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COWPEA, FARMER FIELD SCHOOLS AND FARMER-TO-FARMER EXTENSION: A BENIN CASE STUDY

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Abstract

This paper presents the findings of a short qualitative study funded by the International Fund for Agricultural Development, under the auspices of Phase I of the International Institute of Tropical Agriculture's (IITA) African Cowpea Project (PRONAF), based in Cotonou, Benin. The study showed that pilot cowpea Farmer Field Schools (FFS) in Benin were a vital source of new skills and information, integrating a number of existing knowledge-sharing networks of rural men and women. These included church and family ties, and work and savings groups of various kinds. Members of the networks tended to be influential or well connected in terms of membership of various groups, though they were not necessarily the wealthiest members of society. The relevance of the contents of the FFS technical curriculum to these farmers' current needs was variable. Information about neem extract as an alternative to available chemical pesticides, recognised as toxic, was very frequently shared. However, the labour needed to prepare enough of the extract for larger crop areas, and the fact that it was less effective than chemical pesticides under high pest pressure in some localities, were important reasons expressed for not using it. Initial efforts to spread FFS-style farmer education to other organisations were hampered by a complexity of interactions, with many stakeholders holding different views and seeking different goals, in which the FFS programme was only one factor. Though representing a major break with previous extension practice, the FFS methodologies used did not always appear to maximise the potential for experimental learning amongst farmers nor did they necessarily suit the illiterate. There was an apparent lack of functional interaction between PRONAF I and the national agricultural research system (NARS), then in the process of becoming more demand-driven. The potential for expanding positive contacts between the FFS programme and a variety of other organisations is large, and Phase II of PRONAF is making additional efforts to increase communication and collaboration with other projects, programmes and organisations, and to expand FFS at village level.

Research findings

- *Farmer Field Schools set off a chain of events through which farmers try out and test alternative cowpea management practices in a wide variety of ways, adopting, modifying or rejecting them. The more influential and better-resourced farmers dominate this development, and, though they make an effort to share information with a variety of their relatives and friends, such sharing does not necessarily extend to less advantaged individuals. Ways of obtaining access for this latter group need to be researched.*
- *The FFS technologies studied appeared only partially to suit the participants' needs. Their efforts to adapt or modify some of the technologies, and their inability to access the inputs needed for others, bear witness to this.*
- *Some treatments in the FFS appeared to be confounded within the test plots, making it unclear whether farmers would derive maximum learning from the experiments.*
- *The first phase of the FFS pilot programme in Benin operated without sufficient effective contact with other players. The second phase has taken various steps to increase communication and collaboration with other agricultural development players.*

Policy implications

- *Project monitoring and evaluation should ensure a better understanding of access by poorer people to FFS.*
- *More weight should be given to the underlying principles of experimentation and learning and the institutional contexts in which these operate. Attention should be focused more critically on the means (techniques, tools, curriculum etc.) used in FFS, and on opportunities offered by complementary media and organisations. This would improve independent technical and management learning by farmers, communicate unresolved issues to the NARS and other innovation sources, and widen the resource support base for farmers' action.*

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Acronyms and Abbreviations

AKIS	Agricultural Knowledge and Information Service
CRSP	Beans/Cowpea Collaborative Research Program
CVDL	Village Committee for Rural Development
DIAS	Danish Institute of Agricultural Sciences
DIFOV	Benin Directorate of Extension & Training
FAO	Food and Agriculture Organization
FFS	Farmer Field School
GRAIB	Research and Support Group for Rural Initiatives
GV	Groupements Villageois
IITA	International Institute of Tropical Agriculture
INRAB	Benin Institute of Agricultural Research
IPM	Integrated Pest Management
NGO	Non-Governmental Organisation
PEDUNE	IITA's Ecologically Sustainable Cowpea Protection programme
PDRT	Roots and Tubers Development Programme (IFAD)
PRONAF	Inter-country African Cowpea Project
RAAKS	Rapid Appraisal of Agricultural Knowledge Systems
RENACO	West and Central Africa Cowpea Research Network
SDC	Swiss Agency for Development and Cooperation
USAID	United States Agency for International Development

COWPEA, FARMER FIELD SCHOOLS AND FARMER-TO-FARMER EXTENSION: A BENIN CASE STUDY

1 INTRODUCTION

Farmer Field Schools (FFS) were developed in Asia to promote Integrated Pest Management (IPM) under situations of excessive and damaging pesticide use in wetland rice (Kenmore, 1996). In IPM at its most basic, growers aim to keep pests below acceptable infestation levels through need-based application of a combination of available technologies such as host plant resistance, biological control, cultural control measures and chemical or botanical pesticides (Morse and Buhler, 1997). FFS are based on a learner-centred approach in which farmers' groups conduct field experiments to test and learn about new pest management options under realistic conditions, thereby improving their crop management decision-making skills. Going beyond immediate technical extension, FFS have also shown major potential as a starting point for building the capacity of rural people to address other farming livelihood problems. This is a result of the empowering experience of solidarity, self-organisation and networking encouraged in the FFS process (Chhay, 2002; Matteson 1996; Pontius et al., 2001).

Following the encouraging Asian experience, there has been much interest in transferring and adapting FFS to the African situation (Simpson and Owens, 2002; Sones, et al., 2003). Some adopters have sought more efficient ways to disseminate technologies developed at research stations. Others, emphasising the empowerment and organisational elements of FFS, have been interested in FFS as a methodology for building an effective platform for the interaction of diverse stakeholders in a creative innovation process. Whatever the reason, there is general agreement that conventional message-based extension is insufficient or even inappropriate in difficult, diverse and changeable small-scale African farming environments, which has spurred an interest in alternatives such as FFS.

FFS training is lengthy, however, requiring a high level of facilitation and client focus by the implementing organisations. Such knowledge-intensive training and the necessary backup support is considered costly compared to conventional extension (Quizon et al., 2000). Research and extension service organisations in sub-Saharan Africa, as elsewhere, have largely been unaccustomed to facilitating their clients' own learning. Nor are they used to seeking out and welcoming less accessible, often poorer, farmers into a learning process to address felt needs (Matteson, 1996; Nyambo and Kimani, 1998; Simpson and Owens, 2002). Within these contexts, the relevance and contribution of FFS to addressing poverty and related gender issues, and their potential for scaling up through replication within communities themselves, is by no means pre-determined.

Despite these difficulties, from about the mid 1990s, a number of FFS programmes and projects, under the auspices of, inspired by, and with the support of the FAO Global IPM Facility, IFAD and others, took up the challenge. In this paper, we examine the use of FFS by one particular project, the inter-country African Cowpea Project (PRONAF) in West Africa which was funded by IFAD and the Swiss Agency for Development and Cooperation (SDC). The paper is mostly based on a short research study funded by IFAD and conducted by a multi-institutional team in Benin in 2002 (Nathaniels et al., 2003). The aim of the study was to contribute to a fuller understanding of how FFS performed within the operational context of one of the PRONAF member countries. This was considered important for gauging what direction further development of and investment in the FFS approach should take under the second phase of the project (Gbaguidi, 2002; Alessandro Meschinelli, IFAD, pers. comm.) and how project experiences could contribute to other efforts to link agricultural technology innovators and users.

In this paper the information provided by the study has been organised to illuminate the following themes with respect to FFS and its place in agricultural innovation and extension delivery systems:

- Do FFS reach a wide range of farmers?
- How, and to what extent, does what has been learnt in FFS spread from farmer to farmer?
- Do the FFS promote innovations that offer appropriate solutions to farmers' problems?
- To what extent is farmer experimentation adequately addressed?
- Scaling-up issues.

2 THE CONTEXT

Cowpea in southern Benin

In southern Benin, where most of the findings discussed in this paper originate, cowpea is grown in a variety of situations and localities. Being both nutritious and tolerant of low soil fertility, it is much in demand for home consumption and for sale. This is illustrated on the Adja plateau, a prominent feature of Couffo District in southern Benin, whose once-rich soils historically attracted people looking for a good place to farm. As a result of its popularity the plateau has become densely populated, the soils are degraded and farm sizes are very small. An increasing proportion of the land has become dominated by oil palm plantations that compete with food crops, whilst more or less short fallows have become the main soil fertility recovery practice. Under these conditions, for people who are unable to migrate or otherwise gain access to better land, cowpea fills a valuable niche: It provides food and income and is also used as a small gift of the kind exchanged when visiting or attending various social ceremonies.

