1.4 On-farm management of plant genetic resources through community seed banks in Ethiopia

Regassa Feyissa, Genene Gezu, Bayush Tsegaye and Temesgen Desalegn

Conservation efforts targeting threatened local crops and varieties

Ethiopia is the centre of origin for a number of crops, such as coffee (Coffea arabica) and safflower (Carthamus tinctorius); it is also the cradle of domestication of major agricultural crops, including tetraploid durum wheat (Triticum turgidum), barley (Hordeum vulgare), sorghum (Sorghum bicolor), and a number of legume and oilseed crops (Engels and Hawkes, 1991). Over 90% of Ethiopia’s agricultural production still depends on local varieties that are genetically diverse, have evolved in specific environments and contain a multitude of varied and desirable traits. Strategies for agricultural development aim to increase production and productivity by promoting just a few crops and modern varieties. Plant genetic resources (PGR) that were previously maintained and used by farmers have become at risk of genetic erosion (Worede et al., 1999). Since the 1970s, the Ethiopian government, in collaboration with international donors, and conservation and development agencies, has been attempting to counter this threat. In 1976, the Plant Genetic Resources Centre/Ethiopia (PGRC/E), now the Institute of Biodiversity Conservation (IBC), was established as the national gene bank of Ethiopia. Since its foundation, IBC has aimed to balance both ex situ and in situ conservation. Such an integrated approach was, and continues to be, an example for PGR programmes in Africa, and in the world as a whole.

The founder of the institute, Dr Melaku Worede, has always emphasized the need to ensure that activities concerning the conservation of PGR reach farmers indirectly, through efforts in breeding and research, and that these activities should be structured in such a way that the farmers themselves can both contribute to conservation and directly benefit from this conservation through use (Worede and Mekbib, 1993). Consequently, the institute, under Dr Melaku’s leadership, has been promoting in situ conservation, through on-farm management, which has distinguished Ethiopia from many other public programmes (FAO, 1996, 2001). Over the years, the institute has collaborated with a number of international organizations or programmes, including the Seeds of Survival Programme of the Unitarian Service Committee of Canada (USC, Canada); the Global Environment Facility (GEF); Bioversity International; and the Community Biodiversity Development and Conservation (CBDC) Programme. Dr Regassa Feyissa, leading author of this chapter, was responsible for implementing several of these programmes in the 1990s. IBC has played a critical
role in initiating on-farm management activities in Ethiopia, as well as in other countries in Africa.

The integration of both off-farm and on-farm conservation efforts is essential. The situation in Ethiopia following the tragic drought of 1984 is in itself a good argument for promoting such integration. When the gene bank attempted to restore the PGR that were lost as a consequence of the drought, it was unable to reach those farming communities hardest hit with the amount of seed needed to support a quick recovery. Since gene banks normally hold samples that are small in size, the multiplication of seed for redistribution to farmers after the crisis took years. No matter how efficient conventional gene banks are in multiplying and disseminating seed, it will always take a long time for farmers to benefit from the back-up service that the gene banks can provide them with.

In 2003, Dr Regassa Feyissa established the non-governmental organization (NGO) Ethio-Organic Seed Action (EOSA). This NGO entered a vital niche (i.e. organic seed of local varieties), and as such was able to support many of the country’s on-farm management activities through development projects. EOSA provides technical support and oversight for practices contributing to on-farm management, and promotes the use of local crops and varieties in agricultural development. Genene Gezu and Bayush Tsegaye, co-authors of this chapter, have been working on EOSA programmes for a number of years. The organization works closely with local and national government extension agencies, including national agricultural research institutes and universities. Co-author Temesgen Dessalegn provides support to several farmers’ groups associated with EOSA, through his research work at the Holeta Agricultural Research Centre. Professionals like these have been working with farmers’ groups engaged in on-farm management in Ethiopia for more than 20 years, thereby laying a foundation for motivating farmers to assume their responsibilities in processes that can be described as community biodiversity management (CBM).

