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A Case Study

The West African Regional Integrated Production and Pest Management (IPPM) Programme



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Introduction

The pioneering rice breeder, Peter Jennings, who led early advancements in high yielding rice varieties during the Asian Green Revolution, has argued for what he sees as the inevitable need and potential for a second revolution. However, this second revolution would focus on agronomic-based technology as opposed to the Green Revolution which focused on seed-based technology. Although speaking specifically of rice when he said “agronomy’s time has come to lift farm productivity out of stagnancy”, his ideas apply equally to other food and fibre crops in developing countries.

“Extension of agronomic-based technology is very slow compared to the extension of seed-based technology. ... But, it is as powerful as the Green Revolution.

Yet, according to Jennings, moving in this direction requires answering two very important questions: How do you do agronomy? Where do you do agronomy? His answer: “I think it’s got to be done on farms under the real conditions where the farmers are doing the planting ...” (Jennings, 2007)

However, that transition presupposes the existence of effective extension systems. Yet, farming systems worldwide have been going through dramatic changes as a result of globalization, liberalization and rapid urbanization. Public extension services have been in decline over the past decade, amounting to one of the most striking changes in the agricultural landscape. In reality, without functional research-extension architecture in place, the hoped-for improvements in agronomic practices by tens of millions of smallholder farmers are unlikely to materialize.

Furthermore, many of the initiatives under consideration and aiming at “sustainable production intensification”¹ involve complex mixes of domesticated plant and animal species and associated management techniques, and require greater skills and knowledge by farmers. To increase production efficiently and sustainably, farmers need to understand under what conditions agricultural inputs (seeds, fertilizers and pesticides) can either complement or contradict biological processes and ecosystem services that inherently support agriculture.

For example, farmers need to know how soil amendments promote the action of soil-based organisms which facilitate access to key nutrients and suppress plant diseases; how insects and worms help to build a healthy soil structure which, in turn, promotes water- and nutrient-holding capacities and recharges groundwater resources; or how native pollinators and predacious insects can be conserved to enhance key ecosystem services that contribute to more efficient farming systems. Without some practical form of education, farmers rarely will have access to this kind of knowledge.

¹ “Sustainable Production Intensification” (SPI) is one of the primary Strategic Objectives of the FAO

Sustainable intensification also requires diversification of many farming systems. Diversifying the smallholder farm provides opportunities for rebuilding soil fertility by enhancing nutrient flows and efficiencies while introducing new sources of food and nutrition for local populations. Having a greater choice in what farmers can sell, trade, eat, or feed to animals will, over the long run, lead to both greater economic and ecological resilience.

In all cases, farmers need to see for themselves that added complexity and increased efforts can result in substantial net benefits to productivity, but they need also to be assured that increasing production actually leads to increased income. Too many successful efforts in raising production yields have ended in failure when farmers were unable to market the increased outputs. Understanding how to access rural credit, how to develop warehouse receipt systems or, especially, how to sell any increased output, becomes as important as learning how to maximize input efficiencies or build fertile soils.

Sustainable intensification requires informed decisions to be made locally by individuals and by groups. A diversity of community-based education approaches has evolved over the past 20 years that specifically address these challenges in smallholder agricultural systems. Some of these models have been successfully tested over large scales and a wide range of environments.

The larger programme presented here comprises a number of tightly related projects, supported by various donors and coordinated by the FAO. The core project, entitled “**Integrated Production and Pest Management (IPPM) project for Senegal, Mali, Burkina Faso and Benin**”, is funded by the government of the Netherlands.

This case study reports on how the Farmer Field School (FFS) model has been used in the context of the programme to catalyze important changes among stakeholders in the savannah zones of West Africa.



The West African Regional Integrated Production and Pest Management (IPPM) Programme

Established to improve farming skills and raise smallholder farmers' awareness of alternatives to toxic chemicals, the West African Regional Integrated Production and Pest Management (IPPM) Programme, by the end of 2010, will have worked with 116 000 farmers in four West African countries, resulting in improved yields and incomes and making substantial progress in reducing the use of chemical pesticides. Through development of national infrastructure for field-based training in IPPM, the programme has attracted the interest of other development initiatives to partner with its established infrastructure which includes efficient national coordination units, hundreds of trained facilitators, functional relationships between the FFS staff and national and district-level institutions and local communities, and expertise in translating technical messages into farmer-friendly language.

As a result, development projects dealing with rice, cotton, river pollution, agro-forestry, conservation agriculture, climate change and a host of specialty crops are now using the FFS infrastructure and expertise, and the programme has expanded to three more countries.

The IPPM Programme is built on three main objectives: building local farming capacity, improving food security and livelihoods and raising awareness of negative externalities and positive alternatives.

Capacity building. To introduce, develop and encourage adoption of a community-based approach to capacity building that:

- n focuses on developing farmer skills for improving agricultural management through application of techniques for non-formal, discovery-based learning methods at the farmer and trainer level;

- n involves all relevant actors at multiple levels: community, district, national and regional;
- n emphasizes informed decision-making through an experimental, self-evaluative and “adaptive management” approach to agricultural research-extension systems;
- n helps farmers understand the mechanisms of the most important biological and ecological processes and how these processes can be encouraged through good management to contribute to improved productivity and profits.

Food security and livelihoods. To help participating countries develop a positive and consistent trend toward increased food security and improved livelihoods, beginning with organizing farmers in season-long, exploratory learning sessions that aim to:

- n optimize the use of available inputs, including the elimination or large-scale reduction of toxic pesticides (i.e., WHO Category Ia, Ib and II pesticides);
- n improve soil fertility management practices in order to increase water penetration and retention, nutrient-holding capacity, and diversity and activity of soil biota;
- n increase yields and net farm income;
- n help farmers to diversify farming systems in order to improve both ecological and economic resilience, as well as nutritional diversity;
- n assist farmers to better understand and manage economic decision making in order to increase profitability; including developing skills related to better local and regional marketing, basic business skills and self financing mechanisms.

Farmer Field Schools principal organizational elements

- Each FFS consists of a group of approximately 25 farmers, working in small subgroups of about five each. The training is field based and season long, usually meeting once per week.
- The season starts and ends with a “ballot box” pretest and post-test respectively to assess trainees’ progress.
- Each FFS has one training field, divided into two parts. One is IPPM-managed, where management decisions are decided on by the group, not a fixed “formula”. The other follows a conventional treatment regime, either as recommended by the agricultural extension service or through consensus of what farmers feel to be the “usual” practice for their area.
- In the mornings, the trainees go into the field in groups of five to observe and make careful observations of growing stage and condition of crop plants, weather, pests and beneficial insects, diseases, soil and water conditions, etc. Interesting specimens are collected, put into plastic bags and brought back for identification and further observation.
- On returning from the field to the meeting site (usually near the field, under a tree or other shelter), trainees make drawings of the crop plants which depict plant condition, pests and natural enemies weeds, water, and anything else worth noting. A conclusion about the status of the crop and possible management interventions is drawn by each subgroup and written down under the drawing (agro-ecosystem analysis).
- Each subgroup presents its results and conclusions to the entire group for discussion. In these discussions, as well as in the preceding field observations, the trainers remain as much as possible in the background, avoiding all lecturing, not answering questions directly, but stimulating farmer to think for themselves.
- Special subjects are introduced throughout the training. These include maintenance of “insect zoos” where observations are made on introduced pests, beneficial insects and their interactions. Other “classic” special subjects include leaf removal experiments to assess pest compensatory abilities, and life cycles of pests and disease. In recent year, there has been an expansion of the topics to include a more comprehensive, agronomic content,
- Socio-dynamic exercises serve to strengthen group bonding.

Awareness raising. To raise awareness at all levels as to negative externalities associated with many agricultural practices and the positive alternatives that exist, including:

- n understanding the high risks and or benefits associated with most pesticide practices and the availability of low-toxicity alternatives;
- n developing capacity in local laboratories and universities for improved environmental monitoring of toxic chemicals in food and water;
- n sharing results from the programme at all levels, from farmers to decision makers, through all appropriate avenues, including media (radio, TV, bulletins);
- n assisting with the development of better national policies with regard to agriculture and its interaction with communities and the environment.

IPPM and the FFS approach – a strategic match

Moving from Asia to Africa

The Farmer Field School (FFS) is an early innovative model for community based farmer education based on non-formal, adult educational or “discovery learning” methods, developed some 20 years ago in response to the weaknesses of more “top-down” extension models of the time.

The pioneering work on the FFS model was initiated by FAO in Southeast Asia in the late 1980s. Over the past two decades the approach has been adopted by technical agencies outside of FAO and spread to nearly 90 countries worldwide (A. Braun, FFSnet pers. com.).

IPPM in West Africa began in 1996, with the initial training of facilitators in Ghana, led by master trainers from Indonesia and the Philippines. In Francophone West Africa, the first full-scale programme was

implemented by FAO in 2001 in Senegal, Mali and Burkina Faso, with financing by the Netherlands. A second phase began in 2006 adding Benin and partnering with the EU All ACP project. In 2009 the Programme expanded to three more countries – Guinea, Mauritania and Niger through the addition of a GEF/UNEP pesticide, environmental and human health monitoring component.

Key to the continued evolution of the approach is building the foundation for a strong knowledge network in which innovations are “harvested” for use elsewhere. One important development in this regard is the emergence of an independent NGO whose mandate is sharing the FFS lessons learned globally and whose global list server is very active (global-ffs-l@farmerfieldschool.net.)

Although the FFS was developed more than 20 years ago, the process of innovation is active, ongoing, diverse and occurs at all levels, from farmers to national and regional levels.