More to the north, in the southern part of Central Benin, Zou (Zou Collines District) has attracted settlers

much more recently, such that populations are less dense and farms larger. In uplands initially cleared for yam cultivation, cotton has become a major second-season cash crop, preceded by maize and cowpea in the main season (Agli et al., 2001; Edja, 2001; Floquet and Mongbo, 1998). The crop is planted mostly on the flat in Couffo, more often on ridges in Zou Collines, as in the north of Benin. Southern Benin has bi-modal rainfall and cowpea is mostly grown during the second rainy season between September and November. Generally, 4–6 cowpea seeds or more are planted per hole to offset rodent damage and possible low germination rates. Farmers aim to weed twice. Depending on variety, the crop takes between 60 and 75 days to reach maturity.

At all stages of growth and in storage cowpea is subject to severe damage by a wide spectrum of insect pests (aphids, leafhoppers, foliage beetles, thrips, pod borers, weevils) (Jakai and Daoust, 1986). Pesticides are therefore attractive to producers hoping to improve their yields. The official recommendation to cope with damaging attacks is for three to four sprays with approved insecticide products, to be carried out before and during flowering and at pod set. However, the number of sprays actually given depends on individual farmers' circumstances, expectations of benefit and access to pesticides, and ranges from not spraying at all up to spraying more often than is recommended. Typically, pesticide products not approved for use on food crops in the country are used.

Most of these pesticides derive from the cotton-growing sector, which accounts for much of the six-fold increase in pesticide use in Benin over the last decade. Almost half the pesticides used in cotton are rated as highly hazardous (class 1 b) by the World Health Organization, and many of them are widely diverted for use on cowpea, maize and other food crops. Minimal or no protection is employed against repeated contact during mixing and spraying of these products by farmers and other users in the field, in the seed bed and in store (Affognon, 2002; Nag, 2001; Williamson, 2001). Poisoning is common and probably greatly underreported (Fayomi, 1998; Tovignan et al., 2001; Williamson, 2001). There is inadequate control over marketing of pesticides, partly as a result of market liberalisation, and of the black market trade in unregistered pesticides (Affognon, 2002).

PEDUNE/PRONAF

The International Institute of Tropical Agriculture's (IITA) regional programme, Ecologically Sustainable Cowpea Protection (PEDUNE), was established in 1994 in sub-Saharan Africa. Its specific aims were to find alternatives to the use of toxic pesticides and to promote IPM as the standard approach to cowpea pest management in the dry savannah zone (Charles et al., 2000; PEDUNE, 1999). Research and development activities were implemented by national teams in nine African countries (Benin, Burkina Faso, Cameroon, Ghana, Mali, Mozambique, Niger, Nigeria, Senegal), and coordinated by IITA in Cotonou, Benin.

In its first few years the project identified a range of technologies believed to offer valid alternatives to inappropriate use of pesticides in cowpea production. These included using an extract of neem leaf (Azidirachta indica) and other botanical pesticides (papaya and Hyptis), introducing new cowpea varieties with tolerance to important pests such as aphids and Striga, and use of solar drying to limit later pest damage in storage (PEDUNE, 1999). The West and Central Africa Cowpea Research Network (RENACO) and the Beans/Cowpea Collaborative Research Program (CRSP), both sponsored by the United States Agency for International Development (USAID), were instrumental in generating improved varieties and storage technologies assembled by PEDUNE.

In order to raise awareness and field test these technologies, PEDUNE conducted researcher- and farmer-managed on-farm trials. In the case of Benin, promising solutions were passed to the Regional Extension Service (CARDER) under the Ministry of Agriculture, Breeding and Fisheries who then used demonstration trials and training and extension bulletins to spread the ideas.

However, the services of the extension system were considered unsatisfactory, partly as a result of logistical and funding difficulties and reduced contact with farmers (except cotton farmers), as well as the tendency to oversimplify information in the linear delivery system. In 1999, under PRONAF Phase I, the successor to PEDUNE, FFS were introduced as a potential alternative and effective approach for technology transfer. Training of FFS master trainers was conducted in collaboration with the Ghana National IPM Programme and the Food and Agriculture Organization's (FAO) Global IPM Facility in Ghana. In 2000, pilot FFS led by these master trainers, drawn from the national extension and research services, began in several of the member countries. In Benin the first FFS were run in Gobé (Central Benin) and Gbékotchihoué (Southern Benin) in 2000. In 2001 a further eight were held, in which a total of 101 farmers, one-third of them women, took part. Farmers were encouraged to become FFS facilitators. To qualify, a candidate had to have attended one season's FFS, have an active interest in learning about new farming practices, be popular with other farmers, willing to share knowledge with his or her peers, and literate. Under PRONAF farmers acting as FFS facilitators received a small allowance (Franc CFA 1500, about US$ 3) whilst participating farmers received Franc CFA 500 (US$ 1) for food.

3 METHODOLGY

The research study team

The study was conducted in south Benin in 2002, during the second or minor rainy season. It was carried out by a seven-person team, composed of representatives of: IITA-Cotonou, the Danish Institute of Agricultural Sciences (DIAS), Benin Institute of Agricultural Research (INRAB), Benin Regional Extension Service (CARDER) and Benin Directorate of Extension & Training (DIFOV). Involved in generating and disseminating crop protection technologies were individuals from IITA and INRAB; CARDER and INRAB members ran the Farmer

Field Schools; monitoring and evaluating activities were carried out by IITA and INRAB representatives; and facilitation and anthropological services came from DIAS and IITA.

Fieldwork methods

Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) was used as a methodological guide for the research. RAAKS provides an operational framework for an open-ended qualitative inquiry based on Agricultural Knowledge and Information Systems (AKIS) and anthropological perspectives (Engel and Salomon, 1997). The focus is on practices and action within given local environments where different stakeholders interact within different kinds of relationships. RAAKS is a cyclic process of enquiry, helping to move from an initial rough understanding of the AKIS under study to a more detailed understanding of its complexities. Researchers progressively add to their initial interpretations of information, deepening their understanding of issues; they identify and interview new stakeholders; and systematise frequent sharing of information. Using this methodology, between August and November 2002, the study team made three visits, each lasting about a week, to selected cowpea-growing communities. The visits coincided with the second growing season in Southern Benin (Couffo) and the southern part of Central Benin (Zou Collines). In the field, team members usually worked in pairs to ensure a balance between social science enquiry skills, local language skills, and technical/extension knowledge. They used semi-structured interviews and direct observation in the field to determine who had taken part in FFS and what they had done or planned to do with the experiences and skills acquired. Each field tour to interview respondents was followed by a team review and analysis of results. This internal review was supplemented by consultation workshops to test ideas and interpretations at the management level of the participating institutions, and at village level (see Table 1 for stakeholders consulted). Secondary information was obtained from published, documented studies on pesticide policy, health, and extension topics.

The study area

The study focused on the villages of Davihoué-Abomey, Gbékotchihoué, Assouhoué, and Gbaconou on the Adja plateau in Couffo District, and Atchakpa and Dani in Zou Collines District. FFS had been conducted by PRONAF in these villages between 2000 and 2002.

It was recognised that choosing villages in which PEDUNE (the project which predated PRONAF) had promoted aqueous extracts of botanicals such as neem before the start of the FFS programme under PRONAF, could make it difficult to separate the effects of the field schools from other earlier promotional efforts. On the other hand, the proposed study methodology offered the possibility of finding out about ideas shared between and amongst community members, including identifying individuals most closely associated with the introduction of new ideas, whether from PEDUNE or more recent FFS (2000–2002) initiatives.

4 RESULTS AND DISCUSSION

Do FFS reach a wide range of farmers?

