4.3 Creating an economic stake for conserving the diversity of small millets in the Kolli Hills, India

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The adaptive potential of neglected and underutilized crops

The general trend in agriculture, particularly concerning grain and cash crops, is an increasing shift towards monoculture, with the focus on a few, high-yielding varieties and hybrids. Thus, agriculture is becoming dependent on just a handful of cereal crops for meeting the demands of the food supply, resulting in a diminishing genetic diversity both on the farm and in dietary habits. According to the Food and Agriculture Organization of the United Nations, three crops – maize, wheat and rice – make up an estimated 87% of all food grain production. This has led to the neglect of a large number of diverse crops that have been contributing to local food security, playing an important role in the livelihoods of local communities in many developing countries. These neglected crops are of particular importance to those living in the semi-arid, mountainous and remote regions of the tropics and subtropics, where crops with a high genetic diversity, suited to stringent ecological niches, have evolved over the years. Most of these regions, besides being hotspots of genetic diversity, are burdened with high populations, poverty and frequent food shortages. Oftentimes, the hardy, adaptive traits of these local crops can save the people from total starvation. Under these conditions, increasing the competitiveness and improving the economic viability of these neglected crops is a must for promoting their effective utilization (Padulosi et al., 2008).

The global initiative on neglected and underutilized species

The M.S. Swaminathan Research Foundation (MSSRF) supports programmes on community biodiversity management to improve the livelihoods of marginalized tribal and small-scale farmers, who are the principal custodians of agrobiodiversity. In this chapter, we introduce those CBM efforts of MSSRF and partners that aim to increase the economic potential of small millets as an important group of neglected, underutilized species (NUS) through value addition and marketing. These activities are part of a global NUS initiative, sponsored by the International Fund for Agricultural Development (IFAD) and coordinated by Bioversity International. The NUS initiative is linked to the MSSRF project ‘Integrated Management of Biodiversity Resources in Partnership with People’, which is being implemented in tribal areas of India, with support from the Swiss Agency for Development and Cooperation (SDC).
Millets and their value in the Kolli Hills

The Kolli Hills are located in the eastern part of Namakkal district, in the state of Tamil Nadu in southern India (Figure 4.3.1). The area covers about 440 km², is at an altitude of between 1000 and 1350 m above mean sea level, and is inhabited by the tribal group called Malayalis. Within this small area, the Kolli Hills offer diverse agro-climatic conditions in terms of terrain, soil and precipitation. Millets were initially the main food crops of the communities who first settled in the area; they include finger millet (*Eleusine coracana*), little millet (*Panicum sumatrense*) and Italian (or foxtail) millet (*Setaria italica*). The lack of communication between the hill-dwelling communities and the plains increased their dependence on these grains for their food security for a very long time. Over the years, this isolation led to substantial genetic variability in these millet species and the region has become notable for this diversity.

**Millets and their nutritional value**

The large upland area of the Kolli Hills provides space for the extensive cultivation of millets, and these grains have constituted the principal food grain of the community for many years. The varying distribution and volume of rainfall in the area has resulted in the development of millet varieties of different maturity periods, which have abilities to withstand adverse climatic conditions (King *et al.*, 2009; Bhag Mal

*Figure 4.3.1*  Map showing the location of Namakkal district, Tamil Nadu.
Traditionally, the community recognizes their dietary superiority over other cereals such as rice, and those engaged in carrying out hard physical work particularly appreciate them. Nutritional studies have shown that these grains are rich in dietary fibres, calcium and iron, and various essential amino acids that are limited in other major cereal crops. In view of this, Professor M.S. Swaminathan suggested that these grains should be referred to as ‘nutritious millets’ rather than ‘coarse grains’ (Bhag Mal et al., 2010). Recently, there has been an increasing awareness among urban consumers of the specific health value of these grains, both in view of their better nutritional composition and their nutraceutical properties.

**Decline in the cultivation of millets**

The introduction of commercial crops such as cassava, which supplies the regional starch manufacturing industry, and horticultural crops such as pineapple has led to a shift from subsistence to commercial farming in the Kolli Hills (Gruere et al., 2009). These new crops occupied the land that was formerly used for cultivating millets. The ready availability of food grains such as rice and wheat, which were supplied at highly subsidized rates by the government under its anti-poverty programme, also contributed to the decline of millets. The hard work associated with the traditional cultivation and processing of millets also led farmers to choose to cultivate other grains that are easier to process and consume. In 2001, MSSRF began a number of projects to counter these developments and to promote the cultivation and conservation of millets. We share here the various practices that are part of our approach, which can also be referred to as community biodiversity management (CBM).

