Chapter 8

Scaling Out Integrated Pest Management with Bean Growers: Some Experiences from Eastern and Southern Africa

*James K.O. Ampofo**, *Hendry Mziray**, *Ursula Hollenweger**, *Elianeny M. Minja**, *Said M. Massomo**, and *Edward Ulicky***

Introduction

Integrated pest management (IPM) is a sound approach for dealing with pest problems. It contributes to the reduction of pest damage, lowers costs of plant protection, and reduces or avoids undesirable side effects caused by pesticides, while preserving the production environment from contamination. However, IPM strategies tend to be tailored to local conditions, and technologically sound and effective IPM strategies are not easily transferred across different production systems. This is often because site-specific agro-ecological and socioeconomic conditions often determine what is best at one place (Van Huis, 1997). To improve upon this, several concepts on farmer involvement in technology generation and diffusion have been proposed and tried. The generation of IPM technology is moving from the approach of research station trials, and subsequent transfer of results by the extension system, to one of different levels of farmer participation to ensure greater suitability of the technology to farmers' production circumstances and adoption. The approach also helps reach more farmers with relevant and new technologies more quickly.

In this chapter, we describe the approach and processes we used to develop and scale out IPM strategies for bean pests with smallholder farmers at selected sites in eastern and southern Africa. The approach was designed to capture inherent local knowledge and other resources to enhance IPM technologies, or adapt exotic technology to local production circumstances. The process helped move new knowledge and technology rapidly across environments. Our goal was to help institutionalize IPM at the community level through participatory processes that capture traditional knowledge and local initiatives.

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* Integrated Pest Management Specialist, Research Assistant, Research Associate, Senior Research Fellow, and Research Assistant, respectively, Centro Internacional de Agricultura Tropical (CIAT)- Pan-Africa Bean Research Alliance (PABRA), Tanzania.

** District Extension Officer, Hai District Extension Service, Ministry of Local Government, Hai, Tanzania.

Methods

The approach was based on:

- Discovery-oriented initiatives, including community experimentation, to identify solutions to specific production problems; and
- Capacity enhancement initiatives: Training activities to enable communities to better manage resources (e.g., adapting available exogenous solutions to local problems).

In all cases, we used every available opportunity to supply relevant products to those that needed them in the target communities.

Participatory learning, technology development, and dissemination

The initial pilot technology development and dissemination process was generated with farming communities in Hai District, northern Tanzania, in collaboration with the District Extension Service of the Ministry of Local Government. The central problem was the "bean foliage beetle" (*Ootheca bennigseni*), a pest that was devastating bean (*Phaseolus vulgaris* L.) crops in the area. This was used as an entry point in the process of developing and scaling out IPM strategies with the local farming communities. Farmers were aware of the pest as a foliage feeder, but did not understand that the larvae damaged the rooting system causing the aboveground symptoms of stunting, yellowing, and premature senescence that farmers often observed. Our chosen approach was learning through participatory hands-on activities: We sampled the soil and plants weekly and studied the pest's life cycle (Figure 1) from adult emergence and foliage feeding through the oviposition in the soil, larval emergence and pupation, together with the effects of larval feeding activities, and back to the adults. We observed that adults diapaused from August until March. This process enabled communities to understand the seasonality of the pest and dispel myths such as: "The insect is brought in by the rain". It was also observed that the pest was restricted to beans and cowpeas (*Vigna unguiculata* [L.] Walp.), and could not develop on other crops within the local fields. The understanding of the pest's biology and ecology enabled farmers to make decisions on measures for control. Further experimentation identified opportunities for management, such as crop rotation to break the pest's life cycle, manipulation of sowing dates to avoid peaks of the pest's emergence, and identification of traditional concoctions for control.

Scaling out strategies

From the experience in Hai, we decided to scale out the IPM strategies to sites where the bean foliage beetle was recorded as a problem hindering bean productivity. The selected sites (Figure 2) were Lushoto district in northern Tanzania, Mbeya Rural in southern Tanzania, Misuku Hills in northern Malawi, Dedza district in central Malawi, and Kisii District in western Kenya. Scaling out strategies were developed for each site through Strengths, Weaknesses, Opportunities, and Threats (SWOT) analyses with all the local stakeholders. The strategies were varied, depending on local resources and opportunities as identified by the stakeholders. We always began with participatory planning activities at the district level, but encouraged each community to adapt the plans to suit their individual opportunities and other prevailing circumstances. At the end of each growing season, individual groups met at the community level to review achievements and failures, and develop strategies to move forward.

