

# Rural and Tribal Women in Agrobiodiversity Conservation

An Indian Case Study



Food and Agriculture Organization  
Regional Office for Asia and the Pacific  
Bangkok, Thailand



M.S. Swaminathan Research Foundation  
Chennai, India

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**RURAL AND TRIBAL WOMEN IN AGROBIODIVERSITY CONSERVATION**

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This paper was presented at the expert consultation on “Agrobiodiversity Conservation and the Role of Rural Women” jointly organized by FAO Regional Office for Asia and the Pacific (FAO-RAP), International Potato Center-Users’ Perspectives With Agricultural Research and Development (CIP-UPWARD), and the SEAMEO Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEAMEO-SEARCA) held in September 2001 at Los Baños, Laguna, Philippines.

## Foreword

In the last few decades, a global concern over world plant genetic resources and an international commitment for conservation have become the main features of sustainable agricultural development, as upheld in the Programme of Action for Sustainable Development (Agenda 21) of the United Nations Conference on Environment and Development. The World Food Summit Plan of Action reflects this theme in Commitment No 3, which recognizes the significance of responsible agricultural practices, judicious use of natural resources and protection of biodiversity to achieve sustainable food security as well as the role of women in these spheres. Recent adoption of the International Treaty on Plant Genetic Resources for Food and Agriculture at the FAO Conference, November 2001, marks a milestone in the march towards judicious conservation and fair and equitable sharing of the resources and benefits accrued from them, including realization of farmers' rights.

For the protection of biodiversity, the stress is on understanding the local knowledge systems and the role of indigenous communities. Conservation of plant genetic resources depends first and foremost on these communities, but they are increasingly documented by applying scientific methods. The scientific quest into the knowledge of local communities, particularly indigenous ones, will underpin the designing of sustainable programmes for plant genetic resource conservation through local stewardship. Such studies and programmes should specifically address the role of women in indigenous communities as local conservators of plant genetic resources, seed managers and keepers of local knowledge.

Furthermore, as globalization and market integration within the countries accelerate, there are threats to both biodiversity and local conservation practices. It may become necessary to promote conservation through economic incentives in order to discourage exploitation of local plant genetic resources by external economic agents. Hence, pragmatic partnerships should be developed to balance commercial interests and conservation ethics, and to ensure a sustainable genetic resource base to achieve food security. As resource transactions and trade move away from the local communities, the social role of women and their economic contribution to food security may be threatened.

The FAO Regional Office for Asia and the Pacific acknowledges the intricate dynamics of indigenous women's stewardship in the conservation and management of plant genetic resources of relevance to household food security. Hence, a programme area focuses on "Gender dimensions in agrobiodiversity management for food security". Under this programme this publication is one of a series of studies, undertaken in collaboration with the M.S. Swaminathan Research Foundation in Chennai, India, to highlight the issues on tribal women's role in Agrobiodiversity conservation and to provide examples of economic incentives for conservation.

I am hopeful that studies such as this one will enrich the knowledge of the scientific and development communities for the dual purpose of achieving conservation of plant genetic resources and food security that explicitly includes women as key stakeholders.

R.B. SINGH  
Assistant Director-General and Regional Representative  
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February 2002

## Foreword

The catalytic role of rural and tribal families, particularly women, in the conservation and enhancement of agro-biodiversity is now being widely recognised nationally and internationally, as well as evident from the following recent agreements and legislation.

1. FAO's International Treaty on Plant Genetic Resources for Food and Agriculture adopted by the FAO General Conference in November 2001.
2. The Doha Ministerial Declaration of the World Trade Organisation, with reference to Trade-related Intellectual Property Rights.
3. The Protection of Plant Varieties and Farmers' Rights Act of India, adopted by both Houses of the Indian Parliament in 2001.

MSSRF has taken the following steps during the last 10 years to ensure (a) that the invaluable contributions of tribal and rural women in enriching genetic resources of economic plants get recognition and reward, and (b) that their *insitu* on-farm conservation traditions are revitalised and strengthened.

- Organisation of a data base to chronicle the contributions of rural and tribal women to preventing genetic erosion and promoting conservation.
- Setting up of a Community Gene Bank and Herbarium.
- Organisation of a Community Agrobiodiversity Centre at Kalpetta, Wayanad, Kerala.
- Organisation of a Resource Centre for Farmers' Rights at Chennai.
- Engendering national legislation as well as all the agro-biodiversity programmes of MSSRF.
- Organisation of periodic workshops and consultations on the role of women in biodiversity conservation and enrichment.
- Bringing out publications dealing with the gender dimensions of biodiversity management (i.e. conservation, sustainable use and equitable sharing of benefits).

