Farmer field schools
on land and water management in Africa

Proceedings of an international workshop
in Jinja, Uganda, 24–29 April 2006

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Workshop participants and authors are thanked for their contributions to this publication, which will serve as a future knowledge base of land and water management - farmer field schools around the world.

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It is sincerely hoped that those who participated in this process will continue their efforts to support improved land and water management in Africa.

A sincere thank you to all those who contributed their wisdom and interest.

Sally Bunning
Land Conservation and Management Officer
FAO Land and Water Division (NRL)

Preface

Throughout Africa, degrading land resources and poor water management are serious impediments to the development of agriculture. Inappropriate farming practices result in soil erosion, a loss of soil organic matter and declining fertility and capacity to retain water. Once-fertile soils become compacted and crusted, causing valuable rainwater to run off rather than seep into the ground and carrying with it precious topsoil and nutrients. The results are unhealthy crops due to water and nutrient deficits and the build-up of weeds and diseases, poor and unreliable yields, and chronic water shortages due to lack of recharge of ground water.

How to escape from this vicious cycle? FAO and other development organizations have been promoting farmer field schools – an innovative approach to adult education first developed in Southeast Asia for pest management – to improve land and water management in Africa. Unlike traditional approaches to agricultural extension, which rely on extension workers providing advice to farmers, farmer field schools enable groups of farmers to find out the answers for themselves. That means the farmers can develop solutions to their own problems. They are far more likely to put what they have learned into practice than if they had been presented with ready-made (but possibly inappropriate) solutions. The extension worker is a facilitator who guides the learning process, rather than a technical specialist who disseminates information.

As this book shows, farmer field schools have proven to be a very useful approach for helping African farmers to improve how they manage their land and water. Numerous projects throughout Africa have shown that they result in improved soils, better yields and higher incomes for farmers. The document summarizes some of these experiences, points out successes, and – equally important – shows constraints and gaps that need to be addressed. Particularly important is the list of policy recommendations: committed support and funding from governments is vital if this promising approach to agricultural development is to make the difficult jump from the donor-supported project into an accepted mainstream approach applied by research and extension agencies throughout the continent.

This publication is the coordinated work of the Land and Water Division of FAO, the Agricultural Economics Institute of Wageningen Agricultural University and Research Centre (LEI/WUR), Environment Alert, and other partners. It was produced as part of FAO's Land and Water Development Division's programme on "Land and Soil Productivity in 2005-6, notably: Environmentally sound soil productivity improvement technologies promoted for sustainable crop production through participatory approaches" (Major Output 001 of Programme Entity 211A2), the "Farmer field school approaches towards integrated land, water and production-systems policies, planning and management" (PE 2KA06) and the interdisciplinary programme on Biodiversity for Food and Agriculture.

Parviz Koohafkan
Director, Land and Water Management Division, FAO

Executive summary

Land and water management farmer field schools have been piloted since 2001 in East Africa and Zimbabwe in order to respond to increasing demands for improved field-level capacities and targeted materials for use by extension staff and facilitators. From 2004 to 2006, activities were expanded through capacity building and mainstreaming farmer field school approaches on land and water management in the region. In East Africa, farmer field schools are being scaled out and institutionalized, including on land and water management. Establishing a strong farmer field school support capacity in general requires close collaboration with country teams and mechanisms such as improved networking, knowledge and information sharing, and training skills development to ensure that farmer field school principles are maintained and quality service delivery is maintained.

It is against this background that over 70 participants involved in developing and promoting farmer field schools on land and water management attended a 5-day workshop in Jinja, Uganda. Participants included farmers, farmer field school coordinators, project managers and staff, researchers, extension personnel, and managers and staff of government, international and non-government organizations. Eleven African countries (Burkina Faso, Ethiopia, Kenya, Lesotho, Madagascar, Mali, South Africa, Tanzania, Uganda, Zambia and Zimbabwe) were represented.

The workshop concluded that farmer field schools on land and water management have many benefits, particularly:

- **Livelihoods and food security.** The land becomes more productive and farmers produce more. They have more to eat, and are better able to deal with risk. In Agule, Pallisa District, for example, yields of groundnuts quintupled – from 400 kg to two tons per hectare.
- **Improved long-term land management.** The soil is healthier and more fertile, and it retains more moisture, so crop production is more reliable. There are more trees and soil cover to control erosion.
- **Better planning.** Farmer field schools enable efficient community action planning. Farmers become more aware of their farming environment, so can plan better for drought, pests and other problems.
- **Knowledge and innovation.** Farmers are encouraged to experiment and innovate. They learn how to build on and use their own knowledge.
- **Faster adoption.** Farmer field schools involve many people within a watershed area, so speed up adoption of improved land management techniques.
- **Extension services.** Extension services become more demand-driven, and farmers can tell if they are getting value for money.
- **Stronger leadership and voice.** Farmer field schools strengthen the farmers' "voice" for advocacy and enable strong leaders to emerge.
- **Networking.** Groups of farmers are able to further benefit through exchange of information with each other and with research and extension agencies.

The workshop formulated the following follow-up recommendations:

Invest in land and water management. Investment in land and water management at the community, district and national levels must be a priority to sustain the resource base that produces food and livelihoods. Local people can neither invest nor bear the burden by themselves. The government must provide incentives for communities to improve their management of natural resources, so benefiting the nation and the global environment.

Scaling up. The farmer field school approach in general, and its use for improving land and water management, should be scaled up so it can reach a larger number of farmers. It should be incorporated into the national extension system rather than implemented on a project-by-project basis. Extension staff can play a key role to initiate and backstop farmer field schools. Close collaboration between government and NGOs will assure success.

Design appropriate training. Trained facilitators and technical support are vital. Farmer field schools and land and water management should be incorporated into the curricula of universities and training institutions. Facilitating a farmer field school is not easy and cannot be learned overnight. Training must include extensive on-the-job experience. Training materials are needed for all levels: extension staff, facilitators and farmers.

Build on experiences. A scaled-up programme can draw on the valuable experiences of existing farmer field schools, and of their facilitators who have already been trained and have gained invaluable practical experience. More skilled facilitators are needed!

Link to other education modes. Farmer field schools should be linked to other adult education approaches – such as literacy programmes, primary schools and "farmer life schools". Collaboration between the ministries of agriculture and education is needed for this to succeed.

Build long-term resilience. Extension efforts should focus more on practices that build long-term soil fertility and the efficient use of every drop of water – rather than focusing only on commercial enterprises. This will help farmers benefit from sustained provision of ecosystem goods and services, and cope better with drought, floods and other challenges.

Funding. Adequate funding support is needed if farmer field schools are to succeed. For individual groups to be sustainable, they need to develop their own sources of funding – through revolving funds, group-owned businesses and other self-financing mechanisms. Strong farmer organizations can reduce costs because they can buy inputs at lower prices, and can sell their output for more. Farmers must manage (and contribute to) their farmer field school grants so they can demand good facilitation and make their own decisions.

Mass media. Radio, television and other mass media should be used to promote improved land and water management and popularize the farmer field school approach.

Policies and regulations. Policies must be strengthened and applied effectively to promote appropriate land and water management practices. Policies on land use and soils currently being discussed by the government should be finalized quickly. Byelaws to conserve and make more productive use of land and water must be developed and enforced, with the full participation of local stakeholders.

Participating institutions

See the Appendix for the participants' contact details.

Burkina Faso

Food and Agriculture Organization

Instiut National de l'Environnement et de Recherches Agricoles

Ethiopia

Agri-Service Ethiopia

Awassa College of Agriculture

International Institute of Rural Reconstruction

SOS-Sahel Ethiopia

Kenya

CAB International Africa Regional Centre

Coast Development Authority

Conservation Agriculture for Sustainable Agriculture and Rural Development Project

ETC East Africa

Food and Agriculture Organization

Kenya Agricultural Research Institute

Ministry of Agriculture

Mwingi District Farmer Field School Network

National Agricultural and Livestock Extension Programme

World Agroforestry Centre

Lesotho

Department of Agricultural Research

Madagascar

Food and Agriculture Organization

Mali

Food and Agriculture Organization

South Africa

Agricultural Research Council

Tanzania

Bukoba District Council

Bukoba Farmer Field School Network

Conservation Agriculture for Sustainable Agriculture and Rural Development Project

Expansion of Farmer Field School Programme for E & S Africa

Lake Zone Agricultural Research Institute Ukiruguru

Mbeya District Council

Ministry of Agriculture, Food Security and Cooperatives

Mkindo Farmers Training Centre

Plant Protection Division, Zanzibar

Uganda

Africa 2000 Network Uganda

Environmental Alert

Expansion of Farmer Field School Programme in E & S Africa Project

Food and Agriculture Organization

Fineline Pictures

International Institute of Rural Reconstruction

International Institute of Tropical Agriculture

Makerere University

Mbale District Council

Ministry of Agriculture, Animal Industry and Fisheries

Tororo District Farmer Field School Network

Zambia

Sustainable Land Management in the Zambian Miombo Woodland Ecosystem GEF Project

Zimbabwe

Agricultural Research and Extension

Food and Agriculture Organization

Swedish Cooperative Centre

Europe

Endelea, Netherlands

Food and Agriculture Organization, Italy

Wageningen University and Research Centre, Netherlands

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CTA: Technical Centre for Agricultural and Rural Cooperation, Wageningen, Netherlands

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Paul Mundy (editor and workshop support)

Emmanuel Ssemwanga, Environmental Alert (logistics)

Abbreviations

AGRITEX	Department of Agricultural Technical and Extension Services, Zimbabwe
CA-FFS	Piloting Conservation Agriculture for Improved Land Management and Livelihoods for Smallholder Farmers
CA-SARD	Conservation Agriculture for Sustainable Agriculture and Rural Development
CTA	Technical Centre for Agricultural and Rural Cooperation
Danida	Danish International Development Agency
FAO	Food and Agriculture Organization of the United Nations
FAO SAFR	FAO Sub-regional Office for Southern and East Africa
FARMESA	Farm-level Applied Research Methods Programme for East and Southern Africa
GIPD-CEP	Gestion Intégrée de la Production et des Déprédateurs des cultures à travers les champs-écoles des producteurs
GTZ	German Technical Cooperation
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFAD	International Fund for Agricultural Development
INMASP	Integrated Nutrient Management to Attain Sustainable Productivity Increases in East African Farming Systems
INRAN	Institut National de la Recherche Agronomique du Niger
INSPIRE	Integrated Soil Productivity Initiative through Research and Education
ITDG	Intermediate Technology Development Group
KARI	Kenya Agricultural Research Institute
LEI	Agricultural Research Institute of the Wageningen University and Research Centre
NAADS	National Agricultural Advisory Service, Uganda
NGO	Non-government organization
NRL	FAO Land and Water Division
SAFIRE	Southern Alliance for Indigenous Resources
SCC	Swedish Cooperative Centre
Sida	Swedish International Development Agency
SWOT	Strengths, weaknesses, opportunities and threats
TSh	Tanzanian shillings
ULAMP	Uganda Land Management Project
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WUR	Wageningen University and Research Centre

1 Introduction

Much of the agricultural growth rates recorded in sub-Saharan Africa in the recent past have been based on area expansion rather than intensification. This expansion has been largely driven by increased population pressure and has resulted in land degradation due to unsustainable cropping and grazing practices, deforestation, burning of grasslands, continuous cultivation with minimum soil fertility enhancement (leading to nutrient leaching and soil erosion), all leading to productivity decline and loss of ecosystem services.

A large percentage of the population in sub-Saharan Africa is engaged in unsustainable small-scale arable and livestock farming. Consequently, soil degradation compounded by soil moisture deficits and erratic rainfall, insufficient farm power and inadequate land husbandry and crop management skills of farmers pose a serious food security challenge to sub-Saharan Africa.

In Uganda for example, the Uganda Human Development Report 2005 and the recent reviews of the joint annual Plan for Modernization of Agriculture and the National Agricultural Advisory Services all clearly show the relationship between land and environmental degradation, low productivity, food shortages and poverty.

Land and water management

Inappropriate land and water management is a major problem constraining the development of agriculture in Africa. Soils are being depleted year by year. Once-fertile soils are becoming less productive because of poor management and inappropriate farming practices. The soil is compacted or pulverized by repeated ploughing, and nutrients are run down through continuous growing of the same crops and inadequate measures to restore organic matter – the basis for soil life and productivity. Rainwater fails to seep into compacted or crusted soil; so much of it runs off, carrying with it the valuable topsoil with substantial losses of precious water and plant nutrients. Crops suffer due to impeded rooting, water shortage and nutrient deficiencies, and the build-up of weeds and soil-borne diseases further compromise crop productivity.

Soil nutrient depletion is one of the major constraints to food security and economic development in sub-Saharan Africa. Research has indicated declining soil productivity, relatively low nutrient stocks and negative balances for major nutrients (nitrogen, phosphorus and potassium) (Stoorvogel et al., 1993). Major causes of soil degradation are poor farming methods, including nutrient mining without replenishment, soil erosion, deforestation; poverty and land fragmentation; and rising human populations. Land degradation has far-reaching implications on livelihoods, ranging from low agricultural productivity (posing a risk of food insecurity, poor nutrition and health) to poverty (resulting in a failure to meet basic social needs such as food, shelter and education).

The Soil Fertility Initiative, supported by the World Bank, FAO and other partners in 20 countries in Africa, highlighted the need to mobilize behavioural changes in the use and management of land and water resources and to provide a supportive policy, technical and institutional environment for ensuring the long-term productivity of farmed lands. There was a recognized need for improved dissemination of knowledge and for capacity building to help farmers and other land users to develop farming practices and systems that conserve soil and water resources, ensure sustained fertility and, where possible, reverse chemical, structural and biological degradation of the soil.

Lack of policies

The situation is further aggravated by the lack of national policies regarding land use and soil management, and inadequate linkages between research, extension, policy makers and farmers. The needs of farmers and rural communities are not sufficiently represented in the national research and extension agendas, resulting in a generally poor relevance of the outputs of these systems. The technologies generated by the research system, even when relevant, are not widely taken up by farmers. This is partly because of limited participation of farmers in technology development and evaluation through the reductionist approaches to research. As a result there is limited ownership and adoption of technologies. In addition, poor linkages between research, extension and policy makers are key bottlenecks in agricultural development.

As a result of these challenges in agricultural development and research, farmer field schools have been considered as a promising participatory approach that can address the inadequacies in past extension approaches and research agenda. This is partly because farmer field schools are a holistic approach to development: they place farmers' interests at the centre, and strengthen the linkages between farmers, researchers, extension workers, leaders and policymakers.

Capacity building through farmer field schools

As a follow-up to the Soil Fertility Initiative, FAO developed a project entitled "Capacity Building for Soil Productivity Improvement and Soil Water Management through Farmer Field Schools and Agro-ecological Approaches", with funding from the Norwegian government. This project ran from April 2004 to June 2006. Its goal was to expand the capacity of governments, NGOs and private-sector service providers to respond to smallholder farmers' needs for knowledge, information and improved capacity on improved land and water resources management and rainfed crop-livestock systems, with a view to enhanced food and livelihood security, improved productivity and ecological sustainability.

A series of coordinated activities developed training tools and engaged national stakeholders in promoting farmer field schools to improve land productivity and land and water management in Kenya, Uganda, Tanzania and Zimbabwe. These activities aimed to empower farmer groups in selecting, testing and adapting management practices that will contribute to enhanced productivity and sustained livelihoods of the farming household. Immediate objectives in the target countries were to:

- Build capacity of farmer field school facilitators, master trainers and service providers (extension, research, technical services) in experiential learning methods to assist farmers in diagnosing and addressing their soil and water management and production constraints and in developing improved land use and management practices and farm-livelihood systems.
- Empower farmers groups and rural communities, with the help of service providers, in identifying, testing and adapting appropriate land use and soil and water management options.
- Mainstream the approaches into agricultural extension and development programmes through policy briefs, technical guidelines and suggestions for institutionalization, scaling out and adaptation to a range of farming systems and contexts.

In Kenya, Tanzania and Uganda farmer field schools are now being scaled out and institutionalized. This includes farmer field schools on land and water management. Successful expansion requires establishing strong farmer field school support capacity in general, close collaboration with country teams, and mechanisms such as improved networking, knowledge and information sharing, and training skills development to ensure that farmer field school principles are maintained and quality service delivery is maintained.

The Jinja workshop

It is against this background that over 70 participants involved in developing and promoting farmer field schools on land and water management attended a 5-day "Workshop on Land and Water Management through Farmer Field School Approaches in Africa" in Jinja, Uganda, in April 2007. Participants included farmers, farmer field school coordinators, project managers and staff, researchers, extension personnel, and managers and staff of government, international and non-government organizations. Eleven African countries (Burkina Faso, Ethiopia, Kenya, Lesotho, Madagascar, Mali, South Africa, Tanzania, Uganda, Zambia and Zimbabwe) were represented.

Workshop objectives

The workshop had the following objectives:

- **Enable participants to share experiences** on how to strengthen the land and water management farmer field schools and who to work with to do this, including technical, policy, and fund mobilization at all levels.
- **Review and document lessons** from the various countries and experiences.

- **Develop recommendations and strategies** to promote wider and effective use of land and water management farmer field schools that will lead to social, economic and environmental benefits.
- **Expose decision makers** at district and national levels to convincing farmer experiences and district support, and generate their commitment to mainstream and scale up land and water management farmer field schools and provide strategic support to institutionalize the process.

Presentations and discussions

The discussions centred on analysing and drawing lessons from the rich experience of farmer field schools for land and water management throughout Africa. Three types of materials were presented:

- **Country papers and presentations** summarizing experiences in Ethiopia, Kenya, Tanzania, Uganda, Zambia, Zimbabwe and West Africa. During the workshop, these papers were refined further based on feedback received from participants.
- **Technical presentations** focusing on specific aspects of farmer field schools for land and water management.
- **Posters and videos** on individual farmer field school experiences.

Working groups

Groups of participants discussed the following issues:

- **Mainstreaming and institutionalization** of farmer field schools for land and water management
- **Farmer field school sustainability**
- **Capacity building**
- **Impact assessment of the farmer field school approach**
- **Impact assessment of land and water management technologies**

These working groups produced recommendations on each of these issues, which resulted in a brief for policy makers in Uganda.

The remainder of this volume is divided into the following parts;

- **Country and regional reports** on farmer field school experiences in Ethiopia. Kenya, Tanzania, Uganda, West Africa (Burkina Faso, Mali, Niger, Senegal and Togo), Zambia and Zimbabwe.
- A discussion of five **major issues** concerning farmer field schools for land and water management: mainstreaming and institutionalization, sustainability, capacity building, impact assessment of the farmer field school approach, and impact assessment of land and water management technologies.
- **Keys for successful farmer field schools on land and water management:** an overview of technical issues and the need for an integrated ecosystems approach, and some policy recommendations.
- A **list of participants** and their contact details is given in the appendix.

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Stoorvogel, J.J., E.M.A. Smaling and B.H. Janssen. 1993. Calculating soil nutrient balances in Africa at different scales. I. Supra-national scale. *Fertilization Research*, 35: 227–235.

2 Country and regional reports

2.1 Ethiopia: Review of farmer field school experience in Ethiopia

Muktar Abduke[1] and Solomon Legesse[2]

Agriculture dominates the Ethiopian economy: it accounts for about 45% of the country's gross domestic product and 85% of exports, and employs 85% of the population. However, agricultural production has been very low over the last 20 years, except for good harvests in recent years in some areas. The reasons for this stagnation are many and complex, but many studies indicate that declining soil fertility is the most serious physical constraint to crop production.

Reports on soil loss and fertility decline in Ethiopia have attracted the attention of both government and donors, and have prompted soil management interventions. This has followed two major tracks – one focusing on soil conservation and the other on the supply of fertilizers.

Though these interventions have made contributions in terms of physical soil and water conservation structures and helped to boost yields in the higher potential areas in years with good rainfall, the prospects for sustainable increase of production are still gloomy and remain a challenge.

The major reasons for these failures are that soil conservation and improvement measures have followed top-down approaches. They have not adequately taken into account the diversity in agro-ecologies and farming systems, nor the various soil management strategies that farmers use. Moreover, research recommendations and technical interventions are often irrelevant to small-scale farmers' priorities, resource endowments and the physical, cultural and economic environment.

Alternative strategies are needed. To optimize the land's productive potential on a sustainable basis, technical and policy interventions should integrate households' crop, livestock and other livelihood activities, and should empower farmers to manage their production system in an appropriate way.

There are limited skills and experiences in promoting such holistic and participatory land husbandry approaches in Ethiopia. However, such limitations cannot delay the search for alternative approaches. NGOs, academic institutions and government agencies have introduced initiatives on a small scale in different parts of the country. Considerable interest and opportunities exist to further improve the effectiveness of these experiences and to scale them up.

The organizations that have been involved in these initiatives include SOS Sahel, FARM-Africa, Save the Children/UK, Agri-Service Ethiopia, Self-Help, GTZ, and Mekele and Debub universities. Participatory natural resource management approaches piloted by these agencies include:

- Participatory action planning and implementation
- Participatory land use planning and implementation
- Farmer-led integrated watershed management
- Participatory forest management
- Integrated nutrient management
- Farmer field schools.

1 SOS Sahel/Ethiopia
2 Agri-Service Ethiopia

This chapter reviews the experiences of various organizations in implementing farmer field schools in Ethiopia: SOS Sahel, Save the Children/UK, Agri-Service Ethiopia, Self-Help International and Debub University. It summarizes their rationale, processes, achievements and lessons, and the challenges and the way forward to sustain and scale up positive findings.

Driving forces for farmer field school initiatives

Ethiopians traditionally organize themselves to do certain things. *Edir* (traditional insurance schemes) and *ekub* (savings association) are the most common of such customary institutions. All the farmer field school initiatives covered here use them as an essential first step in the mobilization and animation process. This generates the initial trust needed to animate people to initiate their own development. But the farmer field school initiatives do not necessarily aim to empower the traditional institutions *per se*; the traditional institutions may not be democratic or desirable, and they may not have a place in the government's long-term development strategy.

The ultimate purpose of promoting participatory development is to empower the people, i.e. to equip target communities with the necessary skills, resources and organizational capacity they need to identify, develop, implement and evaluate their own development plans by themselves. Though traditional institutions have proved to be effective in enabling people to observe certain rules, and in creating a culture that motivates their members to support each other, various social and political constraints have restricted or undermined their importance and capacity to lead the empowerment processes. Moreover, traditional institutions lack the capacity and mandate to discharge duties beyond their traditional domains. So alternative institutional forms have to be sought and farmers supported to establish these organizations that could mobilize, coordinate, and lead the community. Farmer field schools fill this gap.

Another driving force for initiating farmer field school-based programmes has been problems affecting farmers' productivity and livelihoods. These include crop pests such as bush cricket or *degeza* in northern Wollo, potato late blight in western Shoa (Table 1) as well as land degradation.

Some projects (such as INMASP, see below) aim both to empower farmers and introduce integrated methods to address soil fertility problems.

Farmer field school projects in Ethiopia

Save the Children/UK introduced the farmer field school approach in 1999 in an integrated pest management project implemented with the Department of Agriculture. This project aims to improve household food security in North Wollo and Wag Humra zones of Amhara Region. It has developed ways to manage pests using locally available materials, and has trained farmers through farmer field schools. It has also trained trainers to promote the same approach to extension staff in and around the immediate target area. The project has had an overwhelmingly positive impact: it has increased the farmers' self-reliance, encouraged group coherence and action, facilitated rapid response to pests, and led to the generation of new technologies. It has also improved the Office of Agriculture field staff's understanding, skills and attitudes towards participatory development.

Self-Help Development International implemented a pilot project on integrated management of potato late blight through farmer field schools from 1999 to 2002 together with the Ethiopian Agricultural Research Organization and the International Potato Center, financed by the International Fund for Agricultural Development. The goal of this initiative was to increase potato production by developing and applying control measures against potato late blight. As a result of the intervention, farmers significantly reduced their yield losses to the disease and increased their potato production and income levels.

Agri-Service Ethiopia is a local NGO that has been engaged in rural development in Ethiopia since 1969. It started a farmer field school pilot project in 2004 to empower the community through involving them in all steps of development activities and thereby improving the quality of extension services.

