




Maendeleo Agricultural Technology Fund

Improving Livelihoods Through Innovative Partnerships

FARM Africa
Making a lasting difference to Africa's families

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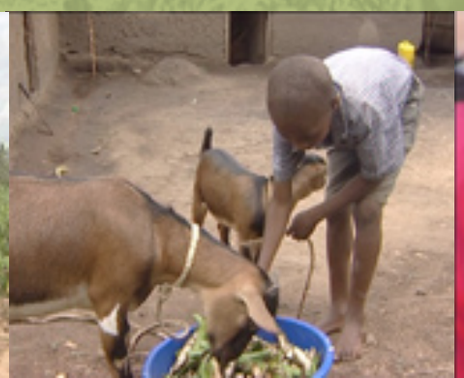
Maendeleo Agricultural Technology Fund



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FARM-Africa Statement

FARM (Food & Agricultural Research Management)-Africa is an international charitable organisation whose goal is to reduce poverty by enabling marginal African farmers and herders to make sustainable improvements to their well being through more effective management of their renewable natural resources. Founded in Kenya in 1985, FARM-Africa has a track record of successful grassroots development in Ethiopia, Kenya, Tanzania, Uganda, South Africa and Southern Sudan. FARM-Africa's vision is of a prosperous rural Africa where existing resources are effectively and efficiently utilised and sustainably managed and where the benefits of development are shared equitably among all citizens regardless of gender, education, ethnic origin, or religion.

FARM-Africa has a fundamental belief in the potential of smallholder farmers and herders to improve their own well being, and in the need to promote their interests, especially those of vulnerable groups. It gives priority to those in greatest need, with a degrading resource base or with poor access to markets and services. FARM-Africa therefore works in marginal areas and focuses on poor farmers and herders.

FARM-Africa sees its roles as: strengthening capacities of local people and institutions rather than building parallel structures; developing new models and ideas through research; disseminating practical experiences to promote wider application of proven technologies and approaches; and advocating for improved policy and practice

MATF Statement

Agricultural productivity and growth in African countries has stagnated for many years, largely due to institutional failures and market constraints, along with limited transfer and adoption of improved technologies by smallholder farmers. This has resulted in decreased productivity and poor income generation in many rural families, fuelling a vicious cycle of poverty and food insecurity. To counter this trend, the Maendeleo Agricultural Technology Fund (MATF) was established to promote dissemination and adoption of improved agricultural technologies within East Africa. It has witnessed consistent and growing demand for its support over the years, becoming a key player in agricultural development work by helping different institutions to move innovative technologies from research into farmers' fields.

MATF is a regional initiative which has focused on the dissemination of innovative and proven agricultural technologies, the facilitation of effective partnerships, and the identification and promotion of innovative dissemination methods. It was established in 2002 with joint funding from the Rockefeller Foundation (USA) and the Gatsby Charitable Foundation (UK). From 2005, the support from the Gatsby Charitable Foundation has been given through the Kilimo Trust (Uganda).

MATF has been providing grants of two to three years duration to organisations with good track records in the field of smallholder agricultural research and development. Project selection has been on a competitive basis: to date over 1700 concept notes have been received in five calls for proposals. Of these, over 50 projects have been funded and implemented in Kenya, Tanzania and Uganda. In the first two rounds of projects, the emphasis was on production aspects of technologies and dissemination processes. In rounds 3 and 4, several projects focused on value addition and processing. In the fifth round, the emphasis is on value addition and market linkages.

The MATF secretariat is based in the Food and Agricultural Research Management (FARM)-Africa country office in Nairobi, Kenya. An Advisory Panel comprising seven agricultural experts from the three East African countries, along with representatives from both donor organisations and FARM-Africa, provides support and strategic direction for the management of the fund. MATF attaches great value to monitoring and evaluation, not just to track achievements or failures, but more importantly to generate lessons in the process of technology adoption and scaling out to benefit more smallholder farmers.

Acknowledgement

Various individuals have worked hard to complete this document. We would particularly like to thank Dr. Lydia Kimenye, the former MATF Fund Manager, for providing the strategic direction of this field study, and Helen Altshul, FARM-Africa Kenya Country Director for the overall management. The MATF staff who have worked closely on this project were Monicah Nyang, Chris Webo and Dancan Muhindi. They have provided the Mediae team valuable information about the projects through various discussions and written reports. The following Coordinators of the seven projects featuring in this book have organised the interactions with farmers and farmer groups in the field and provided an excellent environment for the consultants to operate: Dr. Margareth Karembu, International Service for the Acquisition of Agri-biotech Applications (ISAAA Afri-centre); Janet Syombua Mumo, Kitui Development Centre (KDC); Dr. Methu Joseph, Land'O'Lakes; Alsen Oduwo, Community Mobilisation Against Desertification (C-MAD); Dr. Fina Opio, National Crops Research Institute Namulonge (NACRRI); Dr. Fulgensio Jjuuko, Community Integrated Development Initiative (CIDI); and Ronald Magado, Nakasongola District Farmers Association (NADIFA). Many field workers in the projects have been instrumental in the smooth running of the field visits. Last but not least we want to thank the farmers who have so freely shared their valuable experiences with us.

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Foreword

Smallholder farmers in Africa have survived for many centuries through cultivating crops and keeping livestock. But is surviving all that is needed? The contrast of living standards between the developed countries and African nations is sharp and disturbing; forty-one percent of people in Africa still have to survive on less than a dollar a day. It is high time that we changed from the concept of subsistence farming to viewing farming as a business, with the aim of running profitable enterprises. Agricultural practices need to become more productive and the natural resource base needs to be managed in a sustainable manner. Farmers, both men and women, need better access to input markets and information, to be more aware of the opportunities in the whole product value chain, and to have their confidence and skills strengthened.

The Maendeleo Agricultural Technology Fund (MATF) has taken up these challenges. This document will take you on a journey from where MATF started five years ago to the present day. Several teams composed of project partners and Mediae consultants visited various projects which had received funding from MATF, evaluated their experiences and documented them in a clear way. The document provides good background information on the projects and the agricultural technologies they are promoting, and various stories on how the agricultural innovations have impacted the lives of farmers. For development organisations to facilitate innovation of the smallholder farming sector in East Africa, simply transferring technologies through providing information isn't enough. In this publication you will read about the valuable lessons learned during the formation of strategic and sustainable partnerships among farmers and those who can influence the agricultural innovation process.

Dr. Ralph Roothaert
Fund Manager MATF

Contents

Abbreviations

BGA	Banana Growers' Association
BUDFA	Bushenyi District Farmers' Association
CBO	Community Based Organisation
CBTs	Community Based Trainers
CIAT	International Centre for Tropical Agriculture
CIDI	Community Integrated Development Initiative
C-MAD	Community Mobilisation Against Desertification
DATIC	District Extension Coordination Centre
DRD	Directorate of Research and Development
ELF	Extension Link Farmers
FARM-Africa	Food and Agricultural Research Management (Africa) Limited
FCI	Family Concern International
FFS	Farmer Field Schools
HIV/AIDS	Human Immuno-Deficiency Virus/Acquired Immuno-Deficiency Syndrome
ILRI	International Livestock Research Institute
INCORET	Indigenous Consultants Research and Trainers
ISAAA	International Services for the Acquisition of Agri-biotech Applications
KACE	Kenya Agricultural Commodities Exchange
KARI	Kenya Agricultural Research Institute
KDC	Kitui Development Centre
KIRDI	Kenya Industrial Research and Development Institute
MATF	Maendeleo Agricultural Technology Fund
MoA	Ministry of Agriculture
MoALD	Ministry of Agriculture and Livestock Development
MoH	Ministry of Health

MoLFD	Ministry of Livestock & Fisheries Development.
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries
MoARD	Ministry of Agriculture and Rural Development
MBD	Microfinance Business Development Services Company Limited
NARO	National Agricultural Research Organisation
NAARI	Namulonge Agricultural Research Institute
NADIFA	Nakasongola District Farmers' Association
NGO	Non Governmental Organisation
PPB	Participatory Partial Budgeting
RACBA	Rakai Chicken Breeder Association
RMS	Rapid Multiplication Sites
SARI	Selian Agricultural Research Institute
SDP	Smallholder Dairy Project
TC	Tissue Culture
ToTs	Trainer of Trainers
VEO	Village Extension Officers
WACAP	Wabigalo Agriculture Cassava Processing Group

Executive summary

New technologies can increase agricultural production and improve the livelihoods of smallholder farmers in East Africa. But technology alone is not enough. Seven projects supported by FARM-Africa's Mandeleo Agricultural Technology Fund (MATF) were studied to learn what else has to be in place for new technologies to be taken up by farmers. The projects, in Kenya, Uganda and Tanzania, covered a range of different farm enterprises: bananas, chickens, sunflower and honey, sweet potato, beans, cassava and silage for dairy cows. Information for the case studies came from project documents, discussions with project staff and meetings with farmers who participated in the projects.

The technologies that are promoted must be appropriate and have been shown to work on smallholder farms. This is most likely to be the case where farmers have been involved in developing, adapting and evaluating them.

Successful projects have partnerships which bring together organisations with complementary skills that the particular technology and situation require. Partnerships work effectively when all partners have a clear, shared vision of what the project is trying to achieve and are able and willing to give the project priority within their own work programmes. Regular communication among partners at all levels and commitment from senior management helps to maintain momentum. Local government proved an important partner in several projects.

The most effective approaches and methods for promotion and dissemination of technologies were those that involved the active participation of farmers. These included experimentation with the technology, Farmer Field Schools, visits to farmers in other areas who were already using the technology, and training of trainers from among the farmers in the community. These methods ensure that the knowledge farmers need to use the technology successfully is learned through interaction and trying things out, and that the expertise to train other farmers is available locally without always having to rely on external expertise. Most projects used groups as the main point of contact with farmers: working with existing groups proved more effective than forming new groups specifically for the project.

Building input supply and market linkages to support the technology was important for long term sustainability and future expansion. Moving from subsistence to more commercial production improves farm incomes but also requires new knowledge and skills. Projects have provided training in business and marketing skills to help farmers

make this transition. Others have helped farmers get involved in the processing of their farm output before it is sold. Inputs needed for uptake of the technologies in the seven case studies range from disease-free planting material of new varieties – seeds, tubers, cassava stems and banana plantlets – to manufactured goods such as polythene tubes in which silage is made. Farmers' groups provided a sustainable structure within which these inputs could be grown or purchased.

Farmers will only take up new technologies if they see them as offering a solution to a problem or a way of improving their lives. In talking about these projects, farmers mentioned four main benefits: increased income which means they can look after their families properly; food security; reduced vulnerability and risk; and a sense of achievement, self-respect and increased self-confidence.

Introduction

A major objective of MATF is to promote dissemination methods of innovative technologies that can make a difference to the lives of smallholder farming families. As the case studies in this book will show, these technologies can range from a new variety of a crop that farmers already grow, to entirely new farm enterprises or new ways of managing existing enterprises. The common feature is that they all are designed to tackle a constraint in the current farming system, or to enable farmers to take advantage of an opportunity.

MATF projects bring together partners with complementary expertise and resources to work with groups of farmers. The partners usually include at least one organisation that has access to the technology and can make it available to farmers, as well as one or more partner that can address other factors that are needed if the technology is going to be taken up on a significant scale. These factors vary from situation to situation, but often include bottlenecks in the marketing chain, access to information, training so that farmers can gain new skills and knowledge, and perhaps financial services to enable them to buy new inputs.

Since it started in 2002, MATF has supported over fifty projects in Uganda, Tanzania and Kenya. Throughout, an important aim has been to learn from the projects and to share this learning among the partners and with others working to achieve the same goals. Most professionals working in the agricultural sector will agree that technology must be part of the answer to the current low levels of productivity and incomes that most smallholder farmers in the region experience. But they would also agree that technology alone can never be sufficient. The purpose of this book is to use the experience of MATF projects to identify what is needed for an innovative technology to be widely adopted.

The perspective taken is that of the people on the ground: farmers, those implementing the projects, and other stakeholders in the wider community. The focus is not on the technologies themselves, but on the methods and approaches to dissemination that seem to contribute to project success – and on factors that may limit the impact of a project.

The case study projects

Table 1 Seven case study projects

	Project	Location
1	Diffusion of tissue culture banana through micro-credit scheme	Arumeru District, Tanzania
2	Improving household welfare by improving indigenous chicken production through programmed hatching	Rakai District, Uganda
3	Community-based sunflower promotion integrated with beekeeping	Kitui District, Kenya
4	Smallholder marketing of orange-fleshed Sweet Potato	Homabay District, Kenya
5	Resistant varieties and integrated management packages for bean root rot disease	Southwest Uganda
6	Increasing cassava production through improved technology	Nakasongola District, Uganda
7	Testing and promoting silage making technologies for smallholder dairy farmers	Nakuru and Kiambu Districts, Kenya

The seven projects listed in Table 1 were selected in consultation with MATF management to represent the broad range of technologies, enterprises and types of projects the fund has supported. Each is analysed in a separate chapter. The information on which these chapters are based came from three main sources: documents made available by MATF and the project team, interviews with farmers who have direct experience of the project, and discussions with project partners and other stakeholders. The rest of this first chapter pulls together the lessons from the case studies under six main headings: technology, partnerships, approaches and methods, supporting factors, sustainability, and benefits and impact.

Technology

Each project was focused on a particular technology. A key characteristic of these technologies was that they were designed to tackle a real and in most cases urgent problem that farmers were facing, or to enable farmers to make more efficient or productive use of their existing resources. Four of the seven projects focused on crops that were experiencing severely reduced production levels because of disease. A fifth offered farmers a way of reducing the cost of feeding livestock which was threatening the viability of dairy enterprises. The other two (poultry hatching, and sunflower with beekeeping) introduced changes in farm and enterprise management which offered farmers a better and more secure financial return.

