesus Constanza, promcapa@telesal.net

[34] based on Anonymous (2004)
[35] based on Anonymous (2004), DANIDA/DAALI (2004) and DANIDA/DAALI (2005)
[36] based on Pontius et al. (2002), Puyun et al. 2002 and Ooi et al. (2004)

No	Country	Lead Institutions	Main Donors	Start Year	FFS topics	Facilitators/ Trainers	Farmers trained	FFS	Contact person
21	Egypt	GTZ, Agrovision, DHV, CABI, MTT, IARS/PPRI, Euroconsult, DLV-Agriconsult, ICB, Fayoum Agricultural Directorate, EALIP, ARC Giza, ICARDA, FAO	GTZ, Netherlands, FINNIDA, GoE, FAO, Italy	1996	IPM for mango, citrus, cucumber, tomato, grapes, herbs, potato, strawberry, apricot; improved forage production, animal feeding, animal care, animal health treatment, soil management, management of orobanche in leguminous crops; organic agriculture, health	> 950	~ 210,000	~ 16,629	
23	Ethiopia	SC-UK, BoARD, EARO, SHDI, CIP, SOS-Sahel, WUR	SC-UK, EU, Netherlands, IFAD, USAID, EU, FAO	1999	IPM, management of potato late blight, potato production management, ICM, farm management, moisture conservation, compost preparation, natural pest control, intercropping, nutrient management, IM of Orobanche in leguminous crops	> 500	> 2,210	~ 571	Fantahun Assefa, fat46@ethionet.et
24	Gambia	FAO	FAO	2004	IPPM	nda	nda	nda	
25	Ghana	MoFA, PPRSD, IITA, SARI, NGOs	GTZ, USAID, WCF, IFAD, UNDP	1996	rice, cocoa, cowpea, soja	nda	nda	nda	Femke Griffioen, femkegriffioen@yahoo.com
26	Guatemala	WN, Heifer International, PRODESSA, Manos Campesinas	EED (German Church), VSF, MORIAH Fund	2004	organic coffee production and transformation process, poultry	53	136	29	Larry Paul Fuentes, larry@vmgua.org
27	Guyana	GRBD, GRPA, FAO	FAO	2003	rice, aquaculture	> 12	120	12	Tejnarine Geer, tejnarinegeer@yahoo.com or William Settle, william.settle@fao.org
28	Haiti	MARNDR, CABI, FAO, CIDA	EU	2002	Cabbage	24	55	2	Rodnez Pierre, rodnezpierreagr@hotmail.com
29	Honduras	Zamorano, PROMIPAC	COSUDE, AECI	2000	IPM, food security	nda	nda	nda	Jacqueline Chenier, coanafae@cablecolor.hn
30	Hungary	MARD, FAO	Italy	2003	IPPM for maize	15	210	21	Judit Komáromi, Komaromi.Judit@mkk.szie.hu or Jozsef Kiss, jozsef.kiss@mkk.szie.hu

