FARMERS' PARTICIPATION IN BEAN RESEARCH IN UGANDA

Wortmann, C.S.[1], Kisakye, J.[2], Ugen, M.A.[2], and Sengooba, T.[2]

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[1] CIAT Regional Bean Programme in Eastern Africa, P. O. Box 6247, Kampala, Uganda.

[2] National Bean Programme, Kawanda Research Station, P.O. 7006, Kampala, Uganda.

Introduction

Beans are produced primarily by small scale farmers in Uganda (Bank of Uganda, 1988). The production systems are diverse and often complex. Uganda's favorable climatic and edaphic conditions allow for a wide range of crops to be grown and beans are found grown in pure stand and in association with various cereals, root crops, vegetable crops, tobacco and bananas. These associations are most often intercropping systems, but also relay intercropping and rotations are found. The unreliability of input and output markets necessitates flexibility in the production systems. The farmers' bean production objectives are several and vary in relative importance, from farm to farm, district to district and year to year. Resources available to small farmers are often few and diverse and these must be allocated between different production activities to obtain sufficient but stable production. These characteristics of small scale bean production systems lend to their complexity and diversity and underly the need for working closely with farmers to understand their decision making environment, to identify feasible technological alternatives, and to evaluate these alternatives.

The complexity and diversity of bean production systems in Uganda underlies the need for farmer participation in research. Farmers can provide local knowledge of their objectives and production systems and can contribute to the evaluation of technologies in light of their objectives and constraints. Through on-farm experimentation, technologies can be evaluated

under farmers' environmental and managerial conditions. Farmers, in any case, make the final decision on the worth of a technology and the sooner they can be involved in the evaluation of alternative technologies, the more efficient the research process is likely to be.

Farmer participation has been incorporated into the research process in a number of ways. The most widely practised is on-farm experimentation, where the trials may be managed by the researcher, but often by the farmer. Researchers around the world are, however, trying to involve farmers to a greater extent in the research process. Baker et al (1988) report success in using 'regular research field hearings' (RRFH) in Brazil in the development and dissemination of sheep and goat production technologies. In response to the failure of upland farmers to adopt improved cropping patterns, farmers were involved in the identifying, analyzing and solving of systems production problems in the Philippines (Lightfoot et al, 1987 and Lightfoot et al, 1988), but rather than addressing the crop components of the system, they dealt with soil fertility and the invasion of rotational fallow by *Imperata cylindrica*. In India, researchers collaborated with farmers to establish criteria for screening upland rice varietal material (Maurya et al, 1988). In Botswana, the Agricultural Technology Improvement Project (ATIP) researchers meet with groups of farmers regularly to select technologies to evaluate in on farm trials, to decide on the conduct of the trials and to evaluate the results of the trials (Norman et al, 1988). In Colombia, Ashby (1986) compared the results of a researcher designed soil fertility management trial

with those of a trial designed in collaboration with farmers. In the trial designed in collaboration with farmers, the use of locally available organic fertilizers together with chemical fertilizers was studied, as well as the farmers traditional means of fertilizer application. Subsequent interest was much higher in the trial that farmers assisted to design. In Rwanda, CIAT and ISAR scientists invite small numbers of carefully selected farmers to research stations to evaluate varieties in preliminary and advanced yield trials to identify acceptable and unacceptable varieties at an earlier stage and to learn more about farmers criteria for variety selection (Sperling, 1988 Pers. Comm.).

Background, objectives and resources of the National Bean Programme

Bean research in Uganda started in 1960 after a World Health Organization team conducted a survey of human nutrition in the country and reported high levels of malnutrition and protein deficiencies, especially in the banana-eating zones of the country. The initial objective was to develop high yielding bean varieties. Other objectives which have evolved are: the development of disease resistant varieties; the development of varieties to meet farmer and consumer preferences for plant type, time to maturity, short cooking time, and seed size and colour; the identification of insect and disease control methods; and the identification of productive technologies.

Bean research started at Kawanda Research Station in 1960. In 1985, the work was extended to Kachwekano District Farm Institute and to Serere Research Station. Intermediate and

advanced yield trials are conducted on the variety trial centres (VTC's) located at Kamenyamiggo, Mubuku, Bushenyi (Rubale), Bulindi, Bukalasa, Kachwekano, Kyembogo and Nakabango. On-farm research commenced in 1987 and on-farm trials are now being conducted in Kabale, Mpigi, Luwero, Masindi and Tororo districts.