In several of the above activities, MSSRF has worked in partnership with the FAO Regional Office for Asia and the Pacific. The present publication is one example of this partnership. We are indebted to Prof R B Singh, Assistant Director General and Regional Representative and to Dr Revathi Balakrishnan, Leader of FAO's Gender Programme in the Regional Office at Bangkok, for their active involvement in our collaborative programmes and publications. I hope the present FAO-MSSRF publication will stimulate interest in ensuring that the unique contributions of tribal and rural women do not become "dying art and wisdom", by according social prestige and financial reward for their work. Such a commitment will be in accordance with the ethics and equity principles enshrined in the Convention on Biological Diversity.

M.S. SWAMINATHAN  
Chairman  
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## **Introduction**

Biodiversity is an important property of ecosystems for sustained production of services and resources (Costanza & Folke 1996). The erosion of biodiversity weakens the ecosystem and pulls down its capacity for consistent renewal of natural resources as well as its economic value. Since the Rio Convention on Biological Diversity, the concept of biodiversity in agriculture has been referred to as agrobiodiversity. Agrobiodiversity includes all crops and livestock and their wild relatives, and all interacting species of pollinators, symbionts, pests, parasites, predators and competitors (Qualset et al. 1995). In agriculture, the influence of human beings in the domestication of biological resources has shaped the diversity of living forms. In the process there is continuous gain and loss. However, in the last century the balance turned to loss. This irreversible loss of genes is of major concern for global food security. The role of farmers in the development of diversity in agriculture is crucial. Not only have natural processes and conditions contributed to the creation of agrobiodiversity, but cultural and social diversity encountered in humankind has also had a guiding hand in its creation (De Boef 2000). The rate of agrobiodiversity loss was triggered after the rapid diffusion of semi-dwarf wheat and rice varieties along with several other factors. The most frequently cited evidence for genetic erosion is indirect: the diffusion of modern, high-yielding varieties into areas once known for crop diversity (Hawkes 1983).

Conservation needs to be promoted through the means of economic incentives. An incentive (direct, indirect or service oriented) for conservation is any inducement which is specifically intended to incite or motivate local people to conserve biodiversity. Involving the community and other actors in conservation programmes by providing new approaches to conservation which alter people's perceptions is recognized as the critical factor. The current global view is that rural men and women are the managers of biodiversity and hold in-depth knowledge of local plants; they are thus the custodians of plant genetic resources, highlighting the key role of rural women in agrobiodiversity-based food production systems (Balakrishnan 2000).

## **Objectives**

The objectives of the report are:

- to understand gender differential roles, responsibilities, access and control over the resources of rural and tribal women in agrobiodiversity;
- to address the issues related to agrobiodiversity with multidimensional approaches for promoting in situ on-farm conservation traditions of rural and tribal women; and
- to chronicle and study the traditional gender differential knowledge of rural and tribal women to ensure conservation, sustainable use and equitable sharing of benefits.

## **Women – producers, providers and managers**

Sustainability refers to how people living in a particular place manage resources in order to both maintain themselves on a daily basis and ensure that they have what they need as they move from one annual cycle to the next and from one generation to another. Women are the focal point of these

activities (Collins 1991). Thomas and Slayter (1994) note that gender is a key factor in the division of labour, rights and responsibilities and thus is tightly tied to the management of local ecological systems. Women are traditional caretakers of crop genetic diversity in agriculture. Their knowledge of the growing conditions and nutritional characteristics of various species gives them a vital fund of experience in seed selection and plant breeding. This enables them to maintain the genetic diversity required to adapt to fluctuating weather patterns and biotic pressures and ensure the survival of traditional crops adapted to local conditions and tastes. Women's contribution in resource management has not been widely used and the lack of documentation on such fund of knowledge bars access to it and has resulted in inequality in sharing the benefits. The understanding and appreciation of gender roles in the conservation and enhancement of genetic resources guarantee gender justice in sharing the benefits.

### **Approaches**

The approach adopted while implementing the project was to adapt initiatives to changing situations, with a time frame driven largely by local requirements. The process involved information exchange, problem analysis, joint planning, building trust between the partners, consistent capacity building and negotiation, grass-roots institution building, benefit sharing mechanisms and institutionalization. The project sites were selected on the basis of the prevailing crop genetic diversity, distribution pattern and genetic erosion in varied agro-ecological situations based on the explorative field visits.

### **Study area: land and people**

The study area covers three ecologically distinct and fragile regions: Jeypore, the Kolli hills and Wayanad. The first two areas are located in the Eastern Ghats: Jeypore is at the northern end and the Kolli hills are at the southern end of the Eastern Ghats. Wayanad is in the southern part of the Western Ghats. The focus differed at each site: the traditional paddy varieties in Jeypore and Wayanad and minor millets in the Kolli hills were the focused crops.