**Practices for creating an economic value for millets cultivation**

**Step 1: Establishing self-help groups**

We organized local farmers – mainly women, as they are more enthusiastic when it comes to the cultivation and consumption of millets – into self-help groups (SHGs). Up to this day, we have been supporting more than 35 SHGs in the Kolli Hills, with over 386 members (of whom 214 are women), in the institutionalization of the various millet operations (Padulosi et al., 2009). Figure 4.3.2 illustrates the linkage between different SHGs in the millets value chain. The various SHGs joined together to form the Kolli Hills Agrobiodiversity Conservers’ Federation (KHABCoFED).

**Step 2: Strengthening the local millet seed system**

Farmers cultivate different local varieties of millets in different zones. After collecting the seed of local varieties from different locations, we were able to identify 21 distinct local varieties of finger millet, little millet and Italian millet. As the seed of some of these varieties was in extreme shortage, and the seed of most varieties is mixed with others during the traditional practice of mixed farming, we trained SHGs in the production of quality seed. We further promoted their safe storage through the establish-
Conserving the diversity of small millets in India

Step 2: Establishment of community seed banks (CSBs), as discussed by Shrestha et al. (Chapter 2.8). These CSBs were crucial in the revitalization of the traditional seed storage systems and the promotion of seed exchange practices (Rengalakshmi et al., 2003). Today, SHGs in 12 villages have improved their local seed systems through several practices. The CSBs and their associated practices are important village-managed institutional structures for supporting the conservation of local millet varieties.

Step 3: Increasing yield by improving millet cultivation practices

The availability of quality seed has contributed substantially to the promotion of millet cultivation. Productivity enhancement was essential for the continued cultivation of millets. We supported the SHGs by promoting a number of good agronomic practices, such as planting in rows, using appropriate seed rates, applying farmyard manure and inter-cropping millet with cassava. With the final practice, we aim to increase millet yields and augment the net income from cultivation. The promotion of good agronomic practices resulted in an average yield increase of 39% in finger millet, 37% in little millet and 30% in foxtail millet (Bhag Mal et al., 2010).

Step 4: Carrying out participatory selection for better varieties

We evaluated a wide range of varieties of the three millet species in participatory varietal selection (PVS). We included several hundred accessions from the germplasm bank of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Hyderabad, and a number of improved cultivars from the national...
programme of the All India Coordinated Research Programme on Small Millets in Bangalore. We compared these with local varieties during PVS. With the benefit of farmers’ knowledge and skills we were able to identify several varieties that have 20–30% higher yield than those local varieties in the production system in the Kolli Hills.

**Step 5: Introducing processing technology**

Except for finger millet, all millets have a very hard seed coat that requires a highly abrasive force to remove from the grain. The decortication process, which is almost exclusively carried out by women, usually involves a very tedious, physical labour using a pestle and mortar. Our introduction of a small mechanical milling facility signalled a major change in the outlook of women. It substantially contributed to a revival in finger millet cultivation and consumption. An important spin-off from this mechanization was a new interest, shown in particular by the women, in millet value addition and commercialization.

**Step 6: Developing new millet products**

We used market studies to identify value-added products with good commercial potential. Subsequently, we trained members of the SHGs in value addition at the College of Rural Home Science in Dharwad, a rural campus of the University of Agricultural Science in Bangalore. The SHGs worked collectively to put several products in the production line. We encouraged different SHGs to specialize in different products. Among the most important value-added products that have been developed by these groups are malt, from finger millet; ‘rava’, the broken de-hulled grains of little millet and Italian millet, which are used in local recipes like *payasam* (sweet gruel), and the various different types of flours of these grains. During the early stages of production of these value-added products, our assistance extended to capacity-building on product quality, packaging, labelling, marketing and account keeping. Currently, five villages in the Kolli Hills are engaged in value-addition activities for millet (Bhag Mal *et al*., 2010).

**Step 7: Marketing millet products**

Farmers are experienced in marketing their primary produce, but they often lack capacity in marketing value-added products. We assisted SHGs in marketing through promotional campaigns and awareness-raising activities. We gradually identified members of SHGs with potential and encouraged them to carry out product marketing with local retail outlets. We supported SHGs under the banner of KHABCoFED to establish retail outlets for all Kolli Hills products. Over the last few years, millet products carrying the label ‘Kolli Hills Natural Products’ have been available in department stores in Chennai, and in several other towns in Tamil Nadu. The profitability of these products is 5–10 times higher than that of grains (Table 4.3.1).
Step 8: Promoting the products

Product differentiation and branding are important tools for obtaining a competitive market position. Products are nicely packaged and are accompanied by instructions and recipes. We have been able to develop a specific brand name for the products, and present them as locally grown and organic. MSSRF and the SHGs promote millet products during local events and annual temple festivals to increase awareness of the nutritional quality of millet and its products. In addition, we advocate the use of these products in institutional markets such as the Integrated Child Development Services Scheme of the Government of India.

Increased economic benefits that lead to increased cultivation and use

The economic potential of neglected and underutilized crops, including minor millets, is often under-exploited because of a lack of public awareness of the crops’ qualities, and also because they are truly neglected in terms of public investment in scientific research (Bhag Mal et al., 2010). Our activities in the Kolli Hills have renewed the interest of tribal farmers in cultivating millets. The value chain interventions have generated employment and income for millet producers and other actors in the value chain.