Some technologies were relatively simple – for example, the replacement of a variety of cassava or beans with one or more new varieties that are resistant to diseases that are ravaging farmers' crops. Others were more complex – for example the introduction of a completely new way of preserving fodder for dairy cattle in the dry season, or a technique for ensuring a whole batch of poultry chicks hatch on the same day.

The technology in each case was a starting point: none of the projects would have got anywhere without a technology that had already been shown to work in small-scale farming situations. And whether simple or complex, the technology could only work if farmers were able to learn new knowledge, skills or procedures. New knowledge is a part of any new technology, and without it the technology will not deliver its full potential. How the projects set about enabling farmers to develop new skills, and the confidence to use them, is explored below.

Partnerships

The partners involved in the seven projects covered a wide range of organisations. NGOs often took the lead in bringing together other partners, including university departments, community-based organisations, commercial companies, and government ministries and research institutes. The larger the number of partners, the more complicated it was to co-ordinate their activities and maintain the partnership.

From the experience of these projects, five factors are needed for successful partnerships.

- having the right skills and resources for the particular needs of the project:. In the tissue culture banana project, for example, having a micro-finance organisation in the partnership was essential so that farmers could access credit to buy new planting materials
- a clear vision shared by all partners, from senior management to field level, of what the project is trying to achieve. In one project, differences of view led to the partial withdrawal of a partner and the renegotiation of their role
- clearly stated roles and responsibilities for all partners. Some projects found that a formal Memorandum of Understanding helped to reach and keep to agreements on what each partner would do, but this was by no means essential for projects to succeed
- regular communication among partners, both through formal channels (such as project meetings and regular reports) and through informal contact between personnel from the different partners
- ability and willingness to adjust partners' own work programmes to meet the needs of the project. Some projects found that planned activities had to be cancelled because partners could not deploy staff and other resources at the time they were needed. This can be a particular problem for organisations with a hierarchical structure and little flexibility for making local decisions and adjustments.

In several projects, the partnership expanded as time went on. Local government proved to be an important partner. In some cases, this was because local councils were a future source of funding to expand the scale on which the technology was promoted. With the cassava project in Uganda, for example, the District Council allocated money in its budget to support an expansion of project activities after the MATF funding came to an end. In other cases – including the poultry hatching project – local government extension staff helped in the training of farmers.

As the projects developed, additional expertise that the partners could not provide was sometimes required. For many farmers and farmer groups, stepping up from producing for the local market to supplying larger quantities to a wide market is a big challenge. The sweet potato project, for example, brought in an organisation to train farmer groups in entrepreneurship, marketing and financial management.

Approaches and methods

The projects used a wide range of methods to disseminate and encourage uptake of the technologies. Central to most projects were farmer groups. These have provided the structure within which project activities have been carried out, including training, multiplication of planting material and provision of credit.

Some projects encouraged farmers to form new groups, others worked with existing groups. Both have their advantages. Existing groups already have a level of identity and solidarity, providing a ready-made forum in which a new technology can be introduced. The group will have established ways of working together and there will be an element of trust among the members. Relying on existing groups to implement a project, however, may make it difficult for other farmers to join in. With the formation of new groups, farmers who are not already members of a group have an equal chance of benefiting from the project. A disadvantage is that project staff may have to spend quite a bit of time in supporting the formation and establishment of groups rather than getting on with the main project activities.

Although both types of groups have been successful in MATF projects, the experience of the seven case study projects suggests existing groups are more likely to continue in existence once the project funding is over and to give longer lasting benefits to their members and to others in their communities and beyond.

At least four of the projects used Farmer Field Schools (FFS) as a forum for experimenting with new technology and for training. Farmers who agree to join a FFS meet regularly during a whole cropping season, with a facilitator (often an extension worker or scientist) who guides them through a process of learning by doing, observation and analysis. It has proved particularly useful to help farmers come to their own conclusions about the benefits of a new technology and about how best to adapt it to their own farming systems and family circumstances. FFS require a high degree of commitment by both farmers and facilitators and some projects were not able to maintain as many FFS as they planned.

Even when FFS were not used, experimenting was an important part of projects where there were still aspects of the technology that needed refining. With the tube silage technology in Kenya, farmers were encouraged to try out different modifications to the technology to see how the basic principles could be applied in their own circumstances. While this experimenting provided useful information to the project partners, the main benefit was the high quality of learning that farmers experienced from trying different options and observing and discussing the results. Similarly with the cassava project, farmer groups tried out several new varieties before deciding on the ones that did best in their area.

Another very effective way of encouraging farmers to learn from one another is to organise farmer visits to areas where the technology has already been taken up and integrated into local farming systems. They are time consuming and expensive to arrange, but highly popular with farmers. During the visit, they can see the technology with their own eyes and, more important, ask their hosts questions about their experiences with it. At least two of the projects arranged such visits, in one case taking farmers from Tanzania to Kenya. Only a few individuals can go on a visit, so it is important to maximise the impact on other farmers – by careful selection of who takes part and by using the mass media (radio, for example) to spread information about the visit and the views of the visitors to a much wider audience. Other projects have arranged more local visits for project participants and found this an effective way of maintaining support and commitment within farmer groups as well as consolidating the local uptake of the technology.

All projects arranged training for farmers so that they could acquire the new knowledge and skills needed to make a success of the project technologies. For most projects, the training went beyond the technology itself: some offered training in group management and leadership, others in book keeping and enterprise management.

A particularly successful feature of five of the projects was the training of trainers. This was a deliberate strategy to increase the impact and sustainability of technologies by making sure there are people within the local community who can extend the training more widely than the project partners could do with their own staff and who will be a source of expertise and advice to other farmers when the project comes to an end. This worked particularly well where there was already a structure in place: the cassava project, for example, used the "Extension Link Farmers" within the district farmers' association, who were already playing an important role in linking local group members to technical support and advisory services. Where the training of trainers gave people privileged access to resources, it sometimes created ill-feeling: some participants in the sunflower and honey project felt that the trainers had an unfair advantage because they had been given equipment and protective clothing for collecting honey, which meant they could charge other farmers a fee for using them. The overall verdict from the project partners and participants, though, is that training of trainers has been a positive feature.

Demonstrations are a tried and tested method for showing farmers how a technology works and the results that can be achieved with it. Some projects set up demonstrations at research stations; more often demonstrations were established on farmers' fields which has the advantage that other farmers can see the technology in an environment similar to their own farms. Projects have used demonstration plots as sites to hold field days when large numbers of people from the surrounding area are invited come to see and ask questions about the technology.

Many of the methods described above involve a high degree of participation by farmers. Two of the projects used innovative participatory methods to encourage learning and decision-making among farmers. Participatory variety evaluation was used in the cassava project to identify four varieties, from the fifteen that scientists made available, that were suitable for local conditions. In the silage project, participatory partial budgeting helped farmers analyse the costs and returns from their livestock enterprises at different times of the year, which was an important step in their recognition that preserving fodder for the dry season could save them a lot of money.

Some projects have made occasional use of mass media, particularly radio, as a way of creating widespread awareness of new technologies or reporting specific events. More have produced print media (mainly posters and leaflets) to publicise what they are doing or to provide technical summaries for farmers as a way of

reinforcing information given during training. Most project partners, however, have little experience of using the media in a deliberate, strategic way to achieve project objectives and this is an area in which MATF recognises more can be done.

Supporting factors

Each of the seven projects has taken a holistic approach to the promotion of technology. They have identified the things that need to be in place if farmers are going to gain maximum benefit and looked for ways of ensuring they are available. Although these vary from project to project, some common themes can be seen.

- **Markets:** in small-scale farming contexts where much of the produce is consumed within the farming household or sold in small quantities in local markets, any significant increase in production can easily swamp the market and lead to a fall in price, leaving farmers no better off than they were before. Projects have tackled this in various ways, including providing training in business skills and marketing, encouraging the formation of co-operatives and other types of association, bringing in partners who can provide links to more distant markets, and negotiating contracts with processors for the purchase of farmers' commodities. This move to a more commercial basis of farming has obvious potential benefits but can also put increased pressure on farmers: processors need a regular supply of dependable quality to keep their factories going and if groups of farmers cannot meet these demands, they run the risk of losing contracts and credibility.

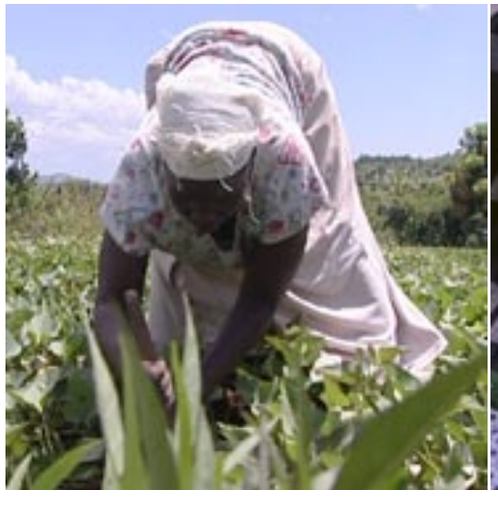
- **Value-addition:** it is true of farming all over the world that only a small proportion of the final price of a product goes to the farmer who produced the commodity in the first place. If farmers are to increase the proportion of the value that comes to them, they need to get involved in some of the activities that add value to the commodity before they sell it. The sweet potato project recognised this and during the life of the project, five processing centres were set up. The lead partner in the cassava project has plans to build a cassava processing factory so that the farmers' groups would sell cassava chips which command a much higher price than cassava straight from the ground. However, maintaining facilities like these and ensuring they remain viable can again put pressure on farmers' groups and organisations, requiring new skills and attitudes towards their enterprises.

- **Supply of inputs:** the technologies in all seven projects require a regular and dependable supply of inputs for farmers, ranging from banana plantlets and cassava stems to polythene tubes for making silage. This is particularly important if the technology is to reach increasing numbers of farmers and not remain within a small enclave. Projects that rely on long supply chains and distant sources are vulnerable to even a temporary breakdown in supply. The banana project, for example, initially had to rely on sources in Kenya to supply tissue culture plantlets for their farmers in Tanzania: when transport systems or quality control procedures at the source broke down, farmers lost out. The partners responded by looking for sources that are nearer to the project area. For the silage project, problems arose when local shops in one area stopped stocking the polythene tubes. To deal with this, the project partners helped farmers form a co-operative that could negotiate bulk purchase of tubes from a wholesaler. With the cassava, beans and sweet potato technologies, setting up systems for producing and distributing clean (i.e. disease-free) planting material has been an important project component. Farmers' groups have proved an effective way of doing this, with some groups creating new businesses out of supplying planting material to farmers in their locality and further away.

- **Technical expertise:** all seven projects were careful to ensure that their partnership included the expertise that was needed to provide appropriate training and technical support to farmers. Continued access to expertise is also needed to help farmers identify and deal with problems that may occur later on.

Planning for sustainability

MATF supports projects for two to three years with the expectation that the technology, once established within the farming system, will continue to spread to other farmers and areas, bringing benefits to more and more people. Projects have tried to ensure the benefits will continue beyond the life of the project in three main ways: working with local government departments to bring support for the technology within the scope of regular extension and advisory services; training



of trainers (as described above); and encouraging the development of farmers' organisations (e.g co-operatives, or federations of farmers' groups) that can link farmers to other stakeholders. In some projects, local government bodies have been sufficiently convinced about the benefits of the technology that they have committed funds within their budgets to support its future promotion and uptake.

Benefits and impact

What benefits do farmers see from the technologies promoted by MATF projects? In the case of these seven projects, farmers talk about four main types of benefit.

- **Money:** in all projects, farmers talk about their increased income. Rather than talk about the money itself, most emphasise the things that the money allows them to do, such as pay the costs of keeping their children in school, clothe their families properly, pay medical expenses, or invest in new farm and off-farm enterprises;
- **Food security:** particularly for the projects which focus on staple crops (sweet potato, beans, cassava), many farmers say that their own food supplies are more secure than before: they and their families are eating more and have more healthy diets;
- **Less vulnerability:** this is partly a question of money and food security, but is seen also in stronger social ties and linkages to more networks and sources of advice and information that farmers experience through their involvement in the projects;
- **Self-respect:** the benefit that comes across most strongly from listening to participants is their sense of achievement, self-respect and increased self-confidence. These benefits are often missed in formal evaluations of development projects but are nonetheless very real to people who have felt excluded and marginalised because of their poverty. For some, this change comes from moving their farming onto a more businesslike footing. For others, it comes from being able to look after the financial needs of their families without constantly having to fall back on help from better-off neighbours or relatives.

Bananas

Introduction

Over 300 small-scale farmers in Arumeru District, Tanzania, have planted banana grown using tissue culture. This technique has been used successfully in Kenya to produce clean planting material that does not carry the diseases that often come with suckers taken from farmers' own banana plants. A MATF project carried out by the International Service for the Acquisition of Agri-biotech Applications (ISAAA) brought the technology to Tanzania. The project has helped farmer's get more than 42 million Tanzania shillings of loans to buy the bananas. Without the loans, few farmers could afford to buy them. Now project participants are reaping the benefits – more food for their families and higher incomes because their maturing bananas are already producing high yields of good quality fruit.

Background

Arumeru is known as one of the main banana producing Districts in Tanzania:

"Traditionally farmers used suckers from the mother plant, so this method transferred all the diseases from the mother plant to the sucker, so the farmer started from a disadvantaged position."

Margaret Karembu - Project Coordinator, ISAAA

the crop provides more than three quarters of the income of farming households in some parts of the district. But production has been falling because banana orchards are affected by disease, caused by fungal and bacterial infections. These diseases are being passed on to the young plants that grew from their suckers, so it has become impossible to find locally-grown clean young plants. Bananas harvested from local plants are small and poor in quality. Yields are less than a third of what they could be. Over the border in Kenya, farmers facing similar problems had tried planting small 'plantlets' produced in a laboratory using a biotechnology called tissue culture – and were very pleased with the result.