The research study started by contacting farmers who had graduated from previous FFS (2000 and 2001) and tracing linkages between them and other community members (see Figure 1, Box 1). The results suggest that those villagers who first became involved in FFS in the PRONAF programme (as well as the earlier PEDUNE programme) have many connections both inside and outside the village. They are members of Village Groups (Groupements Villageois (GV)), an important means in Benin of obtaining access to cotton inputs, such as pesticides, on credit. They hold positions on committees, are members of various credit

Table 1 Stakeholders consulted during the FFS research study, Benin 2002. Numbers (women in parentheses)

Stakeholders	District		National
	Couffo	Zou Collines	
FFS farmers	35 (11)	17(8)	-
Non FFS farmers	8 (1)	8 (2)	-
GV presidents/Farmer Association Chairmen	3	2	-
Chef de village/Village Head	-	3	-
President des jeunes/Youth chairman	-	1	-
NGO directors/leadership	3	-	1
NGO facilitators/technicians	5 (2)	-	-
Technicians	1	-	1
Traders	-	1	-
USPP	-	2	-
NARS Researchers/Management	1	1	5
FFS facilitators	-	-	3
DIFOV	-	-	2
AGRAN	-	-	2

USPP - Union sous préfectoral des producteurs/Subprovincial Union of Producers; NARS – National Agricultural Research System; DIFOV - Direction de Formation Operationelle et de Vulgarisation/ Benin Directorate of Extension & Training; AGRAN - Appui a la Gestion de la Recherche Agricole nationale/Support to National Agriculture Research Management.

and income-generating groups, often those connected with non-governmental organisations (NGOs) involved in development. They are also prominent in churches and may be members of loan circles (tontines) and folklore groups. In Couffo, earlier studies (Nag, 2001) show that several of the males are members of the original or founding families in the village. (In this area a woman normally moves to her husband's home on marriage.) Prominent women amongst the early FFS graduates and FFS farmer-facilitators are connected by marriage to this group. In Zou Collines connections to the original members of the study villages have not yet been established.

These individuals are relatively well-off in terms of indicators such as size of land holdings utilised (about one or more hectares), ability to hire in labour, ability to lend money, having additional income from non-farming enterprises, connections with NGOs, and membership and positions in various organisations. However, they do not form a self-contained group, being in frequent contact with poorer individuals. Given that the PRONAF FFS programme was new, it is encouraging that such an influential cadre became involved with it rather than being in opposition to FFS. Linking the knowledge resources of FFS to this group, with their extensive connections both within and outside the village, constitutes a development of the local knowledge networks. Although most of the better-resourced families are in the middle or higher income groups, they will also include less affluent individuals (Nag, 2001). The 2002 PRONAF FFS programme intended to expand its reach by encouraging more farmers to run their own FFS. When the study started, candidates for the role of facilitators, i.e. farmers who had already attended FFS in 2000 or 2001, were taking part in a revision FFS ('recyclage') which served as in-season training of trainers. The newly qualified trainers then went on to select participants for their own FFS.

The study obtained some interesting descriptions of the types of farmers being invited into these new FFS and how they are selected. A woman who was going to run new FFS in 2002 said that the village mayor played an important role in the selection process. One criterion mentioned was teaching ability. Another experienced farmer-facilitator said that participants in his FFS had to be cowpea producers living close to their fields to ensure facilities for comfortable group discussions.

However, it proved difficult to investigate the selection of participants properly, because the newly qualified facilitators were in the middle of starting up their own independent FFS while the study team was in the field. The team wanted to avoid disturbing this new activity, plus many of the new farmer-run FFS were at inaccessible locations, so information on this point is incomplete.

How, and to what extent, is knowledge spread amongst farmers?

The lives of the entrepreneurs described above are deeply integrated into village society because of their lineage and connections. These individuals actively passed on the knowledge they had acquired to their wives, uncles, parents-in-law, friends and neighbours. Examples of these kinds of linkages were traced in

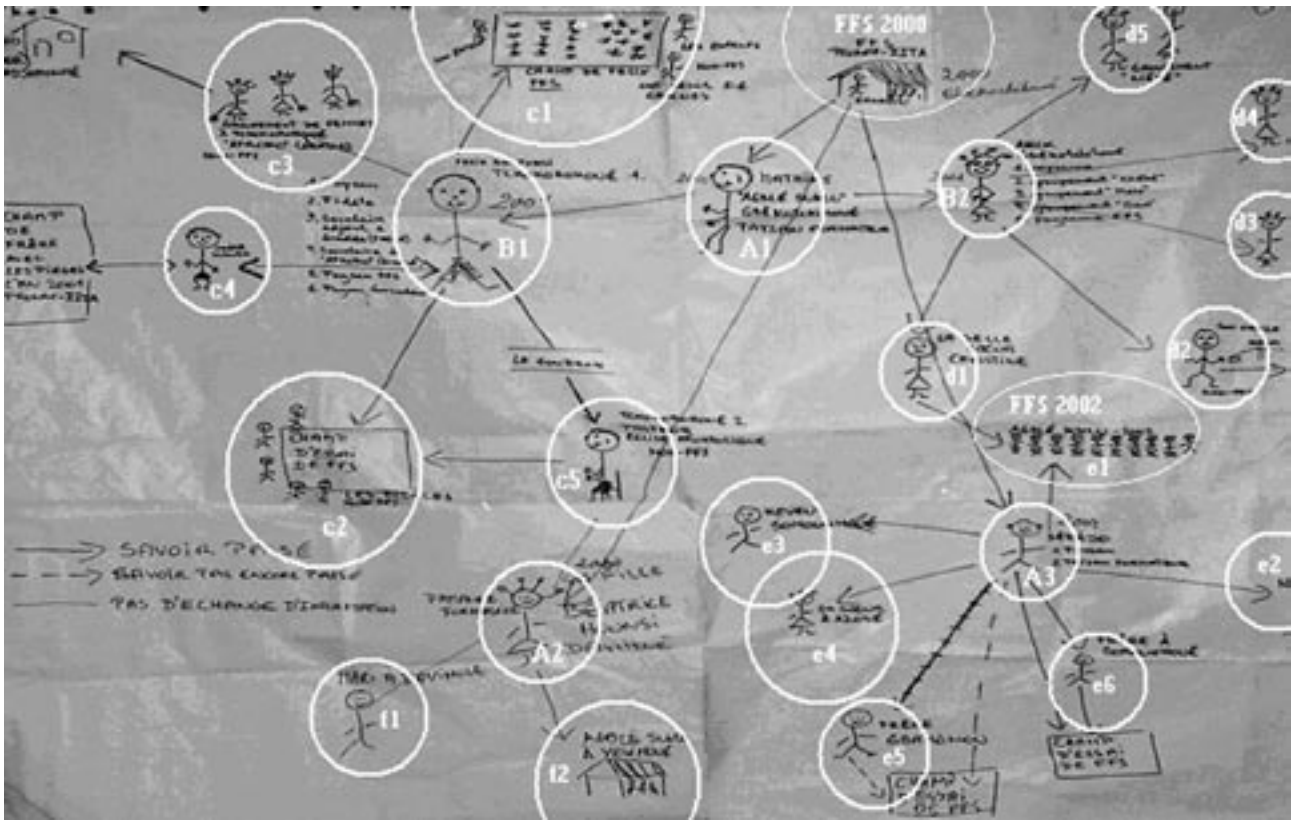

Figure 1 Farmer to farmer sharing of information and ideas originating from cowpea FFS. Gbécotchihoué, Couffo, Benin 2002. Drawn by Anita Nag

Box 1 Farmer to farmer sharing of information and knowledge from cowpea FFS, 2000-2002 Benin.

Gbécotchihoué village in Couffo District was the location of one of the first pilot cowpea FFS run in Benin under PRONAF in 2000. Mathias (A1 in Fig 1) who had been a village based field technician under PEDUNE, was one of the participants in 2000. In 2001, Mathis went on to run his own FFS with support from PRONAF FFS master trainers. Felix (B1 in Fig 1) is a modest farmer from the subvillage of Tchokorohoué who grows cowpeas and tomatoes. He attended the 2001 FFS where he learned about neem extract as a safe alternative to cotton pesticides, about sowing fewer seeds per hole, and about making comparisons to test different practices. "At the school I also learned to experiment and to turn the soil thoroughly before sowing. That is why I have divided my plots into two this year (2002). On one half I have not turned the soil before sowing and on the other half I have. When I harvest, I will count the peas in the pods on both sides of the field and see if the result is different, or I can count how many baskets full of cowpea pods each half gives." Felix has shared what he learnt with his children (c1 in Fig 1) and at the church he attends where the priest (c5) has given him a plot (c2) on which to show what he has learned in practice during the season. Felix explained he was also going to pass on his knowledge to a women's group 'Aproko' (c3, Fig 1) where one of his two wives is a member and he is secretary. Felix also benefits from his brother's collaboration with IITA technicians to run and monitor pest catches in pheromone traps (c4, Fig 1). Through this connection Felix gets early warning on pest densities and when to spray.