The National Bean Programme is composed of two breeders, two pathologists, three agronomists, an entomologist, a soil chemist, and an agricultural economist. An agronomist, the entomologist and the economist are away on MSc studies. The programme collaborates with a virologist and soil microbiologist from Makerere University in research on Bean Common Mosaic Virus and dinitrogen fixation. The National Bean Programme receives support from the CIAT Regional Bean Programme of Eastern Africa, which also serves bean research programmes in Kenya, Ethiopia, Somalia, Sudan and Madagascar. Each of the researchers is backed by one or more assistants, with ranks ranging from Field Assistant to Assistant Agricultural Officer. The on-farm research agronomist works in close collaboration with district extension staff. The National Bean Programme activities are centrally coordinated by the National Coordinator, who is also a member of the steering committee of the CIAT Regional Bean Programme of Eastern Africa. The Ministry of Agriculture is the main source of financial support for research operations, but nearly 50% of the funding for operational expenses is received from USAID/Kampala and CIAT.

On-farm research and farmer participation in bean research in Uganda

Exploratory surveys

In 1987 and 1988, work was initiated by the researchers with farmers in Kabale, Rakai, Mpigi, Masaka, Luwero, Masindi and Tororo districts. Background information about the districts was collected from the District Agricultural Offices and other sources. In each of the districts, three or four villages were selected for a diagnostic survey to be conducted by researchers, together with selected extensionists. A one-day training course on interviewing techniques was held, and a questionaire was either formulated or revised on that day. Interviews were held with 27 to 40 farmers per district, over a period of 2-4 days. The interviewers discussed their findings at the end of each day. After the surveys, the information collected was analyzed and interpreted. Constraints were listed and prioritized, and possible solutions were identified. On-station and on-farm experiments were designed which focused on the important problems.

More recently, surveys have been conducted which were directed to specific aspects of bean production. Two students from Makerere University conducted formal and informal surveys in Mpigi and Rakai districts specifically about the intercropping of beans and bananas. Four students from the University are presently surveying bean storage practices and constraints.

On-farm experimentation

Following the surveys, on-farm experimentation (OFE) commenced. In each district, one or two extenisonists who worked

in important bean growing areas were chosen to collaborate in the OFE and participated in a four day training on research methodology. These extensionists play major roles in the implementation of the OFE, and are responsible for identifying farmers, site selection, and marking out the trials. They work with the farmers to apply the treatments, to plant, care for and harvest the trial, and they collect some of the desired data, while other data, until now, has been collected by the researchers. Data are collected on diseases, weeds, and other non-experimental variables. Yields are measured by the extensionists. Background information is routinely collected on the farmer, his/her farm, and the trial site (see Appendix 1). Researchers visit these farmer managed trials at least twice each season, usually after planting and, again, after flowering. After harvest, researchers and the participating extensionists and farmers meet to discuss the results of the trials, problems and opportunities encountered by the farmers and plans for future experimentation.

During the surveys, it was found that farmers were growing low yielding varieties which were susceptible to pests and diseases, suggesting a need for improved cultivars. As farmers are generally interested in trying different bean varieties, and because variety trials are easy to conduct and can provide breeders with much needed information, on-farm experimentation began with bean variety trials. Seven or eight promising varieties from the advanced yield trials were evaluated in farmer managed trials of two replications on ten farms per district.

Farmers' opinions of the varieties and their preferences were elicited in the meetings between participating farmers, researchers and extensionists which followed harvest. Farmer participation in evaluation has resulted in some varieties being rejected, despite good yield potential, and it has allowed varieties to be well targeted. A white haricot variety was found to be well liked by farmers who are near an urban market. In Kabale, however, farmers rejected it because of its poor keeping-quality. Another variety, G13671, was rejected completely by farmers in all districts, except Kabale district where it received the highest overall rating. Both of these varieties have been released, but they are to be targeted to the appropiate parts of the country. On-farm variety trials and farmer participation in variety evaluation are expected to be an on-going and integral part of the bean breeding work.