Integrated Nutrient Management to Attain Sustainable Productivity Increases in East African Farming Systems (INMASP) is a research and development project funded by the European Commission and the Dutch Ministry of Agriculture. It was implemented in Kenya, Uganda, and Ethiopia from February 2002 to April 2006. SOS-Sahel Ethiopia and Awassa College of Agriculture were the two Ethiopian partners.

INMASP's major objective was to develop an institutionally sustainable approach of identifying, testing, monitoring and evaluating ways to address soil nutrient management constraints. It established farmer field schools, promoted participatory technology development, helped farmers to monitor their soil nutrients, and engaged in policy dialogue.

Table 1 Summary of farmer field school projects in Ethiopia (1999–2006)

	Save the Children/UK	Self-Help Development International	Agri-Service Ethiopia	INMASP
Objectives	Mainstream farmer field schools for integrated pest management in the extension system	Increase potato production through integrated pest management	Empower farmers in development activities	Develop an approach for sustainable nutrient management
Focus	Institutionalization	Potato late blight	Field and storage pests and diseases, sheep parasites, waterlogging, variety screening	Soil fertility
Location	Amhara, North Wollo and Waghemera Zone (11 districts)	Oromiya, West Shoa Zone (3 districts)	Amhara, Oromiya and Southern Ethiopia (4 districts)	Southern Ethiopia (Kindo Koisha district)
No. of villages	126	17	12	6
Duration	Since 1999	1999–2002	Since June 2004	Since 2002
Partners	Regional Bureau of Agriculture & Rural Development	International Potato Center, Ethiopian Agricultural Research Organization, District Office of Agriculture	Respective research centres and district offices of agriculture	Debub University and SOS Sahel
Achievements				
• Farmer field school group size	24	25	25–30	24
• Facilitators	143	NA	24	15
• Farmers	1731	375	340	150

Achievements and impacts

Here are some achievements of the four projects described above.

- **Pro-poor.** Compared to conventional extension approaches, farmer field schools were flexible and pro-poor. Conventional demonstrations of technology packages were biased

towards the owners of bigger plots who could afford to buy seed and fertilizer. It was difficult for smaller landholders to use the technologies. Farmer field schools gave a chance to these small landholders using locally adapted technologies.

- **Technology.** The farmer field school members' access to technologies improved. Non-members visited and learned from members without any external incentives. Fewer farmers destroyed terraces in order to combat rodents.
- **Skills.** Farmers broadened their perspectives and technical skills and increased their competency in research. Farmers also improved their leadership and analytical skills.
- **Participation.** The farmer field schools enhanced farmers' participation in extension work and forged social bonds among their members.
- **Food.** The supply and availability of food rose.

Lessons

Several lessons can be drawn from these experiences:

- **Farmer-centred.** Farmers are free to set the farmer field school agenda. The farmer field schools facilitate learning through the learning-by-doing approach.
- **Mobilization.** The farmer field schools mobilize and organize farmers towards a collective goal. They build social interaction and a team spirit among their members.
- **Holistic.** The farmer field schools links to the economic, environmental, social and political circumstances and concerns of their members.
- **Indigenous knowledge.** The farmer field schools recognize and revitalize farmers' traditional knowledge, and increase their innovativeness.

Constraints

Nevertheless, farmer field schools face numerous constraints and challenges:

- **Approach.** The curricula and learning methods (for adult education) are poorly designed or practised. A clear strategy for monitoring and evaluation, and indicators to measure progress, are lacking.
- **Facilitators.** Success depends on the availability of competent facilitators. However, skilled, experienced facilitators are scarce, and it is difficult to retain and engage trainers without some form of incentive. Frontline staff in all of the projects were field technicians or "trainers" with inadequate knowledge and experiences in participatory development and adult education principles.
- **Number of farmers reached.** The farmer field school approach makes it difficult to involve many farmers at a time. That means only a limited number of farmers can be targeted. In particular, few women took part. Farmer field schools do not allow every interested farmer to participate in school activities: individuals who do not own land (those who rely on rented land), disabled and elderly farmers cannot register as farmer field school members since they are not able to contribute physical resources or labour.
- **Coordination.** Limited work has been done to engage government research and extension organizations in implementing farmer field schools. Linkages between farmers and formal research are poor. Collaboration among partner institutions has been inadequate. Such collaborative initiatives depend on continuous dialogue between partners and other key stakeholders. The absence of close dialogue and a common vision affects both the processes and achievements of the joint intervention.

Mainstreaming and scaling up

Farmer field schools are still a relatively new concept in Ethiopia. The process of developing understanding and trust amongst the different stakeholders is gradual, but the approach is gaining support from government and communities.

The four projects described here did not provide enough experiences for the approach to be mainstreamed into the government research and extension system. They were implemented in limited areas and farming systems, and focused mainly on integrated pest management. The INMASP intervention is the only one to focus on land and water management. Practical experiences and recommendations for mainstreaming and disseminating farmer field schools for land and water management have yet to emerge.

The following can be recommended as ways to mainstream and scale up the farmer field school approach for land and water management in Ethiopia:

- **More pilots.** Further piloting and experimentation on farmer field schools for land and water management are needed in major agro-ecologies or farming systems in Ethiopia. These will make it possible to fine-tune and diversify skills in farmer field schools and harmonize the current variations in approaches. The best experiences and practices must be documented and disseminated. That will build a strong case for informing policies on research and extension, natural resource management, and agricultural and rural development. Efforts to raise policy makers' awareness of farmer field schools are also needed.
- **Partnerships and networks.** It is necessary to forge collaboration and partnerships with research, extension, farmer training centres, and other institutions. A network of farmer field school projects in Ethiopia and elsewhere would enable staff and farmers to learn from each other. A working group of experts from research and extension agencies, NGOs, donors and academic institutions could support farmer field school interventions on land and water management. A national support group from outside government, but involving key experts of concerned government departments, donor agencies, NGOs and academics could also provide vital assistance.
- **Capacity building.** Efforts to build capacity should aim to improve local abilities to plan, establish, run and scale up farmer field schools. They should develop the curriculum on land and water management for different agro-ecologies and farming systems, and produce training materials. An inventory of indigenous knowledge on land and water management would be a useful basis for this. For farmers to benefit from what they learn in the farmer field schools, they will need better access to resources such as microcredit.

Extension services in Ethiopia are planned to centre on farmer training centres. The government plans to establish about 15,000 such centres throughout the country. They are expected to serve as centres for extension services and information, provide modular training to farmers for up to six months, demonstrate entrepreneurship, and provide advice for projects.

It is envisioned that these centres will contribute to rural transformation rather than being limited to agricultural development only. They will operate on the wider principle of human resources development rather than merely on transferring technologies. Linking farmer field schools to this network will make it possible to institutionalize the training of farmer trainers and leaders, influence the curriculum for land and water management, and ensure wider dissemination of the approach.

2.2 Kenya: Land and water management farmer field schools application in Kenya

L.N. Gachimbi[3] and K. Mutunga[4]

The farmer field school approach was introduced on a small scale in Kenya in 1995 by the FAO Special Programme for Food Security, of which Kenya was one of 15 pilot countries. Five Ministry of Agriculture and Livestock Development extension workers attended a six months' training on the farmer field school approach in the Philippines to build up the national capacity in this approach (Abate and Duveskog 2003).

The farmer field school approach was developed in Asia for small-scale rice farmers to learn integrated pest management practices. Although efforts had been made to apply the approach to other farming situations, the experience was still quite limited outside rice and integrated pest management. Bringing the approach to Kenya required a range of adaptations to make it applicable for African farming systems, where a wide diversity of crops are grown and pests are not necessarily the major production problem. Kenya also provided specific challenges: land- and water-related constraints, long distances between farming communities, limited national funding for extension, unpredictable weather and frequent droughts.

A couple of years later, several new farmer field school initiatives were initiated and the approach expanded and modified to cover new topics. The UNDP-funded Promoting Farmer Innovation Farmer Field School project, starting in 2001, included farmer field schools on such diverse topics as bee keeping and soil management. At about the same time the International Livestock Research Institute also initiated a livestock field school project to adapt the methodology to health and production issues of smallholder dairy production. In Central Kenya an FAO funded initiative focused on export vegetable production, and a Kenya Agricultural Research Institute (KARI) legume network pilot project attempted to scale up soil fertility management technologies. In Eastern and Central Kenya, KARI, ETC-East Africa and LEI-WUR also initiated integrated soil nutrient management activities.

The number of farmer field schools, the diversity of topics and their innovations make Kenya a leading country in Africa for farmer field schools. IFAD, UNDP, FAO and Danida have been the largest donors of such initiatives, while the Rockefeller Foundation, DFID and European Union have funded smaller, research based farmer field school activities. A wide range of NGOs and local institutions support farmer field schools on a local scale; they include Plan International and Catholic Relief Services. With rising demand, self-funded farmer field schools have been emerging. Since 2005 the Kenyan government has funded farmer field school activities in a large number of districts under the Njaa Marufuku Kenya programme.[5] Most farmer field school initiatives in Kenya

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are implemented in close collaboration with the relevant ministry. Most farmer field school facilitators are district or divisional extension staff.

Table 2 shows farmer field school projects on land and water management in Kenya (1995–2006). Many other projects also cover land and water management issues, though not as their main focus.

Table 2 Major farmer field school initiatives in Kenya

Project	Districts	Lead institution (donor)	Start year	Main topics	Trained field staff and graduated farmers	Farmer field schools: Staff-led and farmer-led
Soil Management Project	Kakamega Kisii Tranz Nzoia Embu Mtwapa	Kenya Agricultural Research Institute (Rockefeller)	2002	Soil fertility management	49 3073	152 0
Integrated Nutrient Management to Attain Sustainable Productivity Increase in East Africa Farming Systems Project (INMASP)	Mbeere Kiambu	ETC/Kenya Agricultural Research Institute (European Union)	2002	Nutrient management	16 114	4 0
Farm-level Applied Research Methods Programme for East and Southern Africa (FARMESA)	Kakamega Mbeere Kilifi	Ministry of Agriculture and Livestock Development (Sweden)	1999	Water harvesting, crop prod, poultry	11 275	0 0
Conservation Agriculture for Sustainable Agriculture and Rural Development	Mbeere, Nakuru, Siaya, Bungoma, Laikipia	FAO, Kenyan government (Germany)	2004–2005	Conservation agriculture	24 0	34 0
FAO Netherlands partnership programme	Mwingi, Kitui, Nakuru, Taita Taveta	FAO, Kenyan government (Netherlands)	2003–2005	Integrated soil and water management	20 600	0 0
Promoting Farmer Innovation in Farmer Field Schools II	Nakuru, Narok, Bomet, Kitui, Mwingi, Taita Taveta, Kilifi	FAO/ Kenyan government (UN Development Programme)	2004	Maize, soil fertility, vegetables, poultry	4 0	70 42
Mount Kenya East Pilot Programme	~10 districts	Kenyan government (International Fund for Agricultural Development)	2004	Natural resource management	30	
Total					**154** **4062**	**260** **42**

Farmer field schools on land and water management

The following case studies describe major farmer field school initiatives on land and water management.

Soil Management Project and Legume Research Network Project

These two projects that aimed to combat declining soil fertility were initiated in 1994 with support from the Rockefeller Foundation (Muriithi, 2000). They served smallholders in Kisii, Kitale, Mtwapa and Trans Nzoia districts. Researchers from the Kenya Agricultural Research Institute and extensionists from the Ministry of Agriculture and Rural Development were the key implementers. The University of Nairobi managed two sites, at Kabete and Machakos. Some NGOs also participated in project activities. Notable among them were the Environmental Action Team (Kitale), Community Mobilisation Against Desertification (Kendu Bay), CARE-Kenya (Oyugis) and Vi Agroforestry Kenya (Kitale).

The projects aimed to appraise the causes of declining soil fertility, develop low-cost options for addressing the problem, and disseminate them among smallholders. The Legume Research Network Project screened green manure legumes at 11 sites in major agro-ecological zones in Kenya at altitudes from 150 m to 1900 m. The project screened about 40 legume species, using seeds obtained locally and abroad (mainly from the USA). In 2002 the Soil Management Project adopted the farmer field school approach to enable farmers and other stakeholders participate in technology development and transfer. The project has so far trained 49 field staff, and 3,073 farmers have graduated from 152 staff-led farmer field schools.

FAO Netherlands Partnership Programme

This project (2003–2005) operated in Mwingi, Kitui, Nakuru and Taita Taveta Districts: semi-arid areas with low rainfall, poor soils, and where food security was a major problem. The project tested methods to harvest water for runoff farming and to use manure to improve soil productivity. The project aimed to strengthen local capacity to plan, test and adapt improved technologies in soil, water and farm management. The project trained 20 field staff, and 600 farmers graduated from staff-led farmer field schools.

Integrated Nutrient Management to Attain Sustainable Productivity Increase in East Africa Farming Systems (INMASP)

This project (2001–5), part of a broad, East Africa-wide initiative, had common objectives across the region (see page 8). In Kenya, it operated in the high-rainfall area of Kiambu and the low-rainfall area of Mbeere District. The project trained 16 field staff, and 116 farmers graduated from 4 staff-led farmer field schools.

Farm-level Applied Research Methods Programme for East and Southern Africa (FARMESA)

This project supported the Kenyan Ministry of Agriculture to implement farmer field schools in Kakamega and Mbeere districts. In the Lubao and Lunyu areas of Kakamega, the project aimed to increase productivity through integrated and sustained soil fertility management. Kale, a vegetable locally known as *sukuma wiki*, was planted in eight plots to demonstrate the influence of soil fertility on vegetable production. Two plots were planted with maize to demonstrate soil fertility practices. These plots were the sites for farmer field schools, where farmers grew crops under varying

soil fertility regimes to study the effects of fertility on crop growth. In addition, the farmers learned ways to prepare farmyard manure and compost. The programme supported eight farmer field school groups.

In semi-arid Mbeere, the farmer field schools focused on soil and water conservation, water harvesting and agroforestry. The programme supported four farmer field schools in the Kiambeere and Gichiche area of Gachoka Division. Topics included water spreading bands, planting furrows, semi-circular bunds, tied ridges, crescent planting pits, stone bunds and contour ridges. The farmers erected some of these structures on their farms. However, drought affected practices such as agroforestry. Overall, in Mbeere and Kakamega, 275 farmers graduated from staff-led farmer field schools.

Box 1 Topics covered in FAO–Netherlands Partnership Programme training of trainers

- Introduction to integrated water, soil and biological resources management
- Introduction to water harvesting
- Introduction to soil productivity improvement
- Soil aspects relevant to water harvesting and soil productivity improvement/soil fertility and health management
- Conservation agriculture
- Field visit on organic farming, double digging, pit planting, trench cultivation, moisture conservation techniques and nutrient recycling. Practical exercise on composting and field visit to farmers
- Agronomic aspects of water harvesting with focus on crop access to water and introduction to hydrological aspects
- Rainfall analysis and runoff analysis/management practices influencing runoff
- Fertility status of Kenyan soils, crop nutrition/farm input supply
- Review and discussion on soil and water management exercises for farmer field schools
- Monitoring and evaluation of farmer field school activities and participatory planning
- Design of runoff farming systems; water harvesting for domestic, livestock and farm use; water harvesting scheme design
- Overview of runoff farming micro-catchment systems
- Presentation of experience by runoff farming farmer field school groups
- Two-day field visit on runoff farming and hands-on experience
- Group action planning (individual district work plans)
- Course evaluation

Source: Mutunga (2003–5)

Curriculum development, training materials and trials

The FAO–Netherlands Partnership Programme developed curriculum and training materials on land and water farmer field school activities (Box 1), and in 2005, FAO drafted a field guide (to be published in 2008). This field guide includes numerous exercises to stimulate discovery learning.

Various meetings have also discussed an extensive curriculum, including integrated nutrient management, production of specific crops, livestock (as a source of manure), and issues such as HIV/AIDS, leadership and team building.

All farmer field school groups started experimentation and demonstrations in a central learning plot or in a selected farmer's field. An experiment typically consisted of a pair-wise design with two to four different treatments, including a control, on plots measuring 20–50 m^2. The farmer field school members formulated simple hypotheses such as:

> "If we apply manure, diammonium phosphate and *Tithonia* when planting maize variety Cargill 4141, we will harvest more grain because of the improved nutrient status – provided we plant good quality seeds early in the season and there is enough rain."

The group agreed on implementation, meetings, observations and group regulations. Individual farmers also implemented treatments on their own farms, and reported their experiences during the farmer field school meetings. After the second round of training, all participants were expected to set demonstration trials with farmer field school groups in their districts.

Other farmer field schools have run different trials in various districts in Kenya. Table 3 shows technologies and crop trials for three districts carried out for the FAO–Netherlands Partnership Programme. Table 4 shows integrated nutrient management technologies tested by four farmer field schools in Kiambu and Mbeere Districts over a three-year period. Table 5 shows technologies disseminated by the Legume Research Network Project in Kitale.

Table 3 Technologies tested by the FAO–Netherlands Partnership Programme

District	Farmer field school groups	Crop	Technologies
Kitui	4	Maize	Road runoff harvesting, negarims, double-dug beds, tied ridges, open ridges, basins, conservation tillage, zai pits, soil fertility management, fertility pits
Mwingi	6	Maize, sorghum, pawpaw	Tied ridges, open ridges, basins, zai pits, negarims, conservation tillage, soil fertility management, fertility pits, double-dug beds
Nakuru	4	Maize, beans	Tied ridges, open ridges, basins, zai pits, conservation tillage, soil fertility management, fertility pits

Source: Mutunga (2005)

Table 4 Technologies tested in farmer field schools by INMASP in Kiambu and Mbeere Districts

Category	Technologies
Soil fertility improvement	Broadcast, line and spot application fertilizer/manure trials at different rates; pit composting, composting, green manures, legumes, fallowing, mulching
Soil and water conservation	Double digging, terracing, zai planting, basins, nine-seeded holes
Water harvesting	Contour bunds, pitting, road runoff harvesting, tied ridging and open ridging

Source: Onduru and De Jager (2004)

Table 5 Soil management technologies disseminated in Kitale, Legume Research Network Project

Technology	Farmer field school
Forage production and use	Khuyetana
Use of organic/inorganic fertilizers for maize	Bikholwa
Use of organic/inorganic fertilizers for vegetable production	Bulala
Introduction of legumes other than beans	Busime
Introduction of suitable maize varieties	Twende Mbele
Quality seed production	Upendo
Low-cost soil conservation methods	Mteremko
Indigenous technical knowledge for pest control	Mutua

Source: Mureithi (2005)

Farmers have conducted other trials ranging from soil fertility improvement, soil and water conservation to alternative livelihoods. These included fertilizer and farmyard manure application, conservation agriculture, pitting, silage, and yoghurt processing.

Issues

Facilitator capabilities and training. Generally, Ministry of Agriculture extension staff know a lot about fertilizer and manure application, but are less knowledgeable on broader issues such as integrated nutrient management, green manures, conservation agriculture and water harvesting. Various projects have run training for facilitators, with progressively more coverage of topics such as water harvesting, water storage for domestic and livestock use, soil fertility management, and rainfall/runoff analysis.

Facilitators usually attend training of trainers courses on farmer field school methodology and technical issues. These courses have been reduced from one month to two weeks on methodology, and to one week on technical aspects. But this is too short to cover everything. This obliges the farmer field schools to rely on external facilitators for many topics. The quality of facilitators also needs attention: diploma certificate holders would be better placed to deal with land and water management issues in farmer field schools. The training should be spread throughout the project period so facilitators do not forget technical issues. Farmers are generally not competent to start new schools after they graduate; they need a weekly training to refresh their skills.

Training should focus more on a few key topics in land and water management, and use more practical, hands-on exercises rather than routine classroom teaching. Time allocation must depend on the subjects covered. All cases presented should be real, applicable and verifiable: the participants should actually practise the skills they are supposed to learn, and not left to imagine what will happen. The resource persons or trainers should be practically oriented people with hands-on experience. They must be abreast of farmers' practices and emerging issues in research and on farms. The facilitators' training should also cover leadership skills, conflict resolution, farming as a business, and health issues.

Participation. The field approach brings together key stakeholders: farmers, extensionists and researchers have an opportunity to learn together. Farmers guide the main activities; they usually report to the central learning plot at an agreed time during the learning day. Most farmer field schools have more women members than men. But young people have few incentives to join the farmer field school; often, only older people enrol.

A cohesive group is vital to demonstrate water harvesting in a group farm, and to manage the funds – building water harvesting structures takes more money and resources than, say, a demonstration on growing maize.

Training requests. Requests for farmer field school training depend on the circumstances, the farmers' knowledge, and the availability of information. Farmer field school members usually make broad requests for training on unexploited opportunities (such as mushroom growing or livestock keeping), which facilitators sometimes are not able to teach. Requests for training on conservation agriculture, soil fertility, water conservation and cover crops often arise after the farmers have graduated from the farmer field school. The farmer field school approach has spurred demand for training by mainstream district or divisional extension agencies – but they do not have funds or capability to offer such training. What is needed is a budget line in the Ministry of Agriculture for farmer field schools on land and water management. Training requests which the facilitators cannot handle could be dealt with by guest facilitators from other ministries or research organizations.

Training materials. Information for the facilitators' courses comes from various books and manuals provided by donors, as well as from libraries, the internet and nearby research institutions.

However, such information may not be accessible to the farmer field school members: the farmer field schools may be too remote, the information is often expensive, outdated or fails to cover the right topics or ecosystems. Master trainers have helped develop materials on subjects such as poultry and livestock manure, and soil and water. A simple field guide on land and water management is needed for farmer field school facilitators and farmers to provide guidance and answer the most common questions. Such a guide is forthcoming FAO /IIRR 2008.

Partnership and collaborators. Farmer field schools have formed partnerships with the Kenya Agricultural Research Institute, Egerton University and the Coast Development Authority to try out and promote technologies. They have also teamed up with stockists in their own districts. A large number of farmer field school groups have collaborated closely with seed and fertilizer companies to test new products, such as the Mavuno fertilizer produced by Athi River Mining Ltd. This has led to farmers adopting the technology quickly.

Workshops in each district or division are needed to inform stockists, researchers and local leaders of the farmer field school's findings. That would help these actors understand the farmers' constraints and find solutions. For example, retailers could make sure they stock right farm inputs at the right time.

Monitoring and evaluation. The farmer field schools monitor trials using indicators that farmers and researchers choose in a joint workshop. They monitor every week or every two weeks during the season, and for at least two seasons for each trial. Land and water management trials take a long time before farmers see a real impact. The district coordinator monitors the farmers' and facilitators' performance each month. All in all, too much data are collected: the facilitators cannot keep up. Reducing the amounts to a bare minimum would avoid this constraint.

The Legume Research Network Project and Soil Management Project developed a set of participatory monitoring and evaluation tools in March 2002 (KARI, 2004). These included the following:

- **Economic criteria**: production (e.g., kg/ha, litres), income levels, ownership of assets by group or individuals, poverty (family size, number of meals, access and use of inputs, household food security) and mechanization (farm implements).
- **Socio-cultural indicators**: group cohesion, gender participation, standard of living, wealth (individual/group) and learning ability (including capacity to perform tasks, facilitation or demonstrations).
- **Technological indicators**: adoption levels, facilitation skills, communication skills (number of outreach strategies such as drama and poems) about technologies, sustainability (e.g., number of income-generating activities), post-harvest handling (e.g., suitability, processing) and condition of produce.
- **Institutional indicators**: capacity building, networking, access to credit and marketing ability (volume of sales, price of commodities).
- **Environmental indicators**: conservation of resources, afforestation, pesticide use.
- **Political indicators**: leadership and accountability (e.g., ownership of bank account, attainment of planned activities).

The tools for data collection were in two parts: tools for collecting baseline information, and tools for evaluating the farmer field school process and outcomes.

Sustainability. Sustaining activities after the first year is the biggest challenge encountered by the farmer field school groups (Onduru and De Jager, 2004). Most groups have ensured sustainability by establishing commercial enterprises, diversifying their enterprises (e.g., adding fruit trees or bee keeping), seeking common markets for produce, seeking backstopping on leadership skills, sourcing credit, and running a revolving fund. Some of the groups have "merry-go-round" and "table banking" activities, while others contribute savings of KSh 50–100 (US$ 0.70–1.40) a

month. The Kikapu farmer field school in Nakuru has built up a revolving fund of KSh 50,000 (US$ 715), which it loans to members in the form of farm inputs. The school intends to increase this fund further by charging interest on loans.