In the same village, the priest's daughter, Beatrice (A2, Fig 1), also participated in the 2000 FFS in Gbécotchihoué. Interestingly, she does not attempt to share what she learnt with her father the priest (c5, Fig 1) or others in her home village. Instead she shares what she has learnt with her husband (f1, Fig 1) who comes from Davihoué village, and she has become a farmer FFS facilitator in another FFS (f2, Fig 1) in Yévihoué village.

Anick (B2, Fig 1) was another trainee in Mathias' 2001 FFS. Although she finds it tedious to prepare neem leaf extract, she reports that she does use it on her cowpea and has experimented with using it to protect her tomato crop, with some success. She has also learned to recognise different insects and to try alternative methods for drying the harvested grain. She has shared ideas picked up at FFS to her sister-in-law Christine (d1) who runs another new FFS (e1, Fig 1) in 2002. She has also shared the new ideas with her uncle Olivier (d2, Fig 1) who started using neem extract in his tomato crop in 2002, and with on average 20 members per each of the several different development groups of which she is a member (the cowpea group, the 'gari' group, and the maize group) (d3-d5, Fig 1).

Sédédjo (A3, Fig 1) is another of the original participants of the FFS in 2000. Apart from learning about botanical insecticides as an alternative to cotton pesticides, he also learned to recognise cowpea pests, to conduct germination tests, and why fewer seeds can be planted per hole. He cited organisation and fund management skills as additional benefits of attending FFS. He and Anick's sister-in-law Christine have become farmer FFS facilitators and were involved in a new FFS (e1, Fig 1) focusing on use of botanicals and recognition of cowpea pests. He has also passed on what he knows to his two nephews (e2, e3, Fig 1), his sister (e4, Fig 1), his two brothers (e5,e6, Fig 1), and various cousins.

Refer to the linkages traced in Figure 1

Gbékotchihoué in Couffo District (see Box 1) and in Atchakpa and Dani in Zou Collines District.

Data for Couffo also revealed that, among those with whom FFS participants shared their knowledge, were the more senior wives. As noted above, women often marry into one village from another village (Nag, 2001), and there were examples of their sharing information with sisters and maternal uncles, i.e. members of their families back in their original villages. Some women are themselves farmer-facilitators and pass on information at first hand, both to relatives and to other women in the village where they live.

As touched on in Section 2, PRONAF has put quite a lot of emphasis on farmers acquiring the skills to become trainers. Participation in the FFS process is essentially regarded as a skills-building process, and farmer-facilitators must have attended at least one full season of FFS. One female facilitator confirmed the importance of participating in a field school. She said she had gained the confidence to teach from the experience of presenting the day's observations and answering questions during agro-ecosystems analysis (AESA, see Box 2) in the first FFS in 2000. This respondent, unusually in a facilitator, was illiterate but had been able to take on the role because of her outstandingly strong character, good contacts and a strong interest in FFS. She was very conscious of her illiteracy as a handicap, and gave as important characteristics for becoming a farmer-trainer: knowledge of the FFS curriculum, availability in the village, an easy-going nature, and the ability to read and write.

Whilst it appears that farmer-trainers are self-selected (with encouragement from their peers), PRONAF has sought to consolidate their training skills. They do this by inviting candidates to take part in revision FFS ('recyclage') in which both technical content and training techniques (such as advance programme planning and presentation skills) are emphasised.

The impact of knowledge being shared on a family basis, whether in or outside an FFS structure, may be considerable. The men's and women's different linkages indicate a potential for sharing within and between villages. It may be assumed that the entrepreneurial men have not only their own interest in mind but also

Box 2 Agroecosystem Analysis in FFS

In AESA, 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. The purpose of the drawing is to stimulate close observation of ecological and climate features that effect the crop. Symbols/drawings of observations are used as much as possible. Small groups of participating farmers discuss their ideas about what action is needed each week as a result of their field observations, and record this at the bottom of their poster. An insect zoo may be established in which farmers can follow the transformation of pest larvae into the adult insects, and learn through observation how for example predatory insects and spiders attack many kinds of pests. Each group of farmers chooses a representative each week and presents their observations and ideas to the whole group for discussion, guided by a facilitator. The discussion is followed by conclusions and recommendations for action to be taken by the whole group in the relevant FFS plots.

that of the village, to which they feel attached by virtue of their lineage.

Sharing knowledge through kinship ties, friends and familiar persons or neighbours is indicated in a number of FFS programmes (e.g. Van Duuren, 2003; Simpson and Owens, 2002; Vander Mey, 1999). FFS graduates acquire stronger roles in their communities as knowledgeable persons who may be willing to share FFS insights and to whom others can go for information.

The question still remains as to what kinds of information farmers share, post FFS. Evidence is mounting that specific practices and skills or complete technologies (e.g. new seed) are more readily shared than agro-ecological concepts or principles (Simpson and Owens, 2002; Van Mele et al., 2005; Van Duuren, 2003). A similar trend towards greater spread of simple ideas and concrete technologies is also apparent in this study (see Table 2). Information on such matters as the use of neem biopesticide and new varieties was more frequently shared than, for example, explanations about the periodicity of insect pest attack. There is a need to consider the potential of complementary methods and tools to help support understanding and communication of more complex concepts such as insect life cycles and biophysical interactions.

Furthermore, what about those who fall outside the current sharing networks? Information blockages within rural communities are not uncommon (Simpson and Owens, 2002). For instance, in the present study, one of the most experienced farmer-facilitators (Mathias) had not told his young female cousin about the use of neem extract. Unaware of alternatives, she continued to use cotton pesticides applied in a health-threatening way. It appears that other interventions or special FFS may be needed to reach groups excluded from current FFS.

Do the FFS promote innovations that can solve farmers' problems?

Two types of innovation may be distinguished here: technical, and organisational or institutional innovations.

Technical contents of FFS

The technical contents of the cowpea FFS were developed, assembled and field tested by national teams in the nine PRONAF member countries (see Section 2). The core technologies were:

- Neem leaf extract, prepared by grinding leaves harvested from local trees in a pestle and mortar. The extract, blended with water, could be used alone, mixed with a lower than usual dosage of the commercial insecticide Orthene (the organophosphate insecticide acephate), or tried out in a mixture with aqueous extracts of Hyptis and papaya.
- Improved cowpea varieties such as KVX61-1 and others with resistance to aphids and Striga. Seed of the improved varieties to be used in FFS was in short supply, as it was produced only in small amounts. (This was done in collaboration with research stations of the NARS of member countries.)
- Seed germination testing, conducted by planting a small plot of 100 seeds in advance of the main plot to assess emergence success. The idea was to show the farmers how to exploit limited seed.
- Solar drying of cowpea seed through the use of black and white plastic sheets to improve its storability.

In the field schools run by PRONAF, these technical contents were introduced in a classic FFS set-up. A basic two-plot field was selected and either donated by or rented from the participating community. Each week, during a full morning session, groups of up to 25 farmer-participants with three PRONAF trainers/facilitators followed the progress of a new variety, with neem (alone or in some combination) being used on one of the plots. This plot was prepared according to the researchers' recommendations for soil preparation, including:

- tilling on the flat rather than ridging, in Southern Benin;
- plant spacing of around 20cm x 40cm rather than the farmers' spacing of around 40cm x 40cm or wider;
- a reduced number of seeds per hole (2–3 rather than the farmers' 5–6 or more);
- pesticide applications based on regular observations on the need for treatment.

The weekly observations carried out compared the progress on the test plot with the results obtained by growing the farmers' local cowpea varieties, using local practice with regard to soil preparation and pest control in the other plot.

Observations from the plots were charted by each group of farmers on large posters, and the groups used these to present and discuss the meaning of their observations to the other groups (see Box 2). Finally a joint FFS decision was taken on what action was to be taken that week and the decision recorded.

