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Biodiversity Conservation and Utilization on the Basis of Farmers Traditional Knowledge: Ethiopian Experience

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Traditional Knowledge is local knowledge, which is unique to every culture and society. It is embedded in the community practices, institutions, relationships and rituals. It is the subtotal of knowledge skills which people in particular geographic areas possess and which enables them to get the most out of the natural environment.

Early Ethiopian civilization serves as an evidence for extent and rationality of traditional knowledge. The domestication of certain crops like coffee, teff, enset, etc. and the development of bench terrace system by Konso nationalities are important cases of achievements in agriculture. The country with written language for over 2000 years, owns manuscripts over 500 years old, which deal with traditional knowledge concerning public health and veterinary medicine.

For close to a centuary, rural development policies and strategies have taken the view that farmers are mismanagers of their natural environment, i.e soil and water. Farmers have been advised, lectured, paid and forced to adopt new soil and water conservation measures and practices. Many have done so, and environments and economies have benefited for a time. But many problems have undermined these efforts in the name of conservation with financial and legal incentives bringing only short lived conservation, which is not sustainable. Nevertheless, recently it has been very clear that some projects in rural areas were successful because they integrated traditional knowledge practices in every stage of their planning and implementation.

Ethiopia is a major world centre of genetic diversity for many important domesticated crop plant species such as sorghum, barley, teff chickpea, and coffee, largely represented in the country by landraces and wild types that are uniquely adapted, genetically diverse forms of these various crops. The genetic diversity found in Ethiopian landraces has been found worldwide in developing new crop varities and addressing acute yield constraints. Much of this crop diversity is found in small fields of peasants who, aided by nature, have played a central role in the creation of maintenance and use of these invaluable resources.

In Ethiopia, traditional farming represents centuries of accumulated experience and skills of peasants who often sustained yields under adverse farming conditions using locally available resources. The foundation for Ethiopian farming is comprised of the traditional crops and landraces which farmers have adapted over centuries of selection and use to meet dynamic and changing needs. Ethiopian farmers are instrumental in conserving germplasm as they control the bulk of the country's genetic resources. Peasant farmers retain some seed stock for security unless circumstances dictate otherwise. Even when forced to temporarily leave this farms because of severe drought or other threats such as war, farmers have often stored small quantities of seed stocks.

In addition to household storage, farmers in various regions of the country have well-established systems to ensure the sustenance of seed supply and they often operate in networks. One of the principal networks is that of the exchange of seed in local markets. Farmers exchange crop types representing a wide range of adaptation to diverse environments. In this way, choice of planting material to suit a particular set of agro-climatic condition. Seed that is not exchanged or consumed can be saved for a more appropriate planting

season. In some of the more developed regions of Ethiopia, such as the central highlands, this practice is becoming less and less common with the availability of new improved cultivars. In most of the drought-prone areas, particularly in the northern Shewa and Wello regions, farmers still depend largely on the above mentioned traditional system of ensuring sustained supply of adaptable planting material.

The broad range of genetic diversity existing in Ethiopia, particularly the primitive and wild gene pools, is presently subject to serious genetic erosion and irreversible losses. The drought that prevailed in the Northern part of the country, has directly or indirectly caused considerable genetic erosion, at times has even resulted in massive destruction of both animals and plants. The famine that persisted in some parts of the country has forced farmers to eat their own seed in order to survive or sell seed as a food commodity. This has often resulted in massive displacement of native seed stock (mostly sorghum, wheat and maize) by exotic seeds provided by relief agencies in the forms of food grain. To counter losses in genetic diversity, the former Plant genetic Resources Centre, Ethiopia (PGRC/E), now the Institute of biodiversity Conservation and research (IBCR) has launched rescue operations during this period (1987-88), including a strategic seed reserve program, in areas subject to recurring drought.

In the context of peasant farms, in-situ conservation is defined as the maintenance of traditional cultivars or landraces in the surrounding to which they have adapted, or in the farming systems where they have acquired their distinctive characteristics. In view of this, landrace evaluation and enhancement program will certainly be needed to promote more extensive utilization of germplasm resources that are already adapted to drought-prone regions of Ethiopia. Under such extreme environments, locally adapted landraces would provide suitable materials for institutional crop improvement programs. There is, therefore, a need to maintain landraces growing under natural conditions in a dynamic state. In Ethiopia, maintaining landraces is probably best achieved through farm or community-based conservation programs.