Building partnerships

The decline of large, state-owned research extension systems reflects a shift in donor attention over the past decade away from support to agriculture, with subsequent loss of financing that previously supported the heavy costs of large extension systems. The rise in oil prices in 2008 that led to alarming spikes in food prices re-focused



global attention on the importance of supporting development in the agricultural sectors of developing countries.

However, as extension systems weakened in West Africa over the past decade, a mosaic of local and national stakeholders emerged to take up the tasks. The composition and relative strengths of the constituents vary across administrative levels within a country, but generally include a mixture of government agencies, NGOs, farmer organizations and, to a limited extent in savannah areas of West Africa, the private sector.

The goal now should not be to replace these ad hoc assemblages with a re-creation of the monolithic, state owned extension systems of the past, but rather to work with this diverse and country-specific set of stakeholders to generate more fruitful, long-term and sustainable outcomes.

In this context the FFS approach itself can be seen as an integral and useful part of any existing system, helping to improve the quality, quantity and practicality of communications passing both horizontally and vertically within the mosaic of stakeholders. The IPPM programme does not seek to be a replacement for an extension system.

Partnerships at all levels are key to the success of the overall process. However, integrating the community-based FFS approach into the local mosaic requires the support and commitment from stakeholders to engage in coordinated efforts at several different organizational levels. The degree to which the programme attracts new partners over time is an important measurable indicator of its success.

National government partners. The programme usually begins in partnership with the ministries of agriculture and environment and the national directions of agriculture and agencies for crop protection. Programme steering committees usually also include ministries of health and trade.

NGO partners. The large regional NGO, ENDA *Tiers Monde* plays an important role in coordinating the design and execution of village-level survey instruments, and assists with data management from the thousands of FFS distributed across the countries.

Farmer organization partners. Large and important farmer organizations, such as the *Union Nationale de Producteurs de Coton du Burkina* (UNPCB) in Burkina Faso and the *Federation Nationale des Maraichers des Niayes* (FNMN) in Senegal, are key partners in helping to institutionalize the FFS approach.

Local government partners. Recently, an important set of partnerships has come into play with the involvement of the district level *Chambres d'Agriculture* in Mali and Burkina Faso, and the *Communités Rurales* in Senegal. These local political bodies bring together representatives of farmer organizations, businesses and district-level representatives of government, including extension services. Awareness of the important outcomes of practical farmer education through FFS helps create a chorus of support for the programme at the higher national levels.

Development project partners. A growing list of national and regional donor projects is engaging in

partnerships with the West African IPPM programme in order to access its growing networks of farmer facilitators and alumni farmer groups. Table 1 shows the size and scope of these partnerships for the case of Mali.

Building social capital

The term “social capital” is commonly used to describe the importance of social bonds, norms and collective action (Pretty 2007). Social capital gives value to the set of connections within and among social networks. Collective action is the evidence of active social networks and therefore an indicator of social capital. Partnerships involve the leveraging of various forms of capital, but the act of forming and acting in partnership is itself an important form of social capital.

Development of social networks to generate collective action is at the heart of the FFS approach. More specifically, the FFS is an example of an **adaptive management** approach (Holling, 1978), which is central to most definitions of sustainability, such as the Ecosystem Approach constructed for the Convention on Biodiversity. Adaptive management is a pragmatic philosophical framework that promotes the principle of ecological resilience as an outcome to management through multi-stakeholder processes at multiple appropriate scales (Lee 1993, Gunderson 2000).

In line with this thinking, the FFS process is “schematic” (Norton 2005) in that the specific content is not fully specified ahead of time by outside experts. Instead, it is open to examination, discussion and specification by the full set of

TABLE 1 Partnership Statistics for IPPM West Africa - Mali

Cropping System	Government Agencies	Farmer Organizations	NGOs	Donor Projects	Organizations Involved	Focal Points Trained	Facilitators Trained
Cotton	2	5	0	1	6	13	192
Market Garden	4	5	8	5	38	10	312
Rice	5	2	1	3	8	10	222
Mango	5	2	1	0	2	0	21
Sesame	2	5	1	1	4	1	48
Karité	0	4	1	1	3	0	41
Dryland Cereals	3	3	0	1	2	2	27
Jatoropha	2	4	1	1	1	0	12
Cowpea	3	2	1	1	1	0	3
Hennah	2	3	1	0	1	0	6
Total	28	35	15	14	66	36	884

Partnerships with the IPPM Programme in Mali. Financial resources for training facilitators and farmers in these partnerships came from donor organizations and NGOs. The IPPM Programme national staff coordinated training and provided guidance on operations and curriculum development as well as on monitoring and report writing.

actors at all levels and thereby helps to fine tune the response specifically to the local agronomic, economic and social context. Local participants are involved with determining the values to be prioritized and indicators to be measured.

The types of social capital developed in the programme are many and differ by organizational level.

Farmer level: working in small groups, the FFS aims to improve decision-making through informed and enhanced understanding of economic, ecological and social systems, leading to improved efficiency, profitability, and economic and ecological resilience. The FFS experience leads to both personal and small-group empowerment through building a sense of increased self-determination, technical competence and the self-confidence to innovate.

Community level: an improved sense of self-determination aids communities in gaining power to influence the type and quality of services made available to them. The programme helps build horizontal and vertical communication. The programme is working to include topics related to self-financing mechanisms and warehouse receipt systems that will provide better economic stability and strength through improved communications among local actors, such as coops, merchants, traders and banks. In the long run, this strengthens community food security and livelihoods.

Field agent (facilitator) level: an increased sense of mastery over the technical subject matter is part of an improved professional self-image that comes with being a facilitator and member of a skilled team. Improved skills in managing groups and guiding group exercises in the farmers' fields allow the facilitator to gain and demonstrate respect for the knowledge and abilities of farmers to become "experts in their own fields". This, in turn, engenders farmers' respect for the facilitators, which further encourages the process. Approximately 67 percent of the facilitators in the programme are farmers, usually associated with a cooperative or farmer organizations.

The communities themselves decide which farmers to train as facilitators. The chosen farmers go for training, with the communities' expectations that they will be returning with useful and pragmatic skills that will benefit all – a strong motivating factor.

Farmer organization level: includes development either of new cooperatives, or revitalization of older cooperatives stimulated by FFS activities.



Success at this level is contingent on promoting transparent and democratic processes. The IPPM Programme adds value and vitality to existing structures through efforts to anchor FFS training and management functions within the farmer organizations, and provides guidance and assistance on how to strengthen marketing opportunities as well as capacity building for improved business and accounting skills.

District and national levels: capacity building within government institutions is usually the first step for the programme, but quickly involves actors at decentralized levels. Empowering field agents to provide better service to farmers also empowers national agencies. In order to succeed, the IPPM Programme needs strong support from the government host agency, such as the Ministry of Agriculture's Office of Crop Protection. Competition between national agencies can sometimes hinder the progress of the programme. Tangible successes in the field result in social and political "buy-in". This helps acknowledge and validate the accomplishments at the community level and spread awareness of the larger potential of the programme up the political chain to the higher levels.

Regional level: outcomes of the project are being made available to regional technical and policy bodies. Examples include the *Comite Sahelien des Pesticides* (CSP) and the Comprehensive African Agriculture Development Programme (CAADP) process. Partnerships with regional and international research organizations offer opportunities for the programme to play a facilitating role in larger initiatives at regional and continental scale.

Professional level: transforming often highly technical messages into field-based curricula is a key element of the programme. This requires ensuring

that the basic cause-and-effect relationships underpinning good agronomic practices are understandable, regardless of literacy constraints and, in effect, constitutes a new professional niche few have sufficient experience to fulfil. The new role requires experience, both with agronomic science and with non-formal educational methods. Efforts need to be made to explicitly define and support development of a professional category of “IPPM Master Trainer”.

Building portfolios of locally adapted “good agricultural practices”

The programme seeks to help farmers develop and adopt their own set of “good agricultural practices” through experimentation, adaptation and adoption of techniques deriving from a variety of sources, including national and international research and other farmers.

Pest management. FFS programmes were initially developed to reduce toxic pesticide use through integrated pest management (IPM). IPM training focuses on conserving and enhancing populations of beneficial insects. Systems such as irrigated rice generally have relatively few insect problems and insecticide use in West Africa by irrigated rice farmers is generally low. However, farmers unaware of the basics of IPM run the risk being vulnerable to commercial pressures to use pesticides.

In contrast, vegetable and cotton systems use high quantities of insecticide and many different highly toxic chemicals. The FFS training benefits farmers by helping them find less toxic approaches to controlling insect pests.

Soil fertility and seedling management. The scope of the FFS has expanded over time to include improved agronomic practices across a growing diversity of agricultural systems. In addition to pest management, the initial work by the programme in West Africa focused on soil fertility management with an emphasis on increasing the use of organic amendments as well as on practices related to establishing better nursery seed beds and employing improved transplanting techniques in both rice and vegetable systems. In a recent survey of 150 post-FFS vegetable farmers in Burkina Faso, the farmers ranked the top three benefits of the programme as: i) developing proper seed beds and nurseries, ii) learning techniques for building and using compost, and iii) making local pesticides from plant extracts.

Marketing and economics. During the first phase of the programme in West Africa, farmers expressed satisfaction with the outcomes of the programme

in terms of higher yields and lower input costs, but many also expressed frustration with not necessarily being able to sell their increased production. In response, a marketing specialist was added to the international management team during the second phase of the programme. Efforts are now underway to conduct marketing studies specific to key areas in the programme countries and to develop curricula for FFS training related to marketing.

Some FFS groups have reported increased demand in the marketplace due to the improved quality of their products, especially as regards improved shelf-life and perceived increases in the safety of food items. The programme has examined and rejected, for the moment, an “IPPM” label because of the enormous difficulties in certification and assuring traceability through commercial and transport chains.