A farmers' network in Busia, Nakuru, under the FAO–Netherlands Partnership Programme has been formed to spearhead sustainability of the farmer field school groups. This network aims to: survey markets and negotiate better prices on behalf of the farmers; source affordable farm inputs by buying in bulk; facilitate training for members; sensitize the farming community on topics such as HIV/AIDS, drug abuse, gender, the environment and legal issues; recruit members into the network; monitor the activities of member groups; solicit, generate and manage revolving funds; and advocate on farmers' issues.

Farmers working with the INMASP project in Kiambu and Mbeere districts set up commercial ventures alongside their trial plots to earn money and provide services. These included upgrading of local goats, starting a milk processing plant to make yoghurt, making bread, growing kale, French beans and pineapples, making poultry feed, doing tissue culture on bananas, and keeping bees.

Trials by farmer field school groups. A proper understanding of soil and water conservation and of integrated nutrient management is critical if farmer field schools are to implement land and water management successfully. Also crucial are choosing the right technology and adapting and maintaining the improved practices. Regular field days on demonstration sites are crucial if the technologies are to be adopted. The benefits of land and water management technologies are visible in crop production if the rainfall is normal. But if there is too little rain to harvest, or too much water causing flooding, water harvesting practices may fail.

Impacts

Farmer field schools have had significant impacts. The farmer field school members have become better off: they were able to raise their farm incomes, improve their farming practices and boost their crop yields (INMASP, 2006).

Crop yields have risen by 20–100% on study plots and in farmers' fields (Loevinsohn et al., 1998). The cost of extension services has fallen drastically: the cost per farmer under conventional extension-led farmer field schools is about US$ 25, while for farmer-led farmer field schools it about US$ 10 for 2 seasons. The approach enhances the interaction between researchers, extensionists and farmers. It promotes group organization and encourages further learning.

Nearly all (95–100%) farmers in the Kiambu and Mbeere farmer field schools do on-farm experiments, while only 35–65% of non-members do so (INMASP, 2006). Members also do experiments on aspects not covered in the farmer field school, suggesting that they do not just blindly apply what they learned (Loevinsohn et al., 1998). Changes in soil, water and nutrient management practices have been widespread, notably the increased use and more focused application of manure and compost and of water harvesting techniques. Most practices were introduced in the farmer field schools, but some existing practices (e.g., "nine-hole planting", where organic material that retain moisture is put in pits) spread from group to group during exchange visits organized by the INMASP project in Kiambu District.

Farmers participating in farmer field schools think the farmer field schools have helped create strong, farmer-based structures – unlike the squabbling cooperatives (Onduru et al., 2002; Mutunga, 2003–5). Farmers also feel that the farmer field schools have helped to bring extension workers closer to them, as previously they did not visit the area often. They further feel that farmer field school forums and facilitators appreciate their knowledge.

Extension workers say that the farmer field schools have helped them reach more farmers than previous extension approaches. The farmer field schools have contributed to building a close relationship between farmers and extension workers, as some farmers have been seeking services from ministry offices (Onduru et al., 2003). The extension workers see their roles gradually change from teacher to facilitator. But they recognize some dissonance between their current job descriptions and the demands of the farmer field schools, as they are required to use other extension methodologies besides farmer field schools. In response, the District Agricultural Office has allocated one farmer field school to an extension worker. The extension workers also think the farmer field schools have stimulated the flow of information among farmers, the sharing of resources and a sense of positive competition. They have stimulated enterprise diversification and emergence of farmer field school networks in Busia and Kakamega Districts (Ministry of Agriculture, 2006; INMASP, 2006).

The following observations are based on an impact study of the INMASP project in Mbeere and Kiambu Districts in 2005 (INMASP, 2006; Bunyatta et al., 2005).

- Farmer field school participants have gained knowledge on soil fertility management and are aware of a wider variety of technologies to address land degradation with special emphasis to soil fertility degradation.
- Participation in a farmer field school leads to higher yields and more on-farm experimentation. Individual farmers' maize yields rising from less than 1 t/ha to 3.5 t/ha.
- There is a need for an integrated crop–livestock approach when addressing soil fertility management.
- Many farm households in the research area are engaging in new commercial, added-value agricultural production but need also support on soil and water management.
- Some 60–75% of the farm households have seen their livelihoods improve. They have learned about how to grow different crops, and how to add value to their produce, such as by baking bread and making jam.
- About 50% of the non-farmer field school members have received technical information from the farmer field schools.
- The majority of farm households evaluate the farmer field school activities positively.

Policy and scaling up

The government's Strategy for Revitalizing Agriculture (GoK-MoA/MoLFD, 2004) cites poor extension, low absorption of modern technology, inadequate research–extension linkages and a lack of demand driven research as constraints to agricultural growth. The National Agricultural and Extension Policy also emphasizes the need for sustainable extension using a demand-driven and beneficiary-led approach, clear accountability mechanisms, cost-sharing with beneficiaries, multidisciplinary service delivery, flexibility in methodologies and approaches, and a participatory approach.

Farmer field schools satisfy all these requirements. Many government and research programmes are using farmer field schools to help farmers learn new technologies. Farmer-led fields schools have proven to be a powerful way to spread technologies quickly. Farmer graduates from a staff-led farmer field school receive a short training and are then supported to run their own farmer field school. That enables rapid scaling up at low cost, getting around the problems of limited numbers of extension staff, low operational budgets at the district level, limited flexibility at district agricultural offices to use funds for farmer field schools, and high transport costs.

Even though several government programmes apply farmer field schools in land and water management, the National Agricultural and Livestock Extension Programme has not officially

adopted the approach. While the Programme generally supports farmer field schools at the policy level, rules generally prevent district teams from operating farmer field schools. This gap between policy and practice need to be addressed if farmer field schools are to be fully integrated in the government system.

Synthesis

Box 2 shows some insights from workshops and group discussions to evaluate farmer field schools for land and water management. There is adequate sharing of knowledge and experiences in farmer field schools, though the initial costs are a major weakness. There is also an opportunity of training local facilitators, though farmer field schools face problems of literacy and sustainability.

Donors are advised to do the following:

- Promote nutritious indigenous crops through improved soil and water management.
- Promote marketing infrastructure at various levels, from village to international.
- Create an enabling environment (policies) especially for small-scale farmers for agriculture through incentives (fertilizer subsidies) and payments for environmental services (PES) arrangements, planning, networking, marketing and financing.
- Support the supply of inputs in small, affordable quantities – e.g., packages that contain small quantities of fertilizers, seeds for cover crops, etc.
- Focus on land husbandry and management other than soil conservation. This should include soil fertility management, runoff farming, water harvesting, soil moisture conservation and agro-biodiversity.

Promoting land and water management through farmer field schools has a bright future. The government's Strategy for Revitalizing Agriculture emphasizes the role of natural resource management in agricultural development. The farmer field school approach improves the delivery of extension and advisory services, ensures access to financial services and farm inputs, and creates networks to act as centres for value addition and marketing of agricultural produce.

Donor support needs to be redirected beyond farmer field school groups and networks. It should also develop policies that ensure an enabling environment for farmers to use the knowledge and skills they gain in the farmer field schools to integrate land and water management in agricultural production. This is particularly important in drier areas where lack of water limits crop and livestock production.

What is needed now? Establishing more pilot sites, covering different ecological settings. Training-of-trainer courses for staff from agricultural extension. Promoting exchange visits, farmer training and study tours. Providing technical backstopping at the district level, to ensure sustainability. Finding ways that farmers can translate the energy they develop through the farmer field schools into tangible outputs that will alleviate food insecurity and improve their livelihoods and incomes. Farmer field schools have helped bridge the gap between extentionists, researchers and farmers, providing a forum for regular, close contact with farmers. Although both men and women appreciate the farmer field schools, women in particular seem to value the approach.

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Taveta, Busia and Nakuru districts, and the workshop organizing committee of FAO, the Agricultural Economics Research Institute (LEI), Netherlands, and CTA for providing the support to this paper.

Box 2 Strengths, weaknesses opportunities and threats analysis for farmer field schools on land and water management in Kenya

Strengths

- Sharing of knowledge and experiences
- Facilitation of other group activities
- High technology adoption rate
- Enhanced ownership of process and technologies
- Fast spread of technology outside group
- Mobilization and use of available resources
- Use and creation of farmer expertise
- Increase in group cohesion

Weaknesses

- High initial costs
- Time-consuming process
- Diverse interests of farmers
- Risk of poor leadership
- Hard to raise cash for farmer-led farmer field school operations
- Rigid schedule of meetings
- Personal commitment required
- High illiteracy levels

Opportunities

- Active policy and awareness raising at national level (Ministry of Agriculture)
- More attention to small-scale commercial farming and marketing (Ministry of Agriculture, private
- sector)
- Assisting farmer field schools in initial grants and self-financing activities (Ministry of Agriculture, micro-finance groups)
- Training facilitators (Ministry of Agriculture, FAO, NGOs) include curriculum in colleges
- Co-ordinating office (district office, FAO)
- Technical support (district office, research institutes, NGOs, private sector)
- Encourage gender balance
- Compensate farmer facilitators adequately for their inputs
- Adjust frequency of meetings to the enterprise
- Encourage self-financing farmer field schools
- Ensure quality control
- Link farmer field schools to business and private enterprise
- Sharing of results in district/division workshops

Threats

- Occasionally no formal linkages with farmer field school networks
- Lack of sustainable source of funds
- Limited range of stakeholders involved at local level
- Inadequate resources for monitoring and backstopping
- Facilitators lack training and supervision
- Lack of rules and guidelines for financial management

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2.3 Tanzania: Farmer field school experiences in improved land, water and agro-ecosystems management for sustainable livelihoods and food security in Tanzania

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The vision for reforming agricultural extension in Tanzania by 2010 proposes several strategies: sharing responsibility among stakeholders for planning, decision making, financing and evaluation; empowering farmers and pastoralists through participatory approaches; providing high-quality, professional services; promoting environmentally sound technologies; adopting community-based and gender-sensitive approaches; and linking effectively among farmers, researchers, extensionists, educators, local leaders and other stakeholders.

In 2001, the Tanzanian government in collaboration with FAO embarked on an extension approach to help farmers and pastoralists to develop their skills for acquiring and analyzing information, adopting appropriate technologies and practices by selecting from different options. This alternative approach is that of farmer field schools. Various pilot projects were initiated. This chapter summarizes their experiences.

Farmer field schools on land and water management

There are many farmer field school initiatives in Tanzania. This section describes two in detail: the Soil Productivity Improvement Farmer Field Schools Project in Kagera, and the Mkindo Farmers' Agricultural and Rural Training Centre in Morogoro. Table 6 summarizes several other initiatives.

Soil Productivity Improvement Farmer Field Schools Project, Kagera

This FAO-supported project aimed to mitigate soil productivity and production decline in Kagera Region, northwestern Tanzania. It trained farmers to manage land and water on their farms and in the surrounding catchments, monitor changes in soil productivity, biodiversity and water, and improve their crop and livestock management. It also built the capacity of extension staff through training-of-trainers workshops, helped farmers identify technical options, assessed improved legume cover crops, and promoted ways for farmers to earn money that improved the land

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productivity. Exchange visits enabled interaction and mutual learning among farmers and community leaders. The project began in 2002.

Outputs

The project's outputs include the following:

- The project established 35 farmer field schools: 25 in Bukoba, five in Karagwe and five in Ngara districts. Three training-of-trainers' workshops were conducted for 61 extension and 17 farmer facilitators. About 1,000 farmers took part in the farmer field schools, while over 2,000 others benefited without participating. More than 30 leaders from the village, district, regional and national levels became familiar with the farmer field school approach.
- The project strengthened the farmers' knowledge of land management, and farmers started applying integrated land management on their own fields.
- Farmers (both farmer field school members and non-members) in Bukoba district widely adopted technologies to replenish soil nutrients, conserve water, control erosion and improve the soil biodiversity.
- Maize grain yields rose from an average of 1 ton/ha to 4.5 tons/ha.
- The project developed an agro-ecosystems analysis form on soil health and management which was widely applied in all 35 farmer field schools.
- Ten of the farmer field schools improved their management of local organic inputs (farmyard manure, compost, house refuse, etc.) and integrated them into their crop/livestock production.
- The project conducted about five exchange visits each season, and held three end-of-season workshops to evaluate the farmer field schools' performance and plan for the next season.
- It compiled two modules – on soil health and management and on crop/livestock integration – for the FAO field guide on land and water management.
- The farmers started five commercial activities, most on crop/livestock integration. Each farmer field school saved a modest amount of money from its crop sales and other activities. Several farmer field schools are registering with the government as community-based organizations and opening bank accounts; an important early step in farmer empowerment.
- Collaboration was promoted between research, extension, district administrations and farmers.
- Ten improved legume cover crops were introduced and tested.

Constraints

- In some years, drought affected the yield – which is the farmers' best way of telling whether their soil management is improving.
- Some farmers dropped out of the farmer field schools because they found their expectations were not met or because of disputes with other farmers or facilitators.
- The farmer field schools varied in their level of development, depending on the facilitators' and leaders' effectiveness and individual farmers' objectives and commitment.
- Late submission of reports and complex fund transfer arrangements delayed the implementation of planned activities.
- A lack of extension staff in some districts meant there were not enough people to train as facilitators.
- District administrations were able to contribute only small amounts to support the farmer field school activities because they preferred to fund infrastructure and marketing.
- People were afraid of bandits, especially between Karagwe and Ngara.

Plans

- Scaling up the farmer field school programme to cover more of the region and lake zone, and linking with a new Improved Land Management Consortium.
- More focus on farmer innovators.
- Translating the new farmer field school field guide into Kiswahili.
- Providing training in new areas: crop/livestock integration, processing of farm products, crop diversification, and large scale production.

Mkindo Farmers Training Centre

Mkindo Farmers' Agricultural and Rural Training Centre in Morogoro Region was established in 1996 by the Indonesian Farmers' Fund as part of a cooperation agreement between Tanzania and Indonesia. The Centre acts as the national centre for training farmers and trainers on irrigated rice. It has emphasized on transferring the farmer field school approach to Tanzania from Indonesia, where it originated.

In 1993–4, six farmers and two extension agents from the Mkindo irrigation scheme attended a three-month-long training on irrigated rice management in Indonesia. In 1999 two Indonesian farmers spent three months in Tanzania to impart skills in rice production to farmers in the Mkindo scheme. In 2002 two Indonesian farmers and a curriculum development specialist spent six months at the Centre to help on technical issues.

The Centre offers training courses on growing food crops, especially irrigated rice. It can accommodate 20 farmers at a time, but it is planned to raise the capacity to 50. It may in future cater for farmers from neighbouring countries, with programmes tailored for their needs.

Outcomes

The period 2000–5 has seen remarkable improvements in the livelihoods of the Centre's targeted community. Some 770 farmers received residential training on irrigated rice, while 247 attended training of trainers on the principles of integrated pest and production management using the farmer field school approach. The trainees came from all over Tanzania, with sponsorship from various development programmes. Ten days of formal residential training at Mkindo cost TSh 70,000 per person.

Four hundred farmers from the Mkindo area formally graduated in rice production; so did another 200 from neighbouring villages. Still more have graduated informally. Their new skills have enabled them to raise their paddy rice yields from about 1 t/ha to an average of 5.5 t/ha.

The Centre earns money from its activities; it pays TSh 300,000 per year to the government for irrigation water. It is a reliable source of skilled labour for rice production for region.

As a result of these successes, various development organizations have adopted the farmer field school approach for their extension work. The Ministry of Agriculture, Food Security and Cooperatives has also announced that it will use farmer field schools as an alternative extension approach.

Other farmer field school activities in Tanzania

There are many other farmer field school initiatives in Tanzania, dealing with various subjects. Most of these are summarized in Table 6. Those not covered include the Special Programme for Food Security (smallholder irrigation on rice and onions) in Morogoro and Iringa, and the Tunza Mazingira Uongeze Mapato programme (CARE Kisulu). The main donors for farmer field school activities in Tanzania are FAO, IFAD, the government of Germany, Danida and CARE.

Table 6 Other farmer field schools in Tanzania

	Duration, location	Objectives	Activities	Outputs	Lessons
Farm Level Applied Research Methods for Eastern and Southern Africa (FARMESA)	Gairo division, Kilosa, Kongwa, Mlali division, Mbeya rural, Isangati division 1996–2001	• Test participatory methods • Document and train on promising methods	• Test production technologies • Training workshops • Recommend changes to curricula of agricultural colleges • Publish manuals on participatory approaches	• Participatory approaches recommended • 15 training workshops on participatory methods • Curricula of training institutes and Sokoine Univ modified • 2 manuals on participatory approaches	• Farmers groups enhance communication at farm level • Farmer field school approach effective for technology development and transfer
Southern Highlands Extension and Rural Finance Support Programme, IFAD	Mbeya rural (Mbeya) and Mbinga district (Ruvuma) 1998–2000	• Develop technologies to increase crop and livestock production • Develop participatory, demand-driven extension approach • Strengthen smallholder agricultural, credit delivery, inputs stocking, processing and marketing systems • Develop primary cooperatives and savings and credit societies	• Train, do research and run demonstrations with extension staff • Form farmer groups, facilitate credit for farmers and stockists • Support regional offices	• 200+ farmers and extension staff trained on farmer field school approach • Maize yield rose from 1.2 to 5 t/ha • Savings and credit cooperative societies “Benki Kata” established in wards	• Farmer field schools cover more people than Training and Visit approach • Farmers can manage land and water on-farm without extensionists • Scaling up possible if farmers graduates are supported • Farmer field school members developed sense of ownership through cost sharing

	Duration, location	Objectives	Activities	Outputs	Lessons
East Africa Sub-regional Pilot Project on Integrated Production and Pest Management	Bukoba and Muleba districts (Kagera) 2000–4	• Improve extension systems ability to provide education farmers need • Exchange farmer field school experiences within and between countries • Study the replicability and effectiveness of farmer field schools	• Develop curriculum on banana, cassava, soil productivity and cross-cutting issues • Train trainers • Implement farmer field schools • Promote bank system • Network • Cover bananas, cassava, maize, pineapples, dairy goats, soil productivity and conservation agriculture • Run regional meetings, farmer exchange visits, farmer networks and forums, quarterly evaluation workshops	• 60 villages involved • 207 farmer field schools established (90 farmer run, 117 extension run) • Ca 5,800 farmers (nearly half women) • Banana production up from 20 kg to 45–60 kg/bunch	• Strong institutions formed at ward and division • Farmers take up training and facilitation roles • Farmer field school graduates sell skilled labour to other farmers • Farmer field school members take leadership roles in the community • Farmer field school groups preferred by development partners as entry points for other interventions
Integrated Production and Pest Management Project	Unguja and Pemba (Zanzibar) 2001–2	• Demonstrate environment-friendly plant protection measures against pests and rodents • Upgrade skills of facilitators and farmers • Improve land and water management capacities of farmers, with focus on rice production	• Conduct workshops for facilitators and resource persons • Train trainers on special topics • Coordinate farmer training programme • Train graduate farmers on follow up activities • Produce materials to disseminate technology	• 52 farmer field schools established on irrigated and rainfed rice, vegetables, bananas and cassava • 5 curricula and 5 training guides on crops produced • Ca 1,100 farmers (nearly half women) trained • Increased knowledge, skills and practices • Crop yields rose by 100% (wetland rice), 45% (dryland rice), 255% (vegetables), 180% (tomatoes), 100% (bananas), 150% (cassava) • Various improved practices adopted • Leaflets, videos, case studies produced	

	Duration, location	Objectives	Activities	Outputs	Lessons
Conservation Agriculture for Sustainable Agriculture and Rural Development (CA-SARD)	Arumeru and Karatu districts (Arusha) and Bukoba district (Kagera) 2004–6	• Accelerate adoption of profitable conservation agriculture practices by small farmers	• Train facilitators and monitor 33 farmer field schools • Specialized training in conservation agriculture • Conduct field days of inputs and implements • Identify equipment sources • Conduct exchange visits, etc.	• 17 facilitators trained • 33 farmer field school groups established • 15 draft animal power operators trained • 15 artisans trained on equipment repair and maintenance • 40 farmers in exchange visits • Enhanced collaboration from village to national level • Improved implement supply	• Jab planter saves work • Big interest among farmers on soil issues • Appreciation of cover crops • Farmer field schools are a good way to teach conservation agriculture
Expansion of Farmer Field Schools Programme for East and Southern Africa	Bukoba and Muleba districts (Kagera) 2005–8	• Expand farmer field school interventions and improve their cost effectiveness and sustainability • Broaden scope of farmer field schools • Establish skills and methods for farmer field schools to respond to farmers' demands • Support farmer field school networks • Institutionalize and improve quality of farmer field schools	• Hold awareness workshops for stakeholders • Develop monitoring and evaluation framework • Conduct farmer network meetings at ward and division levels		
Empowerment of Mbeya and Iringa Farmers Using the Farmer Field School Approach	Mbeya and Iringa regions 2006–8	• Empower farmers in marketing, agronomic technologies and applied research	• Train extension staff and farmer facilitators • Develop curriculum • Implement farmer field schools • Hold technical meetings	• 85 farmers trained in farmer field school approach • Enhanced collaboration of research, training and extension services	• Training strengthened by involving both research and training experts

Implementation

This section draws largely on the approach used in the Soil Productivity Improvement Farmer Field Schools Project in Kagera region, northwestern Tanzania.

Curriculum development

At the end of a training-of-trainers workshop, the participants and facilitators developed a plan for how to implement the farmer field schools in the areas they served. This plan identified the test crops and shows the cropping calendar. It also identified specific production or management constraints in each farmer field school, and outlined the possible options that might overcome these. It suggested possible special topics to cover and the most important farming and socio-economic problems to address.

For the Soil Productivity Improvement farmer field schools in Kagera region, three curricula were developed for different zones. These differed in the timing of operations and the time needed to prepare inputs like compost, which requires an entire season before it is ready.

These curricula enable the district coordinators to plan their coordination visits to different farmer field schools. Each farmer field school met on a certain day each week, and informed the coordinators when this would be. The curricula also made it possible to plan exchange visits and official visits from the regional and district offices, as well as to invite outside resource people to cover special topics.

Inception meetings and training of trainers

Inception meetings were normally combined with training-of-trainers workshops. The first day of the training involved sensitization of stakeholders (region, district and village leadership and NGOs) on the subject the farmer field schools would deal with. This meeting aimed to ensure these stakeholders understood the importance of the subject, and to learn from them how best to deal with it. The meeting also sought their support and endorsement for the activity – important to encourage local people to become involved and to make sure that land and other resources could be used.

About 20 extension staff attended the training-of-trainers workshops, which lasted about 2 weeks. The Kagera project held three such workshops to train the facilitators on the basics of soil productivity improvement, and general principles on FFS implementation. The workshops also covered how to conduct agro-ecosystems analysis in soil health and management, topics such as pest management and irrigated rice, collecting and compiling data on soil quality, plant performance, and costs and benefits.

Establishment of farmer field schools

In consultation with village leaders, the project organized village meetings and introduced farmers to the idea of establishing a farmer field school on soil productivity improvement. Interested farmers volunteered and formed themselves into farmer field school groups of 25–30 members each. Each group elected a chair, secretary and treasurer, with both men and women in the leadership group. Each group discussed with the facilitator the subject to cover, identified knowledge gaps and existing technologies, and selected practices to compare. Some farmers volunteered land to use; otherwise contractual arrangements were made. The Kagera project started with six soil fertility management options, with different amounts of organic matter and mineral

fertilizers. Each farmer field school compared an appropriate farmers' practice with the other five options. In the second season, the farmer field school tested only two promising options along with the farmers' practice. Other farmer field school projects tested only two to three options from the first season.