The technology

Tissue culture has been around for twenty years and in Kenya for about ten. Plantlets are grown in a laboratory from tissue taken from a healthy banana shoot – around 2,000 can be grown from a single shoot. They are grown under controlled, disease-free conditions until they are ready to be planted out in a nursery. This is the point at which the technology leaves the high-tech world of the science laboratory and meets the real world of the farmer.

From the farmer's point of view, this technology represents a big change from their normal practice in growing bananas. Normally, farmers grow new plants from their existing bananas: with tissue culture, they must get plantlets from a nursery. The plantlets are relatively expensive because of the cost of maintaining the laboratory facilities: at TSh 1,000 for a plantlet, a farmer needs to invest over TSh 80,000 – around £45 sterling – to establish an orchard that is commercially viable. On top of that, farmers need to use more fertiliser and buy chemicals to prevent disease taking hold in their orchards. Overall, the technology is more expensive and requires more labour than the normal way of growing bananas. Finding the money to invest until the bananas begin to pay back from the much higher yields and quality was something the project had to help farmers with. ISAAA knew the investment would pay off, from the experience of small-scale farmers in Kenya whose incomes had increased substantially from the new bananas.

Partnerships

The need to bring together high tech facilities for producing plantlets, a means of distributing young plants to farmers, financial support for farmers in the initial stages, training and technical advice to enable farmers to get the most out of the technology, and ensure efficient marketing of the fruit required the cooperation of three main partners, each with distinct roles. Co-ordination of these different roles was a major challenge for the partners.

ISAAA provided access to the tissue culture planting materials as well as overall management of the project. They identified suitable sources of the materials, all of which were in Kenya where the technology is well established and demand from farmers has encouraged commercial firms to set up tissue culture production facilities. This led to two problems for the project: some plantlets arrived in poor condition because of the stress of the long journey; and plantlets from one particular variety did not do well in the local soils and conditions in the district.

The Directorate of Research and Development (DRD) of Tanzania's Ministry of Agriculture and Food Security dealt with training and advice for farmers and also linkages with markets within the district. These services were provided by the main DRD research institute in the area – Selian Agricultural Research Institute (SARI). SARI coordinated provision of extension services and training for the farmer field schools on orchard management, post-harvest handling and utilisation. This involved training the Village Extension Officers (VEOs) and extension staff in the technology so that they could teach and advise farmers.

Microfinance Business Development Services Company Limited (MBD) provided the important financial support by managing a micro-credit scheme. This worked through a group-based lending system known as "Jitegemee". MBD and DRD worked together to identify farmers as potential participants in the project. Apart from practical considerations such as having sufficient land (around a hectare) and labour, the partners deliberately recruited farmers from several communities in the area to make sure the demonstration effect on other farmers was widespread.










Methods used for learning and dissemination

The main methods used were the formation of farmer groups, Farmer Field Schools (FFS), and exchange visits. A key element in all of these methods is that farmers learn from and support each other as well as from the extension staff and other staff of the project partners. Also, the new orchards of participating farmers became highly visible demonstrations of the new technology to other farmers.

Farmer groups were the mechanism by which farmers received micro-credit loans, which reduced the cost of administering large numbers of small individual loans. The group also provided guarantees for the loans: the group was responsible for ensuring everyone repaid their loan on the agreed terms. Between three and eight farmers formed a small group – a UKO – and several UKOs were combined to form a larger group, known as MBUKO. It was this MBUKO that was the legal entity that was responsible for the loan. Loans were given in kind, in the form of plants, fertiliser and pesticides, at the time they were needed by farmers. Interest was paid monthly, but the loan itself was not repaid until the new bananas began to bring in an income.

"The traditional banana takes a year and a half from planting up to harvest, bunches are very small compared to Tissue Culture bananas and you could not make any profit"

Apaikunda Peter - Farmer

Farmer Field Schools were the forum where the main learning took place. The essence of a FFS is that participants learn by doing and from each other, in this case by trying out different ways of managing the new bananas and learning from what works and what doesn't work so well – all under the guidance of a trained facilitator. In this way, the farmers adapt the technology to their own situation while learning the key principles they need to follow. Six FFS were formed, with total membership of 320. One advantage of the FFS was that the members could arrange to market their bananas together, giving them a stronger voice in the negotiation with traders and so securing a better price.

The learning that FFS members engaged in went beyond the technical side of banana management and production: success of the project depended on farmers making a commercial success of their banana enterprise, and their future access to credit and other financial services depended on them handling their loans well and showing themselves to be reliable clients. So sensitisation and subsequent training on micro-credit provision, the business side of banana farming and record keeping was also done through the FFS. The FFS were run by DRD extension staff, supervised and co-ordinated by SARI.

Farmer visits enabled the project participants to see the technology at its various stages and to hear from other farmers who were already using it. The project took farmers from Arumeru to Kenya to see how the plantlets were grown in the laboratory and grown on in nurseries, and then visited banana farmers in Kenya who were able to share with them how they had started, the challenges they had faced and how they had dealt with them, and the benefits the new bananas had brought them. Once they got back home, they received wide publicity by the local media and later shared their experiences through a local TV channel. They have also visited other people in the production and marketing chain to get a better idea of what happens to their bananas after they are sold and what qualities these people look for in the bananas they buy and process.

"We have brought people together into economic groups, that is one key aspect, they are now starting to learn the culture of micro credit within the community."

Charles Panyika - MBD

The farmer-to-farmer learning continued beyond the project itself: because of the intensive and practical learning that went on in the FFS, participants have become, in effect, potential trainers of other farmers within their own communities and beyond. ISAAA has also produced a video featuring many of the participating farmers, as a communication tool to create interest in the technology and the project's approach to helping farmers take it up.

Achievements and impact

It is early days yet: this was a two-year project and the plants take over a year to come into production. But even within the short life of the project, the impact has been substantial. Three hundred and twenty farmers acquired clean planting materials, planting a total of 31,000 tissue culture plantlets. Nine out of ten of these plantlets developed into profitable orchards. Through the group lending system, farmers have received over TSh42 million in loans and repayment has been excellent. By the time the initial period of funding for the project was coming to a close, the first participants were already harvesting from their new orchards and were impressed with the early yields and the quality of the fruit. There have been some disappointments and challenges, particularly with the long supply chain for the plantlets from Kenya. But perhaps the main indication that the project has succeeded is the obvious enthusiasm of the 300 plus farmers who have participated.

Looking to the future, the project partners are confident that they have sown the seeds of a sustainable improvement in banana production in the area. MBD is helping the loan groups convert their micro-credit into revolving funds, so that repayments become available as loans to more farmers. One such revolving fund has already been established. Over half of the farmers who have been through the FFS learning process are expected to become trainers of trainers (TOTs) who can form new schools for farmers who are new to the technology. Demand for the plantlets has stimulated local upcoming entrepreneurs to take up distribution of planting material. Others have taken up the marketing of the new fruit as well as becoming interested in value-addition through processing. A further potential step is for participating farmers to form a Banana Growers Association (BGA) that will take over the co-ordination of services required in the production-distribution-marketing and utilisation chains. In this way, the continued support for and dissemination of the technology will become part of the social fabric of the area, rather than a short-term project reliant on co-ordination by outside organisations. This is a key ingredient for social, financial and institutional sustainability.

Case Study

Wdantu Group's Tissue Culture Project

Apaikunda Peter is one of 11 women in Wdantu group consisting of 39 farmers. She joined the TC Banana project when she saw the successes of other members in the group. Since growing TC banana's she has seen positive changes within her household, her business and her position as a women.

"When we entered the project we remained in the same position as a woman in the wider society. The project has empowered me as a woman from the profit I make from the bananas. I am now able to assist my husband when he has nothing."

She feels empowered and has immediate money through selling TC bananas at the markets, unlike previously with traditional bananas, which made no profit, or coffee, which once taken to the coffee union, could take up to 2 months before payment was received.

She speaks very enthusiastically about the project. With the money she has made she is able to pay for school fees and household items and she has also bought a television She is planning to buy a van with the money she has saved from the project; things that she could not do before joining the project.

Key lessons learned

Bringing all the ingredients together – technology, efficient distribution, effective lending mechanisms, and a proven system for learning new skills and attitudes – is possible through a strong partnership. In this case, the three main partners brought with them unique strengths and expertise. Their roles and responsibilities were agreed at the start and made clear in a formal Memorandum of Understanding: this was a great help in ensuring co-operation and co-ordination.

Farmers are interested in new technologies where they can see clear advantages over their current practices. But where technologies require investment, credit is essential if small-scale farmers are going to benefit.

Exchange visits are a great way of letting farmers learn from the experiences of those who have already successfully taken up a technology. They are expensive to

arrange and only a few farmers can go. But their impact can be extended through mass media reporting of the visits and by selecting individuals who are keen to share what they have learned with others in their community.

Attitudes in rural communities towards credit institutions can be a challenge. Where there is a history of non-repayment of loans, perhaps fuelled by previous projects which have handed out loans which no one ever expected would be repaid, it may be difficult for farmers to learn the discipline of regular repayment and keeping to the terms of a formal loan agreement. The group solidarity and peer pressure through the group-based system can help to overcome these negative pressures. In this project, there has been little defaulting and repayment rates are high.

"Without the group lending, I would never have afforded to buy these new plants. We now have more food to eat, as well as more money for our family's needs. The Farmer Field School has given me the confidence to manage the new orchard. My neighbours are now coming to ask me about the new plants and how they can get some."

Fatuma Ibrahim Msuya - Farmer

Farmer Field Schools have proved a cost-effective means of enabling farmers to learn new orchard management skills and loan administration. Through mutual encouragement and exchange of views, participants have developed new attitudes towards farming as a business and management of farm enterprises have developed.

Access to a reliable supply of planting material that can be delivered in good condition at farm level is crucial. Around a tenth of the plantlets delivered were poor quality or poorly adapted to local conditions. Incidents like this create difficulties for farmers who have taken loans, which will not now lead to the levels of income they expected. Within the project, this has been handled by not expecting repayments from the farmers affected. But the credibility of the technology and the project partners is also at risk if the technology becomes seen as less reliable than it should be. For future sustainability, the project partners agree that having a local facility for production of plantlets is essential: a laboratory is now being built in Tanzania. More generally, a mechanism for quality assurance of planting material is needed if tissue culture is to take off on a large scale: this could be through a voluntary scheme set up by the industry, or a role that government could take on through an existing or new regulatory agency.

Beans

Introduction

Farmers growing new varieties of beans in Kisoro and Bushenyi Districts in southwest Uganda have reversed drastic losses of recent years caused by Bean Root Rot Disease. They now have more and higher quality food for their families and are setting their farms on a more commercial footing. There is now a lot of demand for the new varieties and some farmers are specialising in producing disease-free seed for sale.

Background

Beans are an important part of farming systems in Uganda, as in many other countries in east and central Africa. For poor families, they are a vital source of protein as well as cash through the sale of beans in local markets. They help maintain soil fertility by fixing nitrogen from the air in the soil. But beans are attacked by diseases, which reduce production and discourage farmers from growing them. Root Rot is a particularly damaging disease in southwest Uganda, where in some districts it has

"As a person and individual I am happy and proud as I have got knowledge, income and good food for my family".

Eric Tugabirrwe - Farmer

reduced yields by over 70 percent. In Kisoro and Bushenyi Districts, by the end of the 1990s, some farmers could no longer harvest any beans at all.

The technology

There are two main elements in the technology: growing new varieties of bean that are resistant to Root Rot, and giving the beans the best chance of doing well by using crop husbandry practices that are known to reduce the occurrence and spread of the disease. These practices include using seed that is free from disease; sowing the seeds in lines, which makes it easier to weed and harvest the beans and makes sure the plants are at the right distance from each other; making good compost from available materials which is then used as a fertiliser; and buying new seed after every two or three years instead of always planting seed harvested from the previous year's crop.

"Previously, we could not produce any beans at all so we had no beans to eat and no income from beans. This meant we were unable to pay for school fees or even provide for household necessities."
Vaerian Buiruka - Farmer

Ugandan scientists at the National Beans Programme have developed new varieties that are resistant to bean rot in cooperation with the International Centre for Tropical Agriculture (CIAT). However, seeds of these varieties were not yet available on a large scale and were not known to farmers in the southwest. The challenge for this project was to introduce the new varieties to farmers, train them in the new management practices and facilitate the production of large amounts of seed for farmers to buy and plant. Once established in the area, with good local supplies of seed and access to markets to sell surplus beans, the change in technology and the improvement stood a good chance of being sustainable.

Partnerships

Namulonge Agricultural and Animal Research Institute (NAARI), which is home to the National Beans Programme, was the lead partner. NAARI scientists provided the initial seeds and the knowledge of good husbandry practices, based on their research over the years. They also provided technical backup to other partners and helped solve technical problems reported by farmers.

Kachwekano Agricultural Research and Development Centre in Kabale organised the multiplication of seeds so that farmers would have enough to start using the new technology.

Africare, a local NGO, organised Farmer Field Schools (FFS) in Kisoro District. Extension staff from the District Councils provided training and technical support to farmer groups. They selected two sub-counties in each of the two districts to take part in the project.

Methods used for learning and dissemination

Demonstrations of the new beans and crop husbandry practices were set up on farmers' land. Although scientists and extension officers gave technical advice, the demonstrations were managed by the farmers themselves. This helped the farmers to learn and also gave credibility to the technology in the eyes of other farmers who saw the success of the beans through the growing season.

As well as providing a place where public meetings can be held to promote the

"Our community has benefited from improved incomes and nutrition. Our soils are poor and the project has shown us not only how to grow beans but also other crops such as coffee and tea."
Eric Tugabirrwe - Farmer

technology, demonstration plots attract a lot of informal interaction among farmers. As one farmer with a demonstration plot said, "We like it that people know about us and we enjoy people coming to visit us to learn about what we do – we can also learn more from them and it encourages us to do well."