Some FFS groups have been able to take the “next step” and become certified organic growers. But this option is only available to those farmers who are near major cities where markets for organic produce exist.

Expanding the list of crops. Additional projects involving new cropping systems and methods came on board during the course of the second phase of the programme (Fig. 1). This included organic mango production in Burkina Faso, and karité, cowpea and sesame production in Mali. Basic pruning techniques taught through FFS have helped more than 300 organic mango producers regenerate productivity in their older orchards and control pest and disease problems without resorting to use of toxic chemicals.

Evolving to a “full system” approach

Simple problems can be rapidly addressed, but more complex challenges require sufficient time and a strategy to aid in the longer-term process of adaptation and adoption by farmers. Field schools are not a one-off training opportunity, but rather they must be the entry point for farmers and communities to begin a continuing process of discovery learning. With this philosophy in mind, the programme builds in substantial support for follow-up activities with alumni FFS groups.

Sub-humid savannah system: cotton-cereal-livestock. In Burkina Faso, the IPPM Programme has undertaken the complex challenge of working with farmers to help them diversify cotton systems. The goal is to improve productivity and sustainability in the subhumid savannah zones, where cotton is the dominant cash crop. Cotton production has one of the worst overall impacts on the environment of any crop in the region, due to impacts on the fragile

soils and excessive use of pesticides. Cotton farming has been an “open door” that has brought highly toxic pesticides INTO the region, because pesticides delivered with credit packages that accompany cotton farming often end up being sold for use in other cropping systems, where they don’t belong.

The strategy is to reverse the negative trends of soil fertility and unnecessary toxic pesticide use by exploring options with farmers to diversify and “sustainably intensify” the production system. Given the low world market price for cotton, one tactic is to reduce the surface area under cotton, but sustainably boost cotton yields through the application of compost, leguminous cover crops, use of improved seed and plant management techniques. The remaining arable land of an individual farmer can then be put into other crops, including cereal crops and soil-improving crops that are interplanted or rotated into the system. This includes legumes and forage crops that can be fed to animals or sold on the local market.

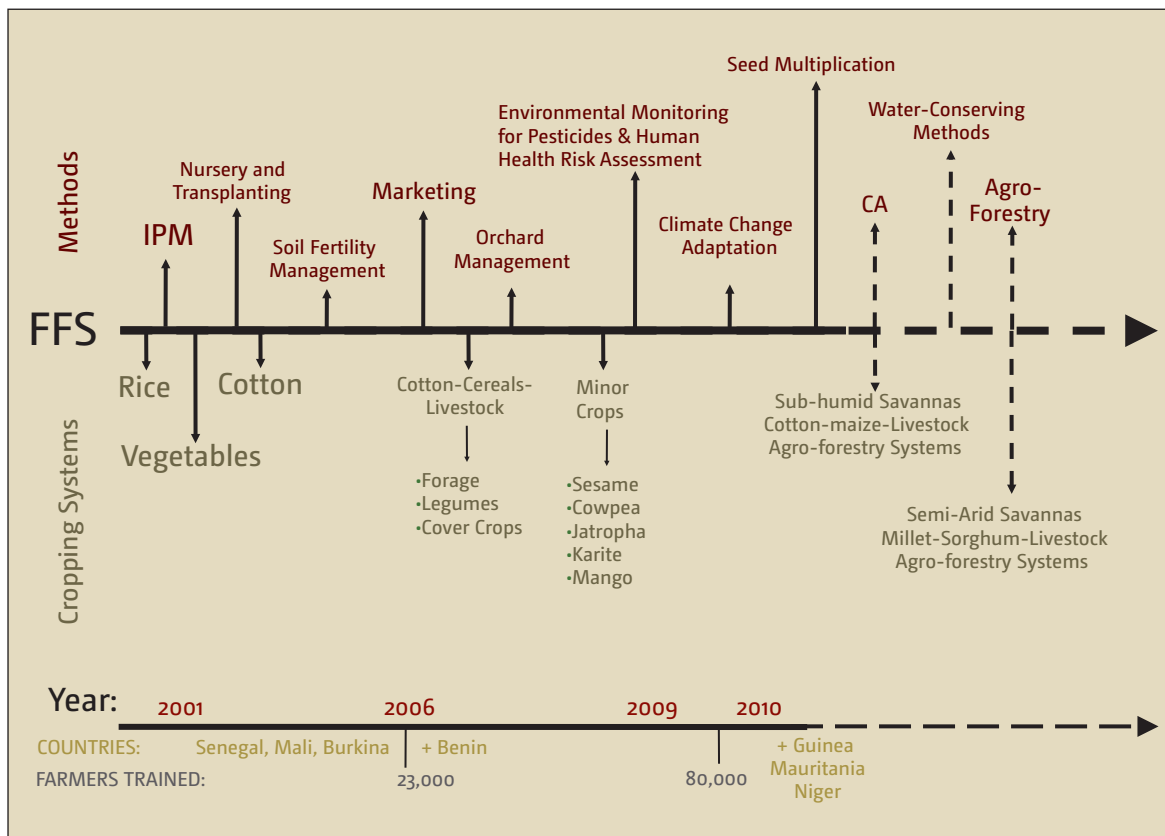
With this diversification, farmers will have a greater chance of profiting on their cash crop and will

also be able to eat, sell, barter or feed to animals the remainder of their production outputs. The environmental benefits include reversing the downward spiral of soil fertility, reducing toxic loads in soil and water and improving overall conditions for biological diversity.

The next step in this diversification could be the inclusion of reduced tillage systems such as conservation agriculture (CA). Although the elements needed for a CA system are currently being developed for an FFS approach in the EU-funded, All ACP component, CA innovations are highly complex and the methods and the costs have to be tested and weighed by farmers. While some of the benefits may be immediate, others will take time to be realized.

Semi-arid savannah system: millet-sorghum-livestock. The programme is planning to address another complex system in the semiarid zone (400–800 mm rainfall), by partnering with the ongoing work of ICRAF, ILRI, CIRAD, national research agencies and others in order to explore opportunities from agroforestry and water harvesting technologies. Work currently underway in the IFAD financed

FIGURE 1. Technical Evolution of the IPPM Programme in West Africa



A diversity of cropping systems and agronomic methods have been included, based on demand expressed by communities and interest and support from partner institutions. Dotted lines indicate expectations for topics to be addressed in future years.

“Smallholder Conservation Agriculture Promotion” (SCAP) project in Burkina Faso and ICRAF in Niger shows that millets and sorghums can benefit from being interplanted in areas where farmers actively promote natural regeneration of indigenous leguminous trees and shrubs (Garrity, D. pers. com.).

Programme structural developments

Progress in capacity building

During 2010, the programme will undergo a set of external reviews, including impact studies across all four countries. Data presented here are from a variety of past studies, both external and internal. Several surveys of alumni FFS farmers were done in 2009, asking for their observations on how their farming practices have changed as a result of their training several years earlier.

Alumni networks and follow-on activities

The programme is experimenting with different ways to increase the adaptation and adoption of improved practices by farmers, for example through the support of follow on activities in which alumni FFS farmer meet as a group in one of their own fields on a weekly or bi-weekly basis, rotating each time to a different field. Here they discuss specific problems and advise each other on possible solutions. If solutions are not forthcoming, the facilitator has

From the field:

I used to cut wood and make charcoal to sell. Now, after attending the IPPM training programme organized by the Agriculture Sector of Sikasso, I reduced wood cutting to dedicate myself to market gardening, and I make more money. I produced more than 5 tonnes of onions, which I sold in the market of Sikasso for almost 2 million Fcfa (US\$4 500) – more than I could make with sale of charcoal. I joined other producers in the area, we created a semi self-funded Field School system that pre-finances the initial costs of the group training, that is to say, purchase of seed, fertilizer and materials for training. At the beginning of the IPPM training programme, we were 5 men and 20 women. Today the IPPM group has 100 trained members, and our production area has become too small. We are looking for assistance to expand.

– SEYDOU FANE, FINKOLO PRODUCTION ZONE, MALI

access to district and national level expertise, thus encouraging two-way flows of information between communities and technical support networks. The cost of these follow-up activities is only a fraction of that of an FFS, comprising only the transportation costs for the facilitator.

TABLE 2. Number of Facilitators trained during Phase I and II

Country	Vegetables	Rice	Cotton	Mango	Cowpea	Sesame	Jatropha	Carité	Total
Benin	90	86	57	0	0	0	0	0	233
Burkina	99	202	104	50	10				465
Mali	243	195	192	10	3	28	12	40	723
Senegal	322	128	61	7	0	0	0	0	518
Total	754	611	414	67	13	28	12	40	1,939
Technical Facilitators			642	33%					
Farmer Facilitators			1297	67%					

Number of Facilitators trained during the course of Phase I&II. Roughly one third were “technician” facilitators (having some technical training and belonging to government agricultural service) and two-thirds were farmers trained as facilitators.