No	Country	Lead Institutions	Main Donors	Start Year	FFS topics	Facilitators/ Trainers	Farmers trained	FFS	Contact person
31	Indonesia	MoA, Local Governments, Indonesian IPM Farmer Associations/Networks, FAO, OXFAM, CRS, Indonesia, World Education, FADO, JAKER PO, LPTP, Gita Pertiwi, Duta Awam, ACDI-VOCA	USAID, GoI, Local Governments, World Bank, Netherlands, Norway, Australia, AsDB, FAO, UNDP, CUSO, HIVOS, Arab Gulf Fund, Switzerland	1989	rice, vegetables, rats, cacao	> 30,000[37]	>1,100,000[31]	> 48,000[31]	Nugrono Wienarto, nugie63@indo.net.id
32	India	DPPQS/DoA FAO, CABI, AME	ADB, FAO, UNDP, EU	1994	rice, cotton, groundnut, vegetables, mustard, chillies, groundnut	> 31,000[32]	> 255,000[38]	> 8,700[32]	Daniel Gustafson, Daniel.Gustafson@fao.org or P.S. Rao, PS.Rao@fao.org
33	Iran	FAO, ICARDA	Italy	2003	IPM for cucumber and grapes and Sunn pest in wheat/barley	> 49	nda	> 42	Alfredo Impiglia, impiglia-fao@scs-net.org
34	Ivory Coast	IITA	USAID, WCF	nda	cocoa	41	nda	126	Sonii David, s.david@cgiar.org
35	Jamaica	RADA, CABI	EU	2002	hot peppers, cabbage	12	25	1	Phillip Chung, chung_p2@yahoo.com Donald Robinson, dononerob@hotmail.com
36	Jordan	FAO	Italy	2004	IPM for cucumber and tomato	8	nda	7	Alfredo Impiglia, impiglia-fao@scs-net.org
37	Kenya	MoA, FAO, KARI, ETC-EA, ILRI, CIP, NRI, SOIADO, CRS, CABI, DANIDA, FD, Land O' Lakes, Plan International, KENFAP, KENDAT	GoK, FAO, IFAD, UNDP, RF, EU, DFID, SIDA, DANIDA, JICA, Misereor, CRS, Netherlands, USAID	1996	IPPM on beans, sweet potato, sorghum, maize, vegetables; crop and poultry production, bananas, tomato, soil fertility testing, water harvesting, bee-keeping, goat keeping, fish farming and conservation, seed variety testing, farm forestry, INM, soil-crop-livestock interactions	~1660[39]	nda	~ 2300[33]	Deborah Duveskog DDuveskog@faonairobi.or.ke
38	Kyrgyzstan	ATC/RAS	Helvetas	2003	IPM for cotton, potato and vegetables (tomato and cucumber)	nda	nda	19[40]	Petra Geraedts, ksap-atc@helvetas.kg

[37] based on data in Pontius et al. (2002) and FAO (2001)
[38] based on data in and Ooi et al. (2004) and Pachagounder et al. (2002)
[39] based on a national FFS survey in preparation of the National FFS Networking and Coordination Workshop, Thika, Kenya, 4-5 May 2005 (FAO, 2005c)
[40] data for 2003 and 2004

No	Country	Lead Institutions	Main Donors	Start Year	FFS topics	Facilitators/ Trainers	Farmers trained	FFS	Contact person
39	Laos PDR	DoA, FAO, OXFAM-Belgium, SEARICE, Village Focus, CIDSE, GAPE	Netherlands, Australia, Norway, OXFAM-Belgium, DANIDA, UNICEF, ILO, CIDSE	1997	IPM for rice and vegetables	201	ncda	~ 768	Randall Arnst, ipmrandy@online.com.kh
40	Lebanon	FAO	Italy	2004	IPM for grapes and potato	6	nda	6	Alfredo Impiglia, impiglia-fao@scs-net.org
41	Madagascar	FAO, CRS, ERI, SAHA	FAO, USAID, Swiss	2004	rice, beans, potatoes, IPM for potato and rice, legumes, reforestation, medicinal plants, fish, green pea , vegetables, onion, garlic, silk, fruit trees, peanuts, carrot, maize, local chicken,ginger , banana, cucumber, watermelon , tomato	226	4187	1000	Thierry Randriarilala, thierry.randriarilala@fao.mg
42	Malawi	WR, MAI, CIAT	WR, UNDP, USAID	2001	crop diversification, product marketing, seed multiplication, soil conservation, irrigation, cassava, HIV/AIDS, bean IPM	32	nda	>77	Midori Yajima, tiyeni@hotmail.com
43	Mali	IER, OHVN, FAO, IITA	Netherlands, USAID, IFAD	1997	IPPM on rice, vegetables, cotton, green bean, cowpea, soja	> 179[41]	> 7,693[35]	> 430[35]	William Settle, william.settle@fao.org and Touré Mamadou, mamadou.toure@ier.ml
44	Mexico	RED A.C., INIFAP-Oaxaca, various Fos, various national NGOs, Univ. of Chiapas,	RF, WB, all lead insitutions	2001	ICM (roses, gladiolas, tomato, maize, coffee, beans), soil fertility, agroforestry, reforestation, green manures and cover crops, rescues of native seeds, horticulture, floriculture, mushrooms, livestock	> 70	> 2,500	> 250	Francisco Guevara, fguevarah@prodigy.net.mx
45	Morocco	INRA, FAO	FAO	2004	IM of Orobanche in leguminous crops	18	110	4	Mohammed Bouhache, m.bouhache@iav.ac.ma