FFS were set up so that participating farmers could try out and learn the new technology through the growing season. Scientists and extension staff drew up a syllabus for the FFS to follow. The training involved practicals, lectures using flipcharts and field days where all the farmers would come to see how the beans had been performing.

Seed loans were given to farmers who could not afford to buy seeds of the new varieties. These loans were in kind, not cash: farmers were given seeds on the understanding that twice the loaned amount of seed would be returned to the project after harvest. This not only helped the initial participants to get started with the technology: it also made sure an increasing amount of seed became available to loan to other farmers.

Farmer groups were the main form of contact between the project partners and farmers. Groups which were already formed were used as this was easier and proved more effective. The project did also try to form some new groups but most of these disintegrated before the end of the project.

Meetings with local government officers and councillors, other stakeholders and local opinion leaders and inviting them along to demonstrations helped create awareness and support for the project in the wider community.

Achievements and impact

Over 40 hectares of land have been used for multiplying seed: over 24 tonnes of new variety seeds have been produced.

Farmers have set up 52 demonstration plots in the course of three seasons.

Over 80 percent of farmers taking part in FFS have adopted the new varieties and improved management practices on their own farms. One in ten of those who took part in the first FFS have helped train farmers in the later FFS.

"As well as the new varieties, farmers have also learnt how to budget and manage their farms. Before this they just sold their beans and seeds without thinking about the future and the next season."
Angela Kamasaza - Project Coordinator

The new varieties can be seen growing, and in markets, in other parts of the two districts: they have been spreading from farmer-to-farmer and community-to-community as more and more people hear about them.

Many of the members of farmers groups who have been involved in the project say they have noticed improvements in their incomes and in the amount and quality of food available to their families. Some also describe how their whole approach to farming has changed, to a more commercial and businesslike approach to planning and managing their farms.

Key lessons learned

Co-ordination: the project has faced difficulties in co-ordinating the activities of the different partners, all of whom have their own responsibilities and demands on their time in addition to this project. This co-ordination function takes time. Resources need to be allocated for it.

A common vision among the partners, that bean root rot was a priority problem and that the project offered the most promising way of tackling it, helped strengthen and maintain the partnership. On the other hand, changes of staff within partner organisations led to some weakening of momentum, particularly in the implementation of FFS in the later stages of the project.

Case study:
Masheruka Central Women Development Club

There are 14 women in this group. The group started in 2001, when the main objective was to run a savings and loan group to access credit and run their farms better.

They found out about the project in 2004 when they were discussing their farming problems with the local agricultural extension office and were told about the project. They did not hear about it at all when it first started.

The new beans give a higher yield and whilst they were initially growing and eating the beans, they have since moved on to selling them as well.

Before the project they lacked income because they had very low bean yields and had to spend the money they earned from their bananas on buying beans. They would also earn money by working as labourers and making handicrafts.

"We were in a bad situation, but nowadays we can eat, we can sell some and keep some for seed."

They also helped some local orphans by buying them blankets, mattresses, books, pens and making parental contributions at school, as well as providing mosquito nets. Some of this was funded by local government funding but they were also able to make a contribution.

"We are happy to do that because we are helping people who are parentless."

The group first received training from the Parish Headquarters and then locally before going to the demonstration plots for practical sessions in applying manure. Training was done using a blackboard but the only other information they had was a calendar with photos of different bean varieties. As they joined the project quite late they did not receive as much training as they need.

Training is held seasonally and they have so far developed some technical knowledge but would like more. They are confident that they can continue the project though as the district staff provide them with support.

Their main business is currently selling seeds to farmers. At the local field day arranged by NAARI they were able to make contacts with other farmers for this business.

Partnerships can only work if each partner has the resources to do its part. Some extension staff felt they could not give sufficient support and advice to the farmer groups because of the limited budget their office had for travel.

Access to local sources of the new seed is crucial for sustainability. Future plans are to support three farmers' groups to produce high quality seed for the local market. This will reduce costs to farmers adopting the new varieties and also generate local income, giving a boost to the economy. However, these groups will need to achieve sufficient levels of sales to generate the income needed to continue buying foundation seed from NAARI and cover their overheads in supplying the district.

Marketing the seed and sensitising other sub counties who will form the market for these seeds is an important part of the strategy for further spread of the technology. One group has decided to rent two acres of land in a neighbouring sub county. This site is more fertile and will allow them to produce seeds for the local market, while using their local land for their own consumption.

Tackling these input and marketing constraints will need a wider set of partners who can give a greater emphasis on seed production and marketing, and on developing the commercial basis of bean production. For example, Ankole Private Sector Promotion Centre based in Bushenyi Town is available to provide training in running farms on a commercial basis including farm management, book keeping, entrepreneurship and how to access and manage micro finance loans. Bushenyi District Farmers' Association (BUDFA) is also keen to become a partner as they see themselves as a bridge between farmers' groups and government research and extension staff.

Existing farmer groups provide a sound basis for innovation and technology transfer. In this project, some of the groups were members of BUDFA which, in the future, could perform a linking role between the project and farmer groups: they could provide support in marketing, for example, and storage of seeds and harvested beans.

Diffusion of technology after the end of a project depends on there being a significant number of farmers who have been introduced to the new beans, so that information and knowledge about them can spread rapidly through farmers' communication networks within their communities, at markets, and in other places where farmers meet and exchange ideas. Some stakeholders feel the scale of this initial project has been too small to lead to rapid diffusion and uptake.

Adaptability of the technology has helped its diffusion. Some farmers are making

"The project has taught me to work hard and think as a business person."

"We have given seed to our neighbours and helped them start their own garden, so they won't steal our beans."
Frank - Farmer

compost from banana leaves, those with cattle or goats kept in sheds use manure, while at least one farmer uses manure from his rabbits. Different farmers have been trying out intercropping the new beans with other crops. One of the advantages of the FFS methodology is that it encourages and supports this kind of experimentation and adaptation.

Farmers learn new skills and practices more effectively and confidently when they have an opportunity to try them out, observe others with more experience and ask questions. Integrating new varieties into their production systems is something farmers do all the time. Some of these disease resistant varieties, however, have a different growth habit from the ones farmers in the area normally grow: they need to learn how best to fit them into their own farms as well as learn the new husbandry practices that will help keep their crop disease free.

Continued technical and scientific support is needed when farmers take up a new technology. In this case, farmers found that they were losing some of the benefit from increased production through pests, which attacked the beans while they were being stored after harvest. The continued involvement of NAARI scientists has enabled farmers to get advice on dealing with this problem. As research and advice are the continuing mandates of the main partners, these activities have continued even when funding for this project came to an end. This shows the importance of having an institutional framework in place through which project benefits can become sustainable.

Cassava

Introduction

Crop diseases can play havoc with farmers' livelihoods. In Nakasongola District of Uganda, farmers have planted new varieties of cassava which are resistant to a disease that has seriously affected production over large parts of the country. Yields are now higher than they have ever been and households are making good money from their surplus production. Collaboration between the district farmers' association, research scientists and local government has been crucial to the project's success.

Background

Cassava mosaic virus is spread by a particular kind of whitefly and has been around in Uganda and neighbouring countries for many years. From the late 1980s, a new form of the virus spread throughout eastern Uganda and dealt a severe

"Before the project all our cassava had been destroyed and we had no food. People depended on other crops and cutting down trees to make charcoal for money."
Semuwemba Bosco - Farmer

blow to households who use cassava both as a staple food crop and as a source of income. People were not getting enough food and income levels were declining. The Nakasongola District Farmers' Association (NADIFA) decided to do something about the problem.

During the 1990s, scientists at Namulonge Agricultural and Animal Research Institute (NAARI) developed new cassava varieties which were resistant to the disease. But only limited quantities of stems of the new varieties were available for farmers to plant. The challenge for NADIFA was to make planting material for these new varieties widely available to farmers so that they could begin to rebuild their cassava production and livelihoods. Cassava is grown by planting stems cut from a mature plant. But the amount of planting material from a single cassava plant is much smaller – and much bulkier to transport – than the seed produced by a cereal crop such as sorghum.

The technology

At one level, the technology is straightforward: farmers replace the old, disease-affected cassava varieties with new varieties that are both higher yielding and resistant to mosaic virus. This required taking stems of the new cassava from NAARI, planting them on multiplication plots within the District and distributing the new stems to farmers, in a way that would be sustainable after the project ended. The technology therefore included the arrangements for creating a continuous supply of new planting material so that the disease-resistant varieties would be widely available to farmers in the district.

To get the full benefit of the higher yields, farmers also needed to find ways of using the increased production to earn money. They have done this at household level by, for example, making cassava chips to sell locally. This in turn has led to plans to build a cassava processing plant and created a need for more concerted marketing efforts beyond the local area.

Partnerships

The two main partners in the project were NADISA and NAARI. Local government at District and sub-County level, and central government's Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), also played an important role.

NADIFA, through its members and their existing groups (special interest groups, or SIGs), has organised farmers to multiply the new planting materials and to come together for training. NADIFA also made the initial contact with NAARI to enquire about the new varieties and is developing plans for further commercialisation and marketing of cassava production and processing – including plans for a processing factory that will produce cassava chips.

NAARI scientists supplied the planting material and give technical advice on multiplication and how to keep multiplication plots free of disease. They have also provided several different varieties for farmers to try out, from which farmers have selected those that perform best in their local conditions.

Local government, through district and sub-county production departments, have organised meetings at parish and village level to make potential beneficiaries of the project aware of the new varieties and how they can acquire them. They have also set up demonstration plots. The District Council has allocated funds in its budget to continue supporting the project initiatives after the MATF funding comes to an end.

MAAIF held workshops where farmers would go to a central farm and do practical work.

Methods used for learning and dissemination

The project used a wide range of methods to promote awareness of the new varieties and to make sure farmers had the knowledge and skills they needed to get the best out of them.

In order to mobilise potential beneficiaries meetings were arranged with groups via established farmers' groups. Meetings were arranged within Parish areas and through






leaders of the farmers' groups. These groups form the basis for regular contact between farmers and extension staff from the District production department. It is the department's policy now only to work with groups as they feel it is the most effective way of communicating with large numbers of people.

Trainers of Trainers (ToTs) were selected by the various farmers' groups. These ToTs received training in disease-free multiplication of cassava, good husbandry practices, and effective training and communication methods. Several of these ToTs were farmers who had already been identified by groups as their Extension Link Farmers (ELF). These ELFs are the main mechanism by which NADIFA members access advice and information, both from NADIFA and other organisations and service providers. As one of them explained, "As an ELF I trained group farmers at the local demonstration plot and if farmers subsequently had problems I would go to visit them to help or they would come and visit me".

Demonstration plots were setup by local government, as well as by NADIFA. These demonstration plots were placed in prominent spots so that farmers would notice them and become interested in the project. The plots were also used for field days later in the project.

Farmers also carried out research into 15 different strains of cassava and narrowed the selection down to four suitable varieties that did well in the District. This information was then passed back to the local government officers through a process of participatory evaluation. The information then passed to farmers running multiplication plots in other parts of the District.

As well as the technical training given to group members by the ToTs, NADIFA also provided training in group organisation and management, and in record keeping. One group leader says that this training "helped me deal with group problems, so that the current issues within the group are only minor ones"; he went on to say that more training is needed in areas such as the planning and management of projects.

NADIFA produces a newsletter in which they provide information about the project and promoted the new varieties of cassava.

Achievements and impact

External evaluations of the project have shown that farmers in the district have benefited financially as well as from better food security. On one independent estimate, each £1 of project funding led to over £3.50 of benefits for participating households. For many farmers, the project has helped them establish their farming on a more commercial basis.

The benefits have been felt far beyond those who directly benefited from the project activities. After the end of MATF funding for the project, NADIFA's groups and their members have continued to be a source of clean cassava planting materials for the district under the Local Government Development Programme, for sub-counties, for fellow farmers and for NGOs (e.g. World Vision and Save the Children). For example in April 2005, the District production department bought 1,000 bags of cassava cuttings at 15,000/= per bag (GBP 5) from NADIFA groups for further multiplication and distribution in other sub-counties.

Some groups are building new enterprises on the basis of the improved production. Members of one group, for example, are using cassava to make pancakes and bread for sale, and also using it as chicken feed. As well as using their own cassava, these groups also purchase cassava for other farmers nearby and so represent an important local market.

One benefit that is difficult to measure comes through clearly in the way farmers talk about how things have changed

"This new technology is now sustainable: we can continue planting from our own materials."
Nalweinpa Christine - Farmer

because of the new cassava, is a renewed sense of confidence and achievement: many farmers say that they have been able to put their lives on a more secure and self-reliant basis and can now face the future with greater optimism.

Key lessons learned

Existing farmers groups provided the framework within which the technology could be established in the district and then spread to other farmers. The fact that NADIFA was already organised around local groups of members, with their Extension Link Farmers as a point of contact, meant that the project could get off to a quick start. Other groups, not affiliated to NADIFA but associated with other organisations and projects, were also able to benefit.

Case study

Kiwongoir Famers Group

Robert Mbaziira is an Extension Link Farmer for Kiwongoir Famers Group. This group, which has 62 members, was formed in 1999 to find ways of fighting poverty.

As they are members of NADIFA, Robert received a letter informing him about the project and inviting him to training.

The members of the group were previously using traditional farming methods and there was a food shortage due to the mosaic disease, their cassava taking a long time to mature and being low yielding.

After training Robert ran demonstrations for his group members showing the difference between traditional methods using the old varieties and new methods with new varieties.

Robert has used income from the project to buy cows to pull his ox plough and excavated a well. He also views the cows as an asset as he can sell them later to fund further expansion. He also sometimes uses the cow manure to improve crop production.

He is also able to pay school fees which he struggled to pay in the past. He supports eight children plus his wife and mother. At the end of last year he also had family problems which led to him having less labour, which caused production problems.