Training materials and methods

The training "materials" were the same as used during the training-of-trainers: the soils and study plots in the test sites; inputs such as crops, organic and inorganic fertilizers and pesticides; fields and landscapes with different crop and land management practices; indicator plants of nutrient deficiencies and toxicity; mini-pits to assess soil quality; tillage tools; legume cover crops; signs of crop quality or pest and disease attacks; and the farmers' own knowledge and experience.

Methods included agro-ecosystems analysis; field rapid soil test analysis; using the five senses of feeling, seeing, tasting, smelling and touching; rulers, strings and scales; printed training modules; and other farmer field school sites (during exchange visits); games and stories for group dynamics; logbooks for keeping records; other stationery such as marker pens, flip charts, masking tape and newsprint; and the venues for specific training such as compost making.

Apart from the knowledge of the facilitator and the farmers themselves, the farmer field schools drew on experienced and innovative farmers who applied good practices, and visiting specialists who addressed special topics.

Organization

The organization of farmer field schools takes place at three levels:

- **Grassroots:** the farmer field school leadership and the facilitator, responsible for routine activities and group discipline.
- **Mid-level:** the district coordinator, who liaises with all site facilitators, monitors progress, and registers constraints, plans and requests for each farmer field school. The coordinator also arranges visitors, exchange visits and specialists to cover special topics.
- **Top level:** the District Agricultural and Livestock Development Officer, represented in the field by the district farmer field school coordinator. This officer is responsible for the smooth running of farmer field schools in the district, and providing additional support such as inputs and the specialists' transport. The officer reports to the District Executive Director during quarterly district technical committee meetings, and links closely with collaborating research institutions and NGOs. The technical specialists and the farmer field school master trainers also collaborate closely.

Partners and collaboration

Many development organizations support the farmer field school effort. They include FAO, IFAD, and NGOs such as Vi Agroforestry and Catholic Relief Services. These organizations collaborate with research institutions and district extension services and with outstanding individual farmers.

Policy and scaling up

The farmer field school approach contributes to reducing poverty, as variously emphasized in the Tanzania Development Vision 2025 document and the 2003 National Strategy for Growth and Reduction of Poverty in Tanzania, known as "Mkakati wa Kupunguza Umaskini na Kukuza Uchumi". Within the Vision 2025, the 2001 Agricultural Sector Development Strategy aims to

create an environment for improving the productivity and profitability of the sector. The Agricultural Sector Development Programme, which puts the Strategy into operation, further aims to improve farm incomes, reduce rural poverty and ensure household food security.

Of the nine general objectives in Tanzania's agricultural policy, it is significant to note that farmer field schools contribute to at least five:

- Food security and improved nutrition by increasing output, quality and availability of food
- Improved rural living standards through increased incomes from agricultural and livestock production, processing and marketing
- New technologies to increase productivity
- Sustainable management of natural resources
- Better access for women to land, credit, education and information.

The Agricultural Extension Reform vision and strategy outline to year 2010, states that

> "The agricultural extension services in Tanzania should, by year 2010, be participatory, demand-driven, carefully targeted, cost effective, gender sensitive and provided in a collaborative and coordinated way involving various stakeholders, including the beneficiaries so as to enable the farming and pastoral communities to utilize available resources in an effective and sustainable manner in order to improve their incomes and overall standard of living."

Another current policy, although not explicitly documented, is about offering extension services to groups of farmers rather than individuals. Working with individual farmers is expensive, time-consuming and difficult where not enough extension staff are available. Farmer field schools serve groups of 25–30 farmers over the entire season; after graduation, these farmers may initiate other farmer field schools, so expanding the process. In 2006 the government approved the farmer field school approach as one way to develop and disseminate technologies in Tanzania.

Impact and sustainability

The impact and sustainability of farmer field schools for land and water management can be shown in various ways.

Crop yields have risen by 20–300% or more as a result of using the technologies tested. The number of extension staff and farmers trained to facilitate farmer field schools has risen. The area where farmers have adopted improved technologies has increased, and the technologies have spread from farmer field school sites to the farms of both farmer field school members and to non-members.

Many farmer field school projects reported an increase in income for many technologies tested. Some involved higher costs, produced greater benefits. The farmer field schools reduced food insecurity and opened access to support from development institutions and projects. Once established, farmer field schools have acted as entry points for other partners working with rural communities.

Farmer field school members gain status in the community because they can get higher yields, earn more money, can obtain information and interact with outsiders. They have acquired the knowledge and skills to produce better and more sustainably. They have pioneered many rural development activities. Capable farmer field school leaders have taken on other leadership roles in the community. The position of women has also improved, since farmer field schools led by women often performed better than those led by men. Women now have more say in decisions within the family.

Better yields are just one of the many benefits of improved soil management. Others include less soil and water loss, increased soil biodiversity and activity, more carbon stored in the soil and

vegetation, and fewer conflicts between land users. These benefits far exceed the monetary losses due to the higher costs. They also go beyond the household, benefiting also the country and the world as a whole.

Lessons

Farmers and extension staff do not know enough about how to manage resources sustainably. That leads to mining of the soil for nutrients and the use of inappropriate methods. By training facilitators and enabling farmers to learn and exchange knowledge, the farmer field schools have improved their capacity to manage land, water and other resources in a sustainable way.

Farmers prefer to work with integrated technologies that address several problems at the same time. They may be costly, but they produce many benefits: local (increased yield, less erosion), national (livelihoods improvement, food security), and global (biodiversity conservation, clean waters, controlled land degradation). Farmers are willing to incur costs for such technologies because of their many benefits.

Innovative farmers are not usually enthusiastic about joining farmer field schools. They consider themselves good land and water managers. But they closely follow developments in the farmer field school, and adopt what they find interesting. Some farmer field schools have tried to capture their knowledge and practices of farmer innovators.

Exchange visits between farmer field schools and interactions with visitors are key incentives for success. Non-members who show interest and apply to join the farmer field school are another encouragement to existing members.

Technologies that cover the soil surface and green manuring using legumes attracted many farmers, especially in drought-prone areas. There is a high demand for seeds of legume cover crops. It is necessary to study how these legumes perform in different areas before recommending them more widely.

Farmer field school activities have been hampered by delays in fund transfers, problems in distributing inputs, limited visits from district and national headquarters, and delays in reporting to the authorities. These problems need to be resolved to avoid discouraging enthusiastic farmer field school members.

Farmers and facilitators think the farmer field school approach is a good one. It emphasizes facilitation rather than instruction. Field observations create awareness and lead to active learning. Coming together makes it possible for members to get to know each other well and to work as a team. Farmers have recommended to many visitors that the approach be scaled up.

Box 3 lists the strengths, weaknesses, opportunities and threats for farmer field schools on land and water management in Tanzania.

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Box 3 SWOT (strengths, weaknesses, opportunities and threats) analysis for farmer field schools on land and water management in Tanzania

Strengths

- Capacity to impart knowledge and skills to a diversity of stakeholders
- Ability to respond to farmer demands
- Harmonization of implementation through participatory curriculum development
- Enhanced farmer teamwork and better understanding through dynamics within the farmer field school group
- Rapid multiplication, supported by farmer field school graduates
- Timely harvesting and marketing of improved yield levels
- Enhanced income through proper management of crops and income generating projects
- Promotion of environmental conservation
- More efficient use of water in irrigation schemes

Weaknesses

- Lack of adequate extension staff in villages
- Illiteracy of some farmers and poor communication skills of extension staff
- Many young people not interested in agriculture
- Land owners allocating difficult plots of land for demonstrations and tests
- Farmers' low confidence in their own technologies; disappearance of local technologies due to their limited use and documentation
- Many innovators unwilling to participate in farmer field school activities
- Slow attitude change among extension staff used to conventional top-down approach, and limited skills in participatory techniques
- Delays at district level in submitting reports, resulting in problems of funding on-going activities
- Farmer drop outs because they expect immediate returns

Opportunities

- High demand by government and various stakeholders for skills in participatory technology development and dissemination
- Existence of a basket of options for technologies to test and demonstrate
- Farmers' interest to continue with smallholder empowerment using the farmer field school approach
- Government approval of farmer field schools as an appropriate participatory technology development approach
- Existence of graduate farmers to facilitate scaling up of farmer field school activities
- Entry points for different rural development projects and programmes
- Surplus labour for smallholders to invest in development activities
- Abundant land for rural development
- Existence of farmer innovators as sources of experience and good management practices

Threats

- Unpredictable weather (drought, floods, etc.), pests and diseases, HIV/AIDS
- Poor land tenure systems to enable use of appropriate land for training
- Low and unreliable prices and unreliable markets for agricultural products
- Poor implementation of laws and by-laws on land and water management
- Lack of expertise at district offices to coordinate and backstop farmer field school activities
- Stakeholder conflicts while implementing conservation measures
- Farmer field school graduates employed elsewhere and mixing up objectives

2.4 Uganda: Review of land and water management farmer field schools experiences in Uganda

Paul Nyende[9], Josha Zake[10] and Charles Rusoke[11]

The concept of farmer field schools was introduced to Uganda in 1996 through the regional project Farm-level Applied Research Methods in East and Southern Africa (FARMESA), which also served Kenya, Tanzania, Zambia and Zimbabwe. In Uganda the project was implemented in the districts of Kumi and Mukono by the Engineering and Appropriate Technology Research Institute of the National Agricultural Research Organization and Makerere University's Department of Agricultural Engineering, in partnership with district local governments and NGOs. These farmer field school initiatives focused on integrated pest and productivity management. They were followed by farmer field schools on land and water management in 2000 (Ebanyat, 2003).

Figure 1 shows land and water management farmer field school activities implemented in Uganda. All these used farmer field schools to demonstrate sustainable land and water management approaches. They aimed to catalyse further adoption of improved practices in diverse farming systems and to encourage the government to improve land and water management on a wider scale.

The projects involved partnerships of national and international research institutions, local government, NGOs and private sector stakeholders.

Impact

Table 7 shows the number of farmer field schools and facilitators trained by each project.

Table 7 Farmer field schools supported and facilitators trained in Uganda

	Farmer field schools and farmer groups supported		Facilitators trained	
	Extension-led	**Farmer-led**	**Extensionists**	**Farmers**
INMASP	5	1	7	9
ULAMP[12]	390	797	85	797
INSPIRE	17	15	30	32
CA-FFS	16	30	56	32

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[11] Senior Agricultural Officer Ministry of Agriculture Animal Industry and Fisheries, PO Box 102, Entebbe, Uganda. charlesrusoke@yahoo.co.uk

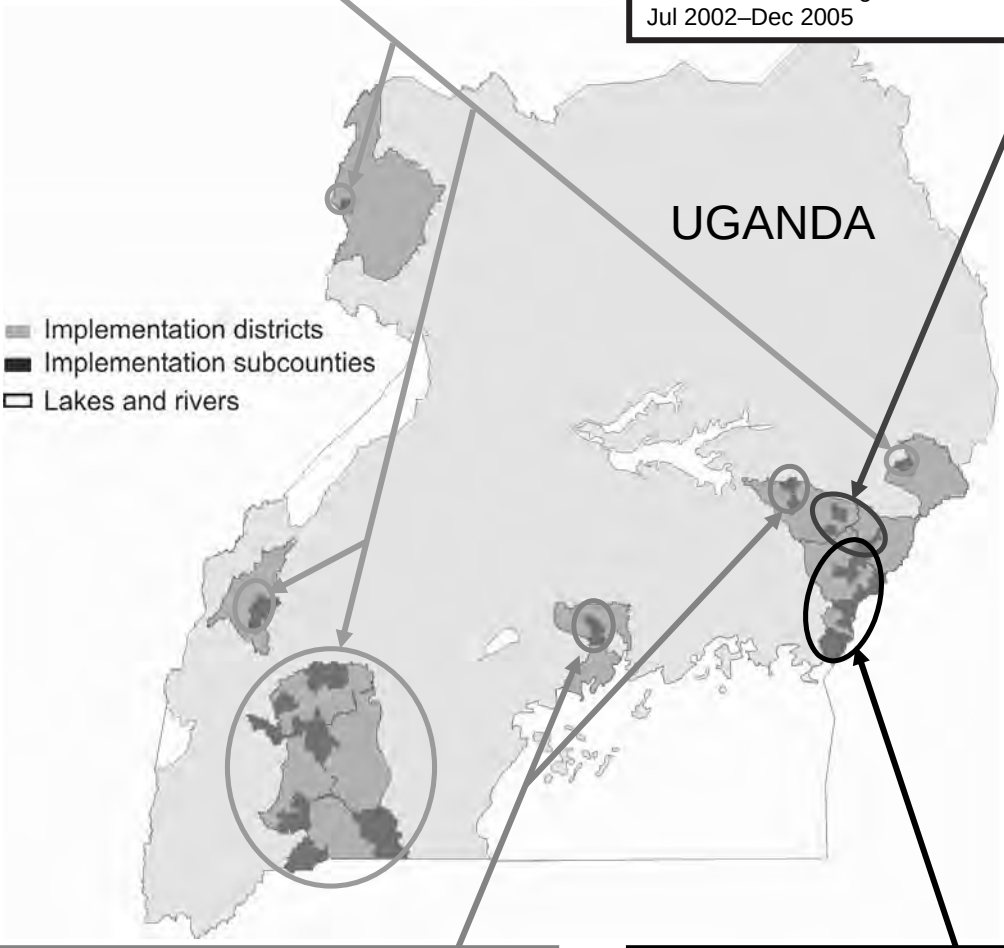
[12] ULAMP has not worked with farmer field schools, but with farmer groups. Concepts and principles used are comparable with the farmer field school approach.

Uganda Land Management Project (ULAMP)

Mbarara, Kabarole, Arua and Kapshorwa districts
Implementers: Regional Land Management Unit; Ministry of Agriculture, Animal Industry and Fisheries; district local governments
1,187 farmer groups established
882 farmer group facilitators
Donor: Sida
US$ 1,750,000 funding
Jul 1999–Oct 2003

Piloting Conservation Agriculture for Improved Land Management and Livelihoods for Smallholder Farmers (CA-FFS)

Mbale and Pallisa districts
Implementers: National Agricultural Research Organisation, Africa 2000, district local governments
48 farmer field schools established
88 farmer field school facilitators
Donor: FAO
US$ 371,000 funding
Jul 2002–Dec 2005



Integrated Nutrient Management to Attain Sustainable Productivity Increases in East African Farming Systems (INMASP)

Wakiso and Pallisa districts
Implementers: Environmental Alert, Makerere University, district local governments
6 farmer field schools established
16 farmer field school facilitators
Donor: European Union
US$ 169,319 funding
Mar 2002–Apr 2006

Integrated Soil Productivity Initiative through Research and Education (INSPIRE)

Tororo and Busia districts
Implementers: Africa 2000, CIAT/TSBF, National Agricultural Research Organisation, Makerere University, district local governments
48 farmer field schools established
62 farmer field school facilitators
Donor: Rockefeller Foundation
US$ 221,450 funding
May 2002–Jun 2005

Figure 1. Farmer field school projects on land and water management in Uganda

Technologies selected and tested

Table 8 shows the type of technologies and implementation approaches tested through the different projects.

Table 8 Type of technologies selected and tested in farmer field schools and farmer groups in Uganda

Project Name	Technologies and approaches tested
Piloting Conservation Agriculture for Improved Land Management and Livelihoods for Smallholder Farmers (CA-FFS)	• Land preparation practices to reduce soil disturbance, compaction and labour, e.g., herbicides, no-till planting tools such as jab and ripper planters • Weed management to reduce soil disturbance, e.g., cover crops, herbicides • Soil and water management practices to check erosion, e.g., physical conservation structures, cover crops, manure • Soil fertility improvement practices, e.g., manure, organic matter and crop residue recycling • Crop rotations and associations • Micro-catchment community planning • Farmer exchange visits, exposures and study tours • Grant and revolving loan approach to financing farmer field schools
Integrated Soil Productivity Initiative through Research and Education (INSPIRE)	• Organic and inorganic soil fertility inputs • Establishing optimum fertilizer combinations, application rates and methods • Cover crops for restoring fertility and building organic matter • Managing obnoxious weeds e.g., striga • Individual farmer field school group planning • Farmer exchange visits, exposures and study tours • Grant and revolving loan approach to financing farmer field schools
Uganda Land Management Project (ULAMP)	• Permanent planting pits filled with manure for annual crops • Mulching, cover crops and minimum tillage. • Cover crops in banana/coffee plantations, with soil/water conservation structures, mulching and manure application • Water harvesting pits in contour trenches, planted with banana • Terrace risers mulched and planted with cover crops • Narrow terraces for vegetables, planted after applying compost, manure and mulch, followed by cover crops
Integrated Nutrient Management to Attain Sustainable Productivity Increases in East African Farming Systems (INMASP)	• Various nutrient management technologies and soil and water conservation practices • Organic fertilizers from poultry, cow dung, kitchen refuse • Mineral fertilizer such as diammonium phosphate and urea • Combination of organic and mineral fertilizers • Legume cover crops, e.g., mucuna, canavalia, lablab as fallow

Curriculum development

Farmer field schools aim to make farmers experts in their own fields. They do this through a systematic training process of weekly discovery-based learning sessions during the crop cycle. Small groups of farmers observe the growing crop, analyse their findings, make recommendations, and share with the rest of the farmer field school members. This process allows farmers to learn, use their previous experience, and innovate alternative ways of dealing with their own problems, so improving their ability to make decisions. The process is meant to provide the farmers with investigative and analytical skills to arrive at logical, meaningful recommendations.

A farmer-centred integrated curriculum guides the process. This helps farmers define the study agenda and later subtopics they are interested in. Farmers take the lead in the learning process. The curriculum is based on a participatory training needs assessment between the farmers and a facilitator. It takes into account constraints and opportunities identified through baseline surveys. Table 9 shows an example of such a curriculum.

Table 9 Example of a conservation agriculture curriculum for a farmer field school

Period	Topic and contents	Practical exercises
Pre-experiment phase (11 weeks): Before the first rain season starts		
Weeks 1–2	Farmer field school methodology • Concepts and principles of farmer field schools • Steps in establishing a farmer field school • Organization and management	Energizer development Music, dance, drama Group dynamics
Weeks 3–7	Participatory diagnosis of constraints and opportunities • Tools for diagnosis • Problem prioritization analysis • Solution prioritization analysis	Transect walks, Resource maps Institutional diagrams Problem trees, etc.
Weeks 8–9	Community action planning • Problems/potential solutions synthesis • Participatory selection (agreement) on specific constraints to address with specific technologies, within project mandate • Commercial enterprise selection • What, who, when, where, how to do	Community and individual household dreams Visioning
Weeks 10–11	Participatory technology development • Objectives and rationale • Designing on-farm experiments • Selection of test crop • Review of constraints • Treatment/ technology • Monitoring and evaluation of experiments	Field experimental design and layout
Exposure/field visit to a functioning farmer field school to observe group dynamics and application of techniques covered		
Experimental phase (20 weeks) while study crops are growing (planting to harvesting, processing and storage)		
Weeks 12–13	Agro-ecosystem analysis • Principles and concepts • Developing monitoring indicators	Making observations in the field on crop growth cycle, soil improvement, etc.
Weeks 14–15	Soil properties and functions • Physical	Simple, field soil testing

Period	Topic and contents	Practical exercises
	• Chemical • Biological	
Weeks 16–17	Local indicators of soil quality • Terms to describe soil processes and characteristics	Field observations
Weeks 18–19	Land use planning • Land suitability classification	Farm tour
Weeks 20–24	Agroforestry • Role in environment management • Shrubs and trees for soil fertility improvement • Tree nursery establishment and management • Technologies (fodder banks, woodlots, improved fallows, etc.) • Fruit tree establishment and management	Set up a tree nursery Grafting fruit trees
Weeks 25–26	Crop husbandry • Pest and disease management • Agronomic practices	Field identification of soil-borne diseases
Weeks 27–32	Conservation agriculture principles and concepts • Tillage systems • Cover crops • Weed management • Soil and water conservation • Farm machinery & power • Catchment approach	Field observation of cover crops Practical handling of tools and equipment
Exposure/field visit to a functioning farmer field school, research station, individual farmers, etc., to see successes		
Post-experiment phase: After experimentation, and includes period after graduation		
Weeks 33–34	Adoption and adaptation of conservation agriculture • Challenges to adoption/adaptation in farming systems • Cost benefit analysis	Micro-catchment transect walk
Weeks 35–36	Networking and advocacy • Importance of networking	Exposure visit
Weeks 37–38	Farmer field school sustainability and up-scaling • Revolving fund	Exposure visit
Weeks 39–40	Market research • Group marketing	Market visit
Weeks 41–42	Graduation • Review of what has been learned • Challenges, learning process and way forward • Graduation preparations	Party
Exposure/field visit to a 2nd generation farmer field school to see success of adoption, adaptation, networking and sustainability		

Note: The curriculum is not a blueprint – it should be flexible.

Process issues, observations and needs

Developing and implementing farmer field schools for land and water management depend on experiential learning and innovation. Investments are often long term. Though it is possible to estimate the final benefits and find ways of measuring them in the short term, most land and water management technologies by their nature require a long planning horizon. When fostered, farmers innovate spontaneously. That means farmer field schools for land and water management must be adaptive. They should emphasize learning rather than working with blueprints (or learning by doing, rather than following prescriptions). The process should accept mistakes as part of the experiential learning process, and is highly consultative.

The farmer field school process was documented using video**.** The curricula were enriched with livestock management and health, with emphasis on the role of livestock in bridging nutrient cycles, as well as topical issues on crops, pest and disease management, farm management and farming as a business (including gross margin analysis), HIV/AIDS and gender. Each programme or project's curricula reflected its own situation and needs. The general building blocks of curricula across projects were agro-ecosystem analysis, special topics and group dynamic activities.

Farmer field schools have been criticized for their high operational costs and lack of a clear financial sustainability strategy. The East African Sub-Regional Pilot Project on Integrated Pest and Production Management developed a way to overcome this sustainability question. This evolved from an initial grant (with partial self-financing by the farmer field schools) into an educational revolving fund (self-financing), supported by the proceeds of commercial enterprises managed alongside the study plots. The process involved:

- Developing proposals for how to use each farmer field school's funds
- Review of proposals with project staff
- Training on savings and credit
- Opening of bank accounts for each farmer field school
- Disbursement of funds (50% loan and 50% grant)
- Monitoring and recovery
- Passing on the loan to new groups and members

Box 4 lists some lessons from 16 semi-financed farmer field schools in Mbale and Pallisa districts.

Box 4 Lessons from INSPIRE and CA-FFS project revolving funds

- Where loans were given to individuals within a group, men benefited more than women
- Most groups decided to use most of the money as loans instead of the 50:50 grant:loan as in the agreements
- Most of the grant money was used to buy learning material/inputs for the learning plots
- Farmer field school groups that were committed to saving found it easy to pay back the loan because they were building their own resource pool, even if the enterprises they invested in failed
- About 30% of the groups did not save at all because their facilitators never encouraged them to do so
- Women (70%) were more committed to saving than men (30%).

In Wakiso district, farmer field schools were facilitated to develop into community organizations with clear objectives and a constitution. These community organizations have accumulated savings and earned money from commercial plots. They can counteract high interest rates and short return periods on borrowed money from micro-finance institutions by agreeing on interest rates and return periods that are suitable for them e.g., 10% interest on funds lent and returning borrowed funds after a season's harvest. They have also been linked to the local government and other development institutions operating in the area.

Policy and scaling-up issues

One of the guiding principles of the National Agricultural Advisory Service, NAADS, is to ensure sustainable management of the environment and natural resources. But there are concerns NAADS is not well suited to provide advisory services on environmental and natural resources management. This is because NAADS concentrates on supporting enterprises that farmers select, not on general services and practices required during agricultural production. That means there is a critical need to

continuously review NAADS and reflect on ways on how to integrate environmental and natural resource issues. Farmer field schools on land and water management provide key lessons on doing so.

The National Agricultural Research and Extension Policy reforms being implemented in Uganda aim to build a more client-responsive and effective research system that fully recognizes and builds on the NAADS concepts of pluralism in agricultural services delivery, technology innovation and a client-driven approach to service delivery and technology uptake. The policy urges research institutions to develop partnerships with a variety of providers of advisory services, particularly NAADS, to orient themselves towards clients and disseminate technologies and information to poor farmers. Reviews of the research system state that farmer institutions will be at the core of the research programme, with grassroots responsibility vested in farmer groups established under the NAADS programme.