TABLE 3. Number of Farmer Field Schools during Phase I and II

Country	Vegs	Rice	Cotton	Mango	Cowpea	Sesame	Millet & sorghum	Carité	Jatropha	Total
Benin	76	30	47							153
Burkina	287	270	247	50	12					866
Mali	769	611	450	24	9	68	62	40	12	2,045
Senegal	424	120	24	7						575
Total	1,556	1,031	768	81	21	68	62	40	12	3,639

FIGURE 2. Numbers of farmers trained by country over the course of two phases of the IPPM Programme in West Africa

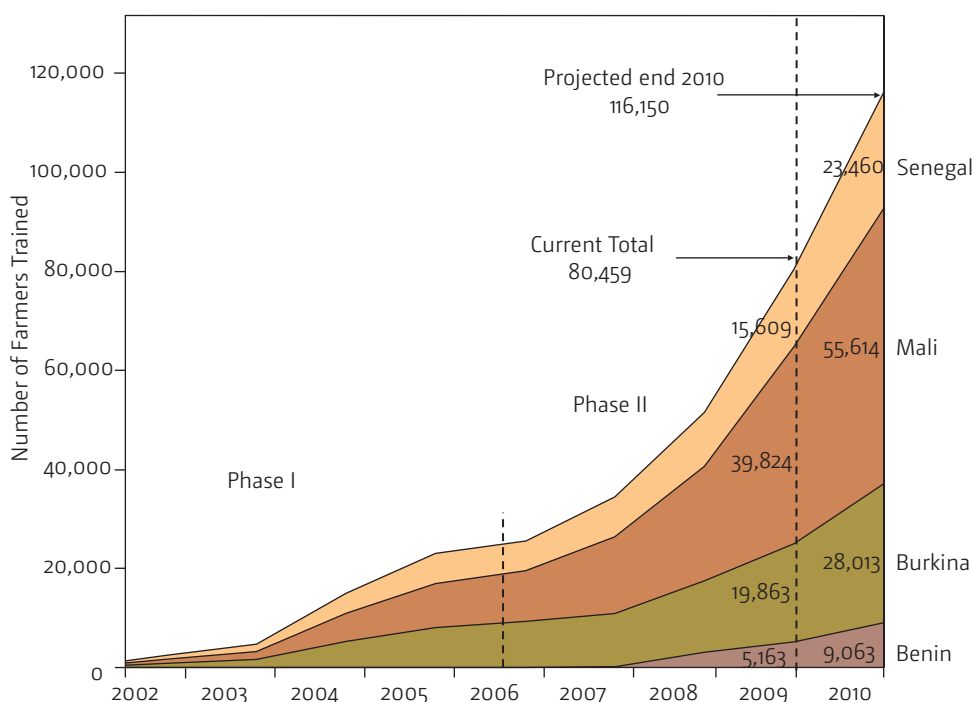
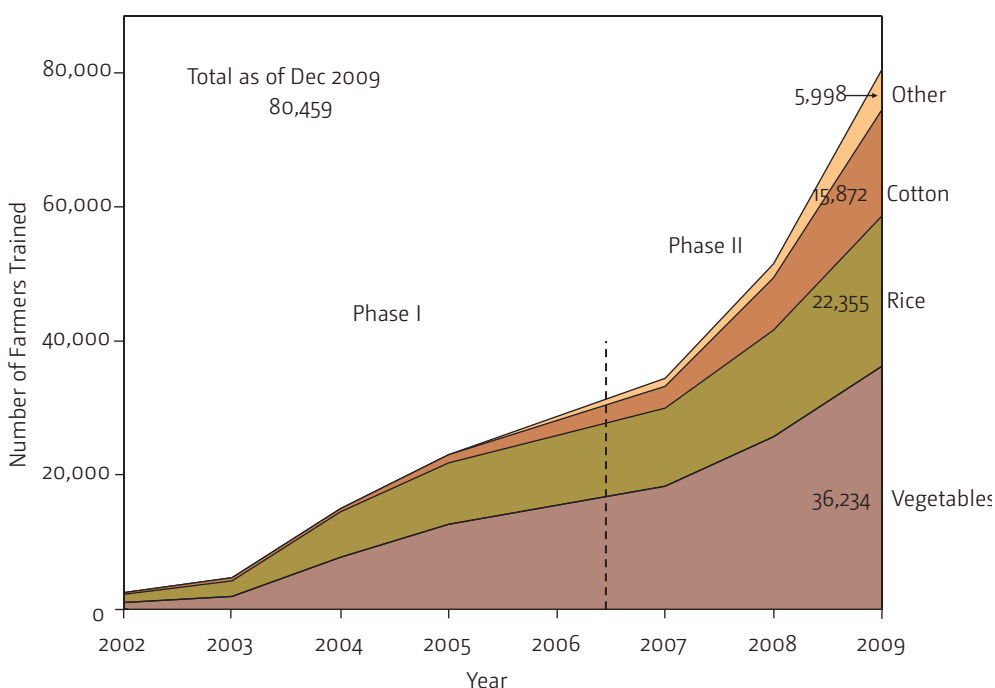


FIGURE 3. Numbers of farmers trained by cropping system over the course of two phases of the IPPM Programme in West Africa



Facilitators trained and Field Schools conducted

Around 1 939 facilitators have been trained. Roughly one-third of these are government agents and two-thirds are farmers (Table 2). More than 3 500 FFS have been conducted, dominated by the three principal cropping systems targeted by the programme (Table 3).

As of December 2009, an estimated 80 459 farmers had been trained in season-long FFS in the four countries (Fig. 2), with most participating in post-training follow-up activities. Roughly 45 percent are vegetable producers, followed by rice producers (28 percent), cotton producers (20 percent) and “others”(7 percent) (Fig. 3).

Area under production

The IPPM Programme has worked principally with small landholders. As of December 2009, an estimated 112 206 ha are being farmed by the 80 459 farmers trained over the two phases of the programme. Whereas vegetable farmers constitute almost half of all farmers trained to date, the total land area under vegetable production is only about 13 percent of the total under production by IPPM farmers (clearly, because highly intensive market gardening is done on much smaller plots than the extensive cotton and rice farming (fig.4)). Rice accounts for 53 percent and cotton 33 percent of the area under IPPM production.

TABLE 4. Average surface area (Ha) under production by IPPM Farmers

Country	Vegs	Rice	Cotton
Benin	0.53	0.57	3.25
Burkina	1.04	1.45	3.80
Mali	0.10	4.26	1.53
Senegal	0.42	1.28	1.00

Predicted growth

Projecting growth of the IPPM Project based on a simple extrapolation is unrealistic, especially since the growth in numbers of farmers trained over the course of the programme thus far is close to exponential (Fig 2 & 3). The important point to note

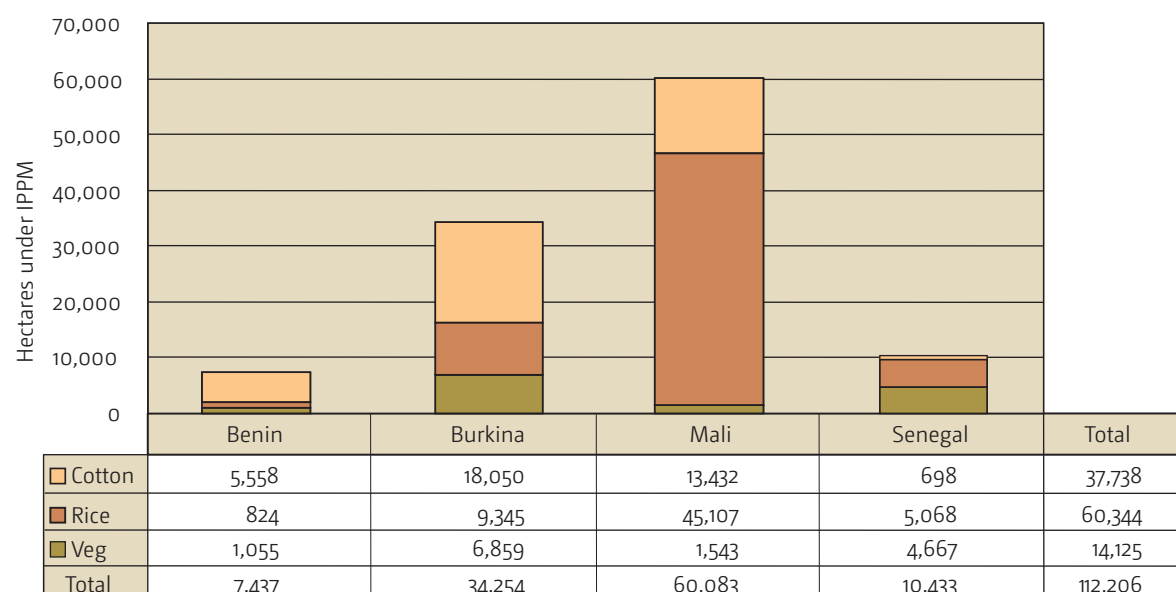
is that growth in the programme takes time to establish, but once underway the number of farmers trained rises quickly.

This highlights the advantage for partner projects that wish to introduce new technical skills to farmers in a country where the IPPM Programme is established can take advantage of the programmes' infrastructure and networks of alumni FFS farmers. Engagement with farmers can be widespread within a relatively short time.

Projection of future growth is of course dependent upon government interest and donor support. As the IPPM Programmes have matured, government interest has grown. For example, the Ministry of Agriculture in Mali has established the FFS approach as the official extension approach for the Malian Direction of Agriculture, and has determined as its priority that 75 percent of the irrigated rice producers in Mali are to be trained through FFS in the next few years. Given the well established programme in Mali, this target of an estimated 125 000 rice farmers could be met within 4 years. Efforts are underway to secure funding.

A similar analysis for other countries in the subregion across the two major savannah production systems suggested that 500 000 farmers could be trained in the next four-to-five years, assuming the resources are available. The estimated cost for this will be around US\$30-40 million.

FIGURE 4. Estimated hectares under production by country and by crop for farmers having gone through IPPM FFS training for both Phases I and II



Impacts on production levels and environment

Substantially increasing food production: rice

The countries in the region are estimated to be importing up to 40 percent of their national demand for rice (FAOSTAT). While much is made of the need for inputs and new varieties in order to increase production levels, less well appreciated is the fact that a 150-year history of importing cheap “broken grain” rice from Southeast Asia continues to undermine local demand for locally produced rice. Making the assumption that farmers are unable to produce higher yields misses the point that in

areas such as the Senegal River basin, the economic incentives are often not sufficient to encourage farmers to make the effort or take the risks necessary for producing more rice. The programme helps farmers boost yields while reducing input costs and lowering risk, which helps make local rice more competitive with cheap foreign imports.