#### ***Jeypore***

The southern part of Orissa, known as the "Jeypore tract" in Koraput district, lies in the northern part of the Eastern Ghats, with a gently undulating plateau and residual hills. The geology of the region is a series of metamorphosed sediment formed into different kinds of rock. The subtropical evergreen type of forest (*sal* forest) has largely been replaced by a species of typical drier zones. Jeypore receives an annual rainfall of 1800 mm and the southwest monsoon delivers more than 70 percent of the rain. The agricultural season starts with the summer showers of April and May. Nearly 45 percent of the land is under cultivation. Out of 19 985 ha, nearly 17 000 ha is under paddy. Paddy is the predominant crop cultivated in the upland, medium and lowland ecosystems during *khariff* season, mostly under rain-fed conditions. The other main crops are pulses, oilseeds, sugarcane and minor millets grown in rotation at higher altitudes. The soil texture varies from coarse sandy loam, alluvial, red laterite to clay. In rice literature, the tract has drawn the attention of

rice bio-systematists, geneticists and conservationists since the first half of the last century when traditional varieties of rice dominated. Jeypore is considered to be a secondary centre of origin of cultivated rice, particularly the “*aus*” ecotype. The Central Rice Research Institute at Cuttack collected nearly 1 750 varieties of rice from this region between 1955 and 1960. An exploratory survey carried out by the M.S. Swaminathan Research Foundation (MSSRF) in 1995/96 managed to collect only 324 varieties. An in-depth study in 1998 showed that only 83 varieties were under cultivation (Annex 1). The introduction of high-yielding varieties along with canal irrigation facilities and the lower productivity of the traditional land races are the main causes of genetic erosion of the traditional cultivars. Of the 514 000 workers registered in the district, nearly 336 000 are cultivators and agricultural labourers. The district has a low literacy rate of 24.6 percent. The Kandha, Langia Saora, Paroja, Bhatara, Gadaba, Amanatya, Halva, Bonda, Koya and Didayi tribes are the original inhabitants of the forest and hills. The Bonda, Paroja and Langia Saora tribes still practise shifting cultivation along with settled agriculture.

### ***Kolli hills***

The Kolli hills are situated at the tail end of the Eastern Ghats in the state of Tamil Nadu. They are part of the Talaghat stretch. The hills have deep ravines and high peaks. On the western, eastern and southern sides they rise abruptly from the plain and on the northern side ascend to it by numerous long and gently sloping spurs. They spread over an area of 28 293 ha and agricultural activities take place in 51.6 percent of the total area; the forest occupies 44 percent; and other activities concern less than five percent of the territory. The area receives an average of 1440 mm annual rainfall distributed fairly over the two seasons. The elevation ranges between 1 000 and 1 350 metres. Irrigation facilities are available to less than 15 percent of the area through springs and wells. The remainder is under rain-fed farming. The agricultural season starts with the onset of the southwest monsoon in June-July.

The Kolli hills are known for their crop genetic diversity, especially in minor millets. The intra-specific phenotypic variability is enormous; the populations are highly heterogeneous in morphological and agronomic character. The heterogeneity within the races and the microclimatic variations in the fields at different altitudes help them to reduce the risk of crop loss due to various biotic and non-biotic stresses. The diversity of species of minor millets in the farmers’ fields shows in the varied space and time dimensions in which each species and its race are distributed across the geographical area of the Kolli hills at varied altitudes, forming what can be called a dynamic mosaic system (Annex 2).

In the Kolli hills, the agrobiodiversity has been declining and there has been a rapid shrinkage in the area under minor millet cultivation in the last three decades. The introduction of cash crops, declining soil fertility, drudgery involved in processing, lack of market channels, increasing transport facilities, availability of cheap rice under the public distribution system, rice as a symbol of social mobility – all these are factors which have affected the cultivation and consumption of minor millets in the Kolli hills. Although the drastic changes in cropping patterns have taken place in the last three decades only, the region seems to have undergone a major change in crops over the

last one hundred years. Secondary statistical data show that in 1883 in the Nammakal region nearly 1 113 ha was under minor millet cultivation as against 967 ha in 1996/97. Similarly in 1883 tapioca was not listed as a cultivated crop in the Kolli hills, whereas in 1996/97 the area under the crop was 5 000 ha. The 1991 census gives the total population at 33 888 living in 6 840 households. More than 95 percent of the inhabitants are tribal people belonging to the Malayali community. The population density is 119 per km<sup>2</sup>. In 1991 farmers numbered 4 200, 1 500 of them small farmers and 2 200 marginal farmers, and agricultural labourers numbered about 10 600.

### **Wayanad**

Wayanad is a hilly district (2 126 km<sup>2</sup>) situated in the southern region of the Western Ghats in the state of Kerala. Its ecosystem is highly disturbed and considered one of the hottest of the 29 ecological “hot spots” in the country. The hill of the district is lofty and has deep valleys. The region is bio-geographically rich with significant landscape complexity and biological diversity in both flora and fauna, with an impressive rate of threatening factors. The elevation is 700 m to 2 100 m. Forty-one percent of the area is under natural forest, ranging from tropical wet evergreen to tropical dry deciduous types. The district has a total population of 700 000, 15 percent of whom are tribal communities.