The Ugandan government's poverty eradication action plan identifies agriculture as the engine of efforts to combat poverty. The government's plan for modernizing agriculture attributes falling agricultural productivity to weak farmer–extension–research linkages that fail to respond to the real needs of farmers. The government aims to enhance extension and research efforts through increased responsiveness to farmers' needs. Farmer field schools offer one way to do this.

The government's Rural Development Strategy envisages the provision of integrated support to farmers' groups/associations. Model farmers identified for support will provide demonstration facilities for other farmers in their localities to ensure dissemination of new ideas and farm practices. Support will include provision of input kits and appropriate technology with regard to correct farming practices and ensuring that producers are able to reach the market.

The government is formulating its national policy on land, land use and soils. This is an opportunity to use the experience with farmer field schools to inform these policies.

Synthesis

In general, the conditions for scaling up farmer field schools in Uganda are favourable, given that existing institutional structures are operating in a very positive and well-developed policy environment. There is increasing interest by different stakeholders in the farmer field school process and for the first time, both research and extension systems in the country are aiming at "increasing farmers' capacity to demand and access relevant and effective technologies and knowledge for profitable agriculture." The farmer field school approach for land and water management can be adapted and integrated into efforts to develop local-level institutions, while the government's rural finance strategy can provide farmers with credit so they can pay for appropriate technologies.

For a start, pilot districts can use their farmer field school experiences and structures to mobilize and advocate for communities and scale up successes. The NAADS programme already operates in many of the farmer field school project sites, and the farmer field school networks already developed provide a platform for scaling up land and water management practices. At national level, scaling up efforts can take advantage of the trained extension and farmer facilitators to quickly take forward the process even without outside funding.

What is required is:

- The districts where the NAADS programme already operates should consider including farmer field schools on land and water management in their work plans and annual budgets at district and sub-county levels, under their programmes for farmer institutional development (with NGOs), and technology demonstration (private extension providers).
- Further technical backstopping and capacity building are needed for private extension providers on soil, water and land management and conservation agriculture. Funding for this could be provided through the private sector capacity building component available in the

NAADS programme. Cost-sharing ventures can be explored by the private sector extension providers making a contribution e.g., for their personal allowances (per diem and transport) while government or donors could provide or pay for the staff required.

- Donors should consider further supporting the formative stage of the scaling up process by providing technical guidance in developing a national programme and by mobilizing resources.
- It is important to advocate for greater involvement of farmers and other stakeholders in technology development and evaluation. Key policies and programmes are needed to influence the research institutions, NAADS and the Plan for modernization of agriculture. These can be incorporated during periodical reviews of these policies and programmes.
- It is important to advocate for mainstreaming of the farmer field school approach and its principles in research policy so that this approach to land management can be scaled up to other areas.

Conclusion

Pilot projects using farmer field schools to promote improved land and water management in Uganda have yielded commendable achievements. They have shown that land degradation and food insecurity can be reduced and livelihoods improved through farmer field schools. Concerted efforts from all stakeholders – government, donors, civil society, the private sector, development partners and communities – are needed to invest in farmer field schools and scale up the successes created by these pilot activities.

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2.5 West Africa: Review of land and water management farmer field schools experiences in West Africa

Karim Traore[13]

Farmer field schools were introduced to West Africa during the mid-1990s with the assistance of the FAO Global Integrated Pest Management Facility. Since then significant farmer field school programmes have begun to develop in the region. The first results are promising, and farmers in many areas are now able to apply land and water management technologies in their own fields without the participation of the extension service.

This review covers five countries in West Africa: Burkina Faso, Mali, Niger, Senegal and Togo.

Sub-regional participatory training programme on integrated plant production and pest management through farmer field schools in Burkina Faso, Mali and Senegal (GIPD-CEP)

The programme drew from various pilot experiences in West Africa from 1995 to 2001. It started in 2001 and was funded by the Netherlands government. Its objectives were to:

- Promote the rational and judicious use of pesticides
- Acquire knowledge and practices necessary for pest management
- Increase farmers' capacity for decision making at the field level
- Improve crop productivity at low cost in ways that protect the environment.

Integrated production and pest management includes four principles. The first of these (produce a healthy crop) fits well with the land and water management programme. This principle focuses on agronomic crop management aspects, especially high yielding varieties, good seed quality, good land preparation, judicious use of mineral and organic fertilizers, and good management of weeds and water.

The learning process in the programme was based on participatory training through farmer field schools. The curriculum included the study of crop management, agro-ecosystem analysis, insect zoos, special topics and group dynamics. The study on crop management compared farmers' and improved practices. Commodities tested included vegetables, rice and cotton. Table 10 shows the number of farmer field schools established by the programme. The farmer field schools had an average of 18 members each.

[13] INERA, Burkina Faso

Table 10 Number of farmer field schools and farmers in the GIPD-CEP programme

Year	Rice		Market gardening		Cotton		Total	
	Farmer field schools	Farmers	Farmer field schools	Farmers	Farmer field schools	Farmers	Farmer field schools	Farmers
Burkina Faso								
2001–2	75	1553	4	89				
2002–3	38	812	31	645				
2003–4	77	1189	66	1032	4	73		
Total	**190**	**3554**	**101**	**1766**	**4**	**73**	**295**	**5393**
Mali								
2001–2	36	632	12	142				
2002–3	55	832	40	696	5	82		
2003–4	94	1519	67	1456	15	293		
Total	**185**	**2983**	**119**	**2294**	**20**	**375**	**324**	**5652**
Senegal								
2001–2	5	120	19	316				
2002–3	18	284	57	1121				
2003–4			92	1932	3	57		
Total	**23**	**404**	**168**	**3369**	**3**	**57**	**194**	**3830**
Overall	**398**	**6941**	**388**	**7429**	**27**	**505**	**813**	**14875**

Source: IPPM evaluation report

In the test plots, improved practices yielded significantly more than the farmers' practices (Table 11). They also used fewer pesticides, which translated into higher incomes for farmers. It is likely that the reduced use of pesticides also improved the farmers' health and protected the environment. Farmers also said the use of fertilizers and seed was improved, and the quality of the crops went up.

In 2004, after 3 years of project activities, some 248 technicians and 472 farmer facilitators had been trained or were being trained in the three countries (Table 12).

This training capacity will allow the implementation of 450 farmer field schools, training 9,000 farmers during each cropping season. There were relatively few women facilitators compared to the numbers of women farmer field school members.

The training material was diversified and included pest control and agronomic issues. The facilitators greatly appreciated the training system. Farmers identified some constraints, including the lack of credit for fertilizers, water management, land tenure, lack of equipment, and market issues. These constraints could limit the application of land and water management options tested in the programme.

Facilitators need a background in agronomy to adjust the curriculum to local conditions. The high level of illiteracy among farmers limited the choice of farmer facilitators. Literacy projects now underway should help improve farmers' participation in the programme.

Table 11 Crop yield benefits and input use changes, GIPD-CEP programme

Country, crop	Yield changes		Pesticide cost changes		Other input cost changes		Net benefit changes	
	%	*n*	%	*n*	%	*n*	%	*n*
Burkina Faso								
Rice	+27	*121*	–24	*121*	0	*7*	+81	*19*
Tomato	+17	*15*	–81	*15*	–16	*15*	+135	*6*
Cabbage	+38	*19*	–75	*19*	+15	*19*	+110	*6*
Mali								
Rice	+19	*7*	–100	*7*	+25	*7*	+41	*8*
Tomato	+44	*5*	–80	*6*	–45	*6*	+36	*3*
Onion	+31	*4*	–92	*4*	–50	*4*	+36	*4*
Cotton	+21	*17*			–10	*17*	+58	*17*
Senegal								
Rice	+23	*15*	–100	*15*	+10	*15*	+36	*13*
Gombo	+21	*8*	–42	*18*	+20	*10*	+40	*8*
Tomato	+11	*12*	+10	*24*	+33	*13*	+7	*14*
Cabbage	+28	*14*	–7	*24*	+13	*15*	+41	*14*
Onion	+23	*15*	0	*10*	+5	*4*	+127	*8*

Source: IPPM evaluation report

Table 12 Number of facilitators (farmers and technicians) trained or in training, GIPD-CEP programme

	Rice		Market gardening		Cotton		Total	
	Technicians	Farmers	Technicians	Farmers	Technicians	Farmers	Technicians	Farmers
Burkina Faso	34	144	36		4		74	144
Mali	19	172	44	14	20	31	83	217
Senegal	15	10	71	101	5		91	111
Total	**68**	**326**	**151**	**115**	**29**	**31**	**248**	**472**

Source: IPPM evaluation report

The farmer field school training raised the farmers' capacities, and they can now solve for themselves many problems in land and water management. But teaching material is still weak on some topics. Farmers have limited access to credit to buy fertilizers and equipment, and this can limit their application of what they have learned. Farmers also often bring up the problem of security - critical issues for investing in land owners have more incentive than tenants to invest.

Promoting fertilizers use by farmers in Niger

This FAO-funded project (GCP/NIGER/041/BEL) works with 1,800 farmers' organizations, grouped in 26 networks and formal unions. The project's training programme promotes the rational use of fertilizers, especially using low doses. The networks offer an opportunity for trainers to bring technical messages to farmers. The project has supported the creation of 200 fertilizer shops, and 60 more are planned. The shops order fertilizers for the farmers' organizations, sell fertilizers to farmers, and deliver information on many topics. These shops are managed by farmers' organizations, but non-members can also buy there.

The project collaborates with two research institutes (INRAN, the National Agricultural Research Institute of Niger; and ICRISAT, the International Crops Research Institute for the Semi-Arid Tropics), which train the farmer trainers. The training sessions are participatory (workshops, visits and practical exercises). A quarter of the participants are women – a smaller percentage than the 40% of the farmers' organization members who are women. The farmers do the training themselves, and cover many different topics – trading, processing, drying legumes and other topics.

Evaluation of this approach showed that relatively few farmers actually adopted the recommendations. So in 2004 the project introduced the concept of farmer field schools. It has established 34 farmer field schools in seven regions in Niger: Agadez, Diffa, Dosso, Maradi, Tahoua, Tillabery and Zinder. It trained 24 farmers as facilitators (23 men, one woman).

The farmer field school members choose what technologies to test during a workshop. They have decided to focus on problems with soil fertility and crop pests in cereal and legume production. Training materials cover the farmer field school approach, principles of non-formal education, integrated management of production and protection, agro-ecosystem analysis, special topics, and group dynamics.

The farmer field schools are still in the early stages, so few data are available. But evaluation after one year shows that the technologies the farmers have chosen to test are relevant for the region. They have expressed a special interest in training on the causes and signs of soil fertility decline, the role of fertilizers in the soil, and how to improve soil fertility without inorganic fertilizers.

The farmer field schools currently have about 20 members each, but this will rise to 25–30 in order to strengthen the small discussion groups. The number of farmers per group will be reduced from 10 to six–seven to increase the level of interaction among the group members. The experimental fields differ in size from one farmer field school to another.

The evaluation found some confusion between learning and commercial activities, and tests involving too many treatments and crop varieties. An ideal test should consist of one 10 m x 20 m plot with integrated crop production and protection including soil and water management techniques, compared with a plot with the farmers' traditional practices. Special study plots may be 5 m x 10 m each; they may compare three treatments with different levels of fertilization, varieties or pest control methods. A half-hectare seed production plot can be used to earn money. Simple trials are key to successful learning.

Other problems include inadequate training of facilitators on the farmer field school methodology, land tenure issues, and the comparability of data from different plots. Each plot should have one notebook for recording agronomic and socio-economic data so the costs and benefits can be calculated at the end of the study.

The fertilizer shops are necessary for the farmer field schools because they supply them with inputs. Boosting the number of external partners (in addition to INRAN and ICRISAT) would allow the technologies to be disseminated further.

Promoting fertilizers use by farmers in Togo

This FAO-funded project serves 3 regions in Togo, with four villages in each region. It uses the farmer field school approach to improve farmers' knowledge on land management. The project covers 307 farmers, 46% of whom are women.

The technologies tested in the 12 farmer field schools deal with sorghum, maize and cassava production under various soil fertility management alternatives. The training covers the farmer field school methodology, selecting and testing technologies, formulating and executing training activities, special topics, and agro-ecosystem analysis.

The project works closely with the Institut d'Appui et de Conseil Technique, the Institut Togolais de Recherche Agronomique, and NGOs. The project started using farmer field schools in 2005.

Good agricultural practices in cotton–cereal–livestock systems in Burkina Faso to enhance farmers' livelihoods

This project, funded by the governments of Norway and the Netherlands, involves FAO, the Institut de l'Environnement et de Recherche Agricoles, and their partners. It uses a farmer field school approach with integrated production and pest management and agro-ecosystems analysis as key features of the curriculum. It also includes elements on many other topics, including soil fertility management, conservation agriculture, integrated farm management, farmer field school methods, organization strategies, intercropping and rotation of cereals and legumes, the integration of cropping and livestock, and agroforestry.

A pilot farmer field school was established in 2005 in Bama, western Burkina Faso, in collaboration with the Union Nationale des Producteurs de Coton du Burkina, the cotton farmers' union. It tested soil fertility management methods and conservation agriculture. After this promising start, the programme plans to train about 20 facilitators and about 200 farmers through 10 farmer field schools during the 2006 growing season in collaboration with the union.

Policy issues and scaling up

In most West African countries, state extension services remain the largest organizations engaged in technology dissemination. Given the right conditions (appropriate public policies, adequate infrastructure and effective consumer demand), the private sector could provide a wide range of production inputs and services such as credit and veterinary services. But providing technical advice on crop production techniques, natural resource management, small enterprise development and others has not attracted the private sector. Local governments count on farmers' organizations and NGOs more and more to provide such advice. But many are not organized in the right way to train farmers through farmer field schools.

As a result of the demise of the training and visit model of extension, governments must decide on the type and size of programmes they can support through their own resources. In response, national programmes have begun to gravitate towards alternative extension methods and financing models.

Farmer field schools are a broad, comprehensive strategy to extension. Table 13 compares them with the training and visit model.

Table 13 Comparison of training and visit and farmer field school models in Niger

	Training and visit	Farmer field schools
Organization and group functioning		
Participants	Contact group of 10 farmers from the same village or from different villages	Group of 25–30 farmers from a farmers' organization or union
Local leadership	No management committee	Farmer field school management committee
Men/women	Contact group mixed or men/women only	Farmer field school group mixed or men/women only
Working code	No working code	Working code
Frequency	Training every 15 days for agronomic observations	Learning every week in the field
Training programme		
Content	Related only to technologies tested	Integrated: includes production and pest management, special topics and group dynamics
Design	Regional diagnosis and planning by central extension office	Participatory diagnosis and development of curriculum during farmer workshop
Training scheme	Research to extension technicians Extension technicians to supervisors Supervisors to technician facilitators Technician facilitators to farmers	Research to facilitators and farmers in the field using adult non-formal education methods
Integrated management	Demonstration plots for each theme	Demonstration plots for integrated management and farmers' practices. Special studies and commercial plots
Learning field	Individual field of a member of the contact group	Collective field
Learning process	Training in two steps: theory and practice	Analysis of agro-ecosystem and field results
Visits and field days	Exchange visit, field day	Exchange visits to other farmers' plots, field day
Evaluation	Evaluation	Evaluation and participatory planning

Source: Evaluation report of the fertilizer project in Niger

Various measures are necessary to successfully scale up the farmer field school approach:

- Ensure that farmer field school facilitators are trained appropriately.
- Select facilitators from various government, non-government and farmers' organizations. Ensure they have a background in agricultural education.
- Develop a human resource strategy for training.
- Guarantee that trainees stay at their location for long enough to establish the farmer field school.
- Train more women as facilitators.
- Incorporate the farmer field school approach into the curricula of universities, agriculture schools and training centres.
- Ensure that the required inputs, equipment and credit are available to farmers so they can adopt the technologies they are testing.

Farmers in farmer field schools face problems marketing some of the produce they grow – for example rice in Burkina Faso and vegetables in Senegal. Grouping the farmer field schools into networks (as in Niger) may be a solution to this. Such networks can maintain the collective community action fostered by the farmer field schools. Well-organized networks have many benefits: they can help sustain the farmer field school process by building leadership, financial management and conflict resolution capacity of farmer groups, and by coordinating the marketing of produce.

The current method of funding farmer field schools is not sustainable, and recently there has been a shift towards self-financing. With coherent and well-facilitated groups, it is possible to progress from completely donor financed, to partially financed, to self-financing. The fertilizer shops programme in Niger has been successful, and a similar system could be used to support the functioning of farmer field schools elsewhere.

Synthesis

In West Africa, the farmer field school approach is an efficient way to overcoming farmers' production constraints in general, and land and water management problems in particular. Farmer field schools helped improve land productivity and farmers' income. Practitioners were trained on specific topics and enable them to use natural resources in a sustainable way. Farmers' skills were also improved. Farmer field schools involve many partners – research institutes, extension services, farmers' organizations and NGOs – as a result of which the intervention capacity of these organizations has improved. This has also contributed to a broad awareness and approval of the approach and reduces the risk of dependency on a limited number of partners. Because all farmer field school projects are part of governments' overall rural development programmes, it increases the chance that the farmer field school model is used in national extension systems.

The most important constraints to the replication or adoption of farmer field schools in West Africa are:

- Many farmers cannot read or write, limiting the choice of farmer facilitators.
- There are few female facilitators, limiting the participation of women in farmer field schools.
- More training materials are needed on land and water management.
- Access to inputs and credit limit farmers' ability to use the options they test.

Overcoming these constraints will be necessary to improve the impact and expand the use of farmer field schools in West Africa. The pilots in Niger and Togo on organizing fertilizer purchases can be tested in other countries. The learning process in farmer field schools can improve if the farmers and facilitators all understand clearly the problem they ware tying to solve. They should select technologies to test in a participatory way, prioritizing the constraints and opportunities. The treatments to test should be as simple as possible, with a limited number of factors (e.g., types of fertilizer) and levels (e.g., fertilizer dosages). A literacy programme should always be associated with the projects to ensure that farmers can participate fully and can use the training materials. Partnerships are very important for scaling up technologies and farmer field schools themselves. More organizations should be included as partners in farmer field school initiatives.

Conclusions

Many other projects on land and water management exist in West Africa but do not use the farmer field school approach. Although the farmer field school concept was introduced to the region in the 1990s, most of the projects reported here are recent, and for most the results are based on only one year of operation. That means it is too early for a final evaluation of these programmes.

Nevertheless, significant farmer field school programmes have begun to develop in the five countries reviewed, covering a range of production systems, from irrigated rice to rainfed cereals, cotton and vegetables. Although the approach is not without problems, the potentials it offers appear great, and are only now being explored by governments for use in the extension system. However, the success of broad-based implementation is closely tied to the successful testing of new approaches in pilot projects and adapting them to local conditions.

The farmer field school approach involves significant training efforts (field training of facilitators takes place over an entire growing season), so success largely depends on the training capacity of the "Master trainers" in FFS learning- by-doing approaches and their timely role in bringing in specialists for on the job technical training. The transfer of land and water management technologies tested in the farmer field schools to more farmers requires close cooperation with players in the fertilizer market and with credit providers.

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2.6 Zambia: Farmer field school experiences in sustainable land management in the Zambian *miombo* woodlands ecosystem

Martin N. Sishekanu[14]

This review focuses on a project funded by the Global Environment Facility that uses farmer field schools to promote sustainable land management in Mikusi and Serenje Districts, in the northern part of Central Province, Zambia (Figure 2).

The project has several goals: reduce carbon emissions from unsustainable slash-and-burn practices locally known as *chitemene* in the *miombo* woodlands (areas dominated by *Brachystegia* and similar species of trees); conserve globally significant biodiversity; and improve local people's household food security and incomes. It is currently in year 3 of the planned 4 years.

There are three major categories of crop production systems in the project area: the traditional *chitemene* system, conventional cultivation, and conservation farming practices. Before the project began, most farmers used *chitemene* (70% of the 15,000 farm households in Mkushi, 97% of the 18,000 farm households in Serenje). The rest used conventional cultivation, except about 3% of farmers in Mkushi, who used conservation farming.

The project has five components. Four of these are: promoting sustainable land management in the two districts; capacity building; supporting studies; and project management, monitoring and evaluation, and information dissemination. The fifth component, scaling-up of the sustainable land management approach to other areas in Zambia, is not being addressed due to lack of funding.

An initial inventory of conservation farming and integrated ecosystem management technologies suitable for the project area resulted in a preliminary list of subjects to address in the farmer field schools. This included the role of organic matter in soils, soil nutrient management including biological nitrogen fixation, the consequences of soil acidity, liming, crop rotation, cover crops, zero and minimum tillage, the impact of burning crop residues, agroforestry, and community management of biodiversity.

The project suggested three models for each farmer field school group to choose from:

- Staple food and cash crop
- Staple food and finger millet
- Staple food, finger millet and cash crop.

The facilitators and farmers chose the model that best suited their area. The models were based on the principle of crop rotation, the production of food staples and cash crops, and soil fertility improvement.

[14] Sustainable Land Management in the Zambian Miombo Woodland Ecosystem Project

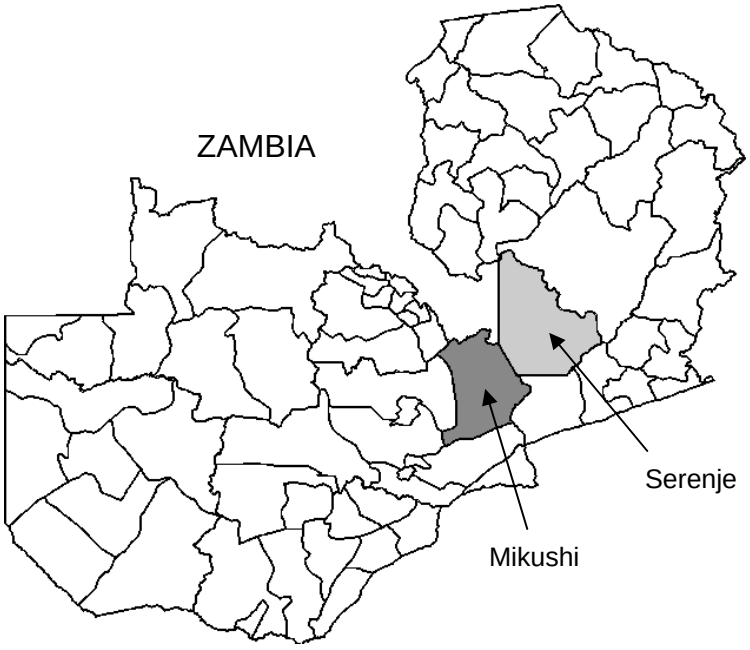

Figure 2 Miombo Woodlands project locations

The project aims to establish 325 farmer field schools, increase the number of farmers using conservation farming to 6,000, and boost maize yields from 800 to 1,200 kg/ha. By its third year, the project had established 233 farmer field schools, some 3,800 farmers were using conservation farming techniques, and maize yields had more than tripled, to 2,570 kg/ha. More than half the 6,240 farmers involved in the farmer field schools were women.

Experience has shown that it is important to spell out the purpose and objectives of the farmer field schools right at the beginning. Facilitators must have effective facilitation and technical skills. One way to help them learn these is through "try-out farmer field schools" to give them the skills and confidence they will later need.

The farmer field school approach has proven an effective way of disseminating information and implementing technology. It enables farmers to learn both the theory and practice of new techniques. Through its emphasis on learning by doing, it creates a lasting impression in farmers' minds. Because it takes place in the field, it enables the farmers to use their own knowledge to solve their own problems. It creates opportunities for farmers to ask questions and clear doubts on what is being taught.

Some other lessons:

- The facilitator should be present at most meetings for them to be effective.
- The layout of the farmer field school test plots should not be complex.
- Maintaining a cover on the soil (important in conservation farming) is difficult in the project areas.
- Field days and tours are important methods of disseminating information.
- Farmers – like donors! – want technologies that can yield results in the shortest possible time.
- Farmer field school projects should collaborate with other stakeholders in the area to avoid unnecessary competition.