Benin

In 2006, Benin became the newest member of the regional IPPM group. Focus has been on rice and cotton production systems in the northern part of the country. Outcomes from the irrigated rice system of Malanville in northern Benin – an irrigated area of 516 ha of which 400 are operational involving 793 producers – illustrate the type of successes recorded

Report from the President of the General Union of Producers of the irrigated perimeter in Malanville, Benin, 2008.



We started producing rice here in 1971 and now we produce nothing else in this area other than rice. We never received any support in training until the IPPM programme. With the IPPM programme, this is the first time that we have had this opportunity. This training has contributed so much, and after only one year, almost all the inhabitants of this area are or will be part of the programme. We told this to the Minister of Agriculture when he passed through here a few months ago. We will also bring this to the attention of the President of the Republic when he comes to see us, because the results (returns) that we have recorded through the programme are spectacular for us. Here are our practices and the results we have achieved:”

Practice	Before IPPM	After IPPM
Seeds	Not quantified	20% to 25% of what was used previously
Seedling age	45 days	15-20 days
Number of seedlings/hill	10+	1 or 2
Planting spacing	transplanted randomly	transplanted in line, 20 - 25 cm
Chemical fertilizers (NPK + Urea)	up to 400 kg /ha	150 kg / ha
Pesticides	none	none
Use of rice straw	sold in Niger markets	buried prior to transplanting
Yields	2.3 t/ha	5.0 t/ha

by the programme. The union is made up of 24 producer groups and the box below presents both the numbers and the words of success.

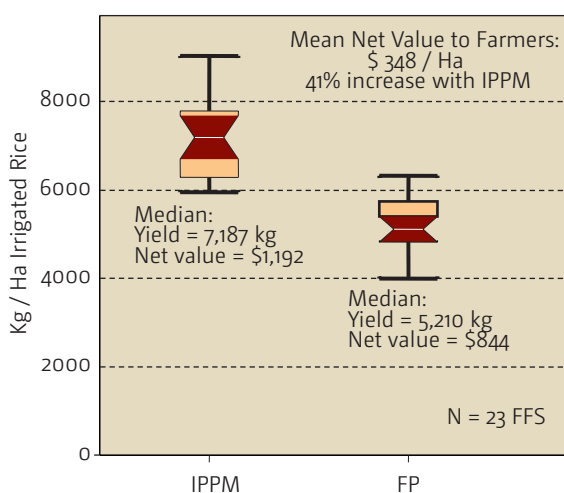
The IPPM Programme in Malanville led to more than doubling production and a 66 percent decrease in use of chemical fertilizer. Reports by Malanville IPPM rice farmers indicated that the neighbouring farmers were at first sceptical, especially just after transplanting when they saw their IPPM neighbours with fields that “did not even look like rice fields” (due to the small size of the seedlings, the few seedlings per hill and large interplant distances). Then, midway through the season, the neighbours noted the robust growth of the FFS fields. In the subsequent season, as indicated by Mr. Souley, most of the entire group of 791 farmers had changed their practices to follow the IPPM methods.

These events took place during the “soaring food price crisis” of 2008, when the government of Benin had established a fair price and guaranteed purchase of existing production by local farmers, which likely motivated and benefited farmers as much as the prospects of increased production.

Mali

By the end of 2009 the IPPM Programme in Mali had trained an estimated 10 600 irrigated rice farmers

FIGURE 5. IPPM versus conventional farmer practice (FP) in Mali



Estimated median values for rice production from three irrigated polders in Mali (*Selingé, Office du Niger, Niono and Baguinda*). Differences between medians represent a 38% increase in yield and a 41% increase in net value. Net values were derived from calculated production costs, which were slightly higher for the IPPM plots.

and 195 technician and farmer facilitators. A recent detailed study of rice production recommendations in 23 FFS highlighted significant differences in yields and net benefits between IPPM and conventional practice (Fig. 5).

Senegal

By the end of 2009, some 3 959 rice farmers and 128 facilitators had been trained over the course of the two phases in Senegal.

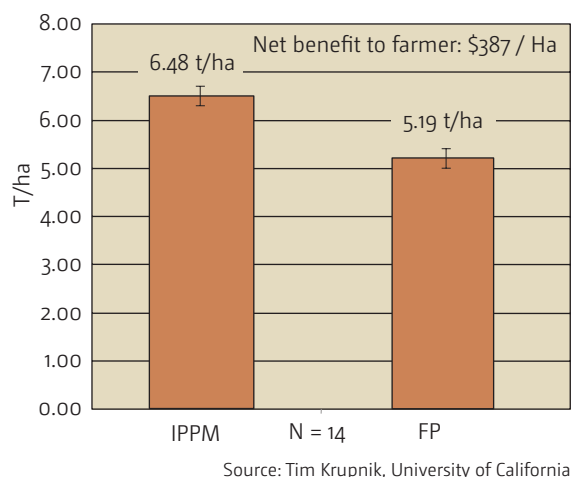
An independent study during the course of 14 FFS compared IPPM improved practices for irrigated rice with conventional practices in the lower Senegal River Basin, demonstrating clear and important differences in yields and net returns to farmers (Fig. 6).

Burkina Faso and Benin

The IPPM Programme also promotes use of higher quality seed by farmers. In Burkina Faso 339 IPPM rice farmers surveyed indicated that prior to their FFS training, 30 percent used improved seed whereas after their training, 92 percent were using improved varieties.

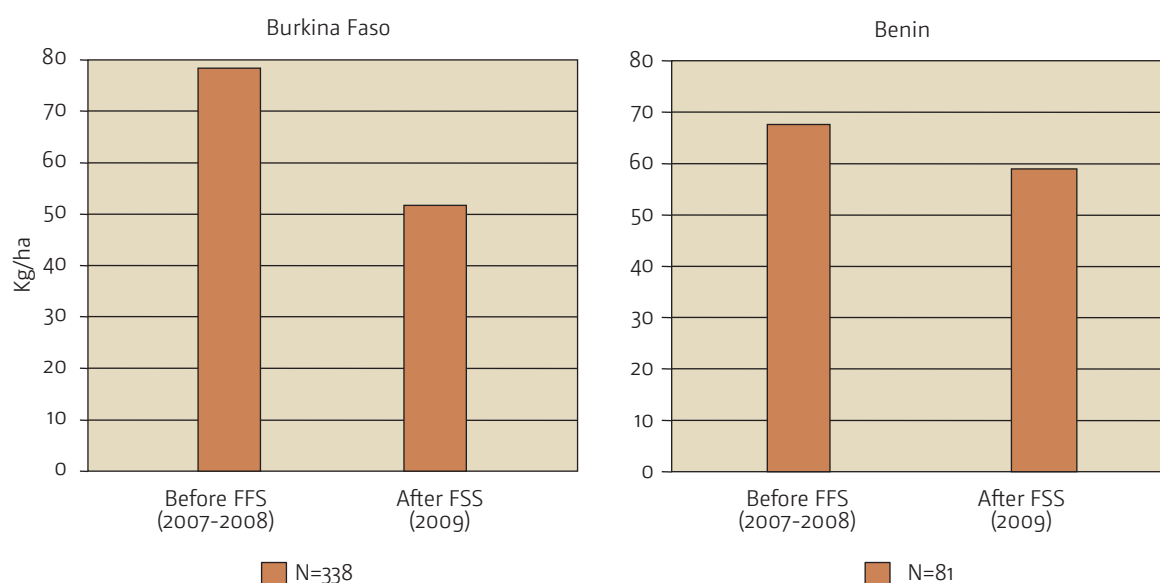
High quality seeds are a valuable resource, not to be wasted. Improved planting practices in irrigated rice systems provide improvements in yield while, in most cases, largely decreasing the amount of seed used per hectare (Fig. 7).

FIGURE 6. Estimated median values for rice production in Senegal from recent research



Conventional practice plots were broadcast seeded, which is common in the districts along the Senegal River. IPPM promotes transplanting rice. Differences between medians represent a 25% increase in yield. With permission from Tim Krupnik, University of California, Santa Cruz. Data unpublished.

FIGURE 7. Quantities of seed used by rice farmers in Burkina Faso and Benin



Based on a survey of FFS irrigated rice farmers 1-to-2 years after training. FFS rice farmers in Burkina Faso and Benin reduced their seed use per hectare by 31% and 13% respectively.

Caring for environmental services

Indications are that FFS farmers are gaining and applying knowledge on safe and effective alternatives to toxic pesticide use as well as on methods for improving soil fertility through increased use of soil amendments. Both outcomes play crucial roles in improving conditions in support of biological diversity in soil and aquatic systems. The benefits in terms of ecosystem services are multiple, ranging from soil protection and enhanced soil fertility to water quality, improved natural biological control and improved pollination.

Reducing pesticide use in vegetables and cotton

Market garden systems in West Africa represent a particular challenge to finding sustainable solutions to current production practices. Relatively high sensitivity to pests and disease and high values from export markets have led to decades of abuse of pesticides.