As regards the farmers' responses to the technical content, the evidence presented in this study provides a more nuanced picture than has been documented before within PRONAF (Agli et al., 2001; PRONAF, 2002). Their interest in some technologies, and apparent lack of interest in or rejection of others, lends further weight to the conclusion that the farming practices offered in the FFS provide only a partially appropriate solution to their priority problems.

Table 2 shows the number of times farmers said they had passed on a named practice. It should be remembered that the study was not a survey and the results are not exhaustive. Rather they represent the issues the respondents felt were important enough to report without excessive probing.

In the table, only those contacts where the respondents could name the person to whom information had been passed are counted. Or, if respondents said they had shared information with a group of people, unless they could specify the number of persons in the group, this is counted as only one person. Women are almost certainly under-reported in the table, because respondents did not, for example, know the numbers of men and women in mixed groups such as tontines. In cases like these women are included in the general count.

On the positive side, the information the participants most frequently reported sharing and using with the widest range of other persons was that about aqueous

Table 2 Number of linkages in which named practices/information, or the full cowpea FFS curriculum, was reported shared with or passed on to individuals and groups, Benin 2002. See explanatory footnote (Numbers of clearly identifiable linkages to women in parentheses)

District	Aqueous extracts	Solar drying	Cowpea variety KVX	Other cowpea varieties	Closer spacing of cowpea	Fewer cowpea seeds per hole	Tilling on the flat	Other practices
Couffo	42 (9)	1	-	2 (1)	-	1	2	1
Zou Collines	137 (17)	4 (2)	6 (5)	-	-	-	-	2

Note 1: aqueous extract: neem, papaya and Hyptis sp
Note 2: Linkages were defined as contact between the interviewed person and another named individual or a group of individuals of known size (eg 20 persons), to which a named practice/idea/skill was reported to have been passed.

If the number of individuals in a group was not known/reported, the linkage was scored as if the practice/information had been shared with one person only.

Where the numbers of women were reported, a separate count of women was made. When numbers were not reported, women are included in the general count. Thus, women are almost certainly under-reported in the table as there were women in some of the tontine groups (reported as mixed) to which ideas on aqueous extracts were passed, and amongst those who were the friends of interviewed women.

Box 3 Reasons given for adoption or non adoption of technologies introduced through FFS, Benin 2002

Adoption

"I used to use (cotton) chemicals just like everyone else in the village. But before the end of the year I always got very sick. Lessons on the causes of this sickness showed that it was due to the chemicals used to treat the crops. I (then) approached those who use the leaves (of neem)". Olivier, Gbékotchihoué, Couffo.

"There were problems in the past. We used the chemical products and the children got stomach-ache. Now, with neem, there are fewer health problems". Alexis, Atchakpa, Collines.

"I used to use the cotton (products) but I have stopped because when I treat (the crops), it takes too weeks for me to get over it. That is why I have understood that it is not good for me". Josué, Atchakpa, Collines.

"In the past we used the chemical products and they made us ill, now I use the leaves (of neem)". Madeleine, Atchakpa, Collines.

"The method I use is solar drying because it is not difficult". Aimee, Dani Village, Collines, sister of Elias, FFS farmer facilitator 2002

Limited adoption

"Personally, I have stopped using chemical products. I mix the three (botanicals) to be sure. But the harvest is not as good as when I used to use the chemical products". Véronique FFS facilitator, Dani, Collines.

"We use the extracts (of botanicals) on the crops we want to eat, we use XTS (a proprietary cotton pesticide) on the remainder". Dennis, Dani, Collines.

"Emmanuel himself says he utilises neem extract on one sixth of his total cowpea acreage. The rest he treats with cotton pesticides or a mix". Interview with Emmanuel, Gbaconou, 2002.

"We enrich the acqueous extract (of botanicals) with Orthene (– an organophosphate insectide –). The degree of pest pressure does not allow us to rely on neem leaves (extract) to kill the pests". Gnancadja, FFS participant, FFS Atchakpa.

Non-use of botanical pest control preparations on cowpea

"In the past, when I was in (the) PRONAF (project) I used the acqueous extracts (of botanicals). Now I use cotton (insecticidal) products. We have asked for help in order to make (more) acqueous extract because of the difficulty of (treating) the (larger) areas. Me, personally, I cannot crush leaves (of neem) to treat one hectare of cowpea". Marguérite, Dani. Collines.

"I don't use acqeous extracts for two reasons: the large number of treatments and the tedious crushing of the leaves". Aimee, Dani, Collines, 2002 – sister of Elias, FFS farmer facilitator 2002.

"These days, PEDUNE has shown us neem, papyer and hyptis. If you are lucky, it works. Chemcial prodcuts work better than the acqueous extracts (of botanicals). The plants produce more". Véronique FFS facilitator, Dani, Collines.

"The acqueous extracts do not work well. That's why people don't use them". Véronique FFS facilitator, Dani, Collines.

Stakeholders' expressed difficulties with solar drying technology

"We cannot do as they say we should – we do not have the means to buy the black and the white plastic (sheets)". Sikatin, Assouhoué, Couffo.

"In our FFS at Alohoué we have only one white and one black plastic sheet. That isn't enough to dry the whole cowpea harvest. We have to do dry a little as a time and leave the rest to wait". Marcelline, Davihoué-Ablomé, Couffo.

botanical extracts (neem, papaya, Hyptis), see Table 2. The overriding reason given was concern about the health of people using pesticides intended for cotton (Box 3) but availability was mentioned too, as was cost. Solar drying was also cited, and interest in the new variety KVX-61-1, available in some of the FFS in 2002.

An advantage of the botanicals is their ready availability locally, making it easier to share the idea of using them in crop protection. Seed, however, is often a scarce commodity, and despite the farmers' keen interest in new varieties there were clearly limits to the numbers of persons with whom seed of the improved cowpea variety KVX, for example, could be shared.

As with other FFS programmes, the Benin field school experiences show that farmers readily adopt and use those ideas that they perceive as directly beneficial and within their means. For instance, where excessive pesticide use is a problem, often due to misinformation or lack of information the FFS have led to substantial reductions in its use, and a disinclination to use calendar spraying (Van Duuren, 2003; IITA, 2003; Sones, et al., 2003). In other cases crop protection has been adopted for the first time, when farmers became aware of the benefits of affordable practices (Vander Mey, 1999).

On the negative side, it was difficult to find evidence of information being passed on about FFS practices such as tilling on the flat or sowing fewer seeds at closer spacing. This calls into question the relevance of these practices in the farmers' environment, whatever their technical merits in the eyes of the researchers. Similar observations were made by Nag (2001). Some of the reasons provided for lack of interest in these particular practices included:

- unsuitability of the local soil and lack of labour to till the soil as proposed;
- the widespread use of another approach (farming on ridges) in Zou Collines;
- the farmers' preference for spacing plants according to the spread expected from a particular cowpea variety, a local spreading variety being unsuited to the closer spacing promoted within the FFS;
- reluctance to sow fewer seeds per planting hole in order to compensate for low emergence due to drought or rodent damage, for example, a germination test evidently being insufficient to compensate for the risk of highly germinable seed being eaten by rodents!

The farmers reported serious difficulties with the aqueous extracts, affecting whether and how they used them. The two principle problems were the difficulty of preparing sufficient amounts (obtained by pounding leaves) and a perception that they were ineffective, particularly if pest attack was high or the farmers thought they risked losing crops. As a result, while some of the interviewees said they continued to work with the extracts, others either had not used them at all or stopped using them.

Those who still tried to use the extracts (see Box 3) said that they had:

- reduced the areas of cowpea they cultivated;
- applied botanicals to only part of their cowpea crop and used cotton pesticide products on the rest;
- used neem-treated cowpea for home consumption and sold produce treated with cotton pesticides;
- applied a mix of neem and cotton pesticide products or, where available, recommended cowpea products such as Orthene;
- applied a mix of botanicals and accepted the reduced yields.

Others said they preferred cotton pesticides despite the health problems and higher costs (Box 3), because using them represented less risk. For example, it offset the risk of not recovering the high costs of labour for weeding.

