Tropentag 2015, Berlin, Germany
September 16-18, 2015

Conference on International Research on Food Security, Natural Resource Management and Rural Development
organized by the Humboldt-Universität zu Berlin and the Leibniz Centre for Agricultural Landscape Research (ZALF)

Development of a Community-Based Dissemination Scheme for Improved Cowpea Varieties

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Introduction

Cowpea (*Vigna unguiculata*) is an important crop for food security, livelihood improvement and cash income for farmers throughout sub-Saharan Africa. In West Africa, cowpea is well adapted to the drier savanna eco-regions, and is mostly produced there (Mortimore *et al*. 1997). Available data indicate that cowpea is an important cash crop in Burkina Faso, Ghana, Nigeria, Mali, Mauritania, Niger, and Senegal (Kormawa *et al*. 2002). Therefore, cowpea breeding programs of national agricultural research systems have developed and released various improved cowpea varieties in sub-Saharan African countries. Though improved varieties possess various advantages, such as high yield and resistance to various biotic and abiotic stresses, dissemination of these improved varieties and implementation of modern cultivation techniques continue to be slow. To overcome these difficulties, a community-based dissemination scheme, "Accelerated dissemination system of improved cowpea varieties via empowered communities in Burkina Faso (AVEC-BF)" was designed with intensive interaction of three major components: (1) Establishment of community seed producers, (2) Selection of suitable improved varieties via farmers' participatory varietal selection (FPVS), and (3) Organizing farmers' schools (FS) for improved management practices (Figure 1). Here, the results obtained through a 3-year demonstration of the scheme in 5 villages of Burkina Faso, as well as the expected impact of the scheme, are discussed.

Material and Methods

Selection of demonstration sites

Five villages were selected from two agro-ecological zones, the Sahel and Sudan savanna, the major production areas of cowpea, to demonstrate the AVEC-BF scheme. All activities were conducted jointly with the farmers in each village as part of the scheme.

Establishment of community-based seed production system

Ambitious farmers from 5 target villages were nominated as potential seed producers, and trained in the essential agricultural techniques and knowledge needed for cowpea seed production. The

training program consisted of three phases: 1) lectures by INERA and IITA scientists, 2) field lectures at INERA in an experimental field, and 3) on-farm technical follow-up by project staff during the 3-year project period. Also, initial support was given to the seed producers or groups who completed the training program to reduce the barrier to starting seed production. The initial support consisted of foundation seed of the recommended improved cowpea variety, fertilizer (on loan), agricultural equipment (on loan), assistance with registration and seminal inspection by the national seed system, and a minimum purchasing assurance of the seed produced. After the 2nd year, each seed producer or group continued the seed production independently with minimal technical backstopping by researchers.

FPVS in target villages

A demonstration field for FPVS was established in each village, and 15 cowpea varieties or breeding lines with various improved characteristics, such as high yield, early maturity, large seeds, *Striga* resistance, and disease and pest resistance, were planted at the beginning of the rainy season in each region. In each demonstration field, plots were arranged in a randomized block design with 3 replications, and the plants were planted at a 40 cm distance between plants, with a row spacing of 60 cm for early maturing lines (6 lines) and 80 cm for medium maturing lines. Following INERA's recommendation, moderate input management, top dressing with chemical fertilizer (N:P:K=15:15:15) at 100 kg/ha, 2-3 rounds of weed control, and spraying for disease and insect control according to the conditions of each location were conducted. At maturity of the early maturing lines, farmers from each target village and neighboring villages were invited to the demonstration field for FPVS. The FPVS was conducted anonymously as described by Muranaka et al. (2013) to avoid influence from social relationships.

Organizing farmers' school in each target village

Two candidates for teacher of the farmers' school were nominated by farmers in each village and were trained in the necessary techniques for cowpea cultivation, and in teaching and administration skills needed for organizing the farmers' school. After training, the certified teacher organized the farmers' school in their own village off-season. In addition, each target village was provided with necessary initial investments, such as a blackboard and chalk, seed samples, and other teaching materials for the school.

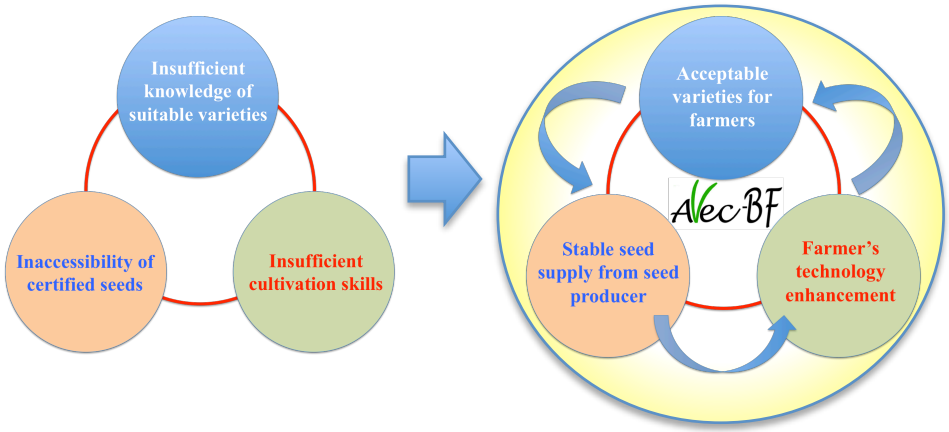

Figure 1: Basic concept of AVEC-BF.

Results and Discussion

Over the duration of the project in 2010-2013, all three key components were undertaken in each village so as to enhance the efficiency of cultivation and promote the integration of the components.