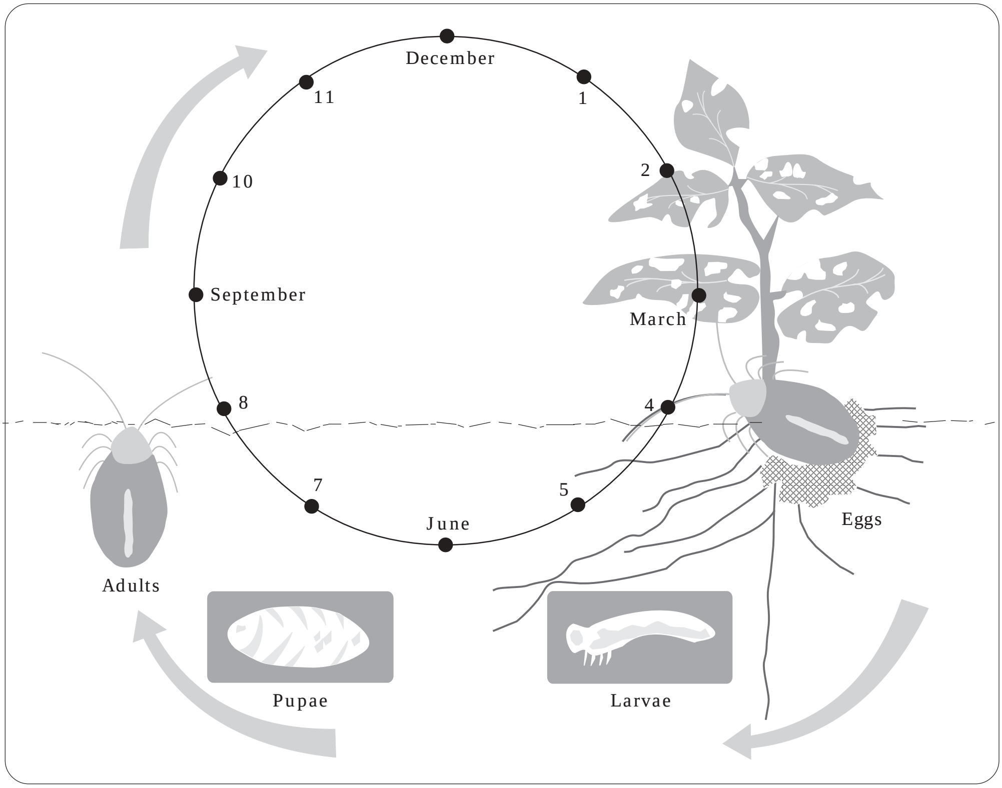

Figure 1. Life cycle of the bean foliage beetle (*Ootheca bennigseni*) in Tanzania.

The groups would also meet with other communities at the district level and share experiences and develop new plans. In this way, the farmers, extension officers, and policymakers received a broader picture of the progress that was being made. It was often interesting to observe how farmers captured their local constraints and opportunities in the planning and execution of activities. A key outcome was that the communities developed a capacity for problem analysis, identification of potential solutions, and opportunities to overcome them. This helped them tackle problems beyond our initial focus, and applied the process to other areas of their daily lives.