Wayanad, once the *nadu* (territory) of *vayal* (paddy field) endowed with many land races of rice, is experiencing a fast depletion of paddy fields. Paddy fields girdle the base of biodiversity-rich hillocks. It has been reported that there were 73 varieties of paddy grown in Wayanad, each with unique qualities. The present study shows, however, that only 18 varieties are left and their very existence is under threat (Annex 3). In 1985, paddy fields covered 20 000 ha but only 16 000 ha by 1998/99. At present, banana, ginger, areca and tapioca occupy 60 percent of the existing paddy fields, and mountains have been converted to tea and coffee estates, which replace forest trees. Intensive commercial agricultural activities, developmental schemes and population pressure are the main factors of degradation of habitats and the associated biological diversity.

The area is ethnically very diverse. The tribes which have been living there for generations are the Panians, Kurichians, Adiyas, Uraalikulumas and Kattunayakans. The Paniyas are the demographically dominant group; they work as wage labourers in the fields and plantations. The Adiyas also earn their livelihood through wage labour. The Kuruchiyas are an agricultural tribal community. The Kattunayakans or Jenukurumas are basically a foraging group, known for their expertise in wild-bee honey collection, and so are the Uraalikulumas. The other immigrants belong to a mixed socio-cultural group of non-tribal origins.

### **Gender issues and concerns in local agrobiodiversity**

The coincidence between the centres of diversity and great civilizations means that the conservation of bio-resources is part of the culture and ethos of past civilizations. Since the advent of domestication some 12 000 years ago, women have performed a major role in plant selection,

domestication, enhancement and conservation. In the process of agricultural evolution, women have played a distinct role in planting, weeding and in post-harvest operations such as harvesting, threshing, seed selection and storage. However, gender roles are changing as a consequence of farm mechanization and changing cropping patterns in many societies. Nonetheless, even in shifting cropping patterns, women maintain their traditional role in seed management (Swaminathan 2000). A global survey conducted by FAO shows that women account for 50 percent of overall food production in Asia. An FAO study on the role of rural women and food security in South Asian countries recognizes the women's key role in post-harvest operations, seed management and maintenance of biodiversity. In addition, women are keen to transmit their complex knowledge to the youngsters in the family by involving them in the process (Choudhury 2000).

The central role of women in agrobiodiversity management and the associated knowledge, particularly in seed selection, production and seed exchange (supply), has been vital for resource enhancement. Seed and grain storage practices and techniques have evolved over a period thanks to their innovative practices. A shift in cropping pattern in many cases does not marginalize the role of women in seed management, particularly in storage activities, except in areas where hybrids are cultivated. But the practice of storing seed in traditional storage structures and the related knowledge have been vanishing at the individual and communal levels.

### **Gender division of labour in farming systems**

Sex-based division of labour prevails in all social systems and in most cases it is very rigid. In such systems, traditionally women are allotted most of the jobs in the domestic sphere and time-consuming drudgery tasks in the fields. They spend long hours in the fields and their participation and close observation give them a deep and comprehensive knowledge of farming systems.

In all three studied areas, even though agriculture is a household enterprise, social norms demarcate the division of labour based on sex and age. Generally land preparation and ploughing are men's jobs. But in the case of the Kolli hills, women also take part in them if there are not enough hands. In steep and very steep lands, bushes are cut and burnt for cultivation of minor millets. While the man cuts plants and bushes, the woman cleans the place by removing the cut plants. Sometimes, women jointly work with men in cutting the bushes and heaping them here and there for drying and burning before the onset of the rains. The other activities like transplanting and weeding are jobs undertaken by women only. Harvesting and post-harvesting activities are jointly taken care of by both men and women. In Jeypore and the Kolli hills, women play an inevitable role in conserving, enhancing and utilizing the agrobiodiversity. Their role in seed management, which includes selection, cleaning and storage, is highly significant.

In Wayanad, selection of paddy fields and land preparation for seed production are men's jobs. Occasionally, elderly women are also involved in the selection of paddy seeds. Kurichiya farmers select and harvest separately only those crop plants that have fully developed and mature grains for their seed stock. Women in general are not involved in seed selection and storage (Annex 5). This is mainly because the concepts of purity and pollution dominate the minds of the people. Men select

the seed in the threshing yard (elder women support the activity). Traditional institutional mechanisms, such as the custom of exchanging seed when the community members gather for weddings or cultural festivals, exist among men within the village.

In the case of little-millet cultivation in the Kolli hills, women are responsible for most of the agronomic practices and post-harvest operations, including seed storage and seed supply (exchange). Even though some of the activities are shared by men and women among the Malayalis, by being in charge of caring and watching over the crop the women are in a position to take almost all decisions regarding minor-millet cultivation (Annex 4). They are the most knowledgeable about the crop. Because they take care of the household food and nutritional security, they prefer to grow minor millets as they have more subsistence value.