Commercial contracts with processors need a higher scale of production than before. Once production moves from meeting family and very local needs for food to commercial uses, the quantities that are available for sale become crucial. Processors need a regular supply of cassava roots at a level that will keep their factories going efficiently; and farmers can get better prices in the market if they are able to negotiate contracts for regular delivery of agreed amounts of cassava to traders. So once the new cassava varieties were established in the district, NADIFA came up with plans to build a processing factory. There was already one factory (not owned by NADIFA) in the district; a second factory would increase capacity but also introduce an element of competition so farmers would not depend only on the prices offered by a single buyer.

However NADIFA now need to negotiate contracts with buyers of the cassava chips the new factory will produce before they can guarantee to farmers that they will be able to take their produce at a reasonable price. The association is confident that when such a contract is in place, it will provide sufficient motivation for farmers to scale-up their production to keep the factory working at capacity. But without such a ready market, increases in production are likely to lead to falls in the price that farmers can get for their cassava.

Opportunities to increase production put pressure on other resources. One major constraint to increasing production is the limited amount of land that can be cultivated by manual labour. More could be done if

farmers had access to equipment like tractors or ox ploughs. At least one group has been able to hire ploughing teams from cotton farmers in the District.

A continuous supply of planting material is needed: poor farming households, particularly in times of drought, face a stark choice between saving stems for planting next season, feeding them to their animals, or selling them for cash they can use to buy other food. One of the main problems has been that dry spells have forced farmers to sell lots of their stored cassava roots and stems. This has meant that the project has had to start from the beginning each season because farmers have had to sell or eat their planting materials. A one-off investment in multiplication and distribution of planting material is not enough.

Institutional constraints can slow down the implementation of projects. For example, inefficiencies in the banking system led to a transfer of project funds from MATF to NADIFA being "lost" at one point, causing delays and a lot of inconvenience trying to track it down. For farmers, the high interest rates charged by microfinance institutions make it impossible for them to take out loans to invest in increased production or enterprises for processing of cassava.

Training can be much more effective if trainers have adequate printed materials for their own and the farmers' use. Also, practical training is much more useful than simply theoretical instruction. Some participants felt that some topics were not taught well, particularly handling the cassava after harvest, because there were no practical sessions. At the same time, training must go beyond technical skills in the technology itself. Some of the most valued training has been in management of group activities and in basic farm business skills such as record keeping.

Relying on farmers as trainers has both strengths and weaknesses. On the one hand it reduces costs and means that the project can train many more farmers. It also makes sure that after a project ends, the expertise to continue training others remains in the community. On the other hand, inexperienced trainers need support, not only in answering technical questions about the technology that farmers bring up with them during training, but also in developing their confidence and competence in training.

Cost-sharing makes it more likely that farmers will value the new technology and feel a sense of ownership of the project. In this project, planting materials were not handed out free: farmers paid a subsidised price for the new cassava stems and also paid towards the cost of the training.

Poultry

Introduction

New ways of managing local poultry and careful cross-breeding with improved strains, have transformed the lives of several hundred households in Rakai District, Uganda. As well as producing lots of eggs for the family to eat, poultry are now a major source of income, enabling farmers to buy household goods, invest in other enterprises and support the schooling of their children. Trained farmers have become a source of advice, information and inspiration to many other farmers in the District.

Background

Subsistence farming and poverty are widespread in Rakai District. Many families were affected by HIV/AIDS, including orphans. The main objective of the project was to reduce levels of poverty amongst subsistence farmers, especially women and orphan-headed households, in

"Before the project, we had no management apart from we used to sell the adult chickens – there were no vaccinations and it worked on a natural system but the numbers kept reducing and reducing."
Owalwe Vincent - Farmer

"The project was really good, things are good, we are eating eggs and it is good!"
Hajare Katashabe - Farmer

two sub counties - Lwanda and Ddwaniro. The main emphasis was on improving household income and nutrition by improving indigenous chicken production, through promotion of programmed hatching coupled with selected breeding and improved stock management, housing, feeding and health care.

The technology

There were three main elements to the technology, each of which on its own brought improved results but taken together represented a substantial upgrading of poultry keeping in the area. The technology at first seemed complicated to farmers who took part, but those who persevered with it saw substantial gains. The three elements were as follows.

- Programmed hatching: this is a way of ensuring a batch of eggs hatches on the same day, which makes subsequent management and marketing of the chicks much more efficient. Eggs are taken and stored when they are laid while the hen is given an infertile egg to sit on. The eggs which are no more than 10 days old are then picked and given to the hens to sit on. In exactly 21 days and 6 hours the chicks will hatch.
- Selected breeding: participating farmers were given layers and cocks, which were crosses between local and exotic breeds. These combined the higher production of the exotic with the resistance to local conditions and disease on the local poultry. Farmers were also trained on how to manage breeding within their flocks.
- Improved flock management, including vaccination, housing, feeding, watering and health care.

Partnerships

CIDI (Community Integrated Development Initiatives) established a strong partnership of organisations from the beginning of the project. The partners played a number of important roles in the project

Makerere University – Faculty of Agriculture, Department of Animal Science trained farmers especially in data collection and record keeping. They were also responsible for providing and disseminating information on modern poultry keeping.

Indigenous Consultants Research and Trainers (INCORET) participated actively in training farmers on programmed hatching technology and dissemination of information about the preparation of local herbs, parasite control and mixing of feeding supplements.

St. Jude's Organic Rural Training Centre was involved in training farmers as Community-based Trainers (CBTs), providing on-farm practical demonstrations of various technologies and training farmers in sustainable agricultural techniques.

District Extension Coordination Office of Rakai provided extension services, training, and delivery and vaccination of birds.

Rakai District Agricultural Training and Information Centre (DATIC) participated in training.

Rakai District Farmers' Association mobilised farmers to take part in the project and facilitated the sharing of experiences among farmers.

National Agricultural Research Organisation (NARO) shared its available research findings on indigenous poultry for dissemination to farmers.

All partners had signed the project proposal in which each of their roles was clearly set out. This helped CIDI in the co-ordination of activities. Nonetheless, there were occasions when partners' own work programmes clashed with project activities. Co-ordination worked best when there was a jointly agreed action plan.

Partners sometimes faced their own constraints which prevented them fulfilling their role. For example, local government sometime experienced delays receiving funds from central government. This affected the project when local government was expected to supply vaccines for poultry. In fact, during the two years of the project, vaccines were only received twice from local government and CIDI therefore had to source vaccines from commercial producers.

Between them, the partners covered scientific expertise on poultry, training, dissemination of information and supply of inputs. Two areas of expertise that were not covered in partnerships, which in retrospect would have been good to have from the beginning, were micro-finance and marketing. The former would have helped resource poor farmers gain a foothold, while the latter would have addressed the emerging problem of finding outlets for the increasing quantity of eggs and birds.

Methods used for learning and dissemination

At the beginning of the project, three sensitisation seminars were held with district authorities to establish a good working relationship and mobilise the District Production Department, which is responsible for overseeing extension services.

Ten sensitisation seminars were then conducted for farmers in eight parishes in the two sub counties that had been identified as the project location. As a result of these seminars, a Parish Coordination Committee was formed in each of the eight parishes to oversee and coordinate project activities. As a result of this campaign 1,800 farmers were sensitised by the end of the first year and this had risen to more than 2,400 households by the end of year two. This helped stimulate demand for the technology, which extended beyond the project area.

Training was provided for the 400 target households within the project. These were regarded as the "direct beneficiaries". Courses focused on:

- Selective breeding
- Programmed hatching
- Construction of improved poultry houses
- Disease control and use of herbal medicine
- Feeding and feed mixing
- Farm planning, business education and marketing promotion
- Use of poultry manure to improve household crop production.

Training involved both practical and theoretical teaching methods and used leaflets, hand outs and visual aids in many cases. Feedback from the training was generally positive. However the trainers felt more could have been achieved if they had the resources to produce simple reference materials in the local language, which farmers could use after the training to guide them in their poultry management.

During the first year farmers were encouraged to form groups to enable the project to reach as many farmers at a reasonable cost in a short period. Throughout the project, workshops were conducted to build the capacity of the groups, train them in group dynamics and ensure they are able to manage themselves

"I am feeling well. Those days I was 30 inches in the waist but now I am 36 because of the balanced diet!"
Hajare Katushabe - Farmer

by the conclusion of the project. Supervisory visits were carried out in the second year to support the work done in year one.

The 20 groups formed over the first year were also formed into a single Indigenous Chicken Breeder and Marketing Association (ICMA). By the end of the project this association had established a central poultry feed centre and started selling vaccines to farmers along with providing basic technical advice. The association is also serving as a market outlet for poultry products and is expected to provide the focus for future marketing efforts, as well as supervising the District breeding programme.

Input supply was crucial to getting the project underway. Four hundred and two farmers were identified to receive improved laying birds and cockerels: they were given 4,002 breeder hens and 798 cocks. These households then became a source of improved birds for other households in the area. Vaccination was given to all birds before distribution, as disease was common among local poultry.

Community-based Trainers (CBTs) were selected and given intensive training on the technology so that they could then be a local source of advice and expertise. The technology is quite knowledge-intensive, since it represents a major change from previous ways of managing poultry that farmers were used to. Having a trained farmer nearby helped to overcome the difficulty faced by CIDI and the District extension staff in meeting the needs of a large and expanding number of farmers who were using the technology. CB poultry enterprises became a sort of demonstration farm to others.

Case study
Improved Poultry Farming

Vincent Owalwe started with 10 local hens and an exotic cock; he now has 90 chickens, and has just sold 120 two-month old ones. He has hatched about 1500 chicks since he started in 2003. His commitment to operating this as a business is demonstrated by his purchase of an exotic breed for his farm. With the income from the chickens he has bought a half-acre of eucalyptus forest, a motorcycle and improved his management of his bananas by using manure. He has also sent his youngest to a better school and the eldest are all married now.

There have, of course, been challenges. Some farmers who were initially members of groups dropped out because the found the technology difficult or time-consuming, or they could not come up with a continuous supply of food and water for the birds. Others lost interest.

Achievements and impact

Over 210 improved poultry the end of the project were housed in proper houses built by farmers. The 402 households who received birds from the project had, by the end of the project, returned 16,000 birds, which were then distributed, to more than 2000 other households.

The forty who were trained as CBTs trained over 1400 other farmers. Overall, the direct and indirect beneficiaries totalled over 2,600. Indirect beneficiaries were those who received training from CBTs and those who learned the technology from other direct beneficiaries.

Many of the beneficiaries report increases in income and wellbeing as a result of the project. For some, the poultry project has been a stepping stone to completely different enterprises through which their livelihoods have been further enhanced. One group member tells how the income from selling birds and eggs has not only enabled her to pay for her children to go to a good school, but also to buy a dairy cow and install solar powered lighting in her house.

The regularity of income from poultry is an important benefit. As one group member said, "Before I was a farmer so I depended on the seasons, now I have two sources of income". This helps to reduce households' vulnerability to poor crop harvests and provides them a source of income to meet payments that must be made throughout the year. For others, the improvement in the family's nutrition is a major benefit.

Others are committed to making a business out of their improved poultry, using the income to re-invest in the business as well as improving their lives in various ways.

The main achievements can be summarised as:

- 2,640 households, representing 14,480 individuals, have benefited from the improved birds and technology
- The Indigenous Chicken Breeders and Marketing Association has been setup as a membership organisation with some farmers selling their produce through it
- Sales of poultry products have risen in line with increased production and prices have reflected the improved quality

- Use of chicken manure on the beneficiaries' farms has increased crop yields and led to improved household nutrition
- Improvements have been seen in housing, family incomes, payment of school fees and general living conditions.

Some progress has been made with marketing, though this has brought challenges, which CIDI is trying to address in subsequent project activities. The Tweyambe Kionyem Group, for example, has secured an order from the local market to provide 2,000 chicks each month for five months and whilst they have enough eggs to meet the order they are facing a challenge to hatch enough every month. The group has talked to other groups about helping them meet this order but one way forward would be for them to find the funds to buy an incubator to help them scale-up their production. This is an area where micro-credit would enable a group to move to the next level of enterprise. Another would be to help groups expand their production of maize, which is both a source of poultry feed as well as a staple food for the family.

Key lessons learned

Programmed hatching and selective breeding require good record keeping. This has been a problem due to low literacy levels. Extension officers have performed this task – but this is not a sustainable solution, and literate group contacts have been identified and are trained to take over responsibility for keeping records.

Forming and sustaining groups is not an easy process. It requires appropriate skills, including conflict resolution skills. Some of the groups found it difficult to manage their finances, again because of low literacy levels. Social cohesion was low in others. In one group of 20 farmers, half abandoned the project for various reasons.

Development of markets has been rather haphazard. CIDI now recognises it would have been better to address this right from the start. Especially with a relatively short term project, exploring the market potential and establishing market linkages early on is a key factor in ensuring sustainability.

Only a limited number of farmers can be reached directly by a project of this scale. Ways must be found of bringing the benefits to a much wider population – though this would raise questions about market. How soon would supply of eggs and improved chicks exceed demand in local markets? Scaling-up of the technology would have to go hand in hand with market research and development.

Sunflower and Beekeeping

Introduction

Since 2003, farmers in three divisions of Kitui District, Kenya, have successfully raised their incomes and improved their food security through the combined benefits of sunflower production and beekeeping. They are using their new skills and knowledge to help other communities establish the same enterprises. Key to the success of the project has been partnership between organisations with different and complementary skills.

Background

Kitui District is a semi arid area. Rainfall is low and erratic: rain usually falls within a short period followed by a long dry season. Average farm sizes range from 2.5 to 7 acres in different parts of the district. Kitui is a food deficit district with poor nutrition and low farm incomes. Over 70 percent of the district's population lives

"I am so happy I can support myself. I now want to increase production of honey to help the family and get more income."
Jennifer Mutia - Farmer

below the poverty line. There are no major cash crops grown in the district though cotton and tobacco are grown on a small-scale. Many families have to sell part of the food they grow to raise cash for the things they need to buy, which makes their food security even more precarious.

