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The IPM Learning and Practicing Guide on Farmer-to-Farmer Dissemination of Bean IPM Technologies: Approach, Processes and Tools is produced by the International Centre for Tropical Agriculture (CIAT)

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IPM LEARNING AND PRACTICING GUIDE

FARMER-TO-FARMER DISSEMINATION OF BEAN IPM TECHNOLOGIES: APPROACH, PROCESSES AND TOOLS

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CPP
CROP PROTECTION PROGRAMME

Donor (CPP) Visit to Mbozi, Tanzania

Compost Making at Bototo, Kenya

Bean Variety Demos in Tarime, Tanzania

IPM LEARNING AND PRACTICING GUIDE

GUIDELINES FOR IMPLEMENTERS OF INTEGRATED MANAGEMENT PROJECTS

This publication was developed by the
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INTRODUCTION TO THE IPM LEARNING AND PRACTICING GUIDE

This guide was required by CIAT Africa office as a tool for Bean Integrated Pest Management (IPM) dissemination with smallholder farmers in the region. It is intended to be used by implementers of integrated development projects interested in community mobilization and action for change. This guide draws lessons and experiences from community action bean pest management activities that initially focused on common bean pests in smallholder farmers' production systems in eastern and southern Africa.

We hope that this guide is able to provide you with ideas on community approach for IPM practice and technology adoption.

For bean growers, this guide on integrated pest

The Netherlands;132p. (CIAT Publication No. 260) ISBN 958-9439-55-1.

Ampofo, J.K.O.; Mziray, H.; Hollenweger, U.; Minja, E.M.; Massomo, S.M.; Ulicky, E. 2004. Scaling up and out integrated pest management with bean growers: Some experience from Eastern and Southern Africa. In: Pachico, D.H.; Fujisaka, S. (eds.). Scaling up and out: Achieving widespread impact through agricultural research. Centro internacional de Agricultura Tropical (CIAT), Cali, Co. p133-142. (CIAT Publication No. 340). (Economics and impact series 3).

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planning

- **Faster mobilization of community members** for different development activities such as building schools
- **According to some of the participating women farmers,** some **male farmers now spend more time in the fields and with their family members**, compared to the period before their involvement in participatory group research activities!
- **Researchers and extension agents have gained a better understanding** of farmer preferred pathways for IPM technology dissemination and adoption.

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management learning process and practices is intended to be used together with other guides and handbooks on bean production including:

1. Controlling diseases and insect pests in bean seed fields
2. Establishing a bean seed business
3. Producing bean seed

A note on technical words: Since some technical words do not exist in local languages, it will be necessary to develop new word in the users' language. In this guide, these technical words are in English.

IPM LEARNING AND PRACTICE

Why farmer to farmer dissemination of bean IPM technologies ?

The common bean (*Phaseolus vulgaris L*.) is a major source of protein and calories in the diet of poor people in eastern, central and southern Africa. Grown largely for subsistence, and mainly by women, beans are eaten fresh or dried, while the leaves are used as a vegetable and the haulm (stems and pod shells) is fed to livestock. Some 40% of the total production in Africa is marketed at an annual value of US$ 452 million (Wortmann *et al*., 1998).

Insect pests, diseases and low soil fertility are among the major constraints to increased bean production causing annual losses of 430,000 tonnes in eastern and southern Africa alone. Previously, pest and soil management technologies have been developed but their

and other services that have helped them to increase bean grain yields from **1-1.5 to 4-5 bags** (each 120kg) and maize from **7-10 bags to 12-18 bags** (each 100kg)

- **Improved household food security** - participating farmers have enough food all year round
- **Increased household income** - ability to pay children's school fees, purchase better clothing and building materials, hire or purchase land, re-invest in livestock and agro-enterprises
- **Opportunity to access training** in different aspects of agricultural production
- **Improved human health** from beans, quality protein maize (QPM) and vegetables
- **A cleaner environment** from less conventional pesticide and commercial use
- **Formation of dynamic Farmer Research Groups - FRGs (social capital)** that have formed the base for rural development

successful tracking of events, documentation of technology adoption and benefits/disadvantages of intervention to the target communities.