Women's skills and knowledge lie in managing the resources, particularly selection (Box 1), enhancement (Box 2) and storage. In the Kolli hills, women farmers follow various selection strategies to select the seed from different crops based on phenotypic characters at either pre- or post-harvest stage, and the storage mechanism varies accordingly. They apply criteria such as uniform, well-filled seeds in post-harvest selection and seed density in the ear head/panicle from the vigorous plants before harvest. They have developed simple methods of selecting seeds and protecting them from insects and pests. Sometimes when the harvested grains come from healthy crops, they set apart the quantity of seed material required for planting or sowing in the following season. Seeds are cleaned carefully by winnowing. During the process, off-colour, undersized and chaffy grains are segregated and removed. In the Kolli hills, women play a key role in seed exchange. They sometimes reserve grain from local or more distant farmers who are known for obtaining good harvests.

**Box 1. Malayali women's expertise in seed selection, enhancement, storage and management**

Women collect seed after harvesting from the threshing floor for crops like little millet, kodo millet and paddy whose loose and drooping panicles will fall before the first threshing operation. Thus they are assured of getting good, well-filled seeds that are managed separately. Crops like Italian millet and finger millet are selected in the field itself for good, disease-free, well-developed, fully filled ear heads. The selected panicles are dried separately then tied together and further dried on the roof. In the case of pulses and oil seeds, during threshing the best seeds are selected; before harvesting, elite, vigorous plants are identified and harvested and threshed separately. The active role of women in seed management, particularly in the selection of elite plants, helps them acquire breeding knowledge and consequently taxonomic/classification perspectives based on the practical motive of utilizing the resources. Thus the process of knowledge acquisition is dynamic and continuous in response to the evolutionary changes and adaptations as a result of natural and conscious selection (Annex 1).

**Source:** MSSRF, Kolli Hills

Seed thus selected are sun dried for two or three days. When their moisture content has reduced to a sufficient level (roughly 10-13 percent), the seeds are stored in mud containers. Before sowing they are once again sun dried. Seed viability will not be affected for two to three years if they are well dried and kept in airtight containers. Seeds of vegetables are mixed with burnt ash and then sun dried. The fruits of a few vegetables during the third or fourth harvest cycle are left on the plant to ripen. The seeds of certain vegetables are left on rooftops to dry. Thus, women perform the role of seed selector and preserver, using traditional wisdom and knowledge. Apart from their own field experience, mothers, elders and older siblings are the sources of knowledge.

### **Gender differential preferences in crop selection**

Women do not only have different expertise, they also have different opinions from their counterparts on the value of land races. In crop development and quality seed production programmes, little millet land races were selected by a set of men and women. Their selection criteria varied greatly. The men selected the early maturing variety i.e. *mallasamai* while the women preferred *vellaperumsamai* and *karumperumsamai* because of their yield and nutritious quality. The women, being responsible for the cooking, explained that they valued *vellaperumsamai* and *karumperumsamai* because of their taste and consistency. While selecting the plants for their seed, men used good panicle as the main variable and the women considered the vigour of the whole plant in the marginal agro-ecosystem along with well-filled grains in the panicle.

#### **Box 2: Women's contribution to genetic enhancement of cultivars**

Knowingly or unknowingly, women are responsible for widening the genetic base by their innovative practice of cropping systems. They deliberate mix various kinds of land races, with different quantitative characters in a single field, as a strategy against risk. In addition, such a practice allows introgression of genes into the crop, which may give rise to new, valuable genotypes. In the Kolli hills, farmers mix two land races of Italian millet and little millet in a single field or in a mixed cropping system. In Jeypore, under wet sowing they mix seeds of short- and long-duration cultivars (locally called *myda* cultivation). The early paddy matures in July and is harvested along with green leaves of the second variety. The late cultivar comes to maturity in December and is harvested in early January.

**Source :** MSSRF, Kolli Hills and Jeypore

According to existing social norms, women are responsible for the nutrition, health and food security of the family. They prefer to cultivate food crops in their fields at least for their own needs. In fact, they take a leading role in the cultivation of paddy and minor millets, even though these are economically less beneficial than other cash crops. A close scrutiny of work patterns reveals that work done exclusively by women involves drudgery and physical strain. The categorization of many tasks as being performed jointly by both male and female does not mean that there is equal sharing of work. This categorization itself shows the tendency to distribute monotonous, time-consuming activities among the females within a particular activity.

### **Access and control over resources**

Access to resources and ownership rights are assumed to be the paramount factors in bringing equity and conservation and sustainable use of bio-resources. The prevailing system of land ownership has an implication on women's position, power and status within the household and community. Land ownership is one of the most important criteria that influence the negotiating and decision-making capacity of women within the household. Availability of the seeds of traditional cultivars is one of the main issues in on-farm conservation in addition to storage facilities. Poverty and household-level seed security are strongly related. In Jeypore, poor households have less capacity to store seeds and need to consume them during lean periods. Thus poverty is one of the prime factors that limit access to local seed resources (Balasubramanian 2000). The availability and access to the preferred traditional cultivars was taken care of by the Community Seed Bank (referred to as "the seed bank").