The natural vegetation is scattered shrubs and trees mainly of drought tolerant acacia species. These are excellent sources of food for bees, which makes Kitui a high potential area for beekeeping and honey production. Earlier projects had introduced new hives to the area so there was already some degree of awareness and some farmers who had been trained in managing bees and extracting honey. With this in mind, Kitui Development Centre (KDC) initiated a beekeeping and sunflower production project using improved beekeeping technology in three divisions of Kitui district, as a means to improve food security and raise household incomes.

The technology

The two main parts of the "package" introduced by KDC fit together to give a better outcome than either of them would on their own. The sunflower produces a crop within three months, so it meets resource poor farmers' need for a quick return on their investment of labour and the money spent on seeds. This return comes from the oil, which they use in the home (saving money which they would otherwise have to spend buying oil) and then sell any surplus locally to other households and hotels. To extract the oil, farmers pay a small fee to use an oil press that is kept within the community: the fee is used to maintain and service the machine. Improved design of beehives, better management of the hives and improved skills in extracting honey provide increased income. By putting the sunflower and bees together, the bees have an additional source of nectar and so produce more honey while the bees pollinate the sunflowers. An additional product of the sunflower is that farmers can feed the residue left after extracting the oil to their animals: it is a protein-rich source of food which promotes health and increases production of milk and meat.

An added environmental benefit is that beekeepers are keen to protect trees in the area because they are a source of food for the bees. Trees that would otherwise have been cut for charcoal – for which there is a market in the towns of the district – are now preserved. This has a positive effect on soil and water conservation, which is a major problem in the district.

"This project is very, very important for the whole community because it generates a lot of money."
Josephine Makuani - Farmer

As well as the benefits to the participating households, the technology has had a wider impact on the local economy. Some farmers have become seed bulkers and gain an income from selling sunflower seeds to other farmers. Local artisans make the improved design of beehives, which the CBOs buy for their group members.

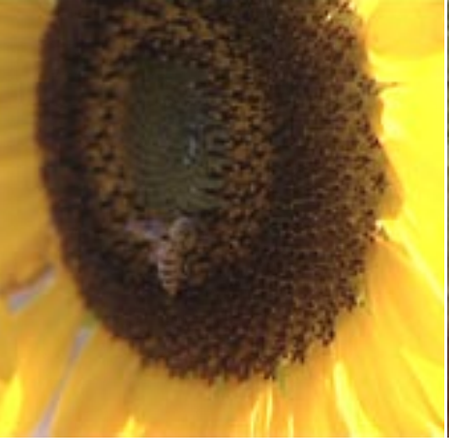
Partnerships

For all these elements to work together, partners with different expertise from four sectors – NGO, CBO, government, and commercial – have collaborated in the project.

Kitui Development Centre, an established NGO in the area, initiated the discussions with communities in the area that led to the project being designed and funded, and provided overall coordination throughout the life of the project.








Four community based organisations were the main implementers on the ground. They bring people together for training and look after the oil presses. They also supply beehives on a loan basis to participating households, through their self-help groups.

Extension staff of the Ministry of Agriculture and Livestock Development (MALD) provided technical input through the Farmer Field Schools that they ran in the area.

Staff of the Ministry of Gender and Sports helped with community organisation and leadership development.

The Ministry of Cooperative and Marketing Development came on board in the second year to provide training on loans and cooperative formation.

Scientists at the Kenya Agricultural Research Institute (KARI) station, Katumani Machakos, carried out research on sunflower varieties, to identify those suitable for the area and developed recommendations for managing the crop.

African Beekeepers Ltd. provided advice and expertise on commercial aspects of honey production and initially acted as a guaranteed purchaser of all honey produced by project participants.

Private agro-vet shops supplied certified sunflower seed supplies.

Demand for the improved beehives stimulated local carpenters to supply them: this has helped towards sustainability of the activities the project has initiated.

Methods used for learning and dissemination

KDC raised awareness through public meetings (barazas) which they organised through the CBOs. They have since created videos and booklets, which they use to continue disseminating information about the project. This community awareness raising was an important part of the mobilisation of participants: KDC's philosophy is that communities should be willing to contribute some of the resources needed to implement a development initiative. The contributions could be in cash, labour or materials (e.g. wood for building hives).

The new technical skills required by project participants were acquired through training provided by the MoALD and KARI. These training sessions were all facilitated by KDC. KARI training involved practical demonstrations at the farm level. Other training was provided through the regular FFS operated in the area by MoALD extension staff. The FFS, and meetings within the CBOs, were also used to feedback results of ongoing research on sunflower at KARI.

Trainers of trainers were identified and given protective suits so that they could train beekeepers in harvesting the honey and also provide a service to those who were unable to do the harvesting themselves.

Training was also given in group leadership and book keeping for leaders, committee members and book keepers of the self-help groups affiliated to the CBOs.

The MoA held training at the community level through a talk which was followed up with a practicall demonstration: no additional communications material was given to participants. However a summary of training content was always given in English to KDC and then distributed to farmers. This had the advantage of reaching farmers who had not attended training, although not all farmers can read English.

Achievements and impact

Within the two years of the project, 2256 farmers had planted sunflowers and 632 households were practising beekeeping. Participating households have been able to reduce their sale of staple food, hence increasing its availability for family consumption from three months to six months after harvest. Their household income has risen from around Ksh. 16.00 per day to Ksh. 50 per day from the sale of honey and sunflower oil. For others in the community, there is now a local source of sunflower oil at an affordable price.

The typical yield of honey has increased from 2kgs per hive per harvest to 7kgs per hive per harvest. Harvesting of honey has also improved from twice to four times in a year. Improved quality and marketing has led to an increase in the price of honey

from Ksh. 50 to Ksh. 110 per kilogram. The number of self-help groups in the four participating communities also increased from 78 to 100. The project provided the community with four oil-pressing machines, 1065 improved Langstroth hives and one honey semi-processing machine. Over 2,000 kg of honey has been sold, generating an income of KSh 225,000.

One hundred and sixty two farmers have been trained on sunflower husbandry while also acquiring skills on the operation and maintenance of the oil-press.

But success can be measured in more than honey, oil and cash: farmers, who have learned new skills and built up new enterprises, feel a real sense of achievement and empowerment that is a valuable legacy of the project, feeding into other development initiatives in the area. As one farmer said: "I am very proud, I feel empowered by the money I earn". Others point to the improved quality of life they and their children now have.

Key lessons learned

Commitment of partners and availability of a market for community products are vital ingredients to project success. In Kitui, there was already a local market for honey. Also one of the partners, African Beekeepers Ltd, agreed to buy all the honey they produced and they continued doing so until 2006. Since then it is being sold locally in the market, through KDC, and there are also middlemen who come and buy it to process and sell in Nairobi. Mainstreaming marketing and market development is essential from the very beginning of a project.

In Kitui there is a history of unsustainable development projects, so people are reluctant to buy into projects once the external funding is finished. Some people thought initially that they would not need to pay back money they had been loaned to purchase hives and other inputs. The community mobilisation phase, coupled with cash contributions and inputs from project participants, was important in developing a sense of ownership and commitment to the project.

Commercial success depends on having enough production to make it economic to invest in processing equipment that will give high quality honey that fetches a high price in the market. This is one of the challenges facing the CBOs, self-help groups and members as they move beyond the project phase to the development of a self-sustaining commercial enterprise.

Collaboration between partners can be difficult if they do not have a common vision for a project. In this project, there were different opinions about the main objective: was it a social development project aimed at reducing levels of poverty, or a commercial enterprise with the aim of building up the scale of production and

Case study
Jennifer Mutia – Chairwoman of Yike Wikwe CBO

330 people from this CBO are involved in beekeeping and growing sunflowers as a result of the project. The CBO itself now has 291 hives with each person having two-three hives and at most four. Jennifer started with one hive and has four now but she hopes one day to have 10 hives to look after.

She learned about beekeeping before the project through a differerent scheme sponsored by Honeycare International and she became interested in getting some hives. When World Neighbours started working there she received training and assistance for the CBO to get 50 hives, and then she realised that she could get money from honey and that it was a good medicine.

All the beekeepers in her CBO are responsible for harvesting and extracting their own honey but at the end of the harvest each person's achievement is announced so everybody knows who is doing well and can compete with them. Last harvest Jennifer came first out of everybody in her CBO and puts this down to following the advice she got from a seminar and making sure the area around her beehives is clean and that the bees get plenty of clean water.

Jennifer is also proud that this has "made me famous and people come to learn from me", but she is also benefiting from the increased income. She is now able to pay school fees for her children and pay for other essentials when her husband is away.

Jennifer has also benefited from the medicinal qualities of honey, which is especially good for treating a cough when mixed with local herbs. She and her friends also claim that "if you eat honey you will never grow old!"

The main problem facing Jennifer's continued success and expansion though is the combination of low rainfall and a lack of access to funds for new hives. She is optimistic however and wants to get training to learn about accessing markets outside the local area as well as packaging.

efficient marketing of honey. This led to the commercial partner, African Beekeepers Ltd. failing to provide the level of service originally agreed because they were disappointed with the speed at which production was increasing. However, they still buy some of the honey that participants produce.

Collaboration can also be a problem at community level when there are differences of view, or even jealousy over some households benefiting and others not. Some participants report that community members have deliberately grazed their animals near beehives in the hope that they will be attacked by the bees, for which they then claim compensation from the CBO. Others say that they have problems when harvesting the honey because the trainers, who have been given the protective suits, regard them as their own property and will not let other beekeepers use them. As

one woman said, "I am trained to harvest the honey but I have to pay the trainers who have the suits to do the harvesting for me".

Training has been an important part of the project. For the benefits of the project to spread to other communities, training in the technology will have to become part of the general services provided by extension staff. The FFS, run by MoALD extension staff in the area, do not currently provide any specific guidance on sunflowers and beekeeping; rather they provide general agricultural skills. The FFS could become a key element in the future sustainability and expansion of sunflower and beekeeping in the District by including specific skills training in their programme. Whilst KDC was able to fund training activities during the project period, the number of trainers available now is not adequate and these require payment for their services. FFS seems to have the potential to provide ongoing training and refresher courses that many farmers interviewed expressed a desire for.

Training should be specific to the needs of participants, and sufficiently widespread so that the skills cannot be kept within a small select group, making it difficult for the majority of participants to access them. Training would also have had more long-term impact if trainers had made printed learning and reference materials available to participants.

Having a guaranteed market for the honey was an important factor in getting the project off the ground. However relying on a single buyer is not sensible in the longer term: investigating market opportunities and establishing links with a range of buyers makes an enterprise more sustainable and less vulnerable.

Josephine Makuani is a member of one of the self-help groups. She has been involved for three years now and became interested in the idea after receiving initial information at a meeting.

"I used to get a little money from farming," she says, "which is very tiring, but the bees make money while you sit."

She has eight children, with three still at home. Since her husband is retired, she supports the family with the help of her grown-up children. She feels that at least now she has an income and can buy essentials for the younger children.

She uses the sunflower oil for cooking and has learnt that she can feed the sunflower cakes to her chicken. She bought and feeds the chicken with the proceeds of the honey/sunflower project and now owns a chicken she can sell to meet other needs rather than depending entirely on her grown-up children for financial support.

Sweet Potatoes

Introduction

New sweet potato varieties have improved nutrition and incomes for 300 households in Rangwe Division in Kenya's Homa Bay District. Families are growing and eating sweet potatoes with more vitamins and local women have set up successful businesses to make and sell food products. What was once a subsistence crop is now grown also as a commercial enterprise.

Background

Farmers in Rangwe have grown local varieties of sweet potato for many years – it is a staple part of diets for many families. Researchers in Kenya and other countries have recently developed new varieties with higher levels of Vitamin A and with higher potential yields than local varieties. An NGO, Community Mobilisation Against Desertification (C-MAD), took up the challenge of promoting the planting of these new varieties and encouraging families to use them. This meant finding a way to make planting material available that

"You can see we are really going somewhere compared to where we were before."
Pamela Otieno - Secretary, Achune Widows Women's Group

is free from diseases and adapted to local conditions. But this would not be enough to make sure farmers grow the varieties, or to use them in their meals and feed their children, so training and education became important parts of the project.

Once it was underway, farmers were producing so much of the new sweet potato that they wanted to find ways of using their surplus. This led C-MAD to look for technologies that would add value to the crop and enable families to set up new enterprises to make and sell sweet potato products. In the latest phase of the project, research has identified new market opportunities for these products.

The technology

At one level, the technology seemed straightforward: a new variety of a crop that farmers already grow. What should be easier for farmers than substituting the new variety, or adding the new variety to the range of varieties on their farm? In fact, the new variety is only part of a complex package, some elements of which only developed as the project took off.

The project began with four new varieties, which had high levels of Vitamin A and matured early. By the end of the project, seventeen new varieties were being grown in rapid multiplication sites in the division. Multiplying the materials locally means that they are adapted to local conditions and do not have to be transported long distances. Farmers can see them growing locally, see how they perform and learn from the way in which the multiplication farmers are looking after their crop. But keeping these sites disease free requires a high level of skill, which calls for training from experts.

Using the potatoes effectively was also part of the package. Families needed to be aware of the benefits of Vitamin A and of how to prepare and cook the sweet potato without destroying the vitamin content. For processing, packaging and selling products made from sweet potato, more technology was needed, some of which had to be adapted or newly developed.

Partnerships

Success depended on bringing together the experience and skills of many partners:

Kenya Agricultural Research Institute (KARI) provided the new varieties that they had developed and tested at research stations and on farms. KARI scientists trained farmers in Rangwe on how to produce clean, disease-free vines. They also ran a Farmer Field School through which farmers learned techniques to get the best results from their sweet potato crop.