BENEFITS DERIVED FROM USING THE PARTICIPATORY APPROACH, PROCESSES AND TOOLS

Participating farmers and partners at different target sites have listed some of the benefits that they have gained from participating in bean IPM promotion activities. They include:

- **Confidence** and **knowledge (skills)** that have enabled even the farmers who **cannot read or write to become trainers of other farmers informally**
- **The use of the psychology of development** has made farmers **feel good about themselves** and enhanced dissemination and adoption of technologies
- **Access to new technologies such as improved crop varieties, loans, information**

adoption has been limited to pilot sites. There has therefore, been need to disseminate the technologies to enhance adoption by the wider audience of beneficiaries.

MAJOR BEAN PESTS AND OTHER PRODUCTION CONSTRAINTS

1. INSECT PESTS

1. Bean stem maggot (beanfly) (*Ophiomyia* spp., Diptera: Agromyzidae). Bean stem maggots (BSM) are also known as bean flies. They are described as the most important field

insect pests of beans in Africa. The severity of BSM attack is often associated with poor growing conditions (Allen *et al* 1996, Davies 1998, Songa and Ampofo 1998); and the problem is further aggravated by the soil borne pathogens

such as *Fusarium* spp., *Pythium* spp., etc. (Nderitu *et al.* 1997) that use wounds created by the pest to gain access into the plant. BSM oviposits directly in the plant tissue and the emerging maggots feed in the stem and disrupt nutrient transport.

BSM maggots and stem damage

The leaves of attacked plants turn yellow, wilt and the plant dies. Older plants attempt to compensate for the damage by producing adventitious roots but sometimes this result in the swelling and cracking of the lower part of the stem. Surviving plants are often stunted and grain yield is reduced. BSM attack is most severe in late planted crops. Significant synergistic interactions between BSM and root

activities, respectively. The VICs are providing easy access to information and technologies at village level and help to retain reports on information generated by the community for future use.

12. PARTICIPATORY MONITORING AND EVALUATION (PM&E) SYSTEM

Participatory Monitoring and Evaluation (PM&E) system is a key tool in participatory activities. IPM is a knowledge and technology intensive practice. Unless key partners keep track of events such as activities, results, reach, changes with time, outcomes, constraints, strengths, weaknesses, threats, impacts and gender mainstreaming, it will be difficult to account for the benefits/failures of target community practices. The facilitation and development of a PM&E system among key participants through regular training helps in the

11. VILLAGE INFORMATION CENTRES (VICs)

These are small community/village libraries stocking extension and other relevant reading materials. They are set up by farmers and local leaders in response to farmers' demands for easy access to information within their communities/villages. Government and political leaders participating in bean IPM farmer group activities supported this farmer- and researcher- initiative. In Kisii project site, for example, VIC premises were granted by location chiefs and two of them were partly furnished by the Ministries of Health and Education interested in using the centres for HIV/AIDS awareness and adult literacy campaign

Viewing promotional materials in a VIC

rots' attack on beans have been reported (Nderitu *et al*. 1997). The estimated annual bean production losses due to BSM attack is 194,000 and 96,000 tons in eastern and southern Africa respectively (Wortmann *et al.* 1998).

2. Bean foliage beetle (BFB) (*Ootheca* spp., Coleoptera: Chrysomelidae). This is a sporadic but serious pest of beans in tropical Africa. The adult beetles emerge from the soil during the first seasonal rains. Adults feed on the tender bean seedling leaves causing large-scale leaf damage. The female insect lays eggs in the soil close to the

BFB adult and larval damage

young bean plants and the developing larvae feed on lateral roots and the nitrogen fixing root nodules. Consequently, the bean plants wilt thus causing premature senescence (Ampofo and Massomo, 1998). Most farmers lose their crop each year and a number of them have abandoned the cultivation of beans in some locations.

3. Other insect pests: Other economically important insect pests in different bean growing areas in eastern, central and southern Africa include pod borers (*Helicoverpa armigera* and *Maruca vitrata*), aphids and various pod/seed sucking bugs (*Aphis* spp., *Clavigralla* spp., *Anoplocnemis* sp.) and storage bruchids (*Acanthoscelides* sp., *Zabrotes* sp.).

