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Technical Paper Series

Improving Bean Seed Quality and Availability:

I. Bean Seed Multiplication
II. Making Improved Seeds Available

K. B. Paul and Ron Grosz

Reports # 15 and 16

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BEAN SEED MULTIPLICATION: A LOW-INPUT, FARMER-BASED SEED PRODUCTION SYSTEM

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INTRODUCTION

Beans are a major component in the Rwandan diet, providing 25% of the total caloric intake and up to 45% of protein intake. In spite of their importance, the yield of beans per unit of land has decreased in Rwanda over the years, primarily because of declining soil fertility and the expansion of production into more marginal land (ISNAR, 1982). In addition, availability of good seeds of proven varieties at a reasonable price is a problem for the Rwandan farmers, as is the case for most farmers in developing countries. The present seed production system in the country is inadequate, and the seed distribution system is almost non-existent (Paul and Grosz, 1987). Therefore, the farmers generally save a small portion of their harvest as seeds or buy them from the market or from their neighbors for planting. Although the farmers generally do a good job of screening the seeds, the varieties and/or the quality of seeds are often not good. To help the farmers grow food more efficiently, it is imperative to provide them with good seeds of "improved" adapted varieties.

Over the past three seasons, several of ISAR/CIAT's promising bean varieties and a few local varieties have been tested under the farmers' conditions; four varieties have been identified for their high yield and farmer acceptability (Paul, 1987b). To meet increasing demands from the farmers for the seeds of these varieties, a seed multiplication program was launched beginning in the 1988 A season, involving the farmers themselves. This paper describes briefly the procedure recommended to the collaborating farmers.

OBJECTIVE

The objective was to develop a low-cost, farmer-based system of seed multiplication for improved bean varieties. Since the study was aimed at aiding resource-limited farmers, emphasis was placed on good cultural methods and rigorous seed selection practices rather than on the chemical control of diseases. It is hoped that the farmers will eventually follow a similar system to produce seeds of other farm crops.

CHOICE OF VARIETIES

In previous bean variety trials (Paul, 1987a; Paul, 1987b), both dwarf and climbing bean varieties were tested for their acceptability. Thus far, two dwarf bean varieties, Kirundo and Ikinimba, have been identified that produce yields higher than the farmers' varieties. However, Kirundo is susceptible to halo blight, and Ikinimba to rust; therefore, these are not in the list of recommended varieties.

In general, climbing bean varieties are much less susceptible to diseases and produce much higher yields as compared to dwarf varieties. This is especially true in the area of this study; consequently, farmers were encouraged to plant more climbing beans if at all possible. In this category four varieties--G. 858, G. 2333, Puebla Criollo (all ISAR/CIAT) and Mwirasi (local)--are recommended to the area farmers. Although none of these varieties has better resistance to the most prevalent diseases of the area than the farmers' varieties, they produce at least 20% more yield and readily meet all the other acceptance criteria (Paul, 1987b). Farmers are using one or more of the above varieties for the first season's (1988 A) seed multiplication program.

CHOICE OF FARMERS

The seed multiplication program was explained to the farmer-collaborators. Technicians and extension workers discussed the benefit of having quality seeds and offered to demonstrate methods for producing good-quality seeds. However, it was stressed to the farmers that it would be their program and they would have to provide all the labor. Farmers were given about 500 g of seeds of their choice free of charge and were supervised. Upon harvest and final seed selection, the farmers agreed to sell seed back into the program at a price 10 FRw higher than the market price. With the above understanding, 16 farmer-collaborators were selected for the first season's work.

The seeds produced this way will be distributed to another batch of farmers the following season who will be expected to follow the same production methods under the supervision of technicians and/or the extension workers. After two to three seasons it is hoped that the farmers will see the benefits of better seed production for themselves, and the practice will have caught on.

SEED PRODUCTION PROCEDURE TO BE FOLLOWED

The farmer-collaborators were strongly urged to follow the following steps:

A. Planting and Caring:
   1. Select the best field available for bean production (between 50 and 100 sq m) close to the rugo, for ease of maintenance.
   2. Cultivate the field twice. Add and incorporate good quality manure at the rate of 15 to 20 tons/ha.
   3. Plant beans on time using ISAR-recommended practices, i.e. in line, 20 x 40 cm apart, 2 seeds/hill.
   4. Before sowing, place the seeds in a bucket, moisten them with a few drops of water, and add premeasured quantities of fungicides (either Diasaat, or a mixture of Thiram + Benomyl, depending upon availability, at the rate of 5 g/kg seed. These fungicides will be provided by FSRP for the time being). Mix the seeds and the fungicide well by stirring, wait for 30 min, and plant. Wash hands thoroughly afterwards with soap and water (Paul and Trutmann, 1988).
   5. Use good strong stakes, about 3 m long, for the climbing beans.
   6. Weed the field two to three times.