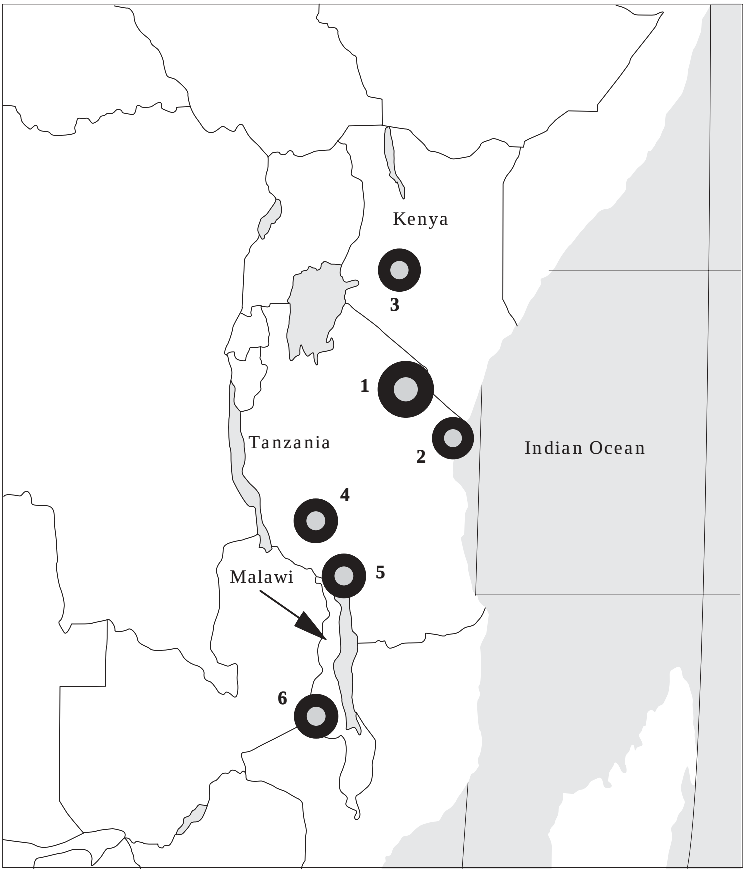

Figure 2. Selected sites for scaling out integrated pest management strategies: (1) Hai District, (2) Lusotho, and (4) Mbeya in Tanzania; (3) Kisii in Kenya; and (5) northern and (6) central Malawi.

A study through questionnaire surveys at field days in Sanya Juu, Hai District, indicated that different groups within the community preferred different dissemination pathways (Figure 3). More of the poorer farmers preferred less time-consuming dissemination processes, such as demonstrations, the mass media (radio), and extension visits, while more of the richer farmers opted for group training activities and seminars. We attribute these differences to the fact that richer farmers are better able to hire farm labor and therefore free themselves for other activities than are poorer farmers, who often hired themselves out to the richer ones.

Community experimentation, demonstrations, and field days. Community experimentation enabled farmers to test and adapt new technologies to suit their own production circumstances. For instance, farmers in Boma N'Gombe village (1020 m) in Hai District identified neem (*Azadirachta indica* A. Juss) extracts for bean foliage beetle control. In Sanya Juu, however, farmers observed that neem could not grow in their environment (1500 m), and therefore opted for a range of alternatives, such as cowshed slurry, fermented cow urine, and other botanicals for experimentation. The logic was that if neem, a plant product, could work, then some of their own traditional medicinal plants and other products could work also.

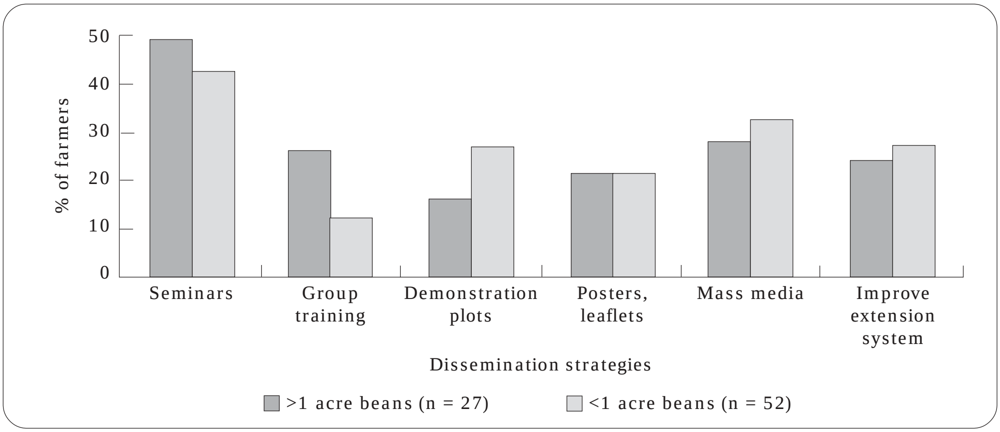

Figure 3. Dissemination pathways preferred by different groups of farmers in Sanya Juu, Hai District, Tanzania, categorized by farm size.

The experiments were installed at several points within the community for evaluation by the members, and as demonstrations for other community members. The experiments had labels describing each treatment. The results were usually obvious to passersby. The farmer research groups, in collaboration with research and extension partners, often held field days at opportune times to share the technology with the entire community. On such occasions, the participating farmers described the research problem, the objective of the experiment(s), the processes and products used, and the results achieved. They would often invite the community to walk through, assess, and discuss their observations. The researchers also often administered questionnaires to all attending the field day to obtain their views and comments for improvement of the entire process. Generally, visiting farmers learned more from the field days, and more easily identified with the explanations given by the participating farmers than by researchers. Several elements were used in the community experimentation process, including collective problem analyses, identification of potential solutions, and experimentation with them. These helped in the confidence building of the farmers, and led to incorporating local ideas and traditional control strategies in the experimentation.