The work described above was undertaken (1899-1997) when PGRC/E with support Unitarian Service Committee, Canada (USC/Canada), implemented the Seeds of Survival Program, Ethiopia (SoS/E). The program continued to represent a participatory, dynamic, farmer-based approach to landrace, conservation, enhancement and utilization. The activity of SoS/E are linked to the more formal off-farm conservation activities at the national gene bank (IBCR). The work was carried out on small-scale peasant farms in collaboration with farmers, scientists and local extension agents. The program is comprised of two major types of farm-based conservation activities: conservation and enhancement of native seed-stock (landrace), and maintenance of indigenous landraces selection (elite materials) on selected farms. The features of these activities are summarized below.

Genetic resources conservation and enhancement activities involving farmers, scientists and local selected farms at strategic sites in areas where the native seeds are still widely grown and where stresses such as recurrent drought, diseases and pest epidemics prevail.

The project designed its conservation measures primarily to maintain in field crop diversity by protecting major cultivars from disappearing, and to improve the genetic performance of the diverse landraces. Targeted crops include sorghum, various pulses and locally adapted maize. Materials collected (or rescued) during the drought period are included in the program. Landraces are maintained on each peasant farm following the traditional practices of selection, production, storage and utilization. Field sites vary each season in conjunction with the traditional crop protection patterns.

The plot size and seed rates for each crop are determined by the farmers, depending on farmer's needs, availability of seed and labour, method of seedling, and soil type. In managing and maintaining the in-situ plots according to farmer practice, the program seek to optimise in-situ conservation, based on the rationale that farmer practices provide a viable approach to long term conservation.

Identification and establishment of strategic in-situ ´pockets` over a network of locations is another major component of the project. This is limited to identifying strategic sites in locations where the targeted landraces are grown, spreading across a range of agro-ecological niches within the project area. In addition to IBCR activities, farmers collaborating in the project practice various forms of stratified and mass selection and multiply their landraces (mainly sorghum and local maize) separately for production. Seeds of selected plants are bulked to form a slightly improved population, which is included in plantings to increase seed supply and for continued selection. An appreciable amount of improvement in crop yield has been observed among the selected materials that are produced following the traditional systems. Yields of sorghum landraces and locally adapted maize, which have been jointly selected, by farmers and IBCR scientists have exceeded the yields of the original landrace seeds, with no additional input. Farmer-selected types are expanding in to other areas of Shoa and Wello regions where frequent crop failures have occurred due to prevailing droughts. To date over 25,000 farmers are using the varieties with the increasing number of farmers each year.

Another aspect of the program deals with restoring landraces in regions where farmers have once planted landraces extensively, but which are now dominated by introduced or improved (high external input) varieties. In the region of Ada in Central Shoa, for example, the indigenous durum wheat has nearly disappeared because of displacement by introduced bread and durum wheat varieties. In this area, farmers (primarily women) traditionally used the local durum wheat to make porridge, enjera, unleavened bread, and home made beer, which they sell or exchange at local markets. Farmers rarely use bread wheat for house hold consumption; rather, they sell it as a commercial crop in urban areas.

The project has been active in promoting the conservation, enhancement and utilization of indigenous durum wheat in Ada and other areas of Central Shoa. Elite durum wheat landraces (composites of three or more genetic lines) are developed at the Debre Zeit Agricultural Research Centre and provided to the project. These composites are further selected and multiplied jointly with small-scale peasant farmers. Land race composites were developed from plant population subjected to selection based on performance in yield tests under different conditions of environmental stress. The genetic lines (agrotypes) are bulked for further selection, multiplication and distribution to farmers.

Since the 1994-95 cropping season, eight composites most preferred by the farmers have been under production at various locations on 4,000 farms in the above-mentioned regions. Farmers demand for landrace seeds have been escalating at an impressive rate. As frequently observed during field visits, the elite seeds are also finding their way to farms outside of project premises, most likely through informal seed exchange or diffusion of seed at local markets.

In a preliminary comparative yield assessment conducted in the project area over the past three years the elite durum landrace selection (composites) generally out-performed their high-input counterparts, which are represented by improved, high yielding varieties. The yield performance of these elite materials on the peasant farms was astonishingly high, compared to both the original farmers seed and the most predominant high yielding variety, Boohie.

In conclusion, this work represents a unique opportunity to conserve landraces in a dynamic participatory way, involving farmers who manage the bulk of the country's indigenous crop genetic resources, and in fact practice in-situ conservation as a part of their traditional management strategies. The program is working to provide farmers with a wider choice of planting material, thereby encouraging sustained supply and use of locally adapted landrace s, especially in marginal or stress environments in which such materials generally perform more competitively than their high input counterparts.

There are two key elements which are required for the success of such a programme: equal partnership with farmers in all aspects of project activities, including planning, implementation and further expansion of the programme, and willingness to learn from farmers, the living repositories of indigenous knowledge. The

success of such a programme also depends in no small measure on close partnership and collaboration between scientists and farmers to achieve a synthesis between modern and indigenous knowledge, thereby creating a new knowledge base.

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