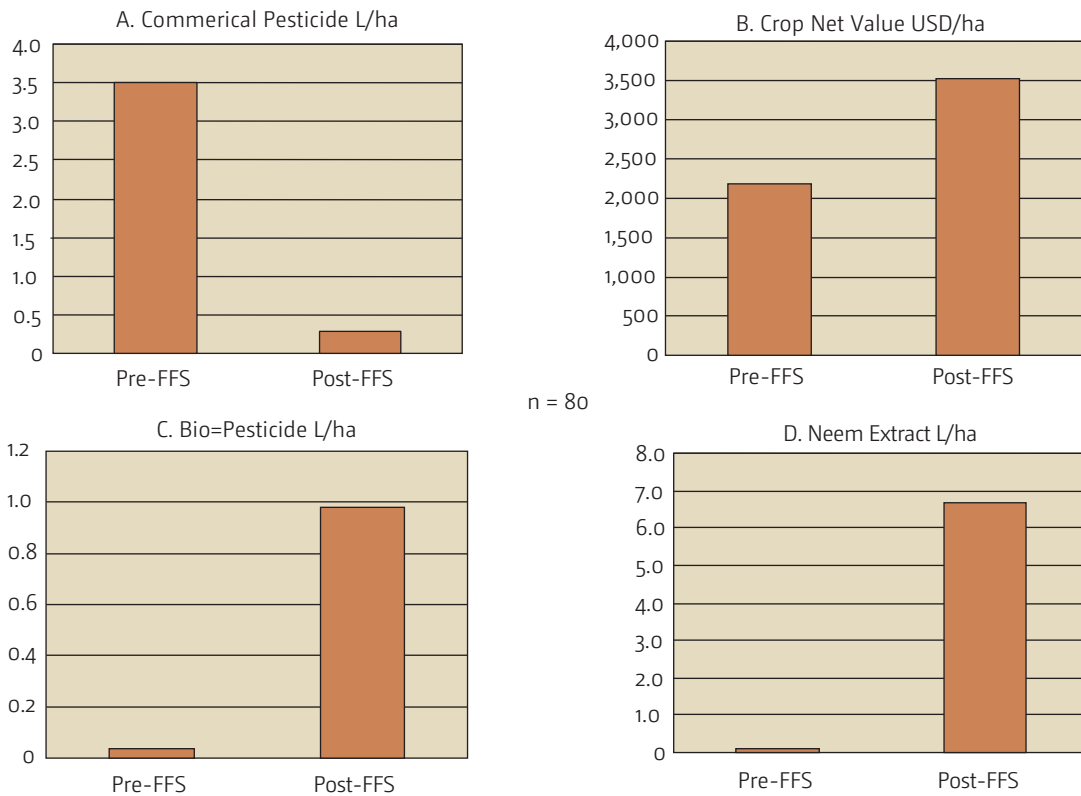
Data from Senegal (Fig. 8) and from Mali (Fig. 9) show 92 and 94 percent reductions in use of synthetic pesticides respectively and, in Senegal, large shifts towards the use of botanical and biological pesticides. These practices represent a substantial shift away from moderate and highly toxic pesticide use which implies important reductions in risks to health and the environment.

Increasing organic matter in soils leads to multiple benefits

Farmers' increased use of organic amendments such as compost or rice straw is one of the most striking outcomes of the programme, as shown in surveys of FFS farmers (e.g., Fig. 9 and 10). Savannah soils in West Africa are extremely fragile. High temperatures and stochastic rainfall patterns put soil carbon and water availability at a premium. Increased organic matter use by farmers is key to increasing water penetration and water- and nutrient-holding capacities of soils, as well as to promoting important biological activities by soil micro-organisms leading to improved nutrient transport and reduced risk of soil-borne diseases. Higher levels of organic matter in soils will reduce runoff from sporadic, but periodically heavy, rain events and reduce the loss of topsoil from erosion.

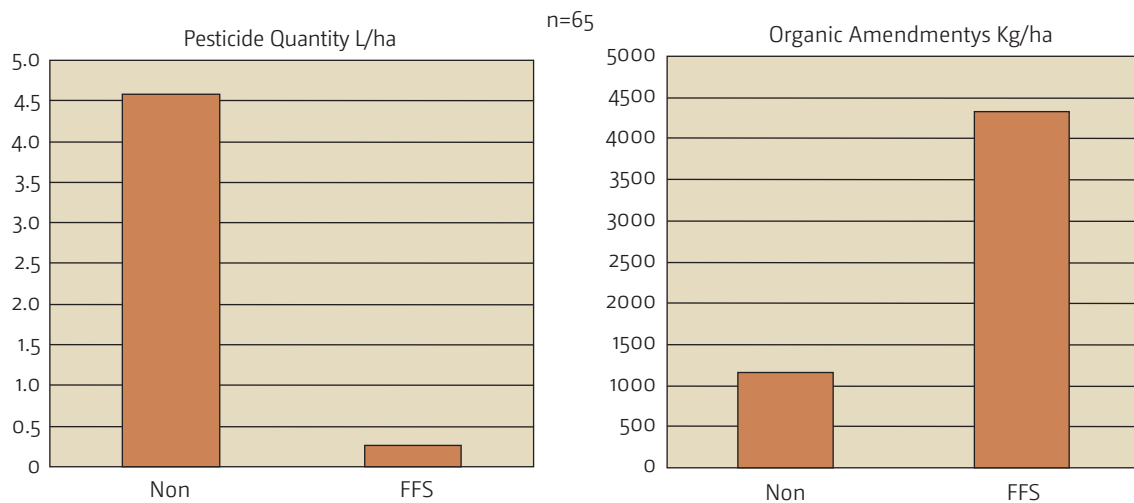
Incorporating compost into soils costs a farmer money, time and effort; hence, the strong response by farmers who adopted these measures indicates they were likely seeing clear benefits. Adoption rates, however, can be thwarted in communities where land tenure rules render ownership rights uncertain. There is little incentive to improve the long-term management of soil and land when the land could be taken away tomorrow and given to someone else.

FIGURE 8. A 2009 independent survey of 80 vegetable farmers from Senegal who had participated in FFS training 1-to-2 years prior



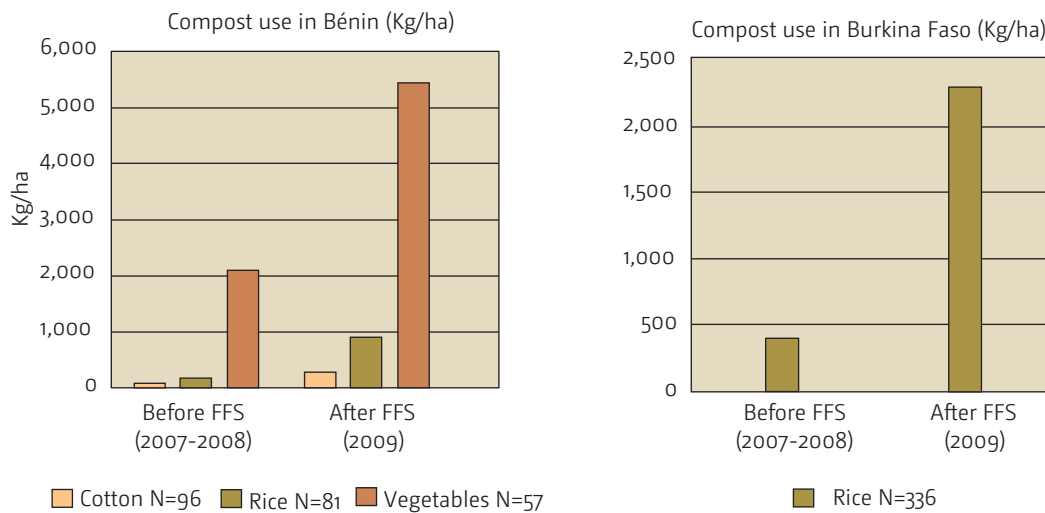
A. Commercial (toxic) pesticide use down 92% for a savings of 3.2 liters/ha and \$60/ha; B. Net overall crop value after calculating input costs (not labour) up 61%. Net difference in value is \$1 332 USD/ha. Percentage of farmers using chemical pesticides went from 97% to 12%; C. Commercial Bio-pesticide use, e.g., “Green Muscle” (*Metarhizium flavoviride*) and “Bibot” (*Bacillus thuringiensis*). Use up from 3% to 75%; D. Locally produced extract from the seeds of the neem tree, which acts as a repellent and anti-feedent for many insect pests. Use went from 3% to 82% of IPPM farmers .

FIGURE 9. Mali cotton production



Post FFS survey of cotton farmers in 65 villages where FFS took place during 2007 and 2008. Pesticide difference in use is an average 4.5 L/ha compared to 0.25 L/ha or 94% less for FFS farmers. Differences in use of soil amendments is between 1.2 T/ha compared with 4.3 T/ha or almost a 4-fold increase in use of compost by FFS farmers.

FIGURE 10. Quantities of organic matter used by farmers in Burkina Faso and Benin



Based on a survey of FFS farmers 1-to-2 years after training, FFS farmers in Benin increased their use of organic matter per hectare in rice, cotton and vegetable systems by 260%, 342% and 481% respectively. Rice and cotton growers in Burkina Faso reported increasing their use of compost by 564% after FFS training. Of these growers 21% reported using some kind of organic soil amendment prior to training, and 71% after FFS training.

Monitoring agrochemical pollution in water

Trends in agriculture over the past decades in West Africa have seen increasing use of highly toxic chemicals in higher-value, often irrigated crops. Yet farmers, agricultural scientists, health officials and policy-makers remain uncertain about the real risks and benefits associated with their use. There is a general lack of basic knowledge of the types, levels and geographic distributions of chemical pesticides being used, as well as their impacts on the economies, ecologies and health of communities in the region.