With regard to solar drying, although there was evidence of the popularity of this approach, the farmers reported problems with obtaining both plastic sheets large enough for drying the harvested grain and drums for storage, since plastic sacks were attacked by rodents (Box 3). Problems similar to this had been observed by Nag (2001), and reduce the relevance of solar drying to some farmers.

These are serious problems concerning the relevance of some of the technologies offered. They need to be addressed both by paying more attention to existing potential technical and institutional solutions (not least by the farmers themselves), and through contributions that other actors (private and public) may be able to make for mutual benefit.

Organisational and institutional innovations

The evidence in both Couffo and Zou Collines is mixed as to what extent the FFS contributed to new or modified institutional arrangements for access to and opportunity to use new knowledge. On the one hand it appeared that, as explained above, rather than stimulating new initiatives, the FFS has been incorporated into the existing institutional system of entrepreneurial activity and decision-making, dominated by members of the leading families and influential persons in the villages. The case of the Village Committee for Rural Development (CVDL), introduced in Gbaconou by the NGO Research and Support Group for Rural Initiatives (GRAIB), is illustrative of traditional decision-making processes co-existing with attempts by development NGOs to introduce new structures. The CVDL was set up to provide a structure for equitable gender and wealth representation at village level, and a channel for support from outside sources to local development initiatives. However, decision-making in Gbaconou is traditionally the province of a core of eight male elders, acting with six younger people, all of whom reside permanently in the village. This institution is central to the activities of this hamlet of 22 dwellings. According to the type of problem to be solved, the traditional group establishes an appropriate sub-group to take charge of it. Such a sub-group was involved in the selection of a young man to take part in the farmer-facilitated FFS in 2002. The wider village community, when interviewed in an open meeting, was more accepting of this system than of the CVDL. However, the CVDL, which represents a committee idea introduced by an outside NGO, saw itself as having selected the participants for the FFS.

FFS are almost invariably introduced into situations with existing institutional structures of some kind, from farmers' associations, through income generating groups and loan circles to religious congregations and village management systems (Simpson and Owens, 2002; Sones, et al., 2003). The presence of organised farmers' groups may be advantageous if FFS facilitators then do not have to concern themselves with group cohesion, organisation and survival after the FFS, and are able to focus on skills enhancement and knowledge acquisition. Where there are no organised farmers' groups, the experience of FFS can precipitate group identity and the emergence of cohesive income-generating organisations (Simpson and Owens, 2002; Chhay, 2002). For this to happen, self-organisation and management experience need to be built up. This may happen through encouraging a high degree of self-management even during the formal FFS phase, as in East Africa where in many cases farmers managed FFS funds themselves (Okoth et al., 2002; Aben et al., 2002). Alternatively, post FFS support such as IPM Clubs has been used (DANIDA IPM, 2003; Alida Laurense, DANIDA IPM Programme Cambodia, pers. comm.) to build confidence in management and self-motivated action. These are important ideas for the future Benin FFS programme.

However there are pertinent issues concerning how this process opens up new possibilities for people who, in one way or another, are marginalised and not given space in existing structures. In the Benin case, what is the position of younger wives, of those who work in others' fields, and those who provide various services? To which fellow farmers do FFS participants choose to hand on training? In the Gbaconou village discussions, it appeared that for some the CVDL represented a counterbalance to the power of the village head (a contentious issue). But women's decision-making opportunities in the CVDL seemed restricted, although GRAIB had insisted on women members. Within the traditional decision-making system at hamlet level, it is also still unclear how women and those less well situated would gain easy access to any new technologies and ideas.

Another issue concerns access to important resources, which may be needed in order to utilise newly acquired knowledge. The current study and earlier studies (Nag, 2001) highlight important differences in the access of men and women to spraying equipment. The field schools so far appear to have played no major modifying role here, unless spraying equipment is owned by an FFS group. It is mostly men who have access, either because they own a sprayer, are able to borrow or hire one through connections to the GV, or have made one themselves (mostly young men and older male children).

Women tend to have significantly less easy or more costly access (Nag, 2001). The women interviewed in this study said that they had to borrow spraying equipment from their husbands or, if they lived close enough, from their fathers or brothers in their place of origin. The equipment has to be operated by the owner or someone he trusts, so women often have to pay hired labour to spray their fields. During the season, young men offer spraying services for a fee. They have various different types of sprayers, some home made, and the price varies according to distance to the field. The fact that few FFS had their own pesticide sprayer available for loan to farmers was highlighted as a constraint to applying either commercial pest control or *neem* extract.

In other major FFS programmes, a highly relevant development is the emergence of larger associations of FFS groups, sometimes spontaneously, sometimes through an active programme encouragement (Sones, et al., 2003; Aben et al., 2002; Chhay, 2002). In Kenya, for example, these FFS forums are managed by farmers through elected officials who solicit funds, explore opportunities for obtaining necessary inputs for members, and liaise with development agencies and other service providers (Sones, et al., 2003). This style of development can again be a source of ideas for the Benin FFS programme.

The very positive effects of FFS in strengthening the capacity and position of women have been highlighted in other FFS (Sones, et al., 2003; Vander Mey, 1999). It is encouraging to see signs of this new role or relevance for women associated with the Benin FFS. Marcelline, wife of the chairman of the GV in Davihoué and her sister-in-law, Amélie, have vigorously adopted the role of FFS trainers. They reflect on what they do, and take many initiatives to ensure their training is well prepared. This has included going to the extent of mobilising participants to irrigate the cowpea crop on the FFS site they managed in 2002, to offset insufficient rains. Participation in FFS can give new confidence to women – Marcelline relates how she can now speak in front of a crowd, which she could not do before. She says it has also been very positive to see how the participants in the new FFS she helps to run did not ask for money or food in order to participate, though this had been customary in PRONAF-run FFS (see Section 2). Instead they contributed themselves. It is of considerable interest that farmers may be willing to participate without outside financial incentives in village-run learning events. Costs of running FFS were considered high by the extension service in Benin (Adegeye and Carsky, 2003). Investment in promoting FFS-style learning may become more attractive if farmers, as indicated here, undertake to share costs.

Could these experiences represent the start of new village-based organised involvement in technical training? How will this be institutionalised? Currently, farmer-trainers such as Marcelline are paid a small allowance per FFS session by PRONAF. This raises the issue of the form that outside support should take to continue encouraging the work of a cadre of village-based trainers, whilst avoiding excessive dependency. Here, there were indications that farmers can participate in initiatives for acquiring new knowledge without the stimulus of allowances, yet there is strong pressure to use financial inducements to drive extension (see for example Dalsgaard et al., 2005 for an interesting discussion on this).

To what extent is farmers' learning through experimentation addressed?

In the FFS observed during this study in 2002, the organisation and training style (presentation and facilitation of topics) conformed to the standard pattern introduced in 2000. However, observations made during the study raise questions concerning the degree to which this methodology serves the objectives of stimulating the farmers' experimentation and learning in response to their pressing problems.

In the Benin FFS, the layout of the main plots conforms to the concept of comparing best bets (termed IPM) with Farmers' Practice (FP). It has been documented that inappropriate and harmful pesticide treatments are amongst the farmers' major problems from a health point of view (Fayomi, 1998). Yet in the FFS design currently recommended, pesticide treatments were confounded with variety and soil preparation treatments, and grouped together as IPM. The result is that participating farmers may have difficulty in distinguishing between the effects of variety, land preparation and pest control. This is because a particular type of land preparation, a new variety and treatment with neem are combined in the IPM plot. Then, in the FP plot, another type of land preparation, possibly another variety (though in some cases the same new variety) and chemical treatment are used.

According to survey information (Affognon, 2002) the main accessible pesticides remain those designed for use on cotton. In 2002, recommended pesticides such as Orthene were supplied by the project to several of the FFS, for use on their FP plots. At the Lanta FFS, Talstar, whose active ingredient is the pyrethroid insecticide bifenthrin, was made available at subsidised cost through the farmers' NGO, AVAME who cooperated in hosting this particular FFS (see Box 4). Orthene and Lanstar are deemed expensive and, unlike cotton pesticides, are not normally available on credit. This was a special, limited effort, and it would seem on the one hand that an unrealistic comparison had been introduced into the FFS experiment. On the other hand, ensuring the inclusion of these products in FFS has the merit of recommending effective products, thus creating at least pockets of alternative practice.