Exploratory trials to determine the importance of various production constraints have been conducted. Incomplete factorial (plus one) trials were conducted for two seasons on five farms in four districts to estimate the effects on seed yield of deficiencies of nitrogen and phosphorus, beanfly, some fungal diseases and the farmers' variety. Yield losses occurring due to N and P deficiency were determined by applying 33 kg N plus 25 kg P_2O_5/ha. Beanfly effects on yield were determined by seed dressing with endosulfon. Seed dressing with thiram and benelate was included to give partial control of some fungal diseases. K20 was compared to the farmers' seed to determine varietal effects. In Mpigi and Kabale district, the greatest yield losses were found to be due to N and P deficiency, and nutritional

screening trials to determine the relative importance of various nutrient deficiencies commenced in the second season of 1989 in Mpigi district on six farms. These nutritional screening trials are to be extended to Kabale district in 1990.

Determinative trials are to begin in 1990 in Mpigi and Luwero districts to investigate the intercropping of maize and climbing beans. Three seasons of research at Kawanda has verified the greater potential productivity of the system, but now farmers need to be involved in the evaluation to determine if the system is compatible with their existing farming systems, especially to determine if the extra yield gained is sufficient to justify the extra labour required.

Trials to verify the value of seed dressings for disease control and beanfly control have been conducted for three seasons in five districts. Overall, yield increases due to seed dressings were small, but enough to pay for the chemicals. Concerns about toxicity remain, however, and the small yield increases resulting from the use of the seed dressings may not be sufficient to recommend dressing of seed produced by farmers.

Another approach to involving farmers in the research is to invite carefully selected farmers to the research stations to give input in the evaluation of promising varieties and production technologies. This allows for farmer input at a much earlier stage than occurs with conventional research approaches where the farmer has a chance to evaluate a technology only after it has been released. This early involvement of farmers in the evaluation allows experimentation to be modified to include or

exclude certain factors or treatments at a stage when relatively few resources have been invested in the experimentation. It is important that the farmers selected for such an exercise be farmers, who through their experience, have developed the art of observing and evaluating bean varieties and of bean husbandry, and who can articulate their opinions. In the first season of 1989, the bean breeders at Kawanda Research Station invited selected farmers to Bukalasa VTC to participate in the evaluation of varieties in preliminary yield trials at late podfill. They observed the varieties in the field and also saw the seed of each of the varieties. Their responses primarily concerned plant type and seed type, and the need for careful selection of farmers for participation in this activity was apparent, as some made little useful contribution (Kayiwa, 1989, Pers. Comm.).

Implications for on-farm research in Uganda.

The experiences of the National Bean Programme in on-farm research suggest that on-farm research should be an important part of any agricultural commodity research programme and that certain key elements should be included.

Exploratory surveys

The exploratory surveys conducted by the National Bean Programme have generally been brief with 40 or less interviews with farmers per district. Often the survey teams were very small and did not involve many disciplines. It is recognized that a greater investment of time and expertise in the surveys would be rewarding (Byerlee et al, 1984), but such surveys are expensive in terms of operating expenses, vehicle use and

researchers' time, and priorities must be set on the use of these resources. If the gathering of information on bean production were to end with the survey, it would be an inadequate information basis on which to conduct a problem solving research programme, especially in light of the diversity and complexity of the bean production systems and the importance of the crop. This gathering of information, however, continues with on-farm experimentation and the involvement of farmers in research. When visiting trials, researchers have opportunities to have discussions with farmers and to observe their crops in the field, and therefore to compile a greater and more accurate body of knowledge about crop production in the area of interest. This knowledge should be utilized when reviewing the Programme's research priorities. Chambers and Jiggins (1986) suggest that such rapid appraisals of the farmers' situation, followed by information gathering during a close working relationship is more appropiate for resource-poor national research programmes than are large scale surveys by multi-disciplinary teams.

Farmer participation

Farmer participation in research is especially important when the cropping systems and the farmers' objectives are diverse and complex. It is then useful to involve farmers in the identification and analysis of problems, the assessment of technologies, and even in the identification of treatments to include in trials. In addition, some research can only be done on farmers' land. The assessment of the importance of some production problems must be done on-farm under farmers'

managerial conditions as the incidence and severity of many problems is likely to be different under farmers conditions than is found on a research station. Determinative on-farm research is needed on certain problems, such as soil fertility management when the nutrient status of farmers' fields is expected to differ from that found on the research stations. Farmer input is needed in the evaluation of technologies which require new skills or extra labour. verification of on-station results can often best be done in cooperation with farmers on their land and under their management conditions.