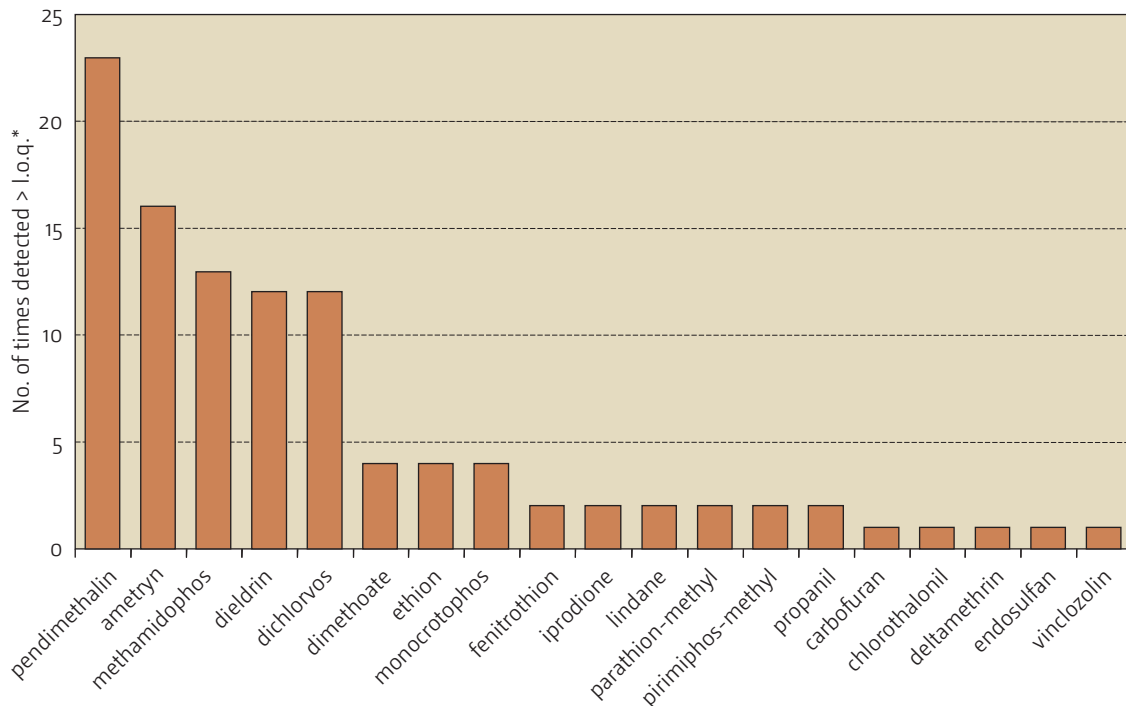
In 2004, the IPPM project undertook a pilot study under a Global Environmental Facility (GEF) preparatory grant in which water samples from rice and vegetable production areas along the Senegal River were subjected to analyses for pesticide residue levels. The results were particularly important given that communities in the area draw their drinking water directly from the same water resources.

During the pilot study, the 84 samples taken found 105 instances in which chemical pesticides were above detection limits. This comprised 19 different chemical pesticides above detection limits (fig. 11) of which, 40 percent surpassed the European Maximum Tolerable Risk (MTR) thresholds for safety by greater than a factor of 100 (fig. 12).

As a result of these findings, the GEF, through UNEP, in 2009 funded the IPPM programme to coordinate sampling and analysis of water samples taken from multiple sites in six West African countries along both the Niger and Senegal Rivers.

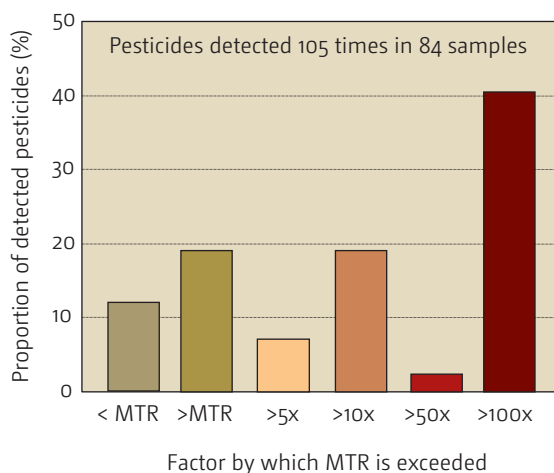


FIGURE 11. Outputs from the IPPM / GEF pilot study in 2004 in three locations along the Senegal River. *Level of Quantification; sample size: N=84



The programme is working in partnership with the Oregon State University Integrated Plant Protection Centre (IPPC) to build capacities of local laboratories to detect pesticides in water. The project employs new, state-of-the-art technology that allows the work to be carried out with greater ease and accuracy and with much less expense. The first results from the project are expected to be available later in 2010.

FIGURE 12. Distribution of samples by the factor by which they exceed the European Maximum Tolerable Risk (MTR) level



Promoting literacy, community health and gender equity

Stimulating the demand for literacy

One of the greatest barriers to development is lack of basic literacy. The average literacy rates in the participating countries are between 25 and 50 percent. The FFS approach attempts to work around this barrier through methods of adult learning that are based on simple experiments and other hands-on, practical methods for skills development. However, the only real solution is for governments and donors to put the needed investments into rural education.

One of the most consistent requests from FFS farmers for follow-up is literacy training. The programme attempts in each country to link interested FFS groups to national literacy programmes, although districts targeted by literacy programmes do not always coincide with the districts in which the FFS are located.

Reducing risks to health and environment

The reduction of health risks associated with use of highly toxic chemical pesticides is a major objective of the IPPM Programme. Risks are especially high in the African context where many types of highly toxic pesticides are found. In addition, farmers rarely



use protective clothing because of the heat, because they are illiterate and do not understand the health risks, or because they are poor and cannot afford the proper gear.

Furthermore, regulatory agencies are either nonexistent or lack funds to carry out their mandates, and environmental monitoring for pesticides is nonexistent. Add to this the fact that nutritional stress and general lack of good health renders individuals more vulnerable to pesticide poisoning and the result is a scenario in which large numbers of farmers, their families and their communities are likely to be at high risk from the negative health effects of pesticides.

GEF programme gathers data on pesticide risks.

The GEF pesticide monitoring project will be one of the first efforts to quantify the issue of health risk from toxic chemicals in West Africa. The project will develop quantitative data on pesticides in surface waters and calculate actual risks to men, women

TABLE 5. Overall statistics on participation by women in FFS during phase II

By Crop	Total	% Women
Vegetables	23,549	58%
Rice	13,210	27%
Cotton	14,636	8%
Manco	1,613	4%
Cow peas	421	40%
Sesame	1,534	27%
Millet / Sorghum	930	5%
Jatropha	300	0%
Karité	1,200	95%
Phase II Total	57,393	35%

“Our Union requested training in IPPM for vegetable crops because the vegetable growers of Dioila had enormous problems with insect damage. Thanks to this training, all the women working in this production area have improved their techniques and yields have doubled or tripled. Tomato production has increased from 5 to 15 baskets per woman. We especially liked the training on preparation and use of natural products like neem that do not pose a danger to women and their children. Now, no one in our area treats their crops with synthetic chemicals. Thanks to our high yields and profits, the union has established a fee payable by each woman working in the polder. To date, the polder can no longer contain all the women and we seek to enlarge the area”.

— MS DIAKITE FANTA DIARRA,
PRESIDENT, UNION OF VEGETABLE PRODUCERS, DIOILA

and children in local communities, both at the source of pollution and for downstream recipients. These data will be used to discuss risks and opportunities for alternatives with the communities and decision-makers, and to alert the international community to the nature of the threat.

Over the course of the project, measurements will be taken periodically of levels of pesticides in surface waters adjacent to communities where IPPM training is taking place. The intention is to correlate FFS training with reductions in pesticide use and with reductions in concentrations of pesticides in surface waters and associated human health risks in local communities.

Large-scale and substantial reductions in the use of toxic pesticides are highly likely to benefit the health of communities, both farmers and consumers. The data from market gardens in Senegal and cotton fields in Mali point to these potential reductions being substantial.

The presence of the chemicals noted during the pilot phase in surface waters of the Senegal River suggest that the entire aquatic food chain, from plankton to fish, is at high risk of being damaged by current levels of pesticide use. Probabilistic modelling, using the water sample data from the pilot project, suggested strong negative impacts were being felt by populations of insects, microcrustacea, macrocrustacea, rotifers, algae and fish.² Farmers

² Conducted by Dr. Joost Lahr of Alterra in The Netherlands and Dr. Wim Mullié, independent contractor in Senegal.



“Our group has had good support from ENDA Pronat for our second FFS season – the “application field school” we put in place after our training in IPPM. The field that we manage and those of the various members provide revenue on a regular basis. We were able to create a mutual savings and credit plan, which motivates us even more. The partnership with IPPM and ENDA, which allows us to improve our living environment, is welcome”

– GROUP LEADER FROM LERAB GUEDE

“ The programme motivated us because the production potential of our group significantly increased. Our fields have allowed us to earn income never achieved by our group. The production was good and merchants came to buy our products even despite our isolation. We reinvest revenues to allow members who wish to conduct activities in the half-season. The repayment with low interest rates will help us save a little and to better prepare for the next season and to invest in maintenance work for our millet mill”

– IPPM PRODUCERS GROUP IN NDIOMDY, SENEGAL (MOSTLY WOMEN)

result in losers in another area, such as the potential for trade-offs between economic environmental or social outcomes. However, for the IPPM Programme, the “zero-sum” trade-offs do not pose a threat because activities that engender environmental benefits often also generate benefits to production, efficiency and profit. In other words, a skilful and pragmatic agroecological approach provides substantial gains in efficiency through enhancing the conditions that promote ecosystem services, thereby benefiting stakeholders at all levels through “win-win” outcomes.

Building systems with greater resilience and higher productivity

New training models decrease costs, increase efficiency and promote diffusion

The question of diffusion of good practices from FFS-trained farmers to other members in the community was researched during the first phase of the programme. Studying the issue in Senegal, Witt, et al. (2008), identified the trade-off between having widespread placement of FFS in a country and the impact of the training in each FFS location. They determined that small proportions of trained farmers in a village are insufficient to induce change beyond the participants of the training and that a critical mass of trained farmers is needed in order to attain effective dissemination of information and positive stimuli for adoption and learning among non-participants.