Small millets have to compete for farmers’ interest with high market value crops like cassava, while for consumer interest they must compete with subsidized crops like rice. We consider the key element of success in developing a millet value chain to be the collective process of decision making, in tune with CBM. MSSRF, together with stakeholders, supported SHGs as local community-based organizations to assume ownership over, and be autonomous in, the value chain, pooling many types

Table 4.3.1 Cost-benefit analysis of the production and marketing of value-added millet products

<table>
<thead>
<tr>
<th>Product</th>
<th>Production costs (US$/ton)</th>
<th>Total return (US$/ton)</th>
<th>Net return (US$/ton)</th>
<th>Profit as % of costs</th>
<th>Labour days for production of 1 ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little millet rava (samai)</td>
<td>0.80</td>
<td>1.20</td>
<td>0.40</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Italian millet rava (thinai)</td>
<td>0.80</td>
<td>1.20</td>
<td>0.40</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Little millet flour (samai)</td>
<td>0.84</td>
<td>1.28</td>
<td>0.44</td>
<td>52</td>
<td>150</td>
</tr>
<tr>
<td>Italian millet flour (thinai)</td>
<td>0.84</td>
<td>1.28</td>
<td>0.44</td>
<td>52</td>
<td>150</td>
</tr>
<tr>
<td>Finger millet flour</td>
<td>0.36</td>
<td>0.48</td>
<td>0.12</td>
<td>33</td>
<td>40</td>
</tr>
<tr>
<td>Finger millet malt</td>
<td>1.12</td>
<td>1.60</td>
<td>0.48</td>
<td>43</td>
<td>400</td>
</tr>
<tr>
<td>Samai uppuma mix</td>
<td>1.44</td>
<td>2.40</td>
<td>0.96</td>
<td>67</td>
<td>300</td>
</tr>
<tr>
<td>Samai rava dosa mix</td>
<td>1.52</td>
<td>2.40</td>
<td>0.88</td>
<td>58</td>
<td>300</td>
</tr>
<tr>
<td>Samai bajji mix</td>
<td>1.52</td>
<td>2.40</td>
<td>0.88</td>
<td>58</td>
<td>300</td>
</tr>
<tr>
<td>Thinai payyasa mix</td>
<td>1.52</td>
<td>2.40</td>
<td>0.88</td>
<td>58</td>
<td>300</td>
</tr>
<tr>
<td>Thinai laddu</td>
<td>2.67</td>
<td>4.00</td>
<td>1.33</td>
<td>50</td>
<td>300</td>
</tr>
</tbody>
</table>

Source: Adapted from Bhag Mal et al. (2010).

a US$1 = Indian Rupee 50.
of resources, understanding economies of scales, and sharing information (Gruere et al., 2009). However, we have not yet reached the point of sustained success. For that, we need to work on the expansion of a sustainable demand for value-added millet products (i.e. to achieve a transformation from a supply- into a demand-driven value chain).

Our current investments focus on the development of robust marketing channels for this, up until now, supply-driven value chain. Difficulties faced include the competition with subsidized commodities like rice, the loss of knowledge concerning the culinary preparation of millet, and changes in consumer behaviour and taste. We realize that it is easier to overcome such problems with consumers inside, rather than outside, the production area. The entry point in our marketing strategy is to understand the past uses of millet, and to develop and promote new uses for millets. We then follow this by raising awareness and exposing consumers to millet and its derived products, including novel foods, during regional events. At present, rice, flour and five value-added products of little and Italian millet, and finger millet malt, reach organic outlets in ten districts. We foresee an increased supply of diversified products to urban consumers in the future.

Providing farmers with an economic incentive to cultivate millets also supported the conservation of local varieties in the Kolli Hills, and the use of associated sustainable, environmentally friendly cultivation practices. With a successful marketing approach and market demand expansion, minor millets have the potential to flourish in their original production environments. As key crops for food and nutritional security, they will continue to support tribal communities, contributing to their resilience in coping with challenges in their rapidly changing environment.
Tribal communities and rice diversity in the Jeypore region

The Jeypore region of Orissa state in India is considered to be a centre of origin of the Aus ecotype of rice, which is known for its early maturing upland varieties. As such, it is home to an enormous diversity in rice landraces (Arumachalam et al., 2006). Figure 4.4.1 shows the location of the Jeypore region in India. Rice has been the staple food of tribal farming communities in Jeypore for generations, and the conservation and use of local rice varieties is central to maintaining their traditional and characteristic lifestyle. Specific varieties are cultivated for use in different occasions, such as festivals, ancestral ceremonies, family functions and rituals. However, the tribal communities are very poor, often suffering from severe malnutrition. This contrast between wealth in diversity on the one hand, and absolute poverty and malnutrition...