B. Monitoring:
   Uproot any plant where more than 3% of the total foliar surface is affected by disease. If only a few leaves are affected, pinch off the diseased leaves. Dispose of the diseased parts properly. This disease monitoring should be done as often as possible, but at least once a week.

C. Harvesting, Screening and Storing:
   1. Harvesting should be done as early in the season as possible to reduce the period during which the mature seed is exposed to pathogens and secondary contaminants (CIAT, 1978).
   2. Only the very healthy pods (i.e. clean without any disease spot) that are not in contact with the soil surface should be harvested and saved (CIAT, 1978).
   3. After drying and threshing the healthy pods, select only the large, sound seeds (seeds that are damaged, discolored or diseased should be picked up for other uses).
   4. The selected seeds should be stored in a dry, cool place and planted in the following season. For longer storage, the seeds should be treated with "actellic" following recommended practices (Paul, 1988).

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MAKING IMPROVED SEEDS AVAILABLE TO RWANDAN FARMERS: THE NUTS-AND-BOLTS OF ESTABLISHING LINKAGES

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Rwanda is a small, land-locked country with an estimated area of 26,338 km^2 and a population of over 6 million people, making it the most densely populated country in Africa. With the exception of periodical shortages of food, agricultural production in Rwanda has thus far kept pace with the increasing population by bringing new land into production. However, acute land shortage makes it necessary to increase agricultural production per unit of land area if the country wishes to remain self-sufficient in food production. To help achieve self-sufficiency, the government of Rwanda entered into an agreement with USAID[1] that resulted in the initiation of a Farming Systems Research and Extension (FSR/E) project. Detailed information on the project can be found in documents cited in the reference.

During day-to-day interactions with area farmers, a constant effort is made to develop a good understanding of their farming systems and production constraints. One of the problems frequently mentioned by farmers is that they do not have access to quality seeds. This paper reports the efforts made by FSRP to help resolve this particular farmer-perceived need by establishing linkages between existing systems.

Seed multiplication and seed distribution in Rwanda are the responsibility of the Selected Seed Service (SSS). SSS obtains seeds of "proven" varieties from the Rwanda Agricultural Research Institute (ISAR), multiplies and supplies them to prefectural extension officers[2]. For the farmers to get these seeds, they must contact their sector's extension worker[3] and pay for the seeds in advance. The extension worker goes to the communal extension agent with the request. The communal extension agent then purchases the seeds from the prefectural officer and passes them on to the extension worker (Fig. 1).

This system might work under some situations. But in the project area as in much of Rwanda, each extension worker is responsible for about 1200 farm families[4] and has no transportation. Thus, it is difficult to serve more than a handful of farmers. The same is true for the communal agents who must deal with a much larger population.

When a farmer orders seeds through this channel, it could be months before they are delivered. Often seeds reach the farmer after the peak planting season. Moreover, if seeds of certain crops are in short supply, a situation far too common, the farmer may never get them. Even worse, farmers may not know if their orders will be filled until the very last minute. This makes good planning difficult. In view of these facts, the present seed distribution system is, at best, inefficient and unreliable.

To gain first-hand knowledge about the seed production and distribution system, a discussion was held with the Director of the SSS. While it was true that the SSS did not have seeds of all the crops the farmers wanted, it did have a large stock of wheat and pea seeds at the time of the discussion and was eager to market them. The Director was informed that many farmers in our area could not find quality seed and that there was an obvious distribution gap. He indicated a desire to improve the existing seed distribution system and invited suggestions.

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[1] This project has been funded under USAID contract number 696-0110-C-00-5015-00.

[2] A prefecture or province is a politico-administrative division of the country. A commune is an administrative subdivision of a province similar to a district or county in some systems. The commune is, again, subdivided into sectors, and each sector is subdivided into cells, the smallest administrative unit. There are 10 prefectures in Rwanda. Ruhengeri is composed of 16 communes; FSRP works in four contiguous communes of this prefecture.

[3] We are translating Rwanda French terms into English as follows: Extension worker is moniteur agricole or monagri; extension agent is agronome de commune. In the Rwanda system, the extension workers are persons who have usually completed primary school and, perhaps, some secondary school education. The extension agents or agronomes are given differing classifications depending on how much technical training they have completed.

[4] The average Rwandan farm family size is eight people, and an extension worker serving only one sector must work with about 600 families or 4,800 people. In fact, in the project area, each extension worker serves an average of two sectors and therefore works with 1,200 families.

Suggestions were made by various national and expatriate personnel for improving the system. Clapp (1986) suggested contacting the local agricultural and trade schools and the CERAIs (Centre d'Enseignement Rural Artisanal Integre) and exploring the possibility of working with them as possible seed distribution outlets. Clapp also helped establish initial contacts with the directors of the SSS and the CERAIs.