As mentioned above, several of the farmers were trained early on in the programme and have experience with using aqueous extracts. These farmers, who in some cases have become farmer-trainers themselves, were experimenting with alternative ways of using neem, different from those promoted in the FFS. There was a clear tendency to mix neem extract with available pesticides, mostly those designed for cotton (see Box 3). In another example, a farmer reported treating his crop with a mixture of botanical extracts and ground chilli, before storage. This was cheaper than the chemical storage product Sofagrain, which contains the insecticides pirimiphos-methyl and permethrin. He had not shared this innovation, the original inspiration for which had come from a radio programme. The responses of the FFS programme to these sorts of farmer innovations were not clear.

Harnessing local and scientific knowledge and joining these creatively is difficult, not least because of the frequent differences between the local and scientific world views and the content of the different knowledge systems. FFS master facilitators, who in most programmes are from the formal sector, may be ill equipped technically and attitudinally to factor farmers' innovation into FFS curricula. However, early findings from an East African project provide encouraging ideas on how FFS can become a platform for fusing farmers' and external knowledge (Duveskog et al., 2002). In this approach, farmer innovators interact with regular FFS groups as members, as guest trainers and through FFS

Box 4 NGO involvement with PRONAF-run FFS, Benin 2001/2002

In 2001 JAE was invited by letter to send send their agents for training in the FFS. Two followed the training. However, in 2002, when they were, according to the agreement and hopes of PRONAF, to assist in follow up of new farmer trainees in the new FFS at Lanta (Couffo District) in 2002, one the agents was seconded to the PDRT project (Project for the Development of Roots and Tubers, IFAD-funded), whilst the other agent left JAE and joined another NGO, GRAIB, also active in the area. PDRT is in need of dynamic field agents as is GRAIB and both have the resources to support agents' activities and employment. As a result, despite the training investment in these agents by PRONAF, neither of them has been available to provide the hoped for follow-up of farmer trainees in the Lanta FFS. These farmers were supposed to repeat each week the lessons/experiences with other farmers back home under the new FFS procedure. The NGOs do not appear to have contributed with materials such as paper and pens to enable these farmers to run AESA-style sessions back in their home villages.

It must be stressed that the JAE staff member trained in FFS (insect recognition, use of aqueous extracts etc) in 2001, now seconded to PDRT, has continued to experiment with neem in his own plant nursery (pépiniere). His knowledge of the FFS approach will, according to him, be put to use when he starts his new practical work with cassava groups within PDRT.

The NGO AVAME is also implicated in the Lanta village FFS in collaboration with JAE. Both NGOs have provided compensation for use of the land at Lanta for the FFS. AVAME has also been instrumental in selection of farmers to take part in the Lanta FFS through its chief operations officer. This NGO staff member approached the village head to effect the selection process in the six villages which make up Lanta commune. According to its director AVAME has been concerned about the health problems of use of cotton pesticides in food crops for several years. Through arrangements with another NGO and Ministry of Agriculture and Fisheries, AVAME has obtained a knapsack pesticide sprayer, a full set of protective clothing (suit, gloves, mask, boots) and synthetic pyrethroid insecticide (bifenthrine 27 EC, Talstar) at subsidised cost. These are used by those following the FFS, amongst others. The director of AVAME was very clear about the influence of the cotton input supply system in making cotton pesticides essentially the only ones available. He explained how this happened, mentioning how cotton farmers would over-report the acreage of cotton they intended to grow, in order to receive more pesticide on credit calculated on that basis. Though the costs would still be deducted from the cotton sales later in the season, the farmer gained by having excess pesticide available for use on a variety of other crops and for crop storage.

study visits to the innovators' farms. This is a practical-minded initiative with ideas that are likely to be of considerable relevance to the Benin case.

Agro-ecosystems analysis and associated mini-experiments such as insect zoos are amongst the more innovative of the activities for learning and experimentation practised in FFS (Box 2). AESA plays a central role in building improvements in agro-ecological understanding that is an important result of participation in FFS (Mangan, 1997). In the Benin FFS, there are indications that the farmers have benefited from this. They have acquired new knowledge about pest insects and their enemies, and about fluctuations in the presence of pest insects that could be exploited, to which the AESA method may have contributed.

Other studies suggest that it may be difficult for agro-ecological concepts acquired in FFS to be shared with other farmers (Van Duuren, 2002; Simpson and Owens, 2002). In this study we could not ascertain whether and how detailed knowledge about insect pest cycles was shared.

As practised at least in Benin, AESA still requires some level of literacy, not to mention confidence. There are some indications that these requirements have been translated into criteria for selecting some of the new FFS participants and rejecting others (see Section 4). AESA requires materials not usually available or freely available to villagers, to prepare the poster on which observations are noted and decisions recorded (see Box 2). Unavailability of these materials was a major reason given (and observed) for failure to repeat the AESA component (as taught) in the new FFS approach, where participating farmers are supposed to repeat each week's FFS activities back in their own villages.

It is again pertinent to ask whether other complementary learning media may not also have an important role to play, perhaps especially as a support for deepening understanding of system-level concepts, and as a support to farmer-facilitators and knowledgeable persons post FFS?

Scaling up

It was early recognised within PRONAF, formerly PEDUNE, that collaboration with other organisations is essential for sharing more widely the useful technologies assembled under PRONAF. To this end several efforts have been made to create more awareness of the technologies amongst development NGOs, and to include their staff in practical FFS training (PEDUNE, 1999; PRONAF, 2002). A recurrent difficulty in realising this has been lack of funds within PRONAF, and amongst many of the NGOs who have expressed an interest.

Relationships with NGOs and religious organisations

The current research study attempted to investigate further recent efforts within PRONAF-Benin to stimulate active partnerships with NGOs in implementing FFS. At this stage, and on the basis of admittedly limited research, it must be concluded that these efforts have not been wide-ranging. Nevertheless, the potential for various NGOs, and maybe also religious and other organisations, to share in the knowledge gained in the FFS, and even adopt aspects of an FFS approach, must be regarded as considerable.

The linkages with the NGOs, AVAME, JAE and GRAIB, in Couffo are illustrative (see Box 4). The initiative taken by AVAME, although small-scale, represents a real attempt to seek an attractive alternative to pesticides produced for use on cotton, a product which, as well as being effective, must be available either on credit or on subsidised terms.

Church constituencies also emerged as organisations where both men and women could share ideas and practices learnt in the FFS (see Box 1). There was evidence that at least some of the churches paid attention to innovations that could improve the lives of their members. This is helped along by a high degree of literacy and flexible structure.

It is against a variety of agendas and interests such as the above that the FFS method and contents must be seen. It cannot be assumed that NGOs will necessarily share PRONAF's precise interest in cowpea, or be interested in implementing a particular style of FFS. Even from this short and limited study, the NGO world reveals itself as very complex. There are shifting working allegiances or partnerships, often dictated by funding and the specific concerns of the funding organisation or project. For example, IFAD's Roots and Tubers Development Programme (PDRT), GRAIB and AVAME had a focus, respectively, on roots and tubers development, soil fertility improvement and more effective, less dangerous and available crop protection products.

The Benin national system for demand-driven agricultural research

The supply-demand model of agricultural innovation in Benin, developed by Arodokoun et al. (2002), may be used to place the PRONAF experience of FFS in a wider national agricultural research and development context. In this model, the management of contacts and sharing amongst agricultural technology suppliers, intermediate users, and farmers is brought about through national, regional and local committees. The main aim of the local and regional committees, which have been most active in the Recherche Développement (RD) system up to now, is to bring a wider range of suppliers and users of technology into contact with each other. This enhances the capacity and opportunities for end users and intermediate users to share in decisions about prioritising and funding research, developing and evaluating the results, and continuing the process.

In this model, a highly positive feature of the PRONAF-Benin FFS initiative is that it is firmly rooted at farmer level, albeit on a small scale. However, there do not appear to be many active connections with the other levels. Furthermore, again using the RD model, the FFS initiative appears in practice to have much in common with what are classified as pre-extension activities in the RD system. In pre-extension, promising technical and management options resulting from earlier participatory research are evaluated under a wide range of agro-ecological and producer conditions by the producers themselves.