The Ministry of Agriculture provided extension services, giving advice to farmers in the division and mobilising farmers to take part in extension activities.

The Ministry of Health staff did most of the awareness creation on the nutritional aspects of Vitamin A rich sweet potato. They gave training on hygiene in food preparation, licensed processing sites and did general health education in the division.

Kenya Industrial Research and Development Institute (KIRDI) carried out research to develop technologies for processing sweet potato and making products that could be sold in the market. They also manufactured, supplied and installed processing equipment for groups who were setting up new enterprises.

Kenya Agricultural Commodities Exchange (KACE) gave market and price information to groups and also provided training on marketing of agricultural and food products.

Family Concern International (FCI) helped groups to access markets by identifying and making market linkages on their behalf. They also gave training on how to access new markets.

Other organisations have been brought in for specific activities. A local micro-finance consultancy firm, ADPP, for example ran a workshop to train micro-enterprises in entrepreneurship, business planning and financial management.

Managing the partnership and the involvement of many different organisations has been an important part of C-MAD's role as project leader. This was based on good

will and good communication, rather than through formal agreements or Memoranda of Understanding. Some planned activities were delayed because it was difficult to harmonise the work programmes of the different partners. This was made more difficult with some of the partners not being based locally, when activities of local staff were co-ordinated by distant managers.

Methods used for learning and dissemination

The project has used a lot of different methods to develop relevant knowledge, skills and understanding among farmers and other stakeholders. At the very beginning, awareness creation meetings at three different locations attracted 44 people. Soon afterwards, training was offered in sweet potato agronomy at four sites, in which 114 farmers participated. Further training took place throughout the life of the project, as particular training needs became apparent. Topics covered included the multiplication of clean planting material; meal planning, baking, recipes and the importance of Vitamin A; seed potato storage; handling, processing and baking technology; as well as business skills and marketing.

Encouraging the formation of groups has played an important part. Groups of farmers have developed multiplication sites while groups of women have set up processing enterprises. Eight farmer groups have developed RM (Rapid Multiplication) sites and two women's groups operate successful bakery enterprises. Farmer Field Schools have enabled farmers to receive training throughout the growing season and have also been used to test and adapt seed potato management practices. FFS are also conducting research on the palatability of new varieties. There is, however, no systematic process of disseminating the outcomes of the FFS to other farmers, nor of reporting them to C-MAD: dissemination takes place by word of mouth of the FFS members.

Exchange visits have proved useful in letting farmers and others see at first hand how the varieties and the processing technology are working in other places. They have been able to interact directly with people like themselves who have already successfully integrated the new varieties into their farming and livelihoods. One such visit took 20 farmers from two locations to Busia, Teso and Vihiga Districts in Western Kenya. They had discussions with members of five farmers' groups and self-help groups and learned about the challenges faced, particularly in marketing, and ways in which these have been tackled. The overall impact of these visits was to inspire the visitors to feel they can achieve something and that they had gained sufficient knowledge to be able to move ahead with confidence.

Wider dissemination has come through extension meetings held by MoA staff in the normal course of their work, which have led to groups outside the project area taking up the new varieties; and a field day and exhibition attended by over 300 people, including local dignitaries, which raised awareness of the project and also provided a forum for sampling and selling sweet potato products.

Market research: C-MAD has identified a local FM radio station and printed material as potential future communication tools but has lacked funding and other resources to implement this yet.

Achievements and impact

The project has seen achievements in adoption, production, consumption and processing. Marketing has proved more of a challenge and has been the main focus of the final year of the project (2005-2006).

Farmers now have a wider choice of varieties to plant. The area of sweet potato grown in the division has increased by almost 50 percent and yields have gone up by over half, from 9 to 14 tonnes per hectare. More than 600 households are growing two or three of the new varieties and on average they are eating sweet potato products five times a week compared to three times a week before the project.

"Before the project, women were involved in prostitution because of lack of food security. Now we have food, there is a reduction in HIV/AIDS."
Charles Ogwang' - Farmer

In the course of the project, five sweet potato processing centres, equipped with stores and chippers, have been established. Two mills and two bakeries are now also working in the project area although one mill has had problems due to poor group management.

But beyond these facts and figures, there is the impact felt in the lives of those who have taken part in the project. Many now feel more food secure, partly because they can make their maize and sorghum go further by mixing it with sweet potato. Some speak of their children being healthier and less prone to illness. Many report that they have to spend less on buying food and can use money to buy other things. Some feel more confident about themselves, saying they have become "a better person". The project has opened up new livelihood opportunities for them and increased income has given them a new status within their family and community. Working in groups has strengthened networks and social capital in their communities, with groups engaging in joint savings or collective activity in support of their community. One group has used their savings to invest in medicines and establish themselves as community health workers.

Key lessons learned

For partnerships with large, national organisations to work effectively, it is important that their senior management is committed to the project. This will make it easier for local staff to be able adjust their work programmes to those of other partners. Several training events have had to be postponed or cancelled because staff had other commitments that had to take priority.

Working with groups has enabled the project to achieve greater impact. It has allowed C-MAD and its partners to reach more potential beneficiaries; more importantly, it has enhanced the quality of training and business support because of the bonds of group solidarity, mutual encouragement and reinforcement of learning that a group setting provides.

Marketing aspects should be incorporated in all stages of project implementation. It is important that local market opportunities are identified and serviced first before turning attention to more distant and complex markets.

Realistic time periods need to be allowed for project activities; for example the current efforts to establish linkages with supermarkets involved many lengthy processes including organising a standard approval process, bar-coding, packaging and so on.

Groups who are interested in setting up processing and production enterprises need training in entrepreneurship, business and financial management. This involves not only initial training but also on-going business advice.

Case study

Kinda Women's Group Bakery Enterprise

Kinda Women's Group operate a successful bakery enterprise which makes sweet potato based products like cookies, mandazi and chapatti as well as bread and even the occasional wedding cake! The members started off as sweet potato farmers themselves but, with support from C-MAD, they are now buying sweet potato from local farmers and running a successful business.

The bakery produces around 250 loaves of bread a day and has been so successful that two local schools are now asking for 400 loaves a day each so the bakery is hoping to expand to meet this demand.

The group also runs a mill and recently bought a motorized potato chipper for processing sweet potato chips into flour. This has meant that they are no longer charged unfair prices to use other mills, but it also allows them to earn a modest income providing the service to local producers whilst ensuring the bakery is always supplied with flour.

Employment at the bakery has meant that the group members can support local HIV/AIDS orphans and they now pay secondary school fees for six such children. Crucially though they have also continued to invest in the business including the purchase of bicycles now enabling them to deliver to local consumers more easily.

Some of the constraints experienced by farmers in expanding their production of sweet potato could be overcome by linking them with micro-credit institutions. Small loans would help them in their purchase of planting materials and other inputs, and in hiring labour to cope with increased scale of production.

Development of new processing equipment should go hand-in-hand with the training of local artisans who can maintain and repair it.

Tube Silage

Introduction

Making silage in polythene tubes is giving dairy farmers in Kenya a way of keeping up the feeding of their cows during the dry season, when fresh fodder is scarce, expensive or simply non-existent. A technology that has only been available to large-scale producers in the past is now making life and business better for a growing number of farmers with less than 10 cows.

Background

More than 600,000 farmers with between one and 10 cows make up Kenya's small-scale dairy sector, supplying 70 percent of Kenya's fresh milk. Most now operate a zero grazing system, with grass and other fodder grown on their smallholdings providing the bulk of their animals' food. Napier grass is commonly grown for this purpose, although sorghum and other grain crops are grown in some areas. Because of the rainfall pattern, there are periods of alternate surplus and scarcity of fodder.

"I feel good because some people say if you start making silage, you can do little work and get much production."
Patrick Kihanya Kinuthia - Farmer

In the wet seasons, there is too much feed and farmers lose in two ways. The grass and other fodder become overgrown and poorer in nutritional quality; and they do not benefit from the re-growth than would have happened if it had been cut. Farmers then have to give low quality feed during the dry season or buy in expensive foodstuff from other areas. These losses and extra costs threaten the profitability of smallholder dairying. One way of addressing the losses is conserving the material while its quality is still high. Successful adoption of feed conservation would ensure that milk production is sustained even during the dry seasons. This is where Polythene Tube Silage comes in.

The technology

Silage is a way of conserving surplus fodder so that it can be fed to animals in the dry season when fodder is scarce. It has been used on large-scale dairy farms for many years, using machines to harvest fresh fodder (grass, maize and other crops grown specially to feed animals), chop it up and put it in large plastic bags. The small amount of land that Kenya's 600,000 small-scale dairy farmers have makes this highly mechanised system impossible. In the Land O'Lakes project, a small-scale, more labour intensive method of making silage has been developed and promoted among farmers who have between three and 10 dairy cows.

Farmers chop up the fodder into one-inch lengths, mix it with some molasses diluted in water and then pack about 150 to 200kg of the mixture tightly into a two-metre length of 1.5 metres wide polythene tubing. When the tube is full and tied at both ends, the farmer has a large cylindrical airtight bag in which the fodder mixture ferments, turning into silage, until it is ready to use in the dry season.

The technology works with a wide range of green fodder. Napier grass is commonly used in Kiambu while in Nakuru, farmers grow kowkandy, sorghum and maize.

Partnerships

As in other projects, the project brought together organising skills, technical expertise, extension and technology capacity, local civil society, and expertise in linking farmers to markets.

Land O'Lakes Inc. developed the concept of the project and co-ordinated all activities.

The Kenya Agricultural Research Institute (KARI) provided scientific services particularly on sampling and quality testing of the silage and conducting adaptive experiments on the appropriate proportion of molasses to add to chopped fodder and other technical matters.

Egerton University's Department of Agricultural Economics and Agribusiness role was to assess the level of adoption of the technology. This involved carrying out surveys at different times to see how the number of farmers using the technology changed over time and to find out farmers' views about it. The university attached a graduate student to the project who was responsible for this work.

The Ministry of Livestock Development and Fisheries (MoLFD) and The Ministry of Agriculture and Rural Development extension staff in the districts were mainly responsible for training of trainers and for facilitating on-farm demonstrations of the technology. Later, staff from other government departments (including co-operatives) and from NGOs helped with the training.

Community based organisations (CBOs) including cooperatives and other forms of farmer groups were the main vehicle through which training of farmers in the two districts of Kiambu and Nakuru was delivered. These CBOs were key collaborators as they were responsible for convening the training sessions and general logistics within their respective areas.

The Smallholder Dairy Project (SDP) which was being implemented by the International Livestock Research Institute (ILRI), KARI and MoARD is currently involved in a study of technology transfer mechanisms through Farmer Field Schools. Some of the proposed training in silage making was delivered through current and recently completed FFSs.

Methods used for learning and dissemination

The technology transfer process used by the project followed four steps.

Rapid appraisal of Community Based Organisations (CBOs) identified by extension staff in the two districts was used to select 28 CBOs, 14 in each district. These are





existing groups such as current Farmer Field Schools run by The Ministry of Agriculture and Rural Development (MoARD) extension staff, recently completed FFS, cooperatives or self help groups. The rapid appraisal includes an assessment of the group's involvement in dairy and their perception of dry season feeding as a constraint. This step helps to build awareness of, and commitment to, the project.

Participatory planning workshops are then held with each group to help the members clearly define their visions and missions, identify and understand their constraints, including dry season feeding, and define proposals to address these constraints.

An important exercise in the constraints identification and understanding process is Participatory Partial Budgeting (PPB). This involves asking the group members to say what their costs and returns are at different times of the year, helping them work out their profits or losses they are making and then exploring the effects of profits of reducing the cost and improving the quantity and quality of dry season feed. This exercise dramatises the effects of the dry season feeding problem and enables members to see that higher returns might be possible with adoption of tube silage.

In a PPB exercise in Kiambu, for example, farmers recognised that they incur high costs in purchasing extra feeds during the dry seasons yet the yields from their animals can be up to 45 percent lower than during the wet seasons. The farmers barely meet their production costs during the three-month dry seasons and indeed lose Ksh. 430 per month as they try to keep their animals alive. By looking at the costs and savings from making tube silage, farmers calculated it would bring them a net income of Ksh. 5,285 per cow per month.

Training of Trainers took selected members from groups and extension staff working in the area – from both government and private / NGO organisations – to give them a thorough grounding in the silage technology and how to help farmers adopt it. This included training in how to carry out a PPB exercise with a group of farmers and how to demonstrate the technology. The trained trainers, who are commonly referred to as ToTs, then began work with the selected CBOs to introduce the technology. Six months afterwards, the trainers were brought together for a Training of Trainers review, which was an opportunity to learn from each other's experience and to identify difficulties that could be addressed in future trainings.

Several of the CBOs held field days to give other farmers in the community a chance to see what they were doing. These have attracted large numbers: between 200 and 300 has been typical.

Training has been arranged on other topics at the request of groups. Several have had training on how to set up cooperatives, with a focus on improving milk marketing.

Participants also learn by experimenting and recording. In the training and follow up support, farmers are encouraged to suggest and try out different modifications to the technology. They also provide data on the performance of cows fed with silage to the project partners: recording the performance and then discussing it in their groups and FFS is an effective way of learning from their own experience and that of their fellow group members.

Demonstrations have been held for project participants at KARI research stations.

Adoption studies were a particular feature of the project. Because the technology was relatively new in the small-scale dairy sector, the partners wanted to know how readily farmers were taking it up and of any problems they faced in doing so. These adoption studies were done by Egerton University and the results were used to adapt the learning and technology transfer methods in the next round of training and

"When I have got silage I feel I can go a whole year without any problems."
Jane Njeri Wanyeki - Farmer

Case study

Patrick Kinuthia - Member of Kamosheri Dairy Group

Patrick Kihanya Kinuthia is a member of the Kamosheri Dairy Group. He has been involved in the project since the outset and was one of the first people trained as a ToT. Patrick says the main benefits are that he is now able to maintain constant production throughout the year even during the dry season. The time previously spent trying to gather feed during the dry season has also been freed up which has been beneficial. It is also cheaper because he used to be forced to buy napier grass in order to feed his cows in the dry season.