### **Approaches used in enhancing local agrobiodiversity**

A multidimensional approach is necessary to promote agrobiodiversity conservation. A range of activities and a combination of approaches have been integrated by MSSRF to promote conservation, viz. creating an economic stake in conservation, crop development through participatory productivity enhancement activities, seed supply through network and institutionalization, recognizing, rewarding and supporting women's contribution through appropriate documentation and policies, capacity building and enhancing farmers' skills based on need are some of the important approaches tried to enhance agrobiodiversity conservation.

### **The economic stake in conservation**

The Convention on Biological Diversity emphasizes the link between conservation and commercialization. Conservation of biodiversity becomes a lost cause unless the local people develop a tangible economic stake in conservation to improve their economic status. Sustainability can be ensured only by empowering the workers in the field, especially rural and tribal women. Creating an economic stake in conservation by linking the primary conservers with the market reinforces conservation.

Through several ways, local, national and international markets for land races may be developed to increase the value of genetic resources. The identification of "niche markets" where land races are in demand and information on the marketing channels that bring land-race produce to the market can suggest market bottlenecks and constraints. The lack of adequate storage mechanisms and of transportation facilities from field to market, and inadequate supplies of land races are some of the constraints.



Introducing credit and other facilities could increase supplies and improve the infrastructure. Market constraints might be overcome through promotional campaigns for land-race products and by helping to increase production of land races. Food industry firms should be encouraged to incorporate land races and promote the products.

Minor millets in the Kolli hills are grown on a subsistence scale and never enter the market. The prevailing community's perception is that the lack of market channels is one of the main causes of reduction in the area under cultivation. Marketing channels were explored both at the local and regional levels. The issue was addressed through mobilizing women and men self-help groups to institutionalize the marketing activities. Self-help groups are primarily credit-based institutions that have recognition from the formal banking sector. The Tribal Cooperative Marketing Development Federation of India Ltd (TRIFED), a central government marketing agency committed to the multidimensional transformation of the tribal society by generating and establishing proper marketing channels for tribal produce, was identified at the regional level. For the first time, TRIFED decided to procure minor millet for marketing and to involve self-help groups in its marketing strategy; thus a direct market channel was created in the Kolli hills between producers and consumers through a marketing agency (Box 3). Further efforts were made to create a demand for minor millet by using it in the preparation of bread and of poultry feed. Appropriate agencies were approached and since TRIFED is tied up with the minor millets cultivators, discussions are underway to link TRIFED with bread and poultry-feed manufacturing companies.

Moreover, local markets were used to sell minor millet to revive and enhance traditional food habits. For example, the annual Adi 18, a locally famous festival which attracts about 100 000 devotees of the Arappaleswarar temple located at Valappur Nadu, was used for this purpose. The first two years, MSSRF acted as an active partner along with self-help groups but the third year, the groups handled everything themselves. Both men and women members of self-help groups equally participated in the whole process, from listing the food products and planning to sharing the profits equally. The efforts resulted in encouraging the use of minor-millet food items in the region and also in increasing the area under minor millet cultivation.

**Box 3. Establishing market linkages with the organized sector**

Minor millets have been cultivated on a subsistence scale and marketing is the main constraint for scaling up production. Market linkages were established at local and regional levels: people were mobilized and formed into self-help groups to institutionalize marketing operations. The various self-help groups were brought under a single system, evolved into a federation then linked with TRIFED. Prices, marketing mechanisms and other modalities were negotiated and a memorandum of understanding was signed stating the rules and procedures to be followed in marketing. The federation members signed the agreement on behalf of their group members. MSSRF played the role of facilitator in the process.

At the village level self-help group members organized an explorative survey to estimate the quantity of millet available all over the Kolli hills. Women members identified and procured the minor millets within the hamlet, whereas men procured them from the nearby villages. The commission given to self-help groups by TRIFED is shared equally. In 1999/2000 and 2000/01 the group members procured nearly 25 tonnes of minor millets and marketed them to TRIFED. The linkage has revived the interest among the local people to cultivate minor millets.

**Source:** MSSRF, Kolli Hills

In Wayanad, traditional rice varieties having medicinal qualities have been cultivated on a minimum scale because of market constraints and poor productivity. Among the 18 medicinal varieties, *njavara* has high medicinal qualities. Women are more responsible in the cultivation (sowing, hoeing, crop maintenance, harvesting, food processing) and use of medicinal *njavara* rice (Annex 5). However, their involvement in value addition and quality improvement for marketing of such resources is not prevailing. The stake in cultivation of medicinal rice varieties was created by linking the conservers with the market and enhancing their capacity in value addition. Like in the Kolli hills, women members were mobilized and formed into self-help groups. The potential buyers were identified and linkages have been established between pharmaceutical companies and self-help groups (Box 4). Apart from this the members of women self-help groups have been emerging as conservation entrepreneurs; they do manual processing and sell the rice in the local markets as a group activity.