2. DISEASES

The major bean diseases include root rots

(leaflets, posters, field guides and brochures) on their own activities. Observations showed that farmers developed a sense of pride in their knowledge and the product on paper. This helped to enhance further dissemination. Some farmers moved further by sensitising their local leaders to set aside premises for preserving those materials. These premises in the villages are also known as Village Information Centres (VICs) - small village libraries. The VICs enable community members to stock and retain promotional and other relevant reading materials from different ministries and departments according to current and future community needs at village level.

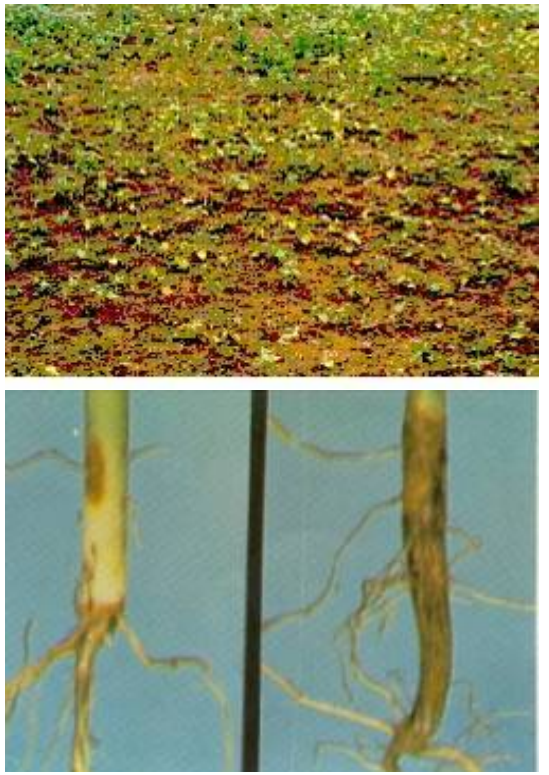
A selection of promotional materials

farmer groups and national bean research scientists in interviews for radio scripts on bean production, helped to improve the dissemination process. The scripts were aired through different national state and private radio and TV programmes. This initiative enhanced the spread of the message to a much wider audience of communities within the country and across the borders to neighbours where the languages are common. Some farmer groups in northern Tanzania have taken initiatives in requesting their local district authorities to sponsor them on a private radio programme where they successfully aired their research efforts and successes in the management of bean foliage beetles (*Ootheca* spp.).

10. PREPARATION OF PROMOTIONAL MATERIALS

Farmers participate in the preparation and pre-testing of simplified promotional materials

caused by *Fusarium* spp., *Pythium* spp. and *Rhizoctonia solani*; leaf and pod diseases including anthracnose caused by *Colletotrichum lindemuthianum*; angular leaf spot caused by *Phaeoisariopsis griseola*, bean rust caused by *Uromyces appendiculatus*, *Ascochyta blight* caused by *Phoma exigua var. diversispora; web blight* caused by *Rhizoctonia solani*; bacterial diseases such as common bacterial blight caused by *Xanthomonas campestris pv. phaseoli*, halo blight caused by *Pseudomonas savastanoi* pv. *phaseolicola;*



Root rot damage on beans

and virus diseases including bean common mosaic virus and black root. Incidence and severity of these diseases vary considerably from season to season. Some diseases that are usually of little economic importance can, at times, be devastating. Bean diseases are widespread and may reduce yields considerably. A complex of root-rot species has been increasing in importance in eastern and central Africa and is devastating in some areas of intensive bean production and low soil fertility (CIAT, 1995; Otsyula *et al*. 1998). Economic losses are aggravated by bean farmers sowing late to avoid susceptible varieties being attacked by foliar diseases and insect pests.

3. OTHER BEAN PRODUCTION CONSTRAINTS

Other bean production constraints include drought, low soil fertility characterized by low

9. WORD OF MOUTH, DRAMA, SONGS, POEMS, RADIO AND TV PROGRAMMES

Farmers and school children have developed their own effective channels of communication among themselves and with the wider audience. Word of mouth, songs, poems and drama are most common and very effective in sending clear messages within and across communities as well as to visitors even if they are presented in the local ethnic languages.