Patrick has a wife and three children who are 8, 4 and 1 year old. He pays for them to attend private schools and all the money for that is generated by his dairy production so this project has made it easier to pay those bills. He has also seen a production increase of more than 7 litres each day due to feeding the cows silage.

Patrick is planning to buy maize stock and napier this year to supplement the napier he grows and to make enough silage to supplement his cows' feed using it for a whole year. He is also thinking of growing fodder sorghum to supplement this and use for silage.

At the beginning of the project Patrick had problems with spoilage of the silage but as time has gone on he has learnt how to make it more efficiently and reduce spoilage. He employs local labourers when he ensiles and he has continued to make silage since the project finished as he sees how beneficial it is. He found that whilst previously he used to milk his cows every 12 hours, since he started supplementing their diet with silage, he needs to milk them about every 8 hours.

Patrick uses a mechanical chopper to prepare grass for feed but this is also very useful for making silage. He had this machine prior to the project and it costs around 60,000 shillings including the motor to drive it. He used to spend 1½ hours each day cutting up feed and this is a problem faced by other farmers when they are cutting up feed for making silage. Manual choppers are also hard work to operate and are therefore not gender friendly. Patrick also cuts his napier manually but he says this is not a problem as he does it regularly and in between other jobs. When he makes silage he uses labourers to help with this.

Patrick sells all his milk to the Githunguri Dairy Cooperative and takes it to the pickup point 3km from his farm using his bicycle, which can carry about 50 litres each trip. Githunguri are also very good as they pay 21.30 KSh per litre compared to 16 or 18 at other dairies. Another advantage of selling to the cooperative is that they always pay punctually 1 month after receiving the milk. The dairy also sells salt and feed as well as helping with insemination of the cows.

Patrick currently gets about 7-8,000 litres of milk per cow per season (300 days) compared to about 4-5,000 litres prior to adopting the tube silage technology. Patrick hopes to expand his business over the next 3 years.

Patrick is also trained to work as a ToT and since the beginning of the project estimates he has trained around 80 groups and many of those have adopted the technology. This has helped with the local dairy cow industry and has also helped local farmers as they start to use dairy goats

promotion. They also provided valuable feedback to the researchers who had developed the technology.

Achievements and impact

Within the lifetime of the project, achievements were relatively local: there had not been time for adoption to spread beyond the groups themselves. However, the adoption studies carried out by Egerton University showed around 25 percent of farmers exposed to the technology had adopted it and farmers were encouraged by the sizable increased in production during the dry season, the condition of their animals, and the time saved. Although the chopping of fodder is very labour demanding at the time, much more time is saved later in the year because feed is to hand.

Key lessons learned

Monitoring and review of project activities is a good way of improving the technology transfer process. Reviews of the training of trainers, for example, led to changes in how this was done. Early training sessions had been for one day only. Feedback was that this was not enough for participants to develop confidence in their ability to make the silage properly and to teach it to others. So later sessions were extended to two days, with the second day devoted to practising the technology. A further review showed a particular need for training in how to maintain the quality of silage once a bag has been opened: this topic was then given more attention in subsequent training.

Feedback from CBOs also showed that getting tools and equipment for chopping the silage efficiently into the right size was not easy. Local firms were invited to display the chopping equipment they had and to discuss with farmers what they needed. On the technology itself, there have been complaints about the quality of the polythene tubes, which Land O Lakes has taken up with manufacturers.

Ensuring a continuous supply of inputs for small-scale farmers can be a problem: in one of the project's areas, local shops stopped stocking the polythene tubes. Where there are strong co-operatives, they can provide an alternative supply chain: by buying in bulk, they can negotiate good terms with manufacturers and wholesalers and can stock inputs locally for purchase by members. The Land O'Lakes project invested time in supporting co-operative formation to help address this problem.

Co-ordination of the activities of many different partners, particularly where some have similar roles or where roles have not been defined sufficiently clearly, creates difficulties not only for partners but also for the participating farmers also.

The fact that organisations and institutions are already in existence makes it much easier for a project to get off to a good start. The silage project was able to work through existing self-help groups, and the FFS already being run by other projects and organisations in Kenya provided a useful framework within which the project could carry out training and demonstration of the technology. There is always the danger, though, that farmers who are not already members of groups or FFS can be left out of the project benefits. This is why the training of trainers, and facilitating the dissemination of technology to other farmers, is so important.

Conclusions

As a development NGO, FARM-Africa is committed to learning lessons from its activities which can be applied in future projects and shared with others. This concluding section reflects on the lessons that can be learned from the seven MATF projects reviewed in this book and looks ahead to how FARM-Africa intends to develop further its efforts at stimulating the uptake of technologies that can transform the livelihoods of small-scale farmers in the countries in which it works.

Impact on farmers' lives

One thing is clear from the case studies presented in the previous chapters. These seven MATF projects have definitely had a positive impact on many rural families who rely on farming for a major part of their livelihood. These are precisely the kinds of families who are the focus of government and donor policies to promote agriculture as a means of alleviating rural poverty. The projects have demonstrated that improvements to technology – and often quite modest improvements – can bring about significant change. There are lessons here that FARM-Africa can share with other NGOs, donors and governments who share their goals and values.

It is interesting to hear how farmers talk about the benefits that the projects have brought them. Some of these are as we might expect: more cash income, feeling less

vulnerable to the shocks and stresses of everyday life, and having enough food to eat. To the farm families involved, though, just as important are the sense of achievement, the self-respect and the confidence in their own abilities that they have gained from the projects.

What lessons we can share from these projects about how this impact has been achieved and how it could be improved? We have grouped them under five main headings: the technologies that provided the initial focus of each project; the importance of markets for farmers' produce and the inputs they need; partnerships that bring appropriate expertise and resources together; dissemination and uptake through which the benefits of the technologies spread through the farming community; and exit strategies that allow project benefits to be sustained and grow after the project comes to an end.

Technology

Technology is at the heart of successful farming, the right planting material (seeds, tubers, cuttings, seedlings) or animals, tools and equipment, and new ways of doing things, can make farming more efficient and productive. The history of agriculture is a story of continuing experimentation, adaptation and change as new opportunities and problems emerge. What these MATF projects show is that introducing new technology and adapting existing technology can help farmers write their own new chapter in this story.

However in the recent history of development projects, there are also plenty of stories about failed technology, about plant varieties or equipment or breeds of farm animals brought by well meaning outsiders that simply did not work in the situations into which they were introduced, leaving farmers worse off than they were before. Farmers are always the best judges of what works in their own circumstances. A major reason behind the success of these seven projects is that farmers were directly involved in the development, testing and adaptation of technologies.

Markets

For farmers to make a living, or part of their living, from their crop and animal enterprises, they must be able to sell at least some of what they produce. In all seven projects, access to markets has been essential to their success and has brought challenges that project managers and farmers have had to deal with. For organisations that focus on technologies, and farmers who are not used to dealing with distant markets, this demands new knowledge and skills. Indeed, there is a strong risk of project failure if an assessment of the market opportunities is not done beforehand. When a project is a technological success, leading to a sudden increase in the production of a particular commodity, there is a danger that prices will fall if the market cannot absorb the increase. Carrying out a market assessment should be part of the process of project design, and funders (such as MATF) should insist on seeing convincing evidence that the market is there before they agree to support a project.

Market links are also vital at the other end of the production process: technologies need inputs, and farmers need reliable sources of these at reasonable prices if they are to sustain the benefits the new technology brings. These can be supplied in various ways, as seen in the seven projects. New planting material can be grown by individual farmers or by farmer groups for sale to their neighbours, or provided through contracts negotiated with commercial firms or research stations. Whatever the arrangement, though, someone needs to make sure it happens. Projects that focus on getting the technology right without building secure links to input and output markets are likely to bring disappointment and frustration. Looking ahead, it is also important that projects do not continue to organise these market links on behalf of farmers: one of the reasons that working with groups has been so important in MATF projects is that groups can learn how to take responsibility for the market arrangements on behalf of their members. Groups can exercise a voice and influence in the market that is much greater than that of individual, small-scale farmers.

One way in which farmers can increase their income from the market is by adding value to their products before they are sold. This is not always possible, particularly where this would require substantial capital investment or where value adding technology is only efficient where supplies of the commodity can be maintained at a high level for an extended period. As these projects demonstrate, turning a good value adding idea into a commercially viable enterprise either at farm or farmer group level is not easy. This should not stop projects and farmers looking for ways. But an awareness of the difficulties, and an ability to find or develop the skills needed, are






essential. Bringing commercial partners into the project partnership is one way of doing this.

Partnerships

For projects that seek to bring benefit to small-scale farming families, having the right mix of partners makes a big difference. Each project needs a particular blend of expertise and resources. This can include a source of the new technology, which in many MATF projects is a research institute or an NGO that has been working with farmers to develop or adapt a technology. Where farmers need credit to buy new inputs, having a bank or a microfinance institution in the partnership can be very useful. In most projects, farmers and others need to develop new knowledge and skills, so a training partner can bring valuable expertise and facilities to the partnership. In some projects, local government bodies have been able to incorporate project activities within their own development programmes, which is one way of ensuring the benefits brought by the project can be enjoyed by an increasing number of farming families in the future.

Having partners with the right mix of skills, resources and connections is not enough to ensure a partnership will work. Setting up and managing a partnership within a local project takes time and sensitivity to each partner's perspective and constraints. Trust between partners and a shared vision both of the aims of the project and of its mode of operation only come from good communication and frequent interaction. There are particular difficulties where a partner organisation has a hierarchical structure in which commitments made by local staff can be set aside by senior managers. In these cases, discussions with senior managers leading to a clear understanding of what time and resources local staff can commit are essential from the very beginning of the planning of the project. Dissemination and uptake

Using a new technology, even when it is an adaptation of something that is already familiar such as a new variety of a locally grown crop, requires new knowledge and skills. At the heart of all MATF projects is a process through which farmers can develop the knowledge and skills they need. The seven projects reviewed here have confirmed that farmers learn best from one another and when they are actively involved in the process: effective learning is both a social and an active process. The projects have demonstrated these principles in various ways, as brought out in the case studies and the overview chapter. These include having farmer groups as the basic unit of interaction between project partners and farm families; establishing Farmer Field Schools in which farmers learn by trying out a new technology over a growing season and reflecting on what they do and observe with the help of a trained facilitator; organising visits to other groups which already have experience with the technology; setting up demonstration plots on farmers' fields where group members and others can come and observe, discuss and ask questions about the technology; and participatory research to assess the performance and suitability of different crop varieties in the local environment, and to explore the costs and returns of taking up a new technology. Project experience suggests that working with existing groups is more effective, and leads to more sustainable outcomes, than encouraging the formation of new groups: however there is a danger that this will exclude those farmers who are not already members of groups – and who may be among the poorer members of the farming community. Projects which seek to be inclusive need to have a strategy for expanding participation beyond the membership of groups that are already well established.

An important lesson from the projects is that training farmers as trainers can help to achieve wider impact and more sustainable outcomes, particularly when project partners can continue to support these farmer trainers in their work even when the project reaches the end of its period of funding.

One area which has received relatively little emphasis in the projects is a strategic use of communication media to spread awareness of the technologies and products among the farming community and other stakeholders – including banks, traders, consumers, potential funders of similar initiatives and policy makers. In the countries where MATF is active, local and national radio stations have large rural audiences, access to television is rapidly increasing even in rural areas and newspapers are widely read by opinion leaders. There are local firms which can design and produce print and video material for local promotion of projects and technologies, and for use in training activities. Projects must be careful not to stimulate excessive demand for technologies that cannot be met by facilitating partners or whose output cannot be absorbed by the market However, a careful and deliberate use of local and mass media can help

widen the impact of a project MATF is looking at ways of enabling projects to access and develop the skills needed to make use of these opportunities.

Exit strategies

A successful technology is one that becomes embedded in local farming systems and household livelihoods and then spreads to other areas. While most MATF projects have this as an explicit aim, many do not have a clear strategy for achieving it. However, the seven projects give some clues as to what projects can do to help this happen. First, they can deliberately look for project partners that are well established and have an interest in supporting small-scale farmers in the longer term. Second, they can promote the technology and its benefits to local government in order to gain political support for helping farmers maintain access to product and input markets. Third, they can include in their training activities entrepreneurial skills that farmers can use to explore and take advantage of future market opportunities, beyond the specific technology on which the project is focussing. Fourth, through the ways in which they encourage farmers to take ownership and leadership of the project, they can help build farmers' confidence in their own abilities.

Looking ahead

MATF has been encouraged by the lessons it has learned from its experience so far. Its intention is to continue to identify innovative agricultural technologies that have a potential to have an impact on large numbers of smallholder farmers. It will do so by providing competitive grants to consortia of partners who work with farmers to develop innovations in their agricultural practices and who can link farmers to markets. In future, more emphasis will be given to developing exit strategies right from the start of the project, so that farmers and farmer organisations develop lasting and mutually beneficial partnerships in a business oriented farming sector.

Some technologies take more than two or three years to become sustainable at the grassroots level. MATF is planning to start a Technology Maturity Fund which will create follow-up opportunities for promising technologies to develop the required ingredients for sustainability: knowledge, skills, attitudes, care for the environment, partnerships in the product value chain, links to input and output markets, and socially acceptable costs and benefits. In future, completed and successful projects will also benefit from a Training and Advisory Unit (TAU) in FARM-Africa. The TAU will be engaged early to document models of good practice based on successful MATF projects. Through provision of these training and advisory services to interested parties, the expectation is that technologies can be scaled out and benefit more rural communities in East Africa.