[41] based on data for the FAO-IPPM programme up to February 2005. Includes both government and farmer facilitator (FAO IPPM Quarterly Report, February 2005)

No	Country	Lead Institutions	Main Donors	Start Year	FFS topics	Facilitators/ Trainers	Farmers trained	FFS	Contact person
46	Mozambique	NDRE/MoA, FAO, MAESA, National AIDS Council, IITA	FAO, AfDB, WFP, Italy, Belgium, SDC	2001	food security, maize, rice, vegetables, legumes, sorghum, sesame, fish ponds, goat and chicken keeping, junior FFLS, cowpea	> 158	~1,605	243	Eugenio Macamo, Macamo, Eugenio.Macamo@fao.org; Antonio Chamuene, cimsan@teledata.mz; or Brice Gbaguidi, b.gbaguidi@cgiar.org
47	Namibia	MAWRD, MHSS, MBESC, MWACW, ORC, NRCS, FAO	WFP, Finland, FAO	2004	junior and adult FFLS	40	240	8	Imms Nameseb, iprog@mweb.com.na
48	Nepal	PPD/DoA, FAO, STSS/DoA, FU/MoAC, DOI, World Education, CARE-Nepal, NARC-Nepal, Helvetas-Nepal, TITAN, RRN, NPDP	FAO, Norway, Australia, DFID, World Bank, World Education, Helvetas, SDC	1998	IPM in rice and vegetables, SRI, soil fertility management, forestry, HIV-Aids, coffee, potato, maize	619	57,050	2282	Ganesh Kumar K.C., kcgnsh@yahoo.com
49	Nicaragua	PROMIPAC, NGOs (CARITAS, CRS), CABI, Promundo Humano, Cacao Nica, INTA, FIDER, SETAC, UNAG	World Bank, COSUDE, USDA, AECI	2000	IPM/ICM in vegetables, maize, beans and cocoa, food security, soil and water management, entrepreneurship, marketing, maize,	136	2,390	108	Francis Porras, promcapa@ibw.com.ni; Jose Angel Rugama, josearugama@alfanumeric.com.ni
50	Niger	IITA	IFAD	2001	cowpea, soy beans	~50	500	25	Brice Gbaguidi, b.gbaguidi@cgiar.org or Toudou Adam, cresa@intnet.ne
51	Nigeria	IITA, FAO	USAID, WCF, IFAD, FAO	2001	cocoa IPPM, cowpea, soy beans, cereals	>90	>1,000	>57	Sonii David, s.david@cgiar.org; Anthony Youdeowei, ayoudeowei@yahoo.co.uk and Brice Gbaguidi, b.gbaguidi@cgiar.org
52	Pakistan	PDA in Sindh, Punjab and NWFP provinces, CABI, FAO, NARC, CRS, WWF Pakistan, Caritas, Plan Pakistan	GoPa, AsDB, EU, World Bank, SDC, CRS, WWF Pakistan, DFID, Caritas, Plan Pakistan	1997	IPM for cotton, livestock, irrigation management, high value crops (Fruit –peach and guava- and Vegetables – tomato and onion), rice, rice-wheat	> 480[42]	> 13,000[36]	> 525[36]	Iftikhar Ahmad, iftahmad@isb.paknet.com.pk
53	Palestine Territory	FAO	Italy	2004	IPM for tomato and strawberry	6	nda	11	Alfredo Impiglia, impiglia-fao@scs-net.org
54	Peru	CIP, CARE-Peru, MAG, CABI, UNAS, FAO-Peru, SENASA	Netherlands, USDA, OAS, IFAD	1997	potato, diversification and IPM (in cotton, rice, coffee, livestock, maize)..	>250[43]	>9000	>600	Jose Tenorio, tenorioj@hotmail.com jtenorio13@yahoo.com