For the establishment of a community-based seed production system at the village level, 17

groups (136 people) received training during the 3-year project period, and produced a total of 46.8 t of certified seed of IT98K-205-8, an early maturing line developed by IITA. To meet the regulations on seed production, approximately 100 ha of uncultivated land were opened for seed production. In addition, sufficient income from sale of the certified seed strengthened the sustainability of seed production.

FPVS was conducted in 2010 and 2011 and a total of 910 farmers (including 286 female farmers) in 5 target villages participated in this activity. Through this activity, 5 breeding lines of IITA and INERA, IT98K-205-8, IT99K-573-2-1, KVx442-3-25, KVx771-10, and KVx775-33-2, were highly recommended by the farmers, and these recommendations were consistent both years. Based on the analysis of a questionnaire, in general the farmers require high yielding varieties with earlier maturity (Fig. 2). Low interest in fodder yield contrasted with reports in Cameroon (Kitch *et al*. 1998) and Nigeria (Muranaka *et al*. 2013).

Farmers' schools were organized in target villages and a total of 1,177 cowpea farming households joined a school. The agricultural school in each target village focused on improving cowpea cultivation techniques and increasing the understanding of the new variety. In addition, a textbook on cowpea cultivation in French and each local language was developed and published to assist the teachers (Ishikawa *et al*. 2013). The textbook in the local language especially enhanced the teachers' school operation in villages.

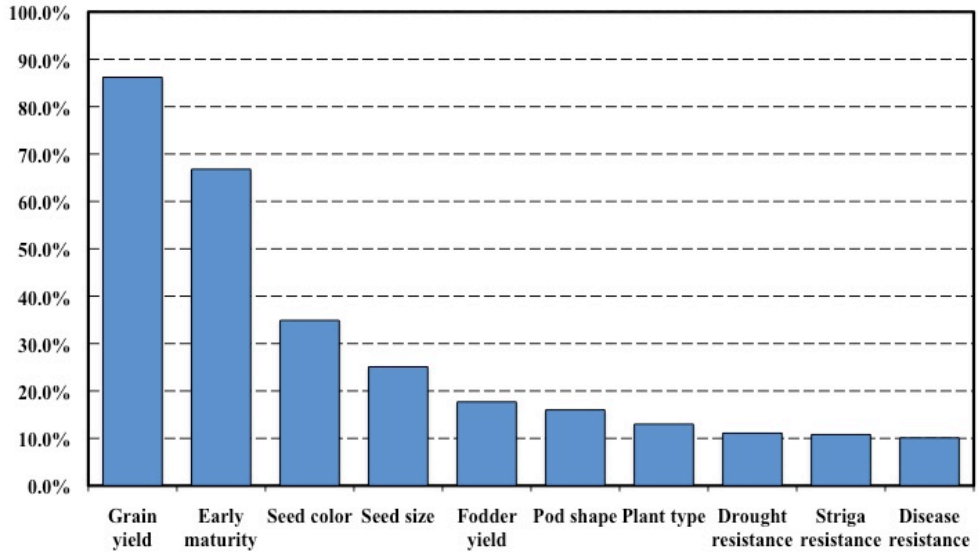

Figure 2. Farmers' selection criteria in multi-locational demonstration field in 2010.

Based on adding the output derived from each component, integrating the three major components had a positive effect when implemented on a community basis. All 5 recommended lines in FPVS were formally registered as released varieties at the Ministry of Agriculture of Burkina Faso, and the data obtained from demonstration fields of the 5 villages were used as part of the data set for registration. The fact that a total of 2,949 farmers and groups purchased seeds of IT98K-208-5, registered as "Niiswe (hunger stopper)" and grown by the established community-based seed producers, indicates that the variety was effectively recognized via the demonstration and seed production fields in each village, and through FPVS and farmers' school activities.

In addition, the production of cowpea in the target villages increased by approximately 158%. This was followed by an equivalent 479% increase in the production of certified cowpea seed and grain seed. The net improvement in the household income was 459% in 2013. Of course, a subsequent valuation 3-5 years after the project closes is desirable for normal impact assessment.

After terminating the project, further surveys and impact assessment are planned to verify the overall impact of the study.

Throughout the 3-year project, the potential of the community-based cowpea dissemination scheme was well demonstrated. Integration and interaction of activities conducted on a community basis promotes effective understanding by farmers of the benefits of suitable improved varieties and cultivation technologies. As an example, farmers can understand how the improved varieties perform in the demonstration and seed production fields located in the village, and via this experience, the associated FPVS activity instills confidence in the benefits of the improved variety. And if they are desired, certified seeds of these improved varieties are available from community-based seed producers, and necessary skills for their cultivation can be obtained at the farmers' school and from resources (teachers and seed producers) in the same village. At the same time, for establishing the community-based seed production system being promoted, the results from FPVS are an important resource to identify varieties suitable for the region, and organization of a farming community in the village and promotion of improved varieties will expand their market for the seed produced. Reports on the farmers' selection criteria and acceptability of these improved cowpea varieties are still limited, and these should differ depending on the region, reflecting environmental and cultural factors. For cowpea breeders, the data generated from FPVS activities conducted in multiple locations provide great support to identify regional preferences and adapt to them when establishing breeding strategies for them.

The results indicate the potential of a community-based scheme and integration of activities to stimulate the adoption and dissemination of new varieties. Each methodology, such as FPVS, establishment of a seed production system, and FS, is not new, but linking these components and applying them in a limited community showed an impact on performance during the 3-year demonstration. The findings showed that the proposed AVEC-BF scheme could contribute to an efficient dissemination system of appropriate cowpea varieties in Burkina Faso.

Acknowledgment

This work was conducted as the IITA international research project "Introduction of new cowpea varieties to enhance food production in semi-arid region of Africa - Appropriate varieties of early maturing cowpea for Burkina Faso (AVEC-BF)" funded by the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan.

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