2.7 Zimbabwe: Review of land and water management farmer field school experiences in Zimbabwe

Jan Venema[15] *and Davison Masendeke*[16]

Farmer field schools were first introduced in Zimbabwe in 1997 by FAO under a technical co-operation programme (TCP/ZIM/6712), whose main focus was integrated production and pest management by smallholder cotton farmers. The first farmer field schools on land and water management were initiated by the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) and FAO from 2000 onwards (Table 14). These are described below. Several other projects use, or have used, participatory approaches other than farmer field schools to promote land and water management. These are discussed later.

Small Grains Integrated Soil Water Nutrient Management

Probably the most significant farmer field school initiative for land and water management has been the Small Grains Integrated Soil Water Nutrient Management project, which ran from October 2000 to December 2004. It was implemented by Department of Agricultural Research and Extension, with support from ICRISAT and FAO. Funding came from the Rockefeller Foundation, FAO and Plan International.

The main goal of the project was to improve the livelihoods of farmers growing small grains (sorghum, millet) in highly variable and risky semi-arid environments. This was to be achieved by establishing farmer field schools and equipping farmers with better farm management skills and decision-making capacity to improve crop (and livestock) performance. The project outputs are summarized below.

- The project identified constraints and opportunities for soil water nutrient management in three districts through participatory situation analysis.
- It trained three district facilitators to establish and operate farmer field schools on integrated land management and lead future training-of-trainer courses.
- It trained 53 farmer facilitators to start and run farmer field schools in three semi-arid districts.
- It established more than 130 farmer field schools, 27 of which were led by farmers.
- It trained 600 farmers trained in integrated land management in sorghum/millet based farming systems in the three districts.
- It developed training modules on land management for core trainers, as well as a participatory monitoring and evaluation framework.
- It outlined an expansion strategy.

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Table 14 Projects and activities using farmer field schools for land and water management

Project	Implementing institution (donor), years	Technical focus	Trained facilitators	Farmer field schools	Future
Small Grains Integrated Soil Water Nutrient Management phase 1	ICRISAT, Dept of Agric Research and Extension, FAO (USAID, Rockefeller, etc.) 2000–2	Small grains, integrated soil water nutrient management	Extension trainers 3 Extensionists 20	Extension-led 7	See next row
Small Grains Integrated Soil Water Nutrient Management phase 2	Dept of Agric Research and Extension, International Crops Research Institute for the Semi-Arid Tropics, FAO (FAO) 2002–4	Integrated soil water nutrient management, livestock feeding	Extensionists 43 Farmers 53	Extension-led 99 Farmer-led 27	Ongoing in 2006
Integrated Plant Nutrition Systems	Africa Centre for Fertilizer Development (FAO) 1998–9	Integrated plant nutrition systems	Farmers 16	Farmer-led 16	Fate uncertain in 2006
Conservation Farming through Farmer Field Schools	Africa Centre for Fertilizer Development, Dept of Agric Research and Extension (UNDP, Global Environment Facility) 2003–	Conservation farming (maize)	Extensionists 6 Farmers 9	Extension-led 5	Ongoing in 2006
Junior Farmer Field Schools	Dept of Agric Research and Extension, Catholic Relief Services, FAO, Organization of Rural Associations for Progress (FAO, Catholic Relief Services) 2003	Integrated soil water nutrient management, poultry, agribusiness, HIV/AIDS	Extensionists 9 Children 185	Extension-led 9	Ongoing and poised for expansion

Most of the farmer field schools are still active, but high staff turnover within the Department of Agricultural Research and Extension means that not all the trained extension workers are presently active as farmer field school facilitators.

Curriculum development. A participatory process produced a curriculum for integrated soil water nutrition management in sorghum and millet. This covers:

- A course on **soil fertility management practices**, including subjects such as selecting the right crops for different soil types and soil moisture regimes; crop nutrient requirements; using annual legumes in soil fertility management; use and management of animal manure; utilizing inorganic fertilizers and use of organic soil amendments. Farmers validated some of the suggested management plans in their own fields.
- A course on **soil and water conservation** theory and practices, i.e., soil erosion and the water cycle; gully erosion and control methods; pegging for improved soil and water management; control barriers for soil and water conservation; tillage and water conservation; management of wetlands and agroforestry and tree plantations. Again, farmers validated some of the management plans.

Training of trainers. Three agricultural extension officers attended an intensive 2-week residential course focusing on growing small grains, soil and water conservation, and soil fertility enhancement technologies. They also attended a season-long training on integrated production and pest management in vegetable crops, where they learned the farmer field school approach. This training gave them broad theoretical and practical knowledge on soil fertility management, and soil and

water conservation practices; the agronomy of cereals (maize, sorghum, pearl millet) and legumes such as groundnuts, cowpea and *mbambara* nuts; and the skills needed for running local training programmes for farmer field school facilitators.

Farmer field schools. Seven pilot farmer field schools with about 175 farmers were established in three districts in southern Zimbabwe in the project's first phase (2000–2). The farmer field schools revealed that using inorganic fertilizers, applying animal manure and anthill soil increased crop yields. Using ridges to conserve soil moisture improved the plant emergence and boosted yields (compared with planting on the flat). But farmers considered the technique too labour intensive and hard to practice on large fields because they had to make the ridges by hand (in subsequent years, they made them using an ox plough). Overall, the combination of fertility and soil water management practices increased yields and incomes.

Second phase. The second phase of the project (2002–4) involved 205 farmer field schools with about 3,800 farmers. It trained 46 extension workers through an intensive two-week residential course covering gully erosion and control measures, soil erosion and the hydrological cycle, control barriers for water and soil conservation, tillage systems and water conservation, management of wetlands, agroforestry and tree plantations in soil conservation, and using the line level and A frame to mark contours.

Post-project activities. After donor funding ended in 2004, farmers continued applying what they had learned on their own. Groups continued conducting experiments in small study plots. They tested level contour ridges, potholing, kraal manure and inorganic fertilizers. The farmer facilitators were motivated to continue running the farmer field schools because they would be implementing the practices in their own fields. They appreciated the difference between the farmer field school and the traditional "master farmer" approach. Some continued even without payment, as they felt they owned the activities, worked together as a group and were appreciated by the community. Catholic Relief Services later inherited three farmer field schools in each district and continues to fund them.

In Zvishavane District, Midlands Province, all 24 facilitator-led and eight farmer-led farmer field schools operating in 2003–4 continued during the 2004–5 season with technical backstopping from government extension workers. The farmer field school groups ventured into seed multiplication, including cowpea under contract with the Agricultural Rural Development Authority. NGOs helped establish junior farmer field schools on poultry. In Gwanda District, Matebeleland South Province, activities continued after December 2004, resulting in contracts to multiply seed of groundnut, sorghum and pearl millet. In Tsholotsho District, Matebeleland North Province, 60 out of 64 farmer field school groups remained active during 2004–5. Some received support from NGOs and the Grain Marketing Board and ventured into commercial and food security projects. Farmer facilitators formed ten farmer field schools in the second season after donor funding ceased. These are still active.

Integrated Plant Nutrition Systems

From August 1998 to December 1999, the African Centre for Fertilizer Development, with FAO assistance and in close collaboration with the Department of Agricultural Research and Extension and interested NGOs, introduced the concept of integrated plant nutrition to local farmers. This concept aims to boost crop production and farmers' incomes by increasing soil fertility. The project trained 17 lead farmers, who then established 12 farmer field schools in their home villages for at least 320 farmers. What happened after donor funding ceased is uncertain. The lack of funds meant it was not possible to continue monitoring the farmers living in remote areas after donor funding ceased; no farmer field school or community action has been reported since 2000.

Conservation Farming through Farmer Field Schools

The African Centre for Fertilizer Development is currently promoting conservation farming through farmer field schools. This programme, which started in 2004, is funded by UNDP, initially through the Africa 2000 Network and then the Global Environment Facility's Small Grants Programme. It is implemented by the Department of Agricultural Research and Extension and lead farmers. The programme began in four districts: Bindura (Mashonaland Central), Seke (Mashonaland East), and Chegutu and Kadoma (Mashonaland West), but now focuses on Seke near Harare for logistical reasons. So far, the African Centre for Fertilizer Development has trained six Department extension workers and nine lead farmers. Five farmer field schools were formed in 2003–4 and an additional two in 2004–5, training a total of 125 farmers.

Junior farmer field schools

In 2003, Catholic Relief Services and FAO added eight "junior farmer field schools" in the same three districts as the Small Grains Integrated Soil Water Nutrient Management project. These junior farmer field schools had 185 children as members. Apart from soil and water management, the children also studied poultry, agribusiness and HIV/AIDS.

Other projects and activities on land and water management

Several other organizations run (or have run) programmes to extend land and water management technologies. Most use participatory extension approaches, though not farmer field schools. Some have scored considerable successes. Three are covered here (Table 15).

Table 15 Other land and water management projects and activities

Project	Implementing institution (donor), year	Technical focus	Trained facilitators	Farmer groups on land and water management	Future
Chivi Food Security Project	Intermediate Technology Development Group 1991–97	Land and water management, micro-irrigation			Ended with donor funding
Smallholder Drought Mitigation Programme Study Circles	Swedish Cooperative Centre (Sida) 1997	Various, including land and water management		Farmer: several thousands (not only land and water management)	Strong support to expand beyond 2006
Gwanda Community Based Natural Resources Management and Sustainable Livelihoods	Practical Action Southern Africa (Germany) 1999–2006	Infield rain water harvesting	Extensionists 6 Local leaders 10 Local drivers 240 Group leaders 202 Contact farmers 450	?	Fate unknown after 2006

Chivi Food Security Project

The Chivi Food Security Project (Intermediate Technology Development Group, 1991–7) was one of the earliest participatory agricultural extension approaches with a strong land and water management component. During Zimbabwe's worst drought in a century in 1991–2, ITDG and the local government started a food security programme in semi-arid Chivi District, in Masvingo Province in southern Zimbabwe. The project aimed to explore alternative strategies and technologies for agricultural extension, help farmers' institutions identify their priority needs and strengthen their capacity, work with local institutions to identify and develop technological options, by building on their traditional knowledge, and influence government agricultural policies to take into account the production needs of small-scale farmers.

The project undertook a participatory extension approach. Activities centred on farmers' clubs and garden groups. The approach was to expose farmers to a menu of possible advanced technologies from a variety of sources, and to encourage them to develop and evolve them, or to reject them. The most popular land and water management technologies included tied ridges, infiltration pits, and sub-surface irrigation clay pipes (the pipes were made by local potteries). The farmers shared these methods among themselves and spread them to other districts through forums, seminars, seed fairs and radio broadcasts. The project also developed a curriculum[17] and trained trainers in participatory extension approaches.

Smallholder Drought Mitigation Programme Study Circles

Study circles are a common form of adult education in Sweden and were introduced in Zimbabwe in 1997 by the Swedish International Development Agency through the Swedish Cooperative Centre in cooperation with the Zimbabwe Farmers Union as part of the Smallholder Drought Mitigation Programme. Study circles are a participatory approach in which groups of five to 15 farmers sit in a circle discussing issues. The Swedish Cooperative Centre has so far produced 14 booklets through the Southern Africa Development Community's Centre of Communication for Development, including one on water and soil conservation, and another on conservation farming. It has translated these into Shona and Ndebele. To promote study circles, inter-sectoral committees are formed at district and sub-district levels. Each ward has a facilitator, trained by the Swedish Cooperative Centre, who supervises a large number of study circles (in one exceptional case, one ward supervisor facilitates 256 circles). In early 2006, study circles were active in 198 wards in seven districts with an estimated 77,000 participating farmers. The programme has recently received support from various NGOs and donors and from the Ministry of Agriculture.

Gwanda Community Based Natural Resources Management and Sustainable Livelihoods

This is a project being implemented by Practical Action Southern Africa (the new name for Intermediate Technology Development Group) and funded by the government of Germany. It has been running in semi-arid Gwanda district in southern Zimbabwe since 1999, and uses an extension approach called "farmer-to-farmer extension support system".

The project focuses on soil and water conservation mainly through in-field rainwater harvesting. More than 2000 households in Gwanda have adopted one or more the following technologies:

- Marking contours using an A frame
- Low cost rainwater harvesting structures – dead-level contours, infiltration pits and low-cost water storage tanks

[17] AGRITEX, GTZ and ITZ (1998). Learning together through participatory extension: A guide to an approach developed in Zimbabwe, AGRITEX, Harare, 59 pp.

- Seed multiplication, preservation and storage
- Soil fertility mechanisms using locally available resources
- Empowerment of local drivers or champions of change, and improved demand-driven service provision.

Curriculum development and training materials

Box 5 lists some materials that have been developed on land and water management in Zimbabwe.

Box 5 Curricula and training materials related to farmer field schools on land and water management

- AGRITEX, GTZ and ITZ. 1998. Learning together through participatory extension: A guide to an approach developed in Zimbabwe. AGRITEX, Harare.
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Strengths, weaknesses, opportunities and threats

Box 6 shows a SWOT analysis for farmer field schools in Zimbabwe. This analysis applies to all types of farmer field schools, not just those on land and water management.

Reasons farmer field schools have not expanded

Past farmer field school activities rarely went through all the steps generally followed in the implementation of a farmer field school. Most went as far as the pilot phase, and very few managed to go as far as the expansion phase let alone as far as the community action phase. Some of the reasons for this are outlined below.

Lack of coordination between government departments running farmer field schools. In the case of the first farmer field school project in Zimbabwe (the integrated production and pest management project in 1997–9), a lack of coordination among the members of the national working group is among the main reasons why the farmer field school activities did not expand during and after the project (FAO-SAFR, 2006). This national working group was drawn from various government units, which did not agree on day-to-day issues. After five seasons of farmer field school activities, the working group could not come up with a national policy to institutionalize the

farmer field school approach. A coherent concept for farmer field school institutionalization has still not materialized.

Box 6 SWOT (strengths, weaknesses, opportunities and threats) analysis for farmer field schools in Zimbabwe

Strengths

- Makes farmers capable of making their own choices in an ever-changing environment
- Has potential of exponential growth through use of farmer facilitators
- Can be used simultaneously with other extension and adult education methods
- Through income-generating projects, farmer field schools can become independent from government resources
- Government extension workers can assist groups rather than individual farmers, so become more efficient
- Farmer field schools have a strong and statistically significant positive impact on yields (Rusike, 2005)

Weaknesses

- Expensive in initial stages
- Not effective for quick, straightforward technical message delivery
- Requires major change in attitude of farmers and extension workers
- Insufficient land and water management technologies readily available for farmers in various socio-economic and agro-ecological conditions to choose from
- Considered demanding by extension workers
- Weak link between agricultural research and extension
- Insufficient resource material development for farmers and facilitators

Opportunities

- General interest in participatory extension methods by government and donors
- Clubs and small interest groups are common in Zimbabwe
- Government realizes that present extension efforts are not sufficient
- Properly institutionalized farmer field schools can apply for credit (e.g., from Agribank)
- Farmer field schools are a good instrument for resource-poor households (farmer field school membership has shifted from richer to poorer farmers over the years)

Threats

- Establishment may see strong, demanding grassroots farmer organization as a threat
- Lack of supervision may result in farmer field schools concentrating on technologies only, and less on empowerment and emancipation
- Lack of supervision may result in the promotion of wrong technologies
- Lack of supervision may cause farmer field schools to revert to narrow interest clubs (e.g., savings) or to Master Farmer training
- Schools may be hijacked by traditionally dominant groups (e.g., traditional leaders, educated persons, men)
- Government institutions distracted by “emergencies” and implementation of land reform
- High extension staff turnover at field level

No clear policy on facilitator trainers. In general, there is no clear policy for deploying the trainers of the facilitators after they have graduated. These people were supposed to organize provincial and district farmer field school teams and to train their field-based colleagues as facilitators. Poor organization at this level reflects the poor organization at the national level.

Inadequate resources. Late disbursement and inadequate funds for transport, stationary and other administrative requirements by the national extension service sometimes hampered farmer field schools after the project-funded phase ended.

Disruption by the land reform programme. Zimbabwe's land reform programme, which started in 2000, has hampered the expansion of farmer field school activities. Some farmer field school groups lost members because they were resettled. In the new resettlement areas, the new settlers take a long time to get to know one other and to get organized because of their different backgrounds and cultures.

Lack of exit strategies. Donor-funded projects promoting the farmer field school concept lacked exit strategies to ensure that activities would continue after the projects ended. Exit strategies need to be part of the project funding. These could be in the form of grants or revolving funds, from which farmer field schools can borrow to finance projects and pay farmer facilitators.

Donor dependency and lack of self-financing. Farmer field schools are usually initiated with donor support, and farmers are not sufficiently aware that they need to become financially independent. Also, they are not given many options to become financially self-reliant.

Lack of appropriate technologies. Conditions under which individual farmers operate vary enormously, both geographically (throughout the country) and over time (from one year to the next). Although a number of land and water management technologies have been identified, they may not be relevant to all farmers. More technologies have to be listed, evaluated and targeted.

Lack of appropriate equipment. There is a lack of equipment, particularly for mechanized soil and water conservation and mechanized conservation agriculture.

Policy and scaling up

The way forward for farmer field schools in Zimbabwe has been discussed on several occasions (Masendeke, 2005; Rusike and Masendeke, 2005). But the various stakeholders have taken very little action since then. Action has also been disrupted by the merger of the government's research and extension agencies.

Institutionalization

Zimbabwean farmers, farmer organizations, research and extension staff, agricultural colleges, NGOs and the private sector need to cooperate in developing and promoting farmer field schools. Worthwhile farmer field school experiences, techniques and tools should be documented. Ways have to be found to transfer the ownership of programmes and projects to clients, in order to promote sustainability after donor funding is withdrawn.

Higher education. Starting up a farmer field school programme is intensive and time-consuming because university and college graduates lack facilitation skills. Education in participatory approaches should be urgently included in the curricula of such institutions.

Department of Agricultural Research and Extension. The farmer field school approach involves radical transformational development for extension agents and their managers. Re-orienting them and developing their skills is complex, intensive and time-consuming. Essentially, all extension agents have to become competent facilitators of farmers and rural community development. Provisions for training them should be made in the annual departmental training budgets at provincial and district levels. So far, there as not been much evidence of such provision.

Engineering. The Department of Agricultural Engineering should be involved with farmer field school programmes so that they can work on implements that farmers want.

Development of the farmer field school approach

The farmer field school approach should be considered as a complementary method to be used with other methods and tools in extension programmes. A number of suggestions have been formulated to develop farmer field schools further:

- The farmer field school training could be extended from one season to two or three, depending on what needs to be achieved. This fits in well with the Master Farmer Training Programme and will also ensure that prospective farmer facilitators can enhance their facilitation skills and technical competence. Experience has also shown that it is very difficult for farmers to comprehend some of the technologies within one season, especially with highly variable seasonal rainfall.
- Research and extension staff should have some insight into the key issues and problems in a specific locality before a farmer field school is started there. This would provide a sound basis for their facilitation. They could obtain such insight through technical, field-based diagnostic surveys and participatory rural appraisals.
- Farmer's experiential learning will be enriched by including study observation tours to other areas. The farmers should visit not only pre-determined experimental plots, but also other participants' fields so they get a better understanding of prevailing problems and potential solutions.
- The farmer field schools should provide a comprehensive and integrated approach, and not deal with isolated production components. For example, soil and water conservation cannot be studied without including aspects of soil fertility and pest management.
- In case of donor-funded projects, each project should have a budgeted exit strategy.

Coordination

Extension needs to be coordinated so resources (government, private sector or donor agencies) are used effectively and efficiently. The Ministry of Agriculture needs to formulate a policy to promote the extension of agricultural technologies and methodologies through the farmer field school approach. This policy should encompass all stakeholders in agricultural research and extension.

Building provincial teams. Generally, trainers and facilitators have been successful in assisting farmers in the adoption, adaptation and development of the various technologies in the field. During some of the last few growing seasons, both drought and excessive rains could have demoralized farmer field school groups and their facilitators, yet many groups were discussing innovative and traditional methods of dealing with these vagaries of the weather. The Department of Agricultural Research and Extension should consider assigning someone in each province as a focal person to develop local programmes. Wherever possible, this person should be trained in participatory extension approaches such as farmer field schools. This process of provincialization is seen as essential for long-term programme sustainability, ownership and leadership, and development of financial resources. Currently, trainers and facilitators are not being used to full capacity as nobody is coordinating or monitoring their activities.

Rejuvenation of Training Branch: The Department of Agricultural Research and Extension's Training Branch has always been the heart of agricultural extension. It has always supplied vital support to farmers and extension staff through in-service training for staff members and production and distribution of farmer resource materials. Despite the merger of the government's extension and research agencies to form the Department of Agricultural Research and Extension, the Training Branch of the former extension agency and the Information Service of the former research agency still work as separate units. It is necessary to revamp the Training Branch and provide it with modern printing equipment.

Sustainability

Group dynamics and management skills. Farmer field school groups in Zimbabwe are not as cohesive as would be expected after more than a season of activities. Generally, they lack group dynamics and management abilities, perhaps because facilitators lack the right skills. Often the facilitators' training course is biased towards technology transfer rather than group dynamics. That means farmer field school projects may miss their long-term objectives, i.e., to nurture groups that will address agricultural and community problems on their own. This is compounded by the fact that season-long training-of-trainer courses have been telescoped into just two weeks, leaving very little time to cover group dynamics properly. The training should last at least one to three months. The first three to four weeks should be used to cover the farmer field school extension approach, which includes group dynamics. The rest of the course would then cover technologies agreed upon to address priority problems identified through participatory curriculum development.

Cost. The initial costs for training trainers and farmer field school facilitators are higher than for conventional extension. Rusike et al. (2004) estimated the total operating and salary cost during the 2001–2 cropping season at US$ 17 per farmer for extension-led farmer field schools, compared to US$ 7 per farmer for the Master Farmer approach. However, if they are conducted effectively, the long-term costs of farmer field schools are low and the returns potentially very high. Once extension agents have the know-how to be effective facilitators, as a result farmers become more empowered, self-reliant and pro-active in obtaining new skills and practices. In the long term, there is less need for the services of "teaching extension agents", as farmers collectively become their own best source of knowledge, practice and innovation. The question of using farmer facilitators, which cost US$ 6 per farmer, needs further development

Donor dependency. Dependency on donor funding is an important issue, where free handouts have tended to replace the culture of self-sustenance. In Zimbabwe, this has led to limited participation in development activities by some communities, especially if they are required to contribute financially to their own projects. Farmer field school methods aim to develop local capacities to device solutions using the community's own initiative. The government cannot sustain huge extension organizations. In expanding farmer field schools, no free handouts (e.g., inputs or snacks) should be provided to participants, as sometimes occurs with special project funding. Pre-conditions for donor funding of farmer field school development should include concrete commitments from both government and local communities on co-funding for farmer facilitators' allowances and for activities that might require additional funding, such as exchange tours and visits.

Farmers' contribution to extension services. Currently agricultural extension is provided at no cost to farmers. A commodity levy to all cash crop producers can be introduced and the funds channelled to extension. Alternatively, cost recovery for technical services to commercial-scale farmers could be introduced.

Commercial activities. Seed multiplication is one of the most common commercial activities among recent farmer field schools. Those in southern Zimbabwe realized during the 2003–4 growing season that seed for small grains and pulses was not readily available. Catholic Relief Services then funded seed multiplication by all the farmer field schools in a project it supported. The farmer field school groups multiplied open-pollinated maize, sorghum, pearl millet, cowpea and groundnuts. Most sold the bulk of the seed they produced and used the remainder for their own plantings and consumption.

Revolving funds. Revolving funds (loans) should be put in place. They would allow farmer field school participants to borrow money to invest in money-making activities such as horticulture, seed production and poultry.

Impact assessments. Impact assessments of the farmer field school approach are critical and should be conducted by farmers themselves, or at least with their full participation. The ability of extension staff to facilitate effective impact assessments by and with farmers is crucial. Only when

farmers can reliably and effectively extend appropriate learning processes, insights and lessons to their peers, will the farmer field school approach be deemed to have had sustainable impact.

Private sector and NGO participation. Participation of the private sector and NGOs in extension should be enhanced, for example by providing support to the government for extension and training or joint programmes e.g., demonstrations, farmer field schools or Master Farmer Training Programmes. Alternatively agro-based chemical and marketing companies can be levied for the purpose of agricultural extension.