[42] based on data in Ooi et al. (2004)

No	Country	Lead Institutions	Main Donors	Start Year	FFS topics	Facilitators/ Trainers	Farmers trained	FFS	Contact person
55	Philippines	KASAKALIKASAN, DoA, CODA, Lingap Maralita	GoP, Japan, IFAD, AsDB, Netherlands, Australia, EU	1993	rice, vegetables, cotton, maize, coconut, mango, nutrition, health, agro-forestry	> 4,000[37]	> 520,000[44]	> 14,000[37]	Jesus Binamira, jsb@agri.searca.org
56	Romania	MAFI, FAO	Italy	2003	IPPM for maize	13	130	13	Tomel Petrache, ptomel@yahoo.com or Jozsef Kiss, jozsef.kiss@mkk.szie.hu
57	Rwanda	MoA	IFAD	2005		-	-	-	Benoît Thierry, b.thierry@ifad.org
58	Senegal	PAN, FAO, IITA	Netherlands, PAN-UK, IFAD	2000	IPPM for rice, vegetables and cotton, cowpea, soja	> 277[45]	> 6,468[46]	>370	William Settle, william.settle@fao.org and Brice Gbaguidi, b.gbaguidi@cgiar.org
59	Serbia and Montenegro	MoA, FAO	Italy	2003	IPPM for maize	25	385	37	Sladjan Stankovic, ssladjan@beotel.yu or Jozsef Kiss, jozsef.kiss@mkk.szie.hu
60	Sierra Leone	MAFFS, FAO, WVI, CRS	FAO, UNDP	2003	food security	260	18,400	736	
61	Slovak Republic	MoA, FAO	Italy	2003	IPPM for maize	5	40	6	Olga Paucova, olga.paucova@post.sk or Jozsef Kiss, jozsef.kiss@mkk.szie.hu
62	South Africa	FSG	IFPRI Renewal	2003	HIV/Aids, Food Security, Income Generation, Women	4	140		Maxwell Mudhara, Mudhara@ukzn.ac.za
63	Sri Lanka	DoA/PPS, MASL, FAO, CARE, Sarvodaya, Gemi Seva Sevana, IMWI	several provinces, MASL, several NGOs, Australia, Norway, UNEP	1995	rice and vegetable IPM, human disease vectors	102[47]	45,107[40]	2,453[40]	L. Amarasinghe, ppsdoasl@sltnet.lk
64	Sudan	ARC, Extension and Horticulture Departments of Gezira Scheme, MoA, Farmers' Union, GSMoA, FAO, ITDG, CARE, World Vision	FAO	1993	vegetable and bean IPM, IM of Orobanche in leguminous crops	1,626[41]	4,197	> 812[48]	Arwa Khalid, arwa94@hotmail.com

[43] based on data in project documents of FAO GCP 036 Project (Internals reports)
[44] based on data in Binamira (2001), Pontius et al. (2002), FAO (2001) and Ooi et al. (2004)
[45] based on data for the FAO-IPPM programme up to February 2005 (FAO Quarterly Report 2005)
[46] based on data for the FAO-IPPM programme up to February 2005 (FAO Quarterly Report 2005; Kuiseu et al., 2003)
[47] covering data between 1995-2002
[48] based on data in Khalid (2002)