In an appraisal by Adomou et al. (2002), it was noted that the execution of the pre-extension activities under the RD system suffers from a number of difficulties. Field staff of the state extension service, CARDER, which officially manages these activities were not properly trained to implement, document or evaluate them with farmers. Ideas to rectify this included provision of training, not only to CARDER but also to NGO field staff, in recognition of the fact that the NGOs are taking on a major role within extension in the areas in which they operate.

This is one of the areas where the FFS experience appears highly relevant to the wider RD system. Although PRONAF has tended to emphasise the extension function of their FFS, it is clearly more accurate to describe their field schools as carrying out both extension AND participatory research.

5 SOME DEVELOPMENTS UNDER PRONAF PHASE II

Here we report briefly on Phase II of PRONAF, launched in 2003 after the current study was completed. This second phase began with a regional workshop attended by researchers, extension organisations, the private sector, IFAD project staff, NGOs and farmers' organisations. Issues, themes and activities to be addressed under the new phase were discussed and defined. The second phase targets fewer countries (Benin, Burkina Faso, Mali, Niger and Nigeria) than the first, and emphasises stronger interaction between diverse stakeholders and development actors.

In Phase I, FFS participants were expected to share what they had learned with their peers. However, little guidance was given as to how this should be done. In the second phase an effort is being made to lower the cost of spreading FFS-based learning within communities and to exploit the superior potential of small groups (clusters) to become a focus for local learning networks (see Box 5).

In a drive to increase communication and understanding about its educational activities for farmers, PRONAF II invited senior officials of the national extension service under the Ministry of Agriculture, Breeding and Fisheries (MAEP) in Benin to visit FFS events in the field. This resulted in project staff being invited by MAEP to make presentations on FFS. Now, under the new vision for the national extension service, MAEP is looking for funds to reinforce their extension agents' capacity through FFS. The project also works in partnership with the IFAD-financed PDRT and offers training in FFS to other development projects.

PRONAF II emphasises the development of new botanical pesticides based on local knowledge that can be accessed through FFS. In Benin, in addition to extract of neem leaf and neem kernals and extract of papaya leaf, FFS participants are being invited to try out an extract of the leaves of Hyptis suavelens which resembles neem leaf extract in its effect (PRONAF-Bénin 2003). In Burkina Faso, within the PRONAF-supported FFS programme, considerable progress has been made in validating local knowledge about the use of botanicals such as *Cassia negricans*, *Sericidaca longipedonculata*, *Securidaca longipedunculata*, *Andropogon ascinodis* and others.

The limited availability of cowpea seed varieties tested in FFS is a major constraint to the adoption and use of new varieties. As an immediate measure to increase its availability PRONAF II has entered into a partnership with farmers. In Benin for example, the project provides inputs such as fertiliser and insecticide to contracted growers, plus additional training in cowpea seed production. At harvest, the seed is divided between the growers and PRONAF (PRONAF-Benin, 2003), furnishing the latter with seed for further promotion within FFS. PRONAF II hopes eventually to encourage private sector participation in production of this seed.

6 CONCLUSIONS

FFS as they are implemented by PRONAF-associated staff in Benin and by farmer-facilitators represent an exciting extension-farmer partnership for catalysing the participatory evaluation of new agricultural technologies. The FFS clearly set off a chain of events through which more farmers go on to try out and test the practices in a wide variety of ways, adopting, modifying or rejecting them.

Although initially the more influential and better-resourced farmers gained access to FFS initiatives, they made the effort to share new information with a variety of their relatives and friends, i.e. people of similar status in the community. However, it was not clear how accessible FFS were to less advantaged individuals, and this proved a difficult area to study. Under PRONAF II steps are being taken to increase farmers' access to FFS experiences through the cluster approach, suited to the

Box 5 Cluster based FFS under PRONAF II, Benin

In Benin communities are often organised in 5–6 villages (or sub-villages). From these communities, some 15–30 farmers, divided in sub-groups of 5 –6, agree to meet on a weekly basis. Each sub-group runs its own (subvillage) village level FFS comprising a FP plot and an ICM plot. The communities nominate their own representatives who are trained as farmer facilitators.

These farmer facilitators are selected on the basis of their willingness and capacity to train and deliver their technical knowledge to peers. They are trained in training of trainer (TOT) sessions run by well qualified Master Trainers. The TOT sessions run in parallel with the (sub) village-level FFS which enables the Master trainers responsible for the TOT to assess performance of and assist the new farmer facilitators closely during the first year. The Master trainers are themselves technicians and farmers with experience of FFS facilitation. The practice of providing farmer facilitators with a small allowance (refer section 4.2) continues under Phase II. The rate is based on what it would cost for the farmer to employ someone to carry out his own farming duties whilst he is engaged in the FFS sessions.

structure of rural communities. This makes the question of whether and how different categories of farmers, and others who provide services such as pesticide spraying, gain access to valuable information introduced through FFS, all the more important.

In the cases studied the technologies offered by FFS seemed to meet the farmers' needs only in part. Their efforts to adapt or modify some of these technologies, and inability to access the inputs needed for others, bear witness to this. PRONAF II has now taken measures to address these issues through greater focus on FFS as a venue for testing local knowledge as well as imported practices, and through seed production partnerships with growers.

In this study FFS were shown to feed into and stimulate local learning networks that are sustained by informal and formal local institutions and organisations. Activities and information-sharing styles in these may depart from those introduced in the FFS (likely to happen in farmer-managed FFS). Under PRONAF I, replicating the standard format of FFS proved difficult, as potential qualified implementers sometimes had different goals and resources. This leads on to the question as to whether a standard format for FFS is always necessary. Transaction costs may make scaling out of standard FFS a daunting task for poor countries, as pointed out by other commentators on the PRONAF pilot FFS (Adegeye and Carsky, 2003). In PRONAF II, efforts are being made to intensify the FFS approach and reduce costs through a cluster approach and close mentoring by experienced facilitators of new farmer-facilitators. It is important to consider complementary extension techniques that, together with FFS, can ensure greater and more sustainable learning and therefore development impact. Flexibility of tools may also make the FFS approach more attractive to other potential implementers and provide them with a softer entry into the facilitation process that FFS at its best represents.

Collaboration with other actors, both formal and informal and public and private, is considered essential for increasing the capacity of FFS to have impact and develop. The pilot programme under Phase I in Benin appears to have operated without sufficient effective contact with other players. PRONAF II has taken considerable steps to remedy this situation, creating interest in FFS skills for capacity enhancement in the national extension service, and direct collaboration with other development programmes. Greater sharing and interaction with the wider RD system is another very important step through which PRONAF may continue to achieve a wider scale of influence on other research and development programmes, NGO and private sector initiatives, and also become more receptive to the influence of these programmes.

7 RECOMMENDATIONS

As interest in and implementation of FFS grow, more needs to be known about access to them by farmers of different wealth categories. How this question is answered will have a significant bearing on whether there should be special types of FFS, flexible participant selection criteria, or indeed other measures, directed at groups whose access to information services through FFS may be marginal.

In step with interest in FFS as an effective method of educating farmers, more weight should be given to the underlying principles of experimentation and learning. The techniques, tools, curriculum etc. used in FFS should be evaluated to ensure that they do bring about maximum independent learning by both literate and illiterate farmers, and information exchange between farmers within and outside of FFS. With respect to potential for scaling up, FFS should be considered as one among a variety of extension methods. In particular, more emphasis should be given to other tools suitable for mass use (e.g. video, drama, radio). If produced in a way that builds on people's experiences of learning their way out of a problematic situation, such tools may be highly complementary to the catalyst effects of pilot FFS in supporting and strengthening the local learning networks.

Taking a lead from FFS programmes elsewhere, and from farmers' own initiatives within the programme, efforts should be made to explore how a wider range of resources can be tapped or generated to run farmer education within FFS and to access necessary inputs.

To consolidate and expand the encouraging efforts already made to communicate and collaborate with other players, PRONAF should participate actively in the RD cycle in Benin by presenting its results to the relevant regional committees, scientific workshops, and other key parts of the annual cycle of research management. It is very important that new researchable issues, arising from close interaction with farmers, are communicated to the appropriate organisations, so that relevance is maintained and improved, negative effects documented, and further improvements made.

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