Conclusions and recommendations

- Successes with donor-supported farmer field school projects have been reported. Established farmer field schools manage to carry on for some time after projects closures. There is not much evidence of spontaneous (farmer-led) growth of farmer field schools, or of government farmer field school initiatives without donor support, although spontaneous growth may have taken place without being known of reported, the latest one being discovered in Tsholotsho.
- The national Agricultural Research and Extension Service should incorporate the farmer field school approach in its training programme and appoint national and provincial focal points (contact persons) to deal with it, making use of trained facilitators. Part of the budget for Master Farmer Training should be re-allocated to farmer field schools.
- There is a need for a constant follow-up of both extension and farmer-led groups. Farmers in particular need refresher courses.
- Other major players should be involved – extension, private sector (agribusiness, seed and fertilizer producers) and NGOs.
- Farmer field school programmes should strongly interact with communities as a whole.
- Individual farmer field schools should become financially independent by growing cash crops or other fund-raising activities.
- Donor-funded projects should include, and budget for, an exit strategy.
- More land and water management technologies should be developed and publicized to cater for the various agro-ecological and socio-economic conditions of individual farmers.
- Equipment for mechanized land and water management and conservation agriculture should be developed.

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3 Major issues in farmer field schools for land and water management

This chapter deals with the following major issues:

- Mainstreaming and institutionalization of farmer field schools for land and water management
- Sustainability of farmer field schools
- Capacity building
- Impact assessment of the farmer field school approach
- Impact assessment of land and water management technologies.

Working groups discussed these issues during the Jinja workshop. Their discussions and recommendations are summarized below.

3.1 Mainstreaming and institutionalization of farmer field schools for land and water management

The farmer field school approach is a tool for empowering farmers. Farmer field schools improve the farmers' participation in decision making, enabling them to come up with recommendations from adaptive research. Farmer field school groups can evolve into networks, which in turn may improve the delivery of services. Box 7 provides a concrete example from Mbale, Uganda

Problems and limitations

Mainstreaming the farmer field school approach faces various constraints:

- There is no clear cut policy that links farmer field schools to national extension systems in certain countries (Kenya, Zimbabwe).
- The approach of farmer field schools for land and water management is fragmented, with every development initiative or project proceeding on its own. This results in a lack of coordination, institutional support and policy thrust.
- The approach is not well articulated at levels of government that control resources (e.g., national level in Kenya), so there is no policy that requires its adoption.
- Most national agricultural extension institutions in the region are undergoing (or have just undergone) reforms: decentralization and a switch to demand-driven extension delivery. However, the position of farmer field schools for land and water management in these institutions is not well defined.
- National institutions emphasize group approaches to extension, but the process to follow and the methodological approach is not clear.
- Adopting the farmer field school approach has certain negative implications for government agencies and NGOs: e.g., the low capacity of farmer field school facilitators, and a lack of funding.
- Where policy guidelines on farmer field schools for land and water management exist, the mechanisms to implement the policy support are lacking.
- Local leaders are slow in embracing farmer field schools.

Opportunities

Nevertheless, various opportunities exist to promote farmer field schools on land and water management:

- Skilled trainers and training centres exist to build others' capacity.
- NGOs and other agricultural service providers support the institutionalization process.
- Extension policies emphasize the demand-driven development and dissemination of technology, cost sharing and participatory action plans.

Box 7 Integration of farmer field schools in Mbale, Uganda

G. Wanakina and P. Opio

Farmers in Mbale were able to come up with adaptive research recommendations and were empowered in decision making. Groups were coherent and came together into networks. The process of service delivery was effective and enhanced. Partnership with other institutions was improved.

Challenges included ensuring sustainability, the slowness of local leaders to embrace the farmer field school approach, the risk of skipping technical details because time is taken by "social" events in the farmer field school, and the need for time to recover loans from revolving funds.

Recommendations for mainstreaming included the need to orient and collaborate with other staff, train more facilitators, integrate the farmer field school approach into approaches used by NGOs and other service providers, and include other livelihood skills in the farmer field schools.

Recommendations

The following recommendations were formulated:

- The district level is the appropriate entry point for implementation, while at the national level there should be lobbying to solicit policy support. Government commitment at both these levels is vital to achieve the adoption of the farmer field school approach.
- Efforts are needed to compare the cost-effectiveness of farmer field schools with other approaches. For example, extension-led farmer field schools cost US$ 25 per farmer, while farmer-led farmer field schools cost only $10. That translates into a grant of a few hundred dollars per group. Other stakeholders could be invited to participate in joint funding of farmer field schools.
- All levels of government should provide resources for a continued farmer field school programme.
- Scaling-up efforts should be flexible to allow the approach to adapt to meet farmers' and national priorities.
- The mass media (including community-based media) such as radio and TV stations should be encouraged to support scaling up of farmer field schools. For example radio and TV programmes can feature farmer-to-farmer questions and answers. Soap operas might feature farmer field schools and show how they solve problems.
- Strategies are needed to conserve the environment and prevent further degradation. Farmer field schools can help farmers identify environmental problems and find solutions to them.
- The facilitators should learn the skills to identify the root causes of problems.
- The farmer field school approach should be included in the curriculum of agricultural universities, colleges and schools.
- The formation of a revolving fund should be encouraged to finance farmer field schools and to enable farmers to apply what they have learned.
- NGOs and other non-government service providers should work within the government's policy framework and collaborate in supporting farmer field schools.

3.2 Sustainability of farmer field schools

This section lists factors facilitating and hindering the sustainability of farmer field schools at various levels: the group level, intervention (project or programme) level, and the network level. It then discusses the implications of existing policies on sustainability, and some recommendations for financing and policy.

Sustainability at group level

Facilitating factors

The following factors facilitate the sustainability of farmer field school groups.

Functioning

- The farmer field school approach itself, due to its participatory design.
- Initial groundwork in the village and a thorough levelling of expectations before starting a farmer field school.
- Applying technical options that work in the field.
- Participatory decision making in all aspects, and especially at the planning stage.
- A holistic, livelihood focus, and literacy education.
- Energizers, songs, etc., contributed by group members (these increase participation among members and make them feel they are contributing).
- Logos and slogans to give dignity to farming and create group cohesion.
- Support for marketing, value addition among groups, etc.
- Graduation certificates (members think they are important and boost their commitment to the group activities).

Membership and leadership

- Voluntary signup to become a member of a farmer field school group.
- A mixed age composition.
- A constitution to strengthen its leadership and management.
- Designated officials and strong leadership.
- Formalization of groups and legalizing their status.
- Farmer-led farmer field schools (these are more sustainable than those that are staff-led).

External relations

- Involving village leaders from the start of farmer field school activities.
- Opportunities for non-members to appreciate the farmer field schools' work, e.g., through field days.
- Networking among groups and formal farmer field school networks.

Finance

- Commercial activities, especially those that do not depend too much on the weather (e.g., livestock, beekeeping) and that provide good returns for the group.
- Savings systems such as merry-go-round schemes.
- Group investments that ensure that farmers have a financial stake in the farmer field school activities (these are preferred over individual investments in the farmer field school).
- Cost sharing of activities and farmers' contributions to opening bank accounts.

Limiting factors

These factors limit the sustainability of farmer field schools at the group level.

- Imposing crops and problem/entry points on farmers.
- Projects with a biased technical focus, e.g., conservation agriculture, soil productivity, livestock (these may not allow enough flexibility to respond to farmers' demands).
- Weak facilitators not trained properly on the farmer field school approach or on technical issues.
- Limited creativity and innovativeness among facilitators to respond to farmers' demands (it is hard for some extension staff to change how they interact with farmers).
- Unclear farmer field school concept, people involved not understanding what a farmer field school is, so having misconceived expectations.
- Age barriers and illiteracy (some age levels do not mix well, and young people are often unintentionally not included in farmer field school activities).
- Inadequate backstopping, visits by support staff and expertise.

Sustainability at intervention level

Facilitating factors

The following factors make it more likely that farmer field school activities established through projects and programmes are sustainable.

Policy and roles

- Involving stakeholders (political leadership, councillors, district agricultural office, national extension programmes, NGOs) from the beginning and making sure that their roles are defined.
- Formalization of networks or cooperatives that can carry activities forward after the project ends.
- Farmer field schools incorporated in policy, integrated in the national agricultural extension system, and included in the recurrent budget.
- Policy dialogue for mainstreaming farmer field schools.
- Good participatory monitoring and evaluation at all levels to learn from experiences and keep all stakeholders informed.

Local support

- Farmer-to-farmer facilitation, e.g., farmer-led farmer field schools.
- Resident backstopping officer at the local level, available to support farmers even after project ends.
- Building on local staff, particularly government officers, rather than hired project staff.

- Not relying only on government officers (due to transfers continuation of government offices is not always guaranteed); instead having a mix of staff from government, civil society and the private sector.
- Incentives for non-project staff and institutions to be involved in the farmer field schools.
- Use of existing farmers' organizations and cooperatives as entry points for farmer field school interventions.

Dissemination

- Incorporation of farmer field schools in the university curriculum so that all extension staff have general knowledge of the approach and do not need to be trained by individual projects.
- Documentation, development of field guides, manuals and books to spread farmer field school knowledge.
- Use of mass media and farmer exchanges to share experiences and build networks.

Limiting factors

These factors may limit the sustainability of farmer field schools at the intervention level.

- Project-hired staff, who may not be able to continue supporting farmer field schools when project ends.
- Frequent transfers of government officers.
- Local leadership and government not informed or involved.

Sustainability at the network level

Facilitating factors

These factors make it more likely that networks of farmer field schools are sustainable.

Management

- Allowing the networks to be self-evolving and taking the time they need to grow strong (projects should not push too hard for network formation – facilitation or stimulation of the evolution of networks should be practised).
- Mutual trust, transparency, good leadership and democratic leadership appointments.
- Network membership consisting of farmer field school groups, not individual members.
- Networks' involvement in general community development, e.g., activities outside agriculture and on issues that benefit the whole community.
- Formalizing of the network to take on tangible tasks e.g., input supply, lobbying, credit, and contract farming.

Finance and income

- A system of supplying farmers with inputs on a loan basis.
- A system of revolving funds, with active bank accounts.
- Networks being engaged in marketing and acting as middlemen between markets and individual farmers.
- Effective records and accounting systems.
- Profits and losses shared by all members to minimize the individual members' risks.
- Involvement in commercial activities and provision of income opportunities for farmers.

Partnerships and communication

- Partnerships with the private sector, research and other external actors.
- Partnership with development initiatives and recognition by district authorities that networks can be entry points for local development interventions.
- Use of mass media and farmer exchanges to share experiences and support the formation of networks.
- Means of communication within the network (e.g., newsletters, internet linkages) to allow peer-to-peer discussions.

Limiting factors

These factors may limit the growth and viability of networks.

- Government attempts to control the network activities if they are profitable or it sees them as a threat.
- External pressure for networks to develop, forcing them to grow faster than their management capacity allows them to.

Implication of existing policies on sustainability

Here are some effects that existing government policies have on the sustainability of farmer field schools.

- Governments do not always consider agriculture to be a major source of income for districts, so they do not give it enough support. It is necessary to create awareness at various levels of government of the importance of smallholder agriculture to the local economy.
- Government staff often knows little about some practices being up scaled through the farmer field schools, such as conservation agriculture, integrated nutrient management and organic matter management so are unable to provide required support.
- More government support should go towards building farmers' capacity to produce (as in farmer field schools), rather into food relief during droughts and other emergencies.
- Governments sometimes focus too much on commercialization, limiting the type of enterprises farmers can get involved in under government funding. There is little scope for farmers to explore site-specific enterprise options.
- Extension services in some countries (e.g., Uganda) provide resources at the local level that could be used for farmer field school activities.
- Decentralization (e.g., in Uganda) facilitates sustainability and local management of funding for agricultural activities.
- Government regulation of commodity prices sometimes helps farmers get better prices.
- Farmers need access to quality seed and inputs in small, affordable packages.
- Farmer field schools are not yet mainstreamed in national extension policies, despite extensive and promising experiences in the field.
- Agriculture needs to be a major topic in primary education. The trend to reducing subjects related to agriculture and natural resources in education should be reversed.
- All extension staff should be trained on the farmer field school approach (as in Tanzania), to ensure a national base for scaling up.
- Including farmers and village staff as agricultural advisors is a good idea.

Financing

Below are some financial implications of a farmer field school approach.

National level

- Government recurrent funding should be allocated for farmer field school activities.
- Farmer groups need access to formal loans from micro-credit institutions.

Project level

- Self-financing farmer field schools should be encouraged.
- Farmer-led schools are preferable to extension-led farmer field schools to reduce implementation costs and ensure better ownership.

District and local levels

- Revolving fund systems should be managed by farmers, through established networks or cooperatives.
- Network committees should be involved in recovery of advanced funds or credit grants. The whole committee must be involved, not just the finance officer.
- Revolving funds should be invested in group activities, not on individual farmers.
- Farmer field school groups or members can contribute to farmer field school networks.
- Networks should venture into processing and branding of produce to attract customers.

Farmer field school groups

- All members should be kept fully updated on the financial situation, and the budget should be discussed regularly among all members.
- Advancing funds directly to farmer field schools empowers farmers, but the whole group must be involved and informed about the group finances.
- Group savings schemes should be encouraged, even if members save only a little at a time, as long as the savings are continuous.
- Participants should share in the farmer field school costs.
- Group members should be able to borrow money from the group's revolving fund.
- Training should cover how to write proposals and access funds.
- Commercial activities should support the farmer field school.

Key policy recommendations

- Other stakeholders should be involved from the beginning of farmer field school initiatives, and their roles should be defined in early stages.
- There should be more focus on farmer-led farmer field schools to reduce costs and increase the number of farmer field schools. Extension staff should backstop farmer field school groups technically, and not to be the main facilitators.
- Farmer field school activities should be linked with adult literacy programmes. This will require collaboration between the ministries of agriculture and education.
- The farmer field school approach should be incorporated at policy level, integrated in the national agricultural extension system, and given a recurrent allocation in the government's budget.
- Farmer field school programmes should rely not only on government staff (who may be transferred frequently), but should have a mix of staff from government, civil society and the private sector.

- The farmer field school approach should be included in tertiary education and vocational training institutions so that all extension staff know about the approach and do not need to be trained by projects.
- The capacity of networks needs to be built so they can drive the extension process.

- The need for political recognition of agriculture as a major business activity and source of income for smallholders.
- Efforts are required to improve policymakers' knowledge about innovative practices such as conservation agriculture, soil productivity and integrated nutrient management.
- Governments should allocate less attention to food relief and more to promoting sustainable livelihoods and the productive capacity of farmers.
- Extension should shift its focus more towards drought-resilient practices and agro-biodiversity, rather than only on commercial commodities.

3.3 Capacity building

This section looks at the capacity building needs of different categories of stakeholders in farmer field schools on land and water management: farmers, facilitators, schools, training institutions, universities and colleges, policymakers and donors, regional and district administrations, and the private sector. For each category, it lists why capacity building is important; the category's needs in relation to farmer field schools, and the problems and limitations the category faces in implementing or promoting the farmer field school approach. It also makes some recommendations and suggests who should be involved in putting these into effect.

Farmers

Why is capacity building important? Farmer empowerment for improved livelihoods

Needs. Knowledge and information sharing (markets, technologies, credit, farm inputs, etc), technical skills

Problems and limitations. Literacy, access to information, trust among farmer field school members, attitudes, livelihood diversity, ownership/group cohesiveness

Recommendations

- Incorporate and intensify adult learning techniques into farmer field school curriculum
- Develop reference/self learning materials in farmer-friendly language
- Establish farmer resource centres in communities
- Proper ground working.

Who should be involved? Programme leaders, farmer field school facilitators.

Facilitators

Why is capacity building important? Skills upgrading, attitude change.

Needs

- **Farmer facilitators.** Training in technical issues, scientific methods on how to test technology, data collection, facilitation skills, group dynamics
- **Extension facilitators.** Training in farmer field school methodology, facilitation skills, group dynamics, social skills, scientific methods on how to test technologies, data collection
- **Research facilitators.** Exposure to the farmer field school approach and methods, social skills and communication.

Problems and limitations. Level of commitments, technical competence, limited facilitation skills, inadequate good-quality training materials, inadequate quality assurance, inherited top-down approach by facilitators, transfer of staff.

Recommendations

- Clear criteria for identifying farmer facilitators
- Effective training of trainers: at least 2 weeks on farmer field school methodology and facilitation skills, and continued reflection on technical aspects and process.

Who should be involved? Farmers, facilitators, programme/project managers, master trainers.

Schools

Why is capacity building important? Use the approach to capture interest among young people, build capacity of young people to ensure continuity.

Needs. Introduction of the methodology into the school curriculum.

Problems and limitations. Lack of awareness, no agriculture in school curriculum.

Recommendations. Awareness workshops, farmer field school "road shows".

Who should be involved? Programme/project managers, heads of institutions, farmer field school facilitators.

Training institutions, universities and colleges

Why is capacity building important? Enrich the farmer field school methodology with different techniques (e.g., drama, theatre), give an opportunity for agricultural extension graduates to be exposed to the farmer field school methodology.

Needs. Integrate farmer field schools into the training curriculum, train trainers, further develop the farmer field school methodology.

Problems and limitations. Limited or static curriculum development, lack incentives to change the curriculum.

Policymakers and donors

Why is capacity building important? For scaling up, funding, ownership.

Needs. Sensitization on the farmer field school methodology, convincing outputs (yield figures, costs), mainstreaming the approach.

Problems and limitations. Insufficient evidence of farmer field school successes vis-à-vis other approaches.

Recommendations

- Awareness workshops and field visits
- Proper data collection and documentation
- Reviews and studies on benefits and sustainability (biophysical and socio economic).

Who should be involved? Programme/project managers, farmer field school facilitators, external reviewers, farmers.

Regional and district administrations

Why is capacity building important? For scaling up, funding, ownership.

Needs. Sensitization on the farmer field school methodology, convincing outputs (yield figures, costs), mainstreaming the approach.

Problems and limitations. Insufficient evidence of farmer field school successes vis-à-vis other approaches.

Private sector

This category includes micro credit institutions and other private service providers.

Why is capacity building important? Value addition and commercialization of the methodology.

Needs. Information and sensitization on the farmer field school methodology for service delivery.

Problems and limitations. Insufficient evidence of farmer field school successes vis-à-vis other approaches.

How to develop curricula

How should the curricula on farmer field school be developed to ensure that it is relevant to the needs of the various stakeholders and the situation on the ground? Some suggestions:

- Build consensus building among all the stakeholders
- Develop self-learning materials in a participatory manner
- Take stock of both indigenous and scientific knowledge
- Hold curriculum development workshops involving all stakeholders (farmers, facilitators, specialists, decision makers, etc.).

These imply the need for a budget to be allocated for farmer field schools, and the institutionalization or mainstreaming of the approach into existing structures.

3.4 Impact assessment of the farmer field school approach

This section addresses how to assess the impact of the farmer field school approach. (The next section addresses how to assess the impact of land and water management technologies that the farmer field schools promote.)

Why assess impacts of farmer field schools?

Assessing the impacts of farmer field schools is important to discover whether they achieve their objectives, and if so, to convince others (policymakers, donors and other stakeholders) that this approach is cost-effective compared to other approaches.

It is possible to measure impacts at different levels:

- **Donors.** Have they changed their ideas on what they fund?
- **Government.** Do they change the way extension services operate?
- **Implementers.** How have their lives changed?
- **Communities.** Have they changed their practices?
- **Farmers.** Have they increased their yields and incomes? Are they empowered?

Recommendations

- Compare farmer field schools with other strategies before scaling them up.
- Decide what impact to measure before the project starts.
- Decide on the impact assessment tools beforehand.

Important aspects of farmer field schools

Farmer field schools differ from other extension approaches in several important respects:

- **Duration.** They last one or more seasons, though the length depends on the enterprise (livestock, land and water management, crops) studied and on the curriculum developed for each one.
- **Discovery learning.** They enable farmers to discover things for themselves through experimentation.
- **Agro-ecosystem analysis.** Farmers observe and analyse what they see in the field based on which management decisions are made.
- **Group dynamics.** The process involves farmers interacting and learning from one another.
- **Facilitation.** Farmer field schools require a qualified, skilled facilitator.
- **Meetings.** The group meets regularly (the frequency differs per enterprise).
- **Timeliness.** Each topic is covered when it is relevant during the season.

Recommendations

- Before assessing impacts, decide which farmer field school activities should be assessed.
- Then assess the impact of the farmer field school.
- Impact assessment can be a useful way to compare different types of farmer field schools. Group the farmer field schools according to their principles in order to compare them.

Dimensions and indicators

We can think of farmer field schools as having impacts in various dimensions: economic, social, environmental, institutional and sustainability. Each of these dimensions can have different levels: farm, catchment, district, ecological zone, and national. Assessments need to be at different levels to capture all the impacts.

Below is a list of potential indications of impact in each of these dimensions.

Economic

- **Income.** Change in income, variability of income (stable over time)
- **Food security.** Availability of food supply in households over the year, variety of food (balanced meals) at household and village/community levels
- **Agricultural production.** Change in production costs, change in yield, change in acreage (per farmer or of all farmers (the acreage per farmer may fall because the farmer cultivates more intensively, or may rise because technology makes it easier to cultivate more), diversification of crops, land value (might change due to interest in cultivating, or improved soil fertility etc.)
- **Agricultural productivity.** Change in yield per hectare, returns to labour (how much a farmer earns per hour of work), returns to inputs (fertilizer use efficiency, water use efficiency)
- **Employment generation.** Number of people employed (linked to income change and rural development)
- **Cost-effectiveness of approach.** Labour cost of officers (training, facilitating costs, etc.), real cash costs (materials, offices, etc.), indirect costs (time of farmers, etc.), benefits (e.g., number of farmers trained), cost of the farmer field school per farmer (compare with other approaches; self-financing farmer field schools have other cost pictures), absolute cost vs. relative cost, initial costs vs. long-run costs, cost per facilitator and number of farmer field schools conducted.

Social

- **Farmer empowerment.** Cohesiveness of the farmer field school group, funds repayment as a group (sustainability), demand by farmers for services, leadership (election/management, functions within the farmer field school), advocacy (participation in forums, decision making by farmers), regulation and registration, gender balance (women's involvement in decision making and leadership roles)
- **Social capital.** Farmer networks, farmer–stakeholder networks (linkages with others)
- **Collective problem recognition and solving** (promoting social responsibility leading to community development). Paying for water use (in irrigated areas), self-help groups, savings and credit.

Environmental

See also the next section on "Impact assessment of land and water management".

- **Erosion.** Number of erosion control measures, number of water harvesting techniques, presence of water use organizations
- **Water.** Quality and quantity
- **Biodiversity.** Change in agro-biodiversity (crop, livestock, associated species)
- **Pollution** (by chemical fertilizers). Water quality, soil life
- **Environment policies.** Existence of policies, implementation of policies.

Institutional

- **Comparison with other approaches.** See cost-effectiveness and other parameters (above)
- **Institutional change** (embedding of the approach in research and extension). Inclusion of farmer field schools in strategic plans , strengthening of farmer organizations (water user associations, producer organizations), farmer field school networking
- **Presence of strong farmer organizations.** Constitution, leadership structure, registration, election, regular meetings, etc.; existing farmer field school networks; performance of farmer organizations and networks (activities, achievements, etc.)
- **Linking to markets** (regional, national, international) and private sector. Number of collaborative projects/institutions, value addition to the product, number of contracts with a market (e.g., to sell products), bargaining power (higher prices for products), improved market chains (bypassing middlemen), group marketing (unions, cereal banks, etc.), number of off-season activities, strategic marketing (market information, sale of produce when prices are high), number of on- and off-farm products, amount of produce put on the market.

Sustainability

See also the section above on "Sustainability of farmer field schools".

- **Spread of information.** Number of non-farmer field school participants adopting farmer field school technologies, number of (semi) self-financing farmer field schools, number of farmer field school groups still functioning several years after project ends, number of technologies or innovations being implemented several years afterwards, relation with research (new technologies adopted by farmers and farmer innovations taken up by researchers).