No	Country	Lead Institutions	Main Donors	Start Year	FFS topics	Facilitators/ Trainers	Farmers trained	FFS	Contact person
65	Suriname	LVV, CABI	EU, FAO	2002	yardlong bean, rice, aquaculture	> 13	> 40	> 4	Patricia Milton, pym@sr.net or pymilton@yahoo.com; Tejnarine Geer, tejnarinegeer@yahoo.com or William Settle, william.settle@fao.org
66	Syria	FAO, ICARDA	Italy	2003	IPM for apple, tomato and Sunn pest in wheat/barley	> 6	nda	> 18	Alfredo Impiglia, impiglia-fao@scs-net.org
67	Tanzania	MAFS, FAO, CABI, CARE, TUMA UMA, LZARDI, PPD-Zanzibar, Selian ARI, Bukoba DALD, MANREC	FAO, IFAD, WB, DANIDA, GTZ, DFID, Netherlands, Austria, Norway, CFC	1997	IPPM for bananas, maize, beans, onions, soya beans, tomato, sweet potato, rainfed rice, vegetables, cassava, coffee; CA, ISM	> 456[49]	> 10,000	> 560[42]	Julianus Thomas ffskagera@hotmail.com
68	Thailand	IBAFFS, DoAE, DNFE, FAO, DoA	GoT, Australia, Netherlands, DANIDA, Thai Education Foundation	1998	IPM, rice, vegetables, schools, fruits	2,262	75,035	3,006	Aroonpol Payakaphanta, agriqua@33.doae.go.th
69	Togo	ICAT, ITRA, FAO	FAO	2004	Soil fertility	30	307	12	Rahim Alimi, adourahim@tg.refer.org
70	Trinidad and Tobago	CABI, MALMR	EU	2002	Cabbage, tomato	16	19	2	Deanne Ramroop, dramroop@hotmail.com
71	Tunisia	Ministry of Agriculture and Hydraulic Resources (DGPCQPA, INRAT)	FAO	2004	IM of Orobanche in Faba Bean	23	44	3	Mohamed Kharrat, kharrat.mohamed@iresa.agrinet.tn
72	Turkey	ICARDA	nda	2003	IPM for Sunn pest in wheat/barley	nda	nda	nda	
73	Uganda	DLGs, FAO, NAADS, A2N, EA, NARO, CIP, CABI	FAO, IFAD, NAADS, RF, EU, Norway, WB, CFC	1999	IPPM, ISM/INM, sweet potato, citrus, mango, cotton, compea, groundnut, potato, sunflower, cassava, beans, coffee	> 290	nda	> 500	James Okoth james.okoth@fao.or.ug
74	USA	Heifer International, National Immigrant Farmer Initiative	US private donations, USDA RMA	2005	horticultural crops, farm planning and management	1	25	1	Michael McGuire, Michael.McGuire@heifer.org

[49] based on a FFS data collection for 1) Tanzania's ASSP formulation (URT, 2004) and 2) Tanzania's participation in a FFS Networking and Coordination Workshop, Thika, Kenya, 4-5 May 2005

No	Country	Lead Institutions	Main Donors	Start Year	FFS topics	Facilitators/ Trainers	Farmers trained	FFS	Contact person
75	Uzbekistan	MAWR, Design and Research Uzgipromeliovodkhoz Institute	FAO	2004	IM of salt-affected and gypsiferous soils	12	240	12	
76	Vietnam	PPD, PPSD, VCC, ASPS, Hoanh Bo PPS	local authorities, Netherlands, Australia, Norway, DANIDA, EU, Belgium, World Bank, International NGOs	1992	rice, vegetables, cotton, maize, rat management, tea, coffee, sweet potato, multiple learning cycles, nutrient management, agro-biodiversity, seed production, livestock	7,210	930,000	33,400	Elske van de Fliert, elske@fpt.vn; Ngo Tien Dung, ipmppd@fpt.vn
77	Zambia	MAFF, MACO, FAO, WFP, MoE, MoH, MCWSS, Kara Counselling, Youth Development Organisation	FAO, GEF, Norway, WFP	1999	IPPM, soil management, crop production, small livestock production, agribusiness, life skills (HIV/AIDS awareness, personal hygiene, nutrition), nvironmental protection, cassava	~ 382[50]	~ 1,900[43]	~ 140[43]	Neiburt Phiri, neiburt.phiri@fao.org.zm
78	Zimbabwe	AREX, FAO, ICRISAT, CRS, SAFIRE, CABI	GoZ, RF, FAO, USAID, Sweden, SADC, IFAD, CFC	1997	vegetable and cotton IPPM ISWNM, DSFL, poultry, Agribusiness, junior FFLS, HIV/AIDS, coffee	166	>3,500	>480	Dave Masendeke, davemas@mweb.co.zw or Jan Venema, Jan.Venema@fao.org