Cross-site visits and farmer conferences. These were often held during the growing season. Farmers from one community or more, sometimes beyond national borders, organized themselves to visit and share experiences with another community (Box 1).

Box 1

Cross-site visits

Farmers from Sanya Juu in Hai District, Kilimanjaro Region, Tanzania, host others from Lushoto district, Tanga Region, Tanzania. Lushoto farmers are experimenting with botanicals for pest management and are also engaged in soil erosion control and integrated nutrient management (INM) studies. They shared these technologies with the Hai farmers and learned from the Hai farmers how to use fermented cow urine for pest control. At the end of their visit, the Hai farmers superimposed the INM strategies they learned on their integrated pest management practices. Farmers from all groups drew synergies from their different activities, and felt more confident about their research as others heard them and accepted their work. The researchers learned about which processes worked well and which ones did not. The process helped to move technologies and experiences across regions.

At such meetings, both hosts and visitors describe the technologies or processes they have used and the outcomes; the whole group discusses and often relates with what they are doing in their own communities. The host group conducts, shows, and describes its experiments and related activities to the visitors, who in turn share what they do. All parties share their experiences, and the groups discuss ways of adaptation of the new technologies under their different production circumstances, and in some cases how to blend them or superimpose one on another. The participants go home with a copy of the proceedings of the conference, and share the new knowledge with their communities.

For many farmers, the process of sharing their technologies and experiences in public, and the acceptance by the general conference, helped boost their confidence to an extent that they were encouraged to learn and share more when they went back home, and to develop farmer networks with a mechanism for information flow and exchange.

Drama. As the farmer research groups became established and gained confidence in their knowledge and the technologies they had generated, they began to assume ownership of the scaling out process, and were prepared to volunteer time and resources for it. They often identified pathways for scaling out that they found suitable to their individual communities. Cultural drama was one of the key pathways used by communities in northern Tanzania. In collaboration with the farmer research groups and local primary and secondary schools, we explored the potential role of drama and other cultural activities in the scaling out of technology among different communities. The messages were developed with the local communities: They composed songs and performed plays with them to create awareness about production problems and opportunities to overcome them (Figure 4). The audience identified with the songs and plays and remembered the messages. The process helped create awareness among the audience and many of them sought to participate in the community learning activities. In Hai District, northern Tanzania, the local administration supported this mode of technology dissemination, and paid for it to be aired over the local radio in order to reach a wider audience.

Figure 4. A group of farmers sharing extension messages through traditional drama and song.

Printed materials. The use of printed materials proved to be a highly useful resource. Researchers developed graphic extension messages based on the new technologies for wider dissemination across communities. They included posters, leaflets, booklets, etc. that were burned onto CD-ROMs and exchanged across the different sites, where they were translated into local languages and disseminated to the farming communities through the different partners. Researchers used the materials to train local extension agents and nongovernmental organization (NGO) field staff, who in turn used them to train farmers. Rural secondary schools also used the materials in teaching agricultural science to students. The availability of such extension materials helped the village extension officers in their delivery to farmers.

Village Information Centers (VICs). Participating farmers from Hai District, in their search for more information, began visiting the research station by the busload to ask for information on various topics. In response, we decided to take the information closer to them through VICs. These were designed as village libraries with agricultural information and contained various IPM as well as other general information that the community felt would benefit it. In some cases, the “library” was expanded to include other subjects, such as health (e.g., Human Immunodeficiency Virus [HIV] awareness), adult education, etc. The VICs were often housed by schools or the local administrative office, and in the absence of a village extension officer, the community appointed an individual who helped explain the contents to needy farmers. The schools also used the information to train students in agricultural science.

Training of trainers. Some farmers volunteered to train their colleagues about new technologies they had acquired, and a great deal of these informal training activities was carried out within the different communities. The researchers started a training program to inform and help develop tools and strategies to enable farmer-trainers and extension agents to perform better. The training activities were based on training needs of the specific communities, and included skill development in problem analysis, and identification of potential solutions and opportunities, but the training materials were shared across communities. Once communities were empowered in this way, several spontaneous community-initiated training activities emerged within many of the sites.