**Box 4. Women conservation enterprises**

Two women self-help groups at Chooralmala in the Meppady village are involved in the cultivation of *njavara* rice. MSSRF facilitated the process by giving technical support for the conservation enterprises. An informal link was established with a leading raw drug merchant in nearby towns for the sale of *njavara* rice and grains. Such became the demand for *njavara* rice that they were not able to meet it satisfactorily. The women self-help group of Chooralmala was able to sell two quintals of rice in the last season, resulting in extra income for a group of ten people. Another group is engaged in producing and marketing a protein-rich powder called *Navadhanyappodi*, flour and *pappads*, which are rich in proteins, starch and minerals.

**Source:** MSSRF, Wayanad

Though the market linkages encourage local people to grow minor millets and paddy, practical constraints discourage them from expanding their activity. In the Kolli hills, minor millets are scattered all over 250 hamlets in 16 revenue villages in undulating terrain. The tribes grow different land races of minor millets in different agro-climatic zones. So, procuring them and selling them in one place is a difficult task. Moreover the available surplus is very low, as pooling is a laborious, time-consuming affair. The financial constraint is another obstacle which prevents tribal farmers from taking the initiative. Organizing venture capital or a revolving fund could help to solve the problem. A compensatory mechanism for the loss through risk cover could encourage some more farmers to venture into the activity. The other hurdles identified are the lack of reliable market information, of market channels, of market access and of the relevant expertise to negotiate and ensure a fair deal. In Wayanad, the negative relationship of yield and medicinal quality results in lower yields and economic benefits, which discourage the farmers. The assured market channels and value addition are the positive factors for the cultivation.

### **Industrial links, e.g. niche marketing**

Another noteworthy feature of cultivation in marginal environments in developing countries is that much of the production is organic. Organic certification could add value to the products of these regions. Urban consumers looking for dioxin-free organic products and capable of paying premium prices would be the target. Identifying reliable partners/collaborators and developing the capacity for negotiation would be essential. A group-based approach could solve practical issues such as scale of production, transportation and storage. It also would instil and develop collective rationale and foster collective ownership.

In the Kolli hills pineapple and minor millets have been produced without application of chemicals for nutrients or pest management. Given the current shift in consumer behaviour towards organic foods in the context of increasing globalization, marketing of organic products was identified as a strategy. By taking advantage of the prevailing organic production system in the Kolli hills, a niche market for organic pineapple was explored among European and other western countries. A certifying agency and other stakeholders in market linkages were identified and linked with self-help groups for marketing (Box 6). MSSRF facilitated the process by organizing a training programme on quality enhancement, procedures related to organic marketing and documentation of the farming practices and by preparing a business plan for the group members.

**Box 5: Organic markets for pineapple and minor millets**

In the Kolli hills, five villages with a large area under pineapple production were identified. The pineapple farmers were mobilized into self-help groups (three women, one men and one mixed groups). Their capacity to negotiate was developed through group discussions and training programmes with external agencies. MSSRF brought together the pineapple farmers and the Ion Exchange Enviro-Farms Pvt Ltd (IEEFL), a marketing agency. ECOCERT International, a Germany-based organic certifying agency, was approached for certification. A group of multidisciplinary experts inspected the site and certified the entire area as an organic production zone for pineapple cultivation (232 acres). Men and women members of the self-help groups pooled the produce coming from the various localities to ensure quality while marketing it at the collection centres. The process instilled a feeling of collective ownership and enhanced the business skills of the self-help members. The collection was done under the supervision of IEEFL. Nearly 40 tonnes have been marketed, out of an estimated potential of 400 tonnes. The increase in profit through organic marketing is estimated at about 40 percent. The International Life and Food Association, a Japan-based NGO working primarily to revive the millet diet in Japan, is negotiating with the self-help groups of the Kolli hills to procure minor millet.

**Source:** MSSRF, Kolli Hills

The high cost of certification could be overcome by scaling up the area under certification. The important agronomical constraint in pineapple growing in a marginal environment is low productivity and brix content (one of the fruit quality traits) due to the fact that natural and continuous cultivation results in poor soil fertility.