[50] based on data in project documents of TCP/ZAM/8924 and GEF Project 1330

Appendix III. Authors' profiles

Arnoud Braun

Endelea, Rietveldlaan 3, 6708 SN Wageningen, The Netherlands. Tel. +31 (317) 418549, Fax. +31 (84) 7500302 , Mobile +31 (6) 30884640. E-mail: arnoud.braun@farmerfieldschool.net. Internet: http://farmerfieldschool.net/

Arnoud has supported the development of land and water management FFS for FAO, particularly in Kenya, Uganda and Tanzania. This also involved the development of targeted FFS training materials. Currently he works independently in support of large- and small-scale FFS initiatives. He operates as a match-making, information resources and networking broker, with emphasis on facilitating partnerships among FFS stakeholders. He is one of the initiators of the Global FFS Network and Resource Centre.

Janice Jiggins

Researching Practice, De Dellen 4, 6673 MD Andelst, The Netherlands. Tel. +31 (488) 451016, E-mail: janice.jiggins@inter.nl.net.

Janice Jiggins is a social scientist and a former professor of Human Ecology at the Swedish University of Agricultural Sciences. She has worked for many years in developing countries as a researcher and consultant, mainly in sub-Saharan Africa and South Asia, on farming and food systems development, natural resource management, the organisation of research, extension, and marketing services for small farmers, women's empowerment, and reproductive health programming. She is currently engaged as a Guest Researcher at Wageningen University Research, and works for her own company, Researching Practice, and as Chair of the System-Wide programme for Participatory Research and Gender Analysis of the CGIAR, in which roles she pursues her passion for methodological and strategic developments that might help bring more sustainable and equitable futures into being.

Niels Röling

Emeritus Professor , De Dellen 4, 6673 MD Andelst, The Netherlands. Tel. +31 (488) 451016. E-mail: n.roling@inter.nl.net

Niels (1937) completed his PhD at Michigan State University in 1970 based on research on the diffusion of innovations in Nigeria. He has remained interested in innovation among small-scale farmers and the conditions that affect it. He has held a chair in the subject at Wageningen University. In this capacity he has supervised doctoral research on Farmer Field Schools and been involved in missions for the FAO on IPM in Rice and Cotton in Asia.

Henk van den Berg

Entomology Department, Wageningen University. Contact address: F.D. Rooseveltstraat 29, 9728RV Groningen, The Netherlands. Tel. +31 (050) 5251855, E-mail: henk.vandenberg@wur.nl or vandenberg.henk@gmail.com

Henk has worked within IPM-FFS programmes in Asia from 1992-2002. By training an entomologist, he is now based in the Netherlands from where he remains actively involved in project development and special studies on the FFS in relation to IPM, NRM and the management of vectors of human disease.

Paul Snijders

Animal Sciences Group, POBox 65, 8200 AB,Lelystad, The Netherlands. Tel. +31 0320-231235, E-mail: paul.snijders@wur.nl

Paul participates in a project on soil productivity improvement in Eastern Africa, which uses the FFS approach. As a retired researcher from the Animal Sciences Group of Wageningen UR he supports the livestock component and crop-livestock integration.