Cluster model. To address this challenge the IPPM Programme has developed a strategy of “clustering” FFS in order to better achieve a critical mass of active farmers. The clustering approach was built into the GEF environmental monitoring project which calls for FFS to be concentrated across communities that share a common water resource. The idea is to facilitate “upstream and downstream” communication, which is critical when the behaviour of one community impacts on the health and well-being of another community.

along the Senegal River have noted periodic massive fish kills.

Improving gender relations

According to recent surveys, the FFS approach is generally perceived as a positive factor in IPPM, strengthening the cohesion within existing working groups and as a safe learning environment that helps to develop practical skills.

The FFS sessions motivate a more dynamic social organization that can lead to the birth of other activities needed to meet the larger needs of the community. Following training, the farmers expressed a desire to connect to networks of other IPPM practitioners.

Monitoring in the four IPPM countries reveals variable participation by women, depending on the cropping system (Table 5).

“Win-win” outcomes

Development programmes always face a dilemma as to whether supporting progress in one area might



As an added benefit, concentrating FFS in a limited area provides the opportunity for trainee-facilitators from the same or nearby locales to return home frequently during long-term training, without travelling great distances. Indeed, the expense of training facilitators in season-long sessions remains one of the points of criticism of the FFS approach. In addition, it can cause family hardship when the head of the household is away for several months. The programme, in response, has developed several different models, including a four-days-on, three-days-off model, which is less stressful on trainees and less expensive.

Sequential model. The programme has developed a “sequential model” for cases where trainees must come from outside the immediate district. With the sequential model, training is set up in two to three week blocks at key points in the developmental cycle of the crop, over the course of the season, with trainees returning home for two weeks in between training sessions. The additional cost and transport is more than made up for by savings in food and lodging and less stress on trainees. In this way, the 120-day training can be cut down to 60 days and still cover the full cycle of the crop.

Focal points. As the programme matures in a country and there are an increasing number of FFS facilitators, it is important to designate focal points for maintaining coherence and quality. Focal points, who should be individuals with extensive FFS experience, are designated to be in charge of

monitoring activities among a local network of facilitators in a particular district. They coordinate communications between the farming communities, the appropriate civil and governmental institutions, and make periodic and unannounced spot visits to ongoing FFS in order to check quality. They also meet periodically and independently with FFS farmers in order to receive specific feedback about the FFS facilitator regarding his or her professionalism in areas such as punctuality, attendance, preparedness and attitude.

Rural radio and television programmes. Local and national communication outlets are an important part of an overall communication strategy to aid in diffusion. A large number of rural radio programmes and several short documentary films regarding the FFS have been produced and aired in local languages.

Expanding beyond national borders

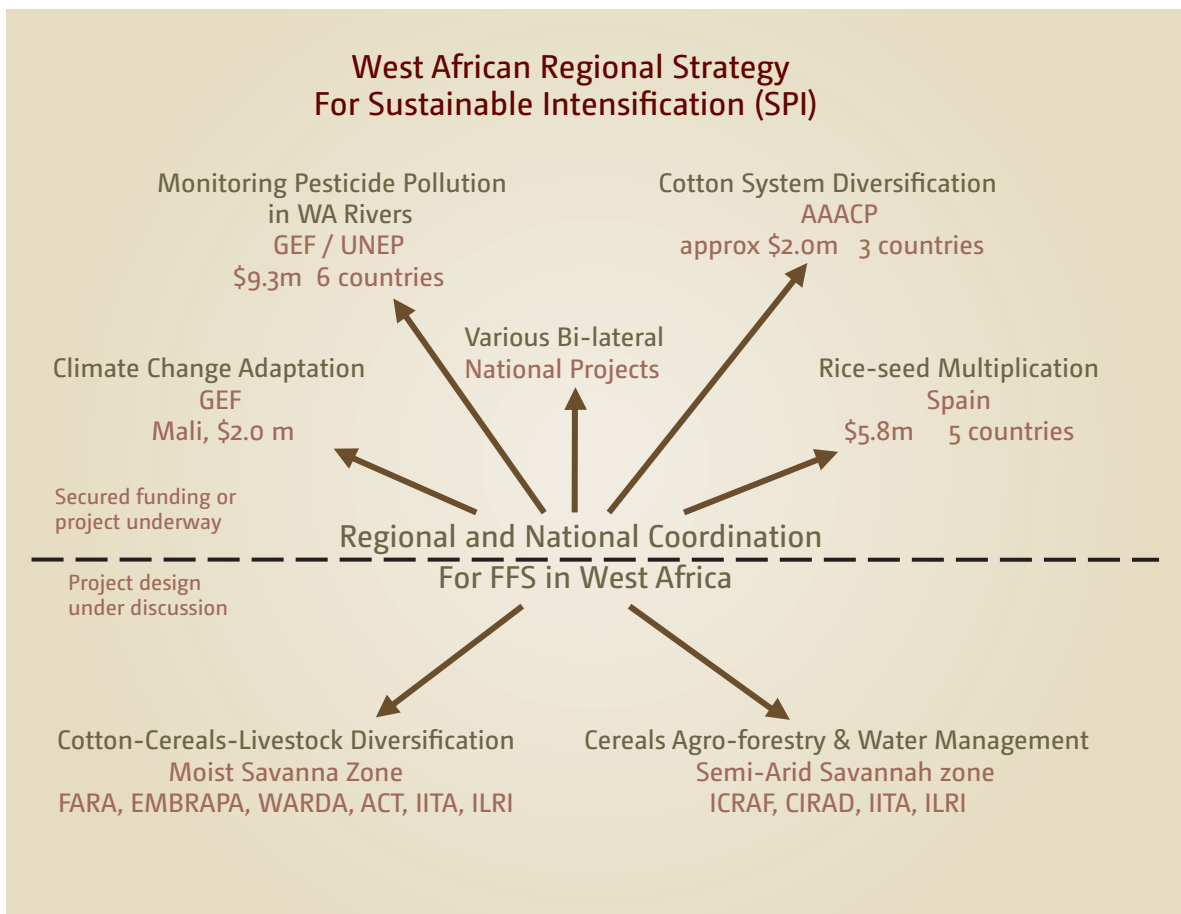
The importance of a regional approach cannot be over emphasized. During the past eight years, the programme has spread from three to seven countries. To move the programme into a new country effectively, a strategy was developed whereby master trainers from FFS-experienced countries were brought into the new countries to help initiate the first full season training of facilitators. For example, in order to initiate the GEF project, Master Trainers from Mali will travel over the border into north-eastern Guinea to conduct the first training-of-facilitators in Guinea; the same for Senegal to Mauritania, and from Benin to Niger. In each case, the trainers and trainees share the same local language and the same agro-ecological context.

Building in the “exit strategy”

The programme does not finance the training of all the farmers in any one country, nor does it establish a large and cumbersome bureaucratic infrastructure along the lines of traditional government extension systems. Rather, the goal is to help promote successful adoption of the community-based, discovery learning model by national agencies that then will carry on with the training. Inspiration for how to make this self-sustaining after the programme ends came from observing events in Mali.

In Mali, the IPPM Programme derives a growing proportion of its financing – currently 30 percent – from new projects that arrived after the programme was in place. An effective FFS national administrative team attracts interest and support from other projects that can benefit from access to experienced farmer facilitators and active and receptive farmer groups.

FIGURE 13. Diagram showing the existing partnerships and major projects that comprise the larger IPPM Programme. Below the dotted line are concepts for expansion currently under discussion



From this observation emerged a strategy to develop an FFS “national coordination unit” (NCU) in each country that will act as a “service provider”, to coordinate new projects with donors who wish to work at the community level, but who otherwise lack the access to networks or the means to administer highly decentralized activities.

The NCU provides staff highly experienced in discovery-based training and FFS national programme execution. It offers to new partners a host of services, from curriculum development to monitoring and evaluation. Most importantly, it facilitates access to existing networks of trained facilitators and active farmers’ groups already familiar with a farmer-based experimental approach to testing and adapting new ideas.

Donors and potential partners would, in return, finance the bulk of the specific training to be addressed in whatever targeted cropping system the partner is focusing on. In this way everyone benefits: donors can dedicate more resources

to the field and less to project administration; governments have better oversight and alignment of capacity building because new donors will not have to “reinvent the wheel”; district level government and farmer organizations will have more consistent access to resources for capacity building, and communities will have a greater sense of consistent support and follow through from technical support services.

This strategy has become the inspiration for a regional programmatic approach (fig. 13).

Establishing IPPM programmes for the long term

During the two phases of the IPPM Programme, certain key elements have been identified that are necessary for developing a successful, long-term and resilient process.

- n Build teams at national and regional administrative levels.

- n Encourage multi-scale process involving all stakeholders and encouraging vertical and horizontal communication and feedback.
- n Build partnerships at all levels.
- n Establish training quality through attention to process as well as content.
- n Build monitoring and feedback links from farmers to focal points.
- n Build over time a portfolio of training materials for new cropping systems, evolving towards a “full-system” agro-ecology approach.
- n Build networks.
- n Development of action research links with national and regional research.
- n Maintain contact with networks of post-FFS farmers through follow-on activities.
- n Work to establish institutional “buy in” with a diversity of government agencies and farmer organizations.
- n Employ human resources and lessons learned from “experienced” countries to initiate programmes in new countries.
- n Develop a large scale, long-term programmatic approach building a platform for collaboration with new partners.
- n Develop an effective communication strategy.

A successful community-based farmer education process empowers stakeholders at all levels.

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List of Acronyms

- CIRAD Centre for International Cooperation in Agricultural Research for Development (France)
- ICRAF World Agroforestry Centre
- IFAD International Fund for Agricultural Development
- ILRI International Livestock Research Institute

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