On a trial basis the following CERAIs, one in each of four communes, were selected:

CERAI Runaba ..... Commune Butaro
CERAI Rushara ..... Commune Nyamugali
CERAI Mucaca ..... Commune Cyeru
CERAI Karuganda ..... Commune Nyarutovu

These schools were visited and the directors were contacted. The directors were urged to aid in testing the proposed system for the following reasons:

- the school would be providing a community service;
- CERAI students could be involved in this seed distribution system, which could help them gain self-confidence;
- the students could be trained in retail sales of agricultural products and in simple bookkeeping methods;
- the CERAIs could add a few francs as a service charge to the price of the seeds sold to generate a small income to support other school activities.

The CERAI staff were very receptive to the idea, but they were concerned that the SSS might not be willing to supply seeds on credit. They also wanted to know how the seeds would be transported from SSS warehouses to the collaborating CERAIs. The SSS readily agreed to provide both credit and transportation. A few days later, the SSS delivered 100 kg each of wheat and pea seeds to each of the four communal offices. They were prepackaged in 1-kg plastic bags. Each communal administrative head or bourgmestre, in turn, arranged to deliver the seeds to participating CERAIs.

Upon checking with the CERAIs after the planting season to find out how the arrangement was working, it was discovered that the CERAIs were able to sell only about one-half of the seeds delivered. In fact, they themselves purchased much of the seeds for planting in their school fields. They cited the following reasons for this low turn-over of seeds to farmers:

1. The seeds were delivered late, near the end of the planting season.
2. Word did not reach many area farmers that they could buy seeds at the participating CERAIs.
3. Prices of the seeds were about 25 to 30% higher than current market prices.

Despite these problems, all four CERAIs felt very positive about the arrangement. An agreement was reached to alleviate most of the problems mentioned and continue the experiment into a second planting season. The CERAI staff indicated that they were proud to be a part of the system and to be able to provide a useful service to their community. The new system also assisted them in training students in the rudiments of managing a small business.

In addition to meeting with CERAI staff members, informal discussions were held with the communal extension agents and extension workers as well as with some of the farmer-collaborators. All felt that this was a much-needed service that should be extended to include all eight CERAIs in the area[5] expanded to cover all important crops of the area.

Farmers are especially interested in buying garden seeds such as tomato, cabbage, carrot, egg-plant, hot pepper, onion and leek. Requests have also been made for young fruit trees, seeds of cover crops, green manure and forage crops. It might also be useful if, in the future, the CERAIs could stock some other agricultural products such as fertilizers, insecticides and fungicides. It should be pointed out that, in this project area, there are no stores that sell such agricultural products, vegetable seeds or other certified seeds.

[5] There are, on the average, two CERAIs per commune.

Although it is somewhat early to evaluate the effectiveness of the seed distribution system now being tested, indications are that it would improve the existing system with little additional cost or effort. All components are already in existence; all that is needed is linkages among these components.

The system will be further monitored, and problems will be alleviated as they arise. If the model proves to be viable, it will be extended to include all the CERAIs in our area. The SSS could use this system to bring seeds closer to farmers in the rest of the country. Making good seeds and other agricultural inputs available to the rural community is a prerequisite to improving Rwanda's agricultural production. Working with the CERAIs is just one possible way of doing this.

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EXISTING SYSTEM

Seeds are delivered and stored at the prefectural level (only one location per prefecture). The farmer has to order seeds through the monagris or communal extension agent. Extension staff do not have easy access to seeds; they often do not know what is available since they must get the seeds from the prefecture. They have no transportation and can serve only a few farmers when they do get some seeds.

SSS — Prefectural Extension Officer — Communal Extension Agent — Sectoral Extension Worker — Farmer

PROPOSED SYSTEM

Seeds are delivered to the CERAI either directly or through the communal office. Seeds will be stored and sold through CERAIs, which are in many locations (there are 32 in Ruhengeri Prefecture). Farmers and the extension cadre can see and choose from what is available and will have direct access. Extension staff can more easily redistribute seeds, if needed. They will also gain additional time to do other jobs.

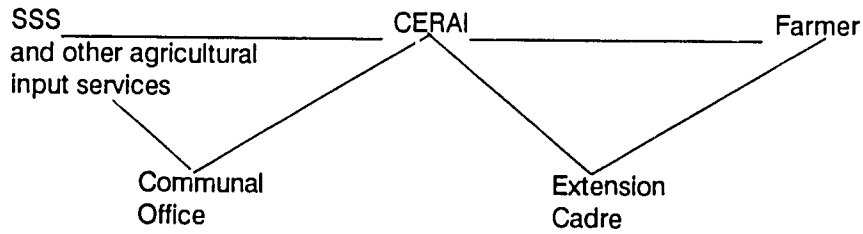

Fig. 1. Comparison between the existing and the proposed seed distribution system.