**Vital role of farmers’ dynamic management of local diversity**

Following a long-standing tradition, farmers retain the seed stock of local varieties unless disruptive circumstances prevent them from doing so. In this way, these farmers have been conserving varieties for generations, maintaining seed or planting material in their gardens, backyards, farm fields and traditional storage facilities (Worede et al., 1999). Farmers cultivate local varieties, and develop new ones that will most likely be adapted to their specific environment, but that will above all satisfy farmers’ specific needs and preferences. They maintain a high degree of genetic heterogeneity in their varieties, thus ensuring continued adaptability under changing conditions (Teshome et al., 1999). This adaptability is the main reason why farmers usually prefer genetically diverse varieties instead of uniform, stable varieties. This use of diversity within varieties, and across locations, serves both conservation and crop improvement purposes. It offers the maximum opportunity for the continuation of co-evolutionary processes, without compromising either diversity or productivity. The informal seed system can therefore be considered the basis for the dynamic management of local varieties by farmers (Balcha and Tanto, 2008). The fact that the informal seed system is the major source of seed
Regassa Feyissa et al. (Bishaw et al., 2008) reflects a need to integrate on-farm management strategies into agricultural development in Ethiopia. Such integration has the potential to result in win–win situations, in linking the conservation and use of local PGR with agricultural development, under changing climatic conditions. In this way, conservation and diversity go hand in hand with agricultural development, and are no longer contradictory forces (De Boef et al., 2010).

Community seed banks: a central pillar of on-farm management

The need to integrate the formal gene bank with the informal seed system led to the establishment of community seed banks (CSBs). IBC began supporting the establishment of CSBs in the 1990s, in collaboration with its national and international partners. On its foundation, EOSA took over responsibility for supporting the CSBs. Today, we at EOSA continue to be engaged in a process of training, equipping and motivating scientists, extensionists and farmers in the conservation and development of PGR, with the CSB playing a central role in this conservation effort. Shrestha et al. (Chapter 2.8) provide a global overview of the CSB as a CBM practice, including some highlights of our experiences in Ethiopia.

Farmers need to be able to access the right quantity of affordable seed, of their preferred varieties, at the right time. We noticed that the CSBs did not initially respond adequately to this need, since their original focus was on maintaining seed security in more general terms. IBC, at that time known as the Plant Genetic Resources Centre/Ethiopia, began to reintroduce local varieties in 1989, in collaboration with the Seeds of Survival/Ethiopia (SoS/E) programme of the USC Canada. The local varieties were multiplied by certain CSB members and disseminated among all the other members, with some small samples of seed being maintained for conservation. In this way, seed security became linked to PGR conservation, through the CSBs. In 1993–1994, IBC, with support from, and in collaboration with, the Global Environment Facility (GEF) and the Community Biodiversity Development and Conservation (CBDC) Programme, integrated the establishment of community seed banks and on-farm conservation into the SoS/E programme. Over the years, the USC, Canada has continued to provide support for the genetic enhancement of local varieties, seed multiplication and distribution (Feyissa, 2000).

Currently, the CSBs are organized as legal entities, under the umbrella of so-called ‘conservation cooperatives’, and have a well-established structure for management and governance. After almost two decades of investment in human resources and infrastructure, and support through institutional and technical assistance, the conservation cooperatives are now well organized and sustainable. In Table 1.4.1, we share the current status of CSBs associated with EOSA’s conservation and development programmes. Figure 1.4.1 indicates their distribution in Ethiopia. Today, the CSBs serve as community centres for organizing local support for farmers in PGR conservation and climate change adaptation. They act as community-level seed and germplasm reserves, where farmers store samples for retrieval during planting season, and where representative samples of local varieties are set aside as germplasm reserves. As a CBM practice, they reduce the threat of genetic erosion, while increasing food
Table 1.4.1 Characterization of community seed banks that are currently supported by Ethio-Organic Seed Action (EOSA) in Ethiopia, 2011