While these channels continue to be key indigenous pathways from different communities, facilitating the media to access participating

knowledge sharing and exchange of experiences was enhanced. Field days and visits/tours were one of the key and effective tools for disseminating the knowledge intensive IPM technologies with smallholder farmers. The innovative farmers believed that the establishment of demonstration and learning plots without field days were a waste of effort because field days promoted the practical learning process through sharing and exchanging ideas while observing the results. Once farmers see and discuss activities with other farmers and get convinced of the performance, they adopt/reject the technology without further experimentation. This is a great short cut in the adoption process compared to researcher's or extensionist's technology demonstrations where farmers confess that they need to conduct their own tests on the technologies in order to prove on their performance before adoption/rejection.

Phosphorous, Nitrogen and Potassium; deficiencies in Magnesium and Iron; Aluminium and Manganese toxicities; lack of improved and quality bean seed; land shortage; land

Phosphorus and Nitrogen deficiency

reclamation from swamps and eroded soils; lack of tree planting; inadequate capacity building in crop and animal production; unreliable markets and credits for farm inputs; lack of agro enterprises and crop diversification; food processing and utilization as well as, formation of farmer associations and unions.

APPROACH

A participatory group approach: modified

Farmer Field School (MFFS) was adopted. The MFFS works well as an approach to community action that is required in the dissemination of knowledge intensive technologies such as in the case of IPM practice. MFFS helps in reaching out to a larger number of community members at different sites compared to the standard Farmer Field School (FFS) approach. Using the group approach, the International Centre for Tropical Agriculture (CIAT) in partnership with regional and national agricultural research and extension services, local leaders, policy makers, locally active Non Governmental Organisations (NGOs) and the private sector have contributed to catalysing the empowerment of smallholder farmer groups through enhancing their capacity to understand bean pests and other production constraints. The approach and processes encourage participants especially smallholder farmers to seek pest and other crop/livestock management options (Ampofo *et al*. 2004; Minja

implementation. The district extension office, local NGOs, village authority, private sector and the research project supported farmers in field experimentation.

8. FARMER FIELD DAYS AND CROSS VISITS

Farmer research groups organised field days and invited other farmer groups and stakeholders from neighbouring villages in the district and beyond. Partners including policy makers, local leaders and NGOs supported the farmers by participating in the discussions during field day sessions and contributed to the sponsorships for visiting farmers. In this way, the farmer-to-farmer

work plans for field activities and agreed on setting up learning (for existing management technologies) and demonstration (for new technologies) plots. Individual farmers, groups or school teachers volunteered among themselves to host such group experiments and organised themselves to prepare the land and plant the crops. Some farmers selected certain

technologies right from the beginning and applied them in their own fields.

Participating and non-participating farmers acquired information and skills from the demonstration and learning plots. Individual farmers and groups consulted the extension, research and other service agents if they encountered difficulties with field work

et al., 2004).

PROCESSES/METHODS

The processes that were used in the participatory group approach include:

- Conducting surveys and interviews to gain an understanding of farmer perception of the bean production constraints and indigenous knowledge
- Sensitising innovative farmers to form research groups to easily access and share information/new technologies
- Conducting formal and informal training for farmers and extension agents targeting particular local constraints
- Organising and conducting meetings during experimentation and evaluation of indigenous and improved technologies
- Organising farmer field days and farmer

group visits/tours to share information and exchange experiences

- Preparing and distributing simplified promotional/extension materials to stakeholders
- Catalysing the setting up of village information centres (small village libraries).

TOOLS FOR FARMER-TO-FARMER TECHNOLOGY DISSEMINATION

1. PRA: To understand farmers' perception of bean production constraints, socio-economic situation and indigenous knowledge. A Participatory Rural Appraisal (PRA) is the first tool to use to obtain background information for the locations. It also enables the researchers to gain some knowledge on the problems to be addressed, the social and economic background of beneficiaries and partners, and indigenous knowledge on management of the different

that the group approach helps them to build social cohesion and create a sense of ownership and responsibility among community members. In this way, most members in the groups become keen to attend group meetings to share ideas on various problems and discuss possible solutions. Farmers nominate representatives to seek solutions from division, ward, district authorities and research institutions. Hence, the group approach enhances and strengthens the process of community empowerment.

7. GROUP DEMONSTRATIONS AND LEARNING PLOTS

Farmer research groups and other service providers participate in drawing up a priority list of constraints and possible management strategies. Most farmer groups selected indigenous and improved strategies for experimentation. The research groups prepared

enhancing the farmer-to-farmer spread of knowledge and technologies.