**Ensuring the value of agrobiodiversity*****Documentation of traditional knowledge: local institutions and biodiversity register***

The Convention on Biological Diversity recognized that biodiversity occurring within a country is the sovereign property of that country. Thus a sense of community ownership needs to be fostered by involving the local communities in chronicling the recognizable biological resources (People's Biodiversity Register), taking into account gender roles, responsibilities and knowledge. This activity will ensure scope for conservation, sustainable use and the equitable sharing of benefits. Also, it will record the conservation practices and underlying ethics prevailing in the region and safeguard the intellectual property rights of local communities. The local-level databases could serve as benchmarks to monitor periodically the impact of biodiversity conservation measures on genetic erosion. Individual and collective creativity should be acknowledged by grant entitlements to the local individuals or communities sharing their wisdom, innovation and practices for commercialization.

In the MSSRF study areas of Wayanad and the Koli hills, a core of village volunteers was selected, formed as a committee and trained in preparation of inventories. The management of such chronicled documents as the People's Biodiversity Register was discussed with the stakeholders and

institutionalized with the help of formal or informal institutions at the village level. Gender perspectives were internalized in the process of forming groups, in the documentation of species and their associated knowledge, and in the management.

**Box 6. People's biodiversity register**

In the Kolli hills, biodiversity-rich areas were prioritized and the local people were formed into a biodiversity management committee with equal representation of men and women. Apart from registering the common knowledge of men and women, the register recorded women's exclusive knowledge on agrobiodiversity. In addition, plant and animal genetic resources, use patterns and the eco-system in which they were found were also recorded. The management process was institutionalized with the help of the local panchayat (*oor gounder*) and members' mobilized resources to update and maintain the inventory.

In Wayanad, a panchayat-level community biodiversity conservation committee was formed with the panchayat leader as chairperson and local villagers, including women and youth, as members. The committee coordinated the preparation of gender-sensitive biodiversity registers, which created a sense of community ownership of the resources. A training manual in Malayalam was issued to enable the local people to prepare the register. A model People's Biodiversity Register for a small village was published by the panchayat presenting people's knowledge of ethno-botanical details and use value of biological resources. A detailed documentation of traditional paddy cultivation in the district was also made in the register.

**Source:** MSSRF, Kolli Hills and Wayanad

Collaborative preparation of biodiversity registers through participatory methods enhanced the awareness among stakeholders of the significance of their agrobiodiversity resources. Awareness creation, education and capacity building are vital in preparing the inventories. The replication of such activity to other parts has to be internalized in formal systems and recognized politically.

**Community gene bank and community herbarium**

Conservation of plant genetic material in gene banks (*ex situ*) is a widely accepted practice in view of increasing habitat destruction and depletion of natural resources. Local communities all over the world are known for their creative agriculture and are responsible for the conservation of genetic resource material. A facility was established by MSSRF at Chennai to conserve farmer-developed and -conserved plant genetic resources. This community gene bank has medium-term storage capacity and is linked with the long-term storage facility of the National Bureau of Plant Genetic Resources. It provides easy access to tribal and rural farm families only with prior informed consent of the farm families, serves as a backup storehouse linked with community seed banks operating at the village level, and acts as a reference centre to recognize the farmers' contributions while implementing the Farmer's Rights bill by documenting gender-specific contributions of materials and their associated knowledge.

**Box 7. Documentary evidence**

The community gene bank at MSSRF holds nearly 1 000 accessions of different crop germplasm. To provide a linkage between ex situ and in situ conservation, the community gene bank is linked with community seed banks. Such a mutually reinforcing linkage ensures the sustainable use of plant genetic materials.

The community herbarium has a collection of dried, preserved plants/parts of rare, endangered, medicinal and traditional cultivars serving as references and it holds 277 voucher specimens.

The seeds, herbarium specimen, and database (Farmers Rights Information Service) will help to ensure the intellectual property rights on contributions of tribal and rural families so that they are recognized under the relevant provisions of the Plant Variety Protection and Farmer's Rights Act 2000 and the proposed Biodiversity Act of the Government of India.

**Source:** MSSRF, Chennai

**Appropriating value to genetic resources**

Appropriating value to a species encourages its conservation in a social system for a variety of reasons. Local people have been maintaining and cultivating the genetic resources primarily for their nutritional and medicinal values and out of certain beliefs and faiths and religious rituals, apart from their economic value. Such practices are disappearing among the villagers due to the changing lifestyle. Their timely promotion at the local level could, however, help in conservation. Women's preferences in crops and varieties are based on their use value such as seasonal food security, culinary tradition and dietary diversity.

### **Box 8. Valuable crops and cultivars preserved by tribal women and men**

Many crops have been conserved on the basis of their value in rituals and their medicinal and nutritional qualities.

**Ritual:** In the Kolli hills, a special preparation of a particular variety of rice, *karunellu*, and a banana variety called *karuvazhai* are important offerings to local deities. These varieties are specially conserved and cultivated for the purpose of offering to the local deity. In Orissa, several rice land races have been conserved on the basis of their value in their religious functions such as *kalakrishan*, *tulsi*, *haladichudi*, *machakanda*, *mer* and *deulabhoga*.

**Nutrition:** In the Kolli hills, women and men prefer little millet for