The role of rural secondary schools in the scaling out process. Rural secondary schools were an important dissemination medium. In some districts, about 5 to 10 villages shared a secondary school, and the student population represented all these villages. Teachers and their students participated in the community experiments, and the students took home what they learned and shared it with parents, relatives, and other members of the community. The schools often composed and performed drama activities about the local production problems and opportunities for their management. The teachers also helped in explaining written and other new information to the general community. Students from such schools often remained within the community as farmers (full or part time), and it is anticipated that the capacity they developed through the IPM development and scaling out processes will continue to benefit them and their communities.

Churches, mosques, and other places of worship. Announcements about the new technologies were made in various places of worship and at other gatherings, and helped inform and create awareness among the local communities about the IPM activities, technologies that were being disseminated, and where to get information.

Partnerships. The scaling out process was greatly enhanced through partnerships with NGOs and other groups such as World Vision (Tanzania), Adventist Development and Relief Agency International (ADRA-Tanzania), Concern Universal (Malawi), and the Ministries of Health and Education (Kenya). These partners developed activities to take the processes and technologies further out to their own areas of operation with their own resources. In Tanzania, ADRA helped to translate booklets from English into Kiswahili, and World Vision raised funds for their publication and dissemination. Concern Universal took the technologies and the processes used to their focus areas in Dedza district and other parts of central Malawi. In Kenya, the Ministries of Health and Education provided other publications on HIV awareness and adult education for the VICs. This helped increase and popularize the VICs in the target areas.

Policy effect on the rate of diffusion. The rate of diffusion was influenced by local government policy as well as local community behavior. In Tanzania, the extension service is a part of the Ministry of Local Government, and the involvement of the district administration helped in the mobilization of local resources for the scaling out process (Table 1). The district administration funded some of the costs of the process (e.g., field days and airtime for radio broadcasts). The communities also spontaneously initiated farmer-to-farmer dissemination activities. In Malawi, however, the Ministry of Agriculture has to test and approve technologies before dissemination activities are authorized. This places a check in the system to prevent rampant dissemination of unproven technologies, but it impedes a large-scale participatory technology development and scaling out processes. The rate of diffusion was therefore slower in Malawi than at the other target sites.

Table 1. The rate of spread of the dissemination process for integrated pest management at different locations.

Location	Farmers involved in:	
	1998	2002
Hai District, N. Tanzania	1 group	52 groups in 12 villages; > 800 farmers participating; > 2000 more aware
Lushoto District, N.E. Tanzania	0	~ 300 farmers participating; > 500 more aware
Mbeya Region, S. Tanzania	0	> 100 farmers participating; > 200 more aware
Kisii District, W. Kenya	0	> 700 farmers participating; > 1600 more aware
Central Malawi	0	14 farmers participating; ~ 100 more aware

Issues Contributing to Success

A key issue that enabled success was the mutual trust that was generated among the different partners in the process. Farmers observed that their ideas were valued, and that the agenda was set to focus on their needs and problems. This helped raise their self-confidence and enabled them to take charge of their actions, as well as ownership of the process. They became motivated to:

- Invest their own resources in the process, for example, meet transportation costs to visit other groups and attend conferences.
- Influence policy decisions, for example, farmers from Boma N'Gombe lobbied district administration to pass a byelaw forcing bean growers to adopt IPM strategies. Those that adopted IPM observed that their bean fields had reduced *Ootheca* emergence, but they were getting invasions from fields of non-adopters.

Another success factor was the (hands-on) learning-by-doing process; sampling and discovering diapausing *Ootheca* adults in the soil convinced farmers that the pest did not come with the rains. The knowledge sparked them with ideas for control, some of which were traditional. Finding success with traditional strategies was a confidence booster for the farmers.

Various dissemination pathways (e.g., posters and leaflets, seminars, cross-site visits and farmers' conferences, on-farm demonstrations, and community learning activities) were used to scale out the technologies. Each pathway had a different level of demand on local resources, researcher time, and costs, but these need to be assessed for benefit/cost efficiencies for better decision making and resource management. The communities often assessed their local resources and opportunities, and decided on the appropriate pathways for them.

In northern Tanzania, IPM appears to have permeated the different sectors of society, involving schools, religious institutions, policymakers, and various sectors of civil society, as observed in Gerung, Indonesia (Dilts, 2001). Different ethnic or social groups tend to identify with different technologies, for instance, traditional technologies of the Maasai and the Wameru in Hai District appeared to be based on animal products such as cow urine and cowshed slurry, while those of the Wasambaa in Lushoto district were more plant related. Recent social interchange and widespread technology diffusion may have diluted this, but it will be useful to understand the relationship between culture and traditional technology; this will help in rapid adoption and scaling out of technologies.

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