Recommendations

- Ensure that impact studies are budgeted.
- Define the expected impacts in advance, related to the programme objectives.
- Assess impacts regularly at national and district levels.
- Identify different categories of costs for farmer field schools, taking the different types of farmer field schools into account.
- Develop a common framework for impact assessment across countries.
- Involve all stakeholders in defining indicators at the relevant level.
- Involve all stakeholders in assessing impacts. Involve them from the beginning, not only during the impact assessment.
- Provide feedback to stakeholders after assessing impacts. Think of how to present this feedback to different stakeholders: policy briefs for policymakers, scientific papers for scientists, pictures for farmers, etc.

- Ensure that measuring indicators is cost-effective.
- Where possible, combine impact indicators with those in the community action plan.
- Don't forget to do a baseline or diagnostic survey to measure indicators before the activity starts – otherwise change will be very difficult to prove.

Methodology and timing

- The impact assessment should be participatory, involving stakeholders at different levels, including those who might be negatively affected.
- The impact assessment process should start early.
- All facets of the project should be involved (they can be at different stages of execution).
- Assessment tools may include surveys, group discussions, quantitative measurements, etc.

Recommendations

- Use different tools for different levels (farmer field school groups, networks, districts, national).
- Use the same tools over time so you can compare one set of results with another.

3.5 Impact assessment of land and water management technologies

This section addresses the issue of assessing the impacts of land and water management technologies, rather than those of the farmer field schools.

Why assess impacts of land and water management technologies?

It is important to assess the impact of land and water management technologies for different types of stakeholders:

- **Donors.** They require evidence that specific technologies are effective: is their investment justified?
- **Governments.** They need evidence of benefits to farmers in terms of food security and income. They also need to consider the various agro-climatic zones and farming systems so they can prioritize future activities.
- **Farmers.** They need to learn from their activities and gain information to improve their decisions.

Problems in assessing impacts

Frequent problems with assessing impacts include:

- **Data.** A lack of (quantitative) data from the start of the project if no baseline survey was carried out.
- **Methodology.** A lack of sound methodologies for collecting data.
- **Funding.** Insufficient funding for a baseline survey.
- **Capacity.** Farmer field school facilitators lack the ability to assess impacts.
- **Validity.** The difficulty of separating out impacts due to specific technologies, and the impacts due to the project rather than external factors.
- **Time frame.** It may be necessary to assess impacts during a project lifetime, but land and water management interventions may take time to show benefits. Farmers may select short-term indicators because they hope for quick benefits.
- **Scales and units.** It may be difficult to select the appropriate scales and units (e.g., plot level, farm level, catchment level) for impact assessment.
- **Assessment for whom?** Impact assessment is relatively satisfactory at the farmers' level. But there may be problems in providing measures that researchers, government or donors view as satisfactory.

Opportunities for impact assessment

- **Farmers.** Farmer field schools offer numerous opportunities for simple impact assessments. For example, farmer field school members make observations during farmer field school sessions, and the farmer field schools include exercises such as interpreting changes over time. They can cover both long-term and short-term indicators, and can bring stakeholders together.
- **Exchange forums and networks.** These involve various stakeholders and could be used to develop an evaluation framework. Once a framework is developed, less effort is required.
- **Donors.** They realize the need for impact assessments, so might be ready to fund the development of an evaluation framework.

Recommendations

- Carry out a simple baseline survey (ensure there is funding for this).
- Train farmer field school facilitators how to evaluate impacts.
- Establish mechanisms for feedback between farmers, extension, research, policymakers and donors.
- Conduct workshops and field visits to check impacts.
- Develop field test and use an evaluation framework for land and water management technologies (seek funding to develop such a framework).
- Develop or adapt standard methods to carry out social impact assessments (e.g., sustainable livelihood approach) and economic impact assessments (e.g., economics of water harvesting systems). Assess when and how often to carry out the analysis, and who should do it.
- Further develop agro-ecosystems analysis sheets for various subject areas (e.g., land and water management, livestock, agro-processing) and disseminate them more widely.
- Analyse impacts on the whole farming system. Analyse the data by farming type and farming system, and try to capture interactions.
- Conduct assessments at intervals to capture short- and long-term impacts.
- Combine various methods for data collection.
- Have a multidisciplinary, independent team carry out the assessment, in consultation with the project team.

Types of impacts

It is necessary to assess impacts on social, institutional, economic and environmental characteristics. Each of these should be assessed at different scales: household/farm, community, catchments, district/provincial and national. This section lists indicators for each type of characteristic in turn.

Social impacts

Household level

- Availability of land, water and natural resources (related to trends).
- Access to land, water and (related to distance). Consider ownership.
- Use of land, water and natural resources (quality and quantity aspects). Measure use for domestic purposes (e.g., drinking water), nutrition, production and income.

Community level

- Above indicators assessed between various groups.
- Take gender and health aspects into consideration to ensure that groups are able to make use of the available resources.

Institutional impacts

- Impacts on community institutions (response to farmers' demands).
- Credit institutions, market associations (including market structures), and market-driven or commodity-driven service providers.
- Adopted and enforced rules (local level), by-laws (district level) and policies (national level) to promote selected technologies.
- Research topics responding to farmers' demands and needs.

Economic impacts

Household level

- Gross margin (income).
- Food security: food availability, stability, access.
- Return to labour (over time) and land.
- Number and quality of livestock.

Community level

- Aggregate level of analysis (sum of households).

District and national levels

- Investment criteria (e.g., net present value, internal rate of return, benefit–cost ratio, and value cost ratio).

Environmental impacts

The items below are measured at the farm level unless otherwise specified.

- **Hydrology.** Change in water levels, change in drying springs/streams, change in soil moisture, change in sediment load (household to catchments levels).
- **Soil and water pollution.** Change in electrical conductivity.
- **Soil health.** Change in number of earthworms per unit of land.
- **Soil chemistry.** Change in nitrogen, phosphorus and potassium balance.
- **Erosion.** Change in number of rills per unit of land.
- **Biodiversity.** Change in beneficial and harmful species; change in invasive species (community level).
- **Soil structure.** Occurrence of hard pans.
- **Deforestation.** Change in number of trees and species; change in woodlots (community level).
- **Overgrazing.**
- **Carbon storage.**
- **Fires.**

Data collection and analysis

The following are useful methods: agro-ecosystems analysis, photos, household surveys, technical surveys (e.g., questionnaires), sampling and in-depth interviews. Many of these can also be used for assessing impacts at the community and district or catchments levels. For district or catchments areas, remote sensing may be appropriate.

Limitations

- Training on agro-ecosystems analysis focuses on integrated pest management rather than land and water management.
- Household surveys can produce subjective responses, are time consuming, and may be limited because many farmers cannot read and write.
- Technical surveys depend on the facilitators' skills.
- Interaction is required between the various levels.
- There are few aggregated indicators that cover several types of impacts.
- Data reporting may be subjective.

4 Keys for successful farmer field schools on land and water management

On the basis of project experiences and the workshop process that have been presented in this document, this concluding chapter pulls together some suggestions for moving forwards with farmer field schools on land and water management. It is presented in two sections:

- Overview of technical issues and the need for an integrated ecosystems approach
- Policy recommendations.

4.1 Overview of technical issues and need for an integrated ecosystems approach

Improved land management options are those land uses and natural resource management practices or technologies that optimize or make effective use of soil, water and biological resources, including biodiversity. A range of feasible land management options and suitable supporting development strategies and interventions can be identified for the different agro-ecological situations and farming systems found in a country (Box 8).

Box 8 Definitions of agro-ecological zones and farming systems

An agro-ecological zone is a land resource mapping unit, defined in terms of climate, land form and soils, and/or land cover, and having a specific range of potentials and constraints for land use (FAO 1996). Essential elements in defining an agro-ecological zone are the growing period, the temperature regime and soil units. (FAO, 2007). The zones can be used to determine land productivity potential and population-supporting capacity under rainfed or irrigated conditions, and what agricultural land-use options are feasible under specified management conditions and levels of inputs.

Farming systems are units of analysis of agricultural production (crop, livestock and fish production) characterized in terms of the resource base, pattern of farm and non-farm activities or enterprises, household livelihoods and constraints, where:

- the natural resource base includes: water, land, grazing areas and forest; climate and altitude; and landscape - slope; farm size, tenure and organization;
- the dominant pattern of farm activities and household livelihoods may include: field crops, livestock, trees, aquaculture, hunting and gathering, processing and off-farm activities; the main technologies used, the intensity of production; and,
- the degree of integration of crops, livestock and other activities (FAO, 2007).

Adapted land management options are the land uses and management practices that have been developed with stakeholders through participatory and adaptive management approaches. They may include farmer innovations and technologies that were brought into an area, through exchange with other farmers or through research and development processes, and which have been subsequently adapted to suit the local context.

Stakeholders in land management primarily include farmers, herders, farm managers and other land users who make decisions on land use, technologies or management practices and levels of inputs, as well as government bodies that influence land use through policies, regulations and interventions and private sector actors that supply inputs, provide investments (companies, banks, etc.) and to some extent influence markets.

Integration of practices on farms and across the farm landscape. The land and water management practices described in previous sections cover a wide range of techniques and practices that need to be effectively integrated on the different types of farms that are represented in the communities. They also need to be integrated across the wider farm landscape. This is a major challenge as the farmer field school facilitators need to draw on their knowledge and experiences in

the area of intervention and on their farmer field school training, to not only test the various practices for their individual effects, but above all, to determine together with the farmers and herders, the advisory service providers – extension and research staff – and the local administration:

- First, how to best integrate the various practices in each of the main **farm types** in the target area (subsistence, commercial, intensive, extensive, etc.) for enhanced and sustained productivity.
- Second, how the various practices can be most effectively used in various parts of the **farm landscape** (hilltop to valley bottom, sandy to clay soil, crop, range and forest land, etc.) to ensure sustainable natural resources management and the maintenance of ecosystem services.

Ecosystem services. Farmers depend on ecosystems to sustain their livelihoods in terms of food and feed production, household water and energy supply, and income generation. Farmers also generate a range of ecosystem services, including the provision of food and other products and many other **environmental services** (those for which they do not received direct benefits) such as climate change mitigation, enhanced water quality and quantity, and biodiversity preservation. The actions of farmers, herders and foresters can enhance and degrade ecosystems. Through changes in land-use and production systems, they can enhance the provision of environmental services to meet society's changing needs. Demand for environmental services from agriculture is expected to increase in the future, but better incentives to farmers are needed if agriculture is to meet this demand. One among several other possible policy tools, are payments for environmental services which hold promise as a flexible approach for enhancing farmer incentives to sustain and improve the ecosystems on which we all depend (FAO, 2008).

Ecosystem services to which farmers contribute cover a wide range of services that are provided by a land use system: production or provisioning services, regulating and supporting services (those provided by natural ecological processes) as well as cultural services. These are presented in Box 9.

Training courses for farmer field schools on land and water management should raise awareness and understanding of the facilitators of the range of additional environmental benefits of production systems and help develop exercises to enable farmers to better understand the wider effects and implications of their management practices.

If the facilitators understand well their environment and the specific interests and needs of communities and farmer field schools, they will be able to better help the farmers to judge and select which are the most suitable practices to test and adapt to local conditions. For example:

- Soil erosion will have different impacts in different places: e.g., removal of a 5 cm layer of soil may have a greater impact on a poor shallow soil than on a deep fertile soil.
- The reduction of water availability will have much higher impacts on humans and livestock in a semi-arid environment than in a humid environment.
- Conservation agriculture (zero tillage together with crop rotations and permanent cover) may be more crucial in a landscape where animal or tractor power, repetitive tillage and down-slope tillage and monocultures are prevalent. In a steep-sloping landscape where the traditional farming practices include perennial and annual species that already provide a good soil cover, improvements could focus on integrated soil fertility, water and biodiversity management for pest and disease control and added productivity and value (e.g., niche markets, eco-labelling).
- The effects of degradation may be partially hidden by the use of fertilizers which compensate for the productivity loss caused by soil erosion and nutrient loss. However, yields will not be sustainable unless soil health is restored.
- Pests and diseases may restrict yields from improved land and water management practices unless they are addressed through agro-biodiversity and integrated pest management.

Box 9 Ecosystem services provided by sustainable agriculture

Provisioning services

- The **production** of food, feed, fibre and fuel from animals and plants (quantity and quality)
- The **supply of water** (quantity and quality) for human, animal and plant consumption
- The **availability of land**.

Ecological services (also known as regulating and supporting services)

- The **water cycle** that determines the changes in water flow and availability and occurrence of floods, storms, excess rainfall and drought (i.e. severity, frequency and extent). This is affected by soil cover (% cover by vegetation, crop residues or mulch), subsoil structure and soil surface sealing or crusting, which all influence water infiltration (permeability) and retention (soil water holding capacity).
- The **carbon cycle** that determines the amount of carbon stored (sequestered) both above-ground as vegetation or biomass and below-ground as soil organic matter and plant roots and the rate of emissions of greenhouse gases (methane, carbon dioxide and nitrogen oxides) from land use and livestock.
- The **nutrient cycle** – the use and restoration of macro-nutrients (N, P and K) and micro-nutrients that is determined by soil biological activity (the soil life depends on soil organic matter) and by the ratio of nutrients provided or removed by farm inputs (fertilizers, manure and plant organic materials) and outputs (harvested, mineralized or leached from the land).
- The **formation of soil** by processes of decomposition of parent rock and organic materials or by wind deposits.
- **Life support** provided through diversity of habitats and associated species e.g., pest–predator interaction, pollination and soil biological activity.
- **Climate regulation** including micro-climate (wind, shade, temperature, humidity) and mitigation of effects of climate change and variability.

Cultural services that contribute to cultural heritage, knowledge systems and human well-being

- Spiritual, aesthetic, cultural landscape and heritage values, recreation and tourism
- Education and knowledge (including indigenous knowledge) and conflict resolution
- Food security, health and income.

An important concluding message for all farmer field schools on land and water management is the need to integrate in the most effective and appropriate way for the given farming system and agro-ecological situation the seven categories of interventions that have been discussed in this publication and summarized in Box 10.

- Community planning at community territory or micro-catchment scale
- Farmer field school approaches for addressing land and water management issues
- Agronomic practices – integrated soil and water management on cropland
- Mixed crop-livestock systems for farmers and agro-pastoralists
- Agroforestry and managing trees on farms
- Watershed management on steep slopes and fragile soils.

In selecting techniques, it is useful to identify and review those that are relevant with farmers and technicians and for each to identify both the production benefits and other ecosystem benefits.

Local authorities and district offices may be able to generate support for the adoption of good farming practices if they too understand the multiple benefits: sustained water supply, productivity, reduced risk of crop failure, biodiversity conservation and climate change adaptation and mitigation. If technical and planning officers are aware of the potential benefits of sustainable farming systems and improved land and water management, they may be able to help identify opportunities for providing incentives to farmers through the national development programmes and to also establish partnership arrangements for payments for environmental services.

Box 10 Technologies and approaches that need to be integrated in sustainable land management programmes and projects

1 Community planning at community territory or micro-catchments scale to address:

- Upstream–downstream land–water effects and water supply
- Livestock management (seasonal grazing, watering)
- Fuelwood, wild foods and other uses of natural resources.

2 Farmer field school approaches for addressing land and water management issues

- Individual farmer field school group planning to address priority land and water problems on farms and community territory
- Farmer exchange visits, exposures and study tours (farmer innovations, successful experiences)
- Grant and revolving loan approach to financing farmer field schools with:
  - o Grants for at least two seasons, and preferably two years, in order to achieve results in restoring soil health and productivity
  - o Additional income generating activities to self finance longer term actions by farmer field schools and individuals
  - o Revolving loans, grants or other payments for environmental services
- Study plots backed up by farmers' trials and innovations that test and integrate improved practices on their own farms/lands to allow a wider range of learning experiences among the group.

3 Agronomic practices – integrated soil and water management on cropland

- Land preparation practices to reduce soil disturbance, compaction and labour
  - o Initial use of subsoiler to break hardpans, compacted soils
  - o No-till planting tools (hand jab planter, rippers/direct seeders for animal draught and tractor power, roller to crush cover crop to provide layer of organic material)

- Improved planting material and optimum seed rate and plant spacing

- Weed and pest management
  - o To reduce soil disturbance (cover crops and/ or herbicides to manage weeds until weed seed population reduced)
  - o Control of invasive and harmful weeds (e.g., striga, couch grass, lantana)
  - o Integrated pest management through biodiversity (enhance pest–predator interaction)

- Optimize water retention and infiltration, minimize runoff and hence erosion
  - o Contour farming (see below)
  - o Cover crops or mulch
  - o Protect and restore soil organic matter – no tillage

- Restore soil fertility and soil organic matter – combine organic and inorganic inputs
  - o Organic fertilizers – manure, compost (e.g., poultry or cow dung, kitchen refuse) and crop residue recycling (organic matter management will reduce soil acidity – a typical result of degradation)
  - o Crop rotations and associations (e.g., cereal–legume mixes, cereals–legumes–tubers)
  - o Optimal mineral fertilizer combinations, application rates and methods for the given soil (e.g., diammonium phosphate and urea)
  - o Legume cover crops and improved fallow (e.g., mucuna, canavalia, lablab)
  - o Minimize organic matter burning (e.g., only for diseased plants, noxious weeds)
  - o Soil amendments as required (rock phosphate, lime, other amendments to maintain pH, reduce manganese and aluminium toxicity, improve uptake of nutrients)

- Drought mitigation
  - o Permanent planting pits with manure for annual crops
  - o Pits in contour trenches for banana
  - o Water harvesting (zai, half-moon, etc.)

- Permanent soil cover in banana/coffee systems (mulch, manure, cover crops)

4 Mixed crop–livestock systems for farmers and agropastoralists

- Cover crops, fodder crops/grass leys for increased feed and soil organic matter – root biomass (e.g., once every five years where land is not in short supply)
- Stall feeding for improved nutrition and manure management
- Integrating livestock into small scale crop production systems using temporary enclosures, improved manure management from kraals, tethering or herding animals on crop residues
- Controlled burning to reduce frequency and intensity, improve pasture species composition (e.g., more palatable and less woody species) and alternative use of grasses (e.g., thatching, crafts)
- Accompanied by livestock health, control of pests and diseases, reproductive management
- Adaptive grazing for herd mobility in dry season and safeguard access to dry season grazing.

5 Agroforestry or trees on farms (recycle nutrients from deep in soil profile, microclimate management)

- Intercropping – alley cropping and strip cropping, on the contour, with species selected for nitrogen enrichment (N fixation), fodder and fuelwood
- Trees on farm (indigenous and self sown exotic trees and shrubs retained in fields and planted trees) in field boundaries, windbreaks, hedgerows, shade trees (e.g., for tea, coffee, vanilla)
- Planted grasses or legumes as soil cover in plantations (weed management, grazing, nutrients)
- Accompanied by sustainable management of woodlots and forests in the territory to supply wood and energy needs, conserve biodiversity and provide non wood forest products.

6 Watershed management (biological measures may need to be complemented by physical conservation structures on steep slopes with high rainfall intensity and on very fragile soils)

- Protect or plant hilltop forests
- Contour farming
  - Earth bunds or banks or stone lines (correct spacing according to slope)
  - Tied ridging (to conserve water) or open ridge and furrows (storage where high rainfall intensity)
- Terracing on very steep slopes
  - Terrace risers (banks) mulched and planted with cover crops
  - High value crops such as vegetables (use of compost, manure, mulch)
- Runoff water management and protection from loss of productive lands by erosion
  - Contour hillside ditches and grassed waterways with check dams (to reduce velocity and deposit sediments)
  - Gully reclamation with vegetation (bamboo, fruit trees and grasses) and check dams
  - Landslip and stream bank stabilization

7 Environmental services The maintenance of ecological processes and related environmental services and benefit sharing arrangements for farmers and herders such as payments for environmental services

- Carbon sequestration through the restoration of soil organic matter and above and below ground biomass (roots of trees, and perennial shrub)
- Maintenance of the hydrological regime (water cycling) thorough enhanced infiltration, reduced runoff and increased soil moisture retention, and reduced risk of floods and drought
- Conservation and sustainable use of agrobiodiversity
  - Crop varieties, livestock breeds and associated species
  - Soil biodiversity, pollinators and beneficial predators and hence control of weeds, pests and pathogens and increased resources use efficiency

4.2 Policy recommendations

TTable 16 lists major issues and policy recommendations identified by participants at the Jinja conference. It also lists who should be responsible for carrying out the recommendations.

This section reflects the discussions during the Jinja workshop. The most important recommendations emanating from the various country and regional papers, and from the workshop as a whole, are given in the Executive Summary.

Table 16 Major issues and policy recommendations on farmer field schools on land and water management

Issue	Recommendations	Responsible bodies
Limited support for adoption and investment in soil and water conservation measures/initiatives	Support investment in and adoption of soil fertility measures and water management (including water harvesting and soil moisture management)	Extension service, ministry of agriculture, agricultural research agency, environmental agency, development partners
Integration of land and water management aspects in short-term, commodity-driven strategy	Integration of short-term strategy with long-term natural resources management strategy	Extension service
Limited knowledge by local leaders of the importance of land and water management issues and their implications to livelihoods	Sensitize local leaders to incorporate land and water management in district action plans with an appropriate budget	Local governments, NGOs
Lack of supportive ordinances and by-laws to enforce sustainable land and water management	Develop enabling legislation and promote practical ordinances and by-laws	Parliament, extension service, ministries of agriculture and environment, local governments
Limited support and investment to scale up soil/water management and rainwater harvesting	Invest in and support widespread efforts for soil/water management and rainwater harvesting at small and large scales	Ministries of finance and agriculture, development partners
Lack of vocational schools for training in agriculture and land and water management	Establish vocational institutions, backed by life schools to transfer skills to young people and those affected by HIV/AIDS	Ministries of education and health, NGOs working on HIV/AIDS
Integration of agriculture, land and water management in primary education curriculum	Include agriculture, land and water management in primary education curriculum through junior farmer field schools	Ministry of education
Lack of incentives for long-term investment in land and water management	Identify type and provide incentives for farmers for long-term investments in land and water management	Ministries of finance and agriculture
Farmer field school sustainability	Build long-term resilience for sustainability of farmer field schools, including: • Promote farmer field schools as an initiative to empower farmers • Link to policy at local, district and	Farmers, ministries of agriculture and environment, NGOs, donors, agricultural research agency, national and international research and development institutions, local governments, extension service, academic

Issue	Recommendations	Responsible bodies
	national levels • Preach practical messages continuously at all levels • Strengthen links among partners • Seek ways to reduce cost of farm power and inputs for farmers • Implement strategy targeted to different types of farmers (hand power, animal power, and motorized). Integrate conservation agriculture • Conduct impact assessments to generate evidence needed to convince donors and policymakers	institutions, private sector
Outdated guidelines for soil and water conservation	Review guidelines	Ministry of agriculture
Lack of district farm planning units	Establish and train farm planning units in each district and provide adequate budgets	Ministries of agriculture and finance
Implementation and enforcement of policies (on land, land use and soils), and harmonization with other polices (forestry, wetlands, water)	Establish mechanisms for training, implementation, enforcement and harmonization of policies	Ministries of environment and agriculture, environmental agency
Scaling up of land and water management farmer field schools to other districts	Establish mechanisms and tools for expanding process to other districts	Ministries of agriculture and finance
Limited technical and financial support to various policymaking levels	Provide technical support and funding for various policymaking levels to facilitate implementation	Environmental agency, ministries of agriculture and environment
Limited knowledge and information about the farmer field school approach and its application among NGOs and private sector service providers	Sensitize NGOs and private service providers to use the farmer field school approach in their community development interventions	NGOs which have piloted the approach, local governments, other NGOs, private sector service providers
Limited access by extension and farmers to updated and targeted recommendations for fertilizer application	Provide updated and targeted recommendations for fertilizer rates and integrated nutrient management practices	Agricultural research agency
Farmer group formation and sustainability	Facilitate group formation and sustainability through business links to appropriate microfinance institutions and markets	Extension service, NGOs, private sector
Quality assurance of farmer field schools	Ensure quality control of farmer field schools is maintained when scaling up	Ministry of agriculture, agricultural research agency

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