<table>
<thead>
<tr>
<th>Region</th>
<th>Location</th>
<th>District</th>
<th>Year of establishment</th>
<th>Type of organization</th>
<th>No. of members 2003</th>
<th>No. of members 2011</th>
<th>No. of crops in 2003</th>
<th>Type of conservation and seed production</th>
<th>No. of crops in 2011</th>
<th>Amount of seed in '000 kg 2003</th>
<th>Amount of seed in '000 kg 2011</th>
<th>Other activity (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amhara</td>
<td>South Wello</td>
<td>Kallu, Harbu</td>
<td>1998</td>
<td>Cooperative</td>
<td>223</td>
<td>377</td>
<td>3</td>
<td>11</td>
<td>8.7</td>
<td>10.5</td>
<td>Number of women members increased</td>
<td></td>
</tr>
<tr>
<td>South Wello</td>
<td>Wore Ilu</td>
<td></td>
<td>1998</td>
<td>Cooperative</td>
<td>362</td>
<td>672</td>
<td>8</td>
<td>14</td>
<td>9.8</td>
<td>13.7</td>
<td>Number of women members increased</td>
<td></td>
</tr>
<tr>
<td>South Wello</td>
<td>Kallu, Fontenina</td>
<td></td>
<td>2009</td>
<td>Farmer group</td>
<td>—</td>
<td>233</td>
<td>—</td>
<td>6</td>
<td>—</td>
<td>3.5</td>
<td>Cooperative legalization applied for by the CSB</td>
<td></td>
</tr>
<tr>
<td>Oromia</td>
<td>East Shewa</td>
<td>Lume</td>
<td>1998</td>
<td>Cooperative</td>
<td>1000</td>
<td>234</td>
<td>7</td>
<td>6</td>
<td>36.3</td>
<td>72.5</td>
<td>Expansion of services, foundation laid for new CSB</td>
<td></td>
</tr>
<tr>
<td>East Shewa</td>
<td>Gimbichu</td>
<td></td>
<td>1998</td>
<td>Cooperative</td>
<td>300</td>
<td>512</td>
<td>4</td>
<td>6</td>
<td>36.3</td>
<td>81.4</td>
<td>Women’s groups organized separately for economic empowerment</td>
<td></td>
</tr>
<tr>
<td>West Shewa</td>
<td>Dendi</td>
<td></td>
<td>2011</td>
<td>Cooperative</td>
<td>—</td>
<td>73</td>
<td>—</td>
<td>8</td>
<td>—</td>
<td>6.1</td>
<td>New CSB established, based on lessons learned from East Shewa</td>
<td></td>
</tr>
</tbody>
</table>

a Source: Tanto and Balcha (2003).
security; moreover, they contribute to social organization at community level, thereby enhancing autonomy of the community in livelihood development.

We also use practices like diversity fairs, seminars and workshops, disseminating information through publications, to raise awareness of the value of local crops and varieties at research and policy levels. Our aim is to contribute to a better integration of formal and informal seed systems, in a manner that contributes to PGR conservation and use. A direct output of this advocacy and awareness work is that some regional governments have started to support and finance the establishment of CSBs.

**Lessons learned for sustaining farmers’ contribution to on-farm management of PGR**

CSBs are crucial for enhancing farmers’ awareness of the value and potential of local crops and varieties. Over time, through their involvement in the CSBs, the pride of communities concerning their heritage of crops and varieties has been growing, motivating them towards the restoration, conservation and use of PGR. The function of the CSBs was initially to create such awareness and act as a point of access to PGR, and, subsequently, to serve as a local backup facility, where local crops and varieties could regain their original or even increased value. In this way, should these communities be faced with droughts like those in the 1980s, they will be better prepared, and will no longer be dependent on IBC for restoring their local varieties.

An important lesson learned is that on-farm management cannot rely on providing direct production subsidies to farmers (i.e. paying farmers to maintain varieties). Instead, the focus should be on enhancing the use and values of local crops and varieties, and promoting non-market and market incentives for farmers to continue to
cultivate them (Tsegaye, 2005). This approach is important for making the practice of conservation economically viable and self-supporting, and for embedding it in farmers’ livelihood strategies.

The controversy over whether in situ and ex situ conservation are cost effective makes little sense as both are important and each has its particular advantages and shortfalls. While the relationship between farmers and their varieties remains limited and evolutionary processes are interrupted under ex situ conservation, the strategy is nevertheless an important security measure in case of disasters.

The experiences gained over the course of our work in using CSBs to achieve on-farm management have resulted in the maintenance and use of a higher degree of crop diversity by participating farmers (Bezabih, 2008). CSBs benefit communities with their organizational capacity and by raising awareness of genetic resources in livelihood development (Engels et al., 2008), thus enhancing the social capital needed to sustain on-farm management as a conservation strategy.