5.9 Participatory varietal selection for enhancing farmers' access to quality seed in Ethiopia

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About 85% of Ethiopia’s 80 million inhabitants depend on agriculture for their livelihoods. The agricultural sector is largely characterized by small-scale subsistence farming and low productivity. Farmer access to quality seed of better adapted varieties is of utmost importance for increasing productivity (Bishaw et al., 2008). Public research institutes and universities are primarily responsible for plant breeding. Their varieties generally target high-potential agricultural environments and as such are not specifically adapted to the marginal growing conditions with which small-scale farmers most often have to contend. Participatory varietal selection (PVS) is becoming a common tool for identifying which materials should be incorporated into breeding programmes, and which traits should be addressed, as well as for testing materials in farming conditions before release (Ceccarelli et al., 2009).

The formal seed system takes responsibility for the dissemination of just a few released, high-demand varieties, resulting in the limited accessibility of improved varieties that are adapted to diverse conditions. For example, over the past six years, thirty bread wheat varieties have been released, but the variety Kubsa remains dominant in 60–70% of the area in the country that is planted with seed of improved wheat varieties. The major reason for its dominance is its widespread dissemination through the public seed and extension system. In 2010, the Food and Agriculture Organization of the United Nations (FAO) reported that 410 000 hectares of Kubsa were highly affected by rust, which had a detrimental impact on the livelihoods of over 65 000 farmers. This situation shows the vulnerability caused by the development-oriented structure of the public seed value chain, which focuses on a limited number of released varieties (Louwaars and De Boef, 2012). One of the options for overcoming these bottlenecks is the production of quality seed of a wide range of adapted varieties by groups of small-scale farmers who market this quality seed locally (Neate and Guei, 2011).

PVS is a common strategy for exposing farmers to released varieties, and it can help farmer seed producer groups identify which varieties to select for producing seed. PVS can even be used to identify local varieties that perform well, in case improved released varieties do not do well in the target environment (Abay and Bjørnstad, 2008; De Boef et al., 2010).

The Integrated Seed Sector Development (ISSD) programme in Ethiopia works with farmers’ groups that are involved in seed production. The programme
supports farmers’ groups to become better equipped technically and more commercial in their approach, thereby increasing the autonomy of the groups in their operations, and fostering their development into local businesses. The ISSD programme aims to enhance seed security through the marketing of seed at community and district levels. Thirty-four farmers’ groups, mostly organized as seed production cooperatives (SPCs), in four regions of Ethiopia, are being supported by teams made up of three experts from the fields of agribusiness development, farmers’ organizational development, and from the technical side of seed production. The SPCs work from units at Bahir Dar University, Haramaya University, Hawassa University, Mekelle University and Oromia Seed Enterprise. Figure 5.9.1 illustrates the locations of the Marwoled, Amard, Kayyo and Habes SPCs. The current chapter shares some examples of how PVS can be used to increase the variety portfolio in local seed business development.

Common set-up of PVS by farmer seed producer groups

We carry out a variation of PVS mother trials with the SPCs based upon the mother and baby design (Snapp et al., 2002; Bänziger and De Meyer, 2002). As researchers associated with various partner organizations in the ISSD programme in Ethiopia, we have been working with the SPCs since 2009, to include released varieties and pipeline materials in their variety portfolio. In the PVS process, the SPC plants the

Figure 5.9.1 Map illustrating the location of the four seed production cooperatives discussed in this chapter.
new varieties in three to four fields belonging to fellow SPC members, or in collective fields, either within walking distance from each other in the same community, or in separate communities. We consider each PVS trial to be one replication. Together with members of the SPC, we collect qualitative data, and quantitative data that we analyse statistically. During informal discussions with farmers, we use matrix ranking to identify the selection criteria for vegetative, flowering and maturity crop stages; farmers evaluate the varieties for these traits. Eventually, we work with the SPC to compare the selection made by researchers and farmers, and identify those varieties to be included in their commercial variety portfolio.

**Marwoled: bread wheat**

Wombera District in the Amhara region is an agricultural area of high potential. Marwoled SPC was officially established in 2010 by a farmers’ group that had more than ten years of experience in seed production, through a contractual arrangement with a public seed enterprise. The SPC has 127 members and it specializes in the quality seed production of hybrid maize and wheat. In 2010, a student of Bahir Dar University (BDU), the ISSD partner in Amhara, conducted a PVS trial with Marwoled SPC to evaluate 12 wheat varieties, consisting of five released varieties (Kubsa included) and seven pipeline materials. Farmers ranked the varieties according to qualitative criteria, while the BDU MSc student measured yield-related criteria. The farmers, together with the student, selected one released variety and two pipeline varieties that had outperformed Kubsa for both yield and disease resistance. Some varieties scored well for productivity but were not selected by the farmers since they scored low for other selection criteria. Marwoled SPC will plant the seed of the experimental plot of the released variety as pre-basic seed. The multiplication will also help for demonstration purposes and for promotion. BDU will help the SPC produce seed of high quality and purity. The pipeline varieties that were identified in PVS are from Kulumsa Agricultural Research Centre (KARC). One of the materials selected in Marwoled is a candidate for national verification. Therefore, Marwoled SPC will have to wait for its verification and release. However, BDU has asked KARC to produce pre-basic seed in advance of its release, so that when it is released Marwoled SPC can plant 100 m² for the first internal multiplication and for further production, thereby becoming one of the first seed producers in the country to have this variety in its portfolio.

**Amard: bread wheat**

Amard SPC was established in 2007, in the Lanfro District of the Southern Nations, Nationalities and Peoples’ Region (SNNPR). The SPC has 80 members who produce Kubsa on a contractual basis for the Edget Farmers’ Union. In 2010, the early onset of rain and subsequent rust infection resulted in low yields. The SPC decided to evaluate five released varieties in order to identify alternatives to Kubsa. In the process of PVS, Hawassa University, the regional ISSD partner, together with the members of Amard SPC, selected three varieties that were 40–85% superior in grain yield compared to Kubsa. Additional traits that were decisive for the selection of these varieties were early maturity, disease and lodging resistance, large seed size and white seed
colour. Amard SPC requested basic seed of the three varieties for seed production. It indicated that it was ready to cover its entire area with these superior varieties and market them to replace Kubsa. However, the public entities responsible for basic seed production could only provide seed sufficient for a few hectares. Kubsa basic seed was, on the other hand, abundant. Consequently, Amard SPC must first multiply the three varieties over a number of seasons for it to be able to cater to local demands. To overcome the time required for the multiplication of seed within the SPC before being able to begin to market it, Edget Farmers’ Union has been supplying basic seed of another variety found to be less susceptible to rust. Amard SPC intends to sell this variety through a contractual agreement with the union. It is expected that in subsequent seasons, Amard SPC will start to market the varieties that they identified in the PVS and are now multiplying for basic seed. This will contribute to their autonomy in the seed value chain, while increasing the number of bread wheat varieties available in the area. This example shows that the increasing autonomy of SPCs is directly linked to increasing diversity. Other operators in the seed chain, owing to economies of scale, prefer just a few, rather than a diversity of varieties. As shown by the example of rust in Kubsa, the latter will make the seed system vulnerable to diseases and to stresses related to climate change.

**Kayyo: red haricot bean**

Kayyo SPC is located in the Boricha District of the SNNPR. The SPC was established in 2007 and its 147 members originate from four neighbouring communities. Since its release in 1974, the red bean variety Wolayita Red has been popular because of its red colour; however, its yields are very low. The identification of more productive red haricot bean varieties follows the strategy of the SPC to produce and package small quantities of quality seed, and market these in neighbouring districts. The SPC decided to test seven released red varieties in PVS, in collaboration with Hawassa University, as part of the ISSD programme. Through matrix-ranking exercises, farmers evaluated traits for early maturity, basal pod height above soil, number of seeds per pod, and upright growth habit. Taking into consideration both yield assessments by researchers and visual evaluation of qualitative traits by farmers, two promising varieties that outperformed Wolayita Red in the PVS trial by more than 175% were identified. During the 2011 season, Kayyo SPC was able to access basic seed of the identified varieties, and now includes them in their variety portfolio for quality seed production.

**Habes: local barley varieties**

Barley is an important crop for food security in the marginal and drought-prone environments of Tigray, in northern Ethiopia. The recommended barley varieties perform poorly because they are not well adapted. Mekelle University (MU) has been working with PVS in five districts of Tigray since 2007 through its Seed Safety for Diversity project. In this project, MU, together with farmers’ groups, evaluated 17 barley varieties, including four improved and 13 local varieties. Some of the local varieties were reintroduced through the national plant genetic resource programme.
In the five districts, farmers selected the variety Himblil, which is a product of participatory plant breeding. Himblil is tolerant to drought and water-logging stress and is more stable than improved varieties under low-input and low-rainfall conditions.

In 2010, as part of the ISSD programme, the farmer research group in Habes was transformed into a legally registered SPC, with 50 members. In Habes, farmers preferred a rare local variety, which was included in the portfolio for seed production and local marketing, along with Himblil and other varieties. We have observed a significant increase in the number of barley varieties cultivated in the communities since the initial PVS trials were carried out in Habes, in 2007. Before PVS, these communities cultivated a maximum of five varieties; now, they grow 9–12 varieties, and all of them use Himblil (Kiros, 2011). Through the analysis of data from an inventory of seed flows, we were able to see that those varieties that were tested and disseminated through PVS, reached farmers within a radius of 100 km from the place where they were initially introduced (Abay et al., 2011).

**PVS and SPCs: enhancing community access to genetic resources**

Both Marwoled and Amard SPCs initiated bread wheat PVS to identify an alternative to the widely grown but rust-susceptible variety, Kubsa. We identified the availability of released and pipeline varieties, which combine disease resistance and yield potential. It was interesting to see that farmers in SPCs selected for a wide range of locally important traits, and as such farmers of Marwoled SPC and farmers of Amard SPC preferred dissimilar varieties for seed production and marketing. We learned that in the case of wheat there is a market for a wide range of varieties, but that not enough early generation seed is available through the public seed system to meet this demand. The reason for using PVS in Kayyo was to identify red bean varieties that are in demand in the local market. The identification of better-performing released varieties provided the SPC with a new business opportunity. However, we had to link the SPC with the research institute in order to organize the structural flow of the required basic seed of identified varieties. Farmers and seed producers showed an interest in released varieties that had previously remained on the shelf and had not been selected for seed production in the public seed value chain. As a result of the weak link in the seed value chain, the released varieties – the products of plant breeding – did not reach and therefore benefit end users. Consequently, the impact of breeding and research remained limited.

We identified a key bottleneck in the structure and functioning of the (public) seed value chain as being the absence of a well-functioning system for the production of pre-basic and basic seed in demand, resulting in obsolete varieties, such as Kubsa, remaining much longer in production than they deserved. This confirms the limitations of the public sector in many developing countries, as identified by Neate and Guei (2011), who further indicate that it is crucial we support smallholder seed enterprises that operate in public–private partnership with a service- and more market-oriented public sector. The ISSD programme therefore brings together key sector stakeholders in the seed value chain, facilitating the SPCs in the development of a wider varietal portfolio. Furthermore, the ISSD programme supports the SPCs in
their autonomy and in their use of diversity, thereby enhancing the resilience of the local production system.

The PVS that was carried out in Habes demonstrates the importance of specific adaptation. Farmers preferred Himblil and local varieties over released improved varieties. Progress is now being made since the Ethiopian government has recognized the importance of specific adaptation, allowing for the release of varieties for specific agro-ecologies. The link with research, through PVS, allows SPCs to have more direct access to a wide range of varieties. The studies in Tigray show that newly introduced, well-performing varieties spread rapidly, once SPCs take up the variety for seed production and initial marketing. As a risk management strategy, especially in marginal environments, farmers often cultivate a number of different varieties. As such, the SPCs may play a role not only in increasing farmers’ access to quality seed, but also by injecting multiple varieties into the informal seed system. As Neate and Guei (2011) indicated, in a global discussion on the role of small-scale seed enterprises in seed security, SPCs in Ethiopia are a crucial instrument for increasing farmers’ access to quality seed of superior and adapted varieties. Promoting local seed business, therefore, is not just a goal; it is also a tool for enhancing the overall performance of the seed sector, by ensuring that better performing superior varieties, either improved or local, are made available to farmers. Through its role in the seed chain, the seed of those SPCs can contribute significantly to seed security at local but also national level. In our experience, the formal system alone is not able to supply a wide diversity of varieties. However, by partnering with SPCs in Ethiopia, it may be possible to strengthen the farming communities’ access to a broader genetic resource base, which will also help them in meeting the challenges posed by climate change.