6. PARTICIPATORY GROUP PLANNING, MONITORING AND EVALUATION

All farmer research groups are encouraged to plan, monitor, apply management strategies and evaluate their activities together. This process helps to enhance their strength in learning together, sharing information and experiences, building confidence on skills to demand services which in turn helps them to sensitise service providers to reach them easily. It worked very well such that local leaders and individual farmers claim

Field evaluation of control strategies by farmers and collaborators

constraints. PRA process enhances the building of trust among partners and establishment of cordial relationships among stakeholders and farmers. Other PRAs may have been conducted at the target sites and lessons can be drawn from these previous studies.

Farmers facilitated to diagnose and prioritise key constraints during PRA

2. PROBLEM IDENTIFICATION

Appropriate identification of pest and soil problems in bean production was conducted with target farmers and service agents during formal classroom and informal field training sessions. Knowledge gaps were identified among farmers and some of the extension service providers. For example, farmers knew that the bean foliage

beetle (*Ootheca* spp.) adults were damaging bean seedling leaves. However, these farmers did not know that the larvae were damaging the roots of the growing bean plants causing pre-mature senescence and low or no grain yield.

Farmers were directed to uproot the plants in their own fields to see the larvae damaging the roots and then discuss possible solutions to the problem. Similarly, farmers and some extension personnel relate diseases such as bean root rots (*Fusarium* spp, *Pythium* spp.) to rotting from heavy rains and insect pest damage from bean stem maggots (*Ophiomyia* spp.) to effects of drought or late planting without mentioning the insect pest. These knowledge gaps were

Group membership (including women), is driven by keenness to learn by doing, sharing information and exchanging experiences. These groups enthusiastically engage in group-to-group visits resulting in farmer-to-farmer spread of knowledge beyond their own communities. Group initiatives and the involvement of different partners enhance the dissemination process and helps in blending farmers' indigenous IPM knowledge (i.e. use of botanical pesticides, wood ashes, cow urine and farm yard manure) with improved technologies such as high yielding pest tolerant crop varieties and cultural practices. Group interaction helps to restore farmers' confidence and build skills in their own indigenous knowledge, which was earlier on thought of as backward and primitive to practise. Confidence in farmers help them to be proud of their knowledge and discoveries thereby making them feel good about themselves. Such farmers become keen in disseminating information,

Informal training also takes place continuously among farmers themselves and with stakeholders at farmer group meetings and during visits by researchers, extension personnel and other service providers, policy makers and donors.

5. FORMATION OF FARMER RESEARCH GROUPS (FRGS)

An important outcome of the participatory group research activities is the enhancement of social capital in the form of farmer research groups (FRGs).

Sanya Juu bean IPM farmer research groups

These groups are formed voluntarily to discuss and find solutions to issues of major importance and common interest to the community.

addressed during participatory group learning by doing with teams from the research, extension services and other partners.

3. PARTNERSHIPS

The group approach directly involves the target communities where different partners have varied development interests in improved food security and household income. These partners include policy makers, local leaders, NGOs, religious leaders and the private sector.

Some of these partners support various farmer activities such as formal and informal training, farmer field days and visits/tours, supply of loans and credits for farm inputs; some of them facilitate the formation of community based associations and others assist in the establishment of agro-enterprises and provision of information on various issues including

markets and agro-enterprises. Some partners are attracted to or motivated by the groups because they provide an avenue for planning other development activities especially in education, health (particularly HIV/AIDS programmes), agriculture and policy restructuring.

4. FORMAL AND INFORMAL TRAINING

Formal training is conducted for farmer group representatives as key stakeholders, extension personnel and different locally active partners. The stakeholders' activities in such training sessions include identification of major production constraints, discussions on different possible solutions, prioritisation of solutions, planning for field demonstrations, allocation of responsibilities to each participating stakeholder and search for support funds.

Participants in training sessions discuss and

contribute to each subject. Formal and informal group training is conducted on a continuous basis

at the on-farm learning and demonstration plots during the cropping season. Constant training assists in timely application of appropriate technologies; facilitates monitoring and identification of other different production constraints; helps in scouting for pests, application of control measures, performance evaluation of different control strategies; and enhances observations on the appropriate and effective cultural practices.