The research-extension-farmer linkage

Extensionists can play an important role in OFR. They work more closely with farmers than do researchers, and often communicate better with farmers because of proficiency in the vernacular and more frequent contact. They are in closer touch with farmers and their needs. If the researcher values the farmer's opinions, the role of the extensionists can be very important to the research process. The research-extension-farmer linkage is important for the development, adaptation and testing of technology, but also for the transfer of verified technology to farmers. Also, resources required for conducting on-farm research are much reduced if extensionists play a major role in the implementation of the research. While the extensionists require some equipment and supplies, such as tape measures, weighing scales, labeling materials and harvesting bags, the researchers do not have to participate in identifying cooperating farmers, site selection, planting and harvesting. Coordination

problems are much reduced, as are travel requirements and the associated transport and per diem expenses.

When involving extensionists in OFR, a choice needs to be made between trying to work with one or two extensionists per district, or to assign trials to all of the extensionists. The experience of the National Bean Programme has been that it is good to work with one or two only, each conducting seven to eight trials. This has allowed us to work more closely with these individuals and to give them training in research methodologies. It reduces sets of equipment required, makes supervision of the work less costly, and facilitates meeting with the participating farmers who usually live within a two kilometer radius. The question may arise as to whether an extenionist should be working with only one research programme or several. Involvement in several research programmes would give wider exposure to cropping systems, but if a research programme's efforts are concentrated with one or two extensionists per district, these extensionists may not have time to conduct more trials, in addition to fulfilling their other duties.

The complementarity of on-station and on-farm research

In some countries, on-farm research is the sole responsibility of a separate research section, such as a farming systems research section or a farm economics section, and the commodity research programmes are restricted to on-station research. Our experience indicates that both on-station and on-farm research should be the responsibility of the concerned research programme, and that all scientists conducting research

to solve farmers' production problems should be free to conduct both on-station and on-farm research. This does not preclude that a member of the research programme will specialize in OFR. The interactions between OFR and OSR are too close to be separately coordinated. The bean programme evaluates hundreds of introductions and lines before selecting entries for on-farm variety trials. The varietal testing on farm allows for variety assessment under farmers' environment and managerial conditions, and it provides feedback to the breeders on the needs of the farmers, allowing the breeders to fine tune their selection criteria and better target the promising varieties. For this process to work smoothly, the bean programme's breeders must be directly involved in the OFR. Agronomists need to have similar involvement in both OFR and OSR. Saying the above, we suggest that as much of the descriptive and diagnostic work of OFR is not commodity specific, the reviewing and compiling of secondary information and much of the survey work should be nationally coordinated, to avoid the need for each programme to collect the same information.

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VARIETY EVALUATION TRIAL (OFR), 198...

LOCATION_____ FARMER'S NAME_____

PLANTING DATE_____

Plot No.	Var	VIG	Bean fly	CBB	ALS	ANTH	Rust	ASCO	Virus	Pod load	Yield	Plant har.	Plot area
101													
102													
103													
104													
105													
106													
107													
108													
109													
201													
202													
203													
204													
205													
206													
207													
208													
209													

APPENDIX A.

Uganda Bean Program Supplemental Questionnaire

Todays date:.....: Interviewer .....

Farmer Number ....: Farmer's Name ..... .Village.....

Farmer's Age:....: Education of Farmer in Years.....

Name of the on farm trial.....

Date trial planted.....: Date harvested .....

Date farmer's field planted .....: date harvested.....

Farmer's seed variety .....: Farmer's seeding rate.....

Farmer: distance between bean plants .....: plants/hill.....

Trail: distance between bean plants .....: plants/hill.....

Other crops in farmer's field and population .....

Other crops in trial field and population .....

How many years has this field in continuous cultivation .....

What was planted in the field the past year.....

Was manure applied this year ....., last year.....

Is the field shaded by large trees; yes ....., no.....

Field size including the CIAT trial plot.....

Field slope .....%: Soil ph .....: Soil texture.....

Topography field; hilltop ...., hillside....,footslope ....,valley....

Distance from field to farmer's house.....

Farmer's total number of fields ....., total acres.....

Number in family ..... ., number between 16 and 60 yrs of age.....

Weeding date; 1st ....., 2nd .....

Weed problem: (circle one) high = 1 2 3 4 5 6 7 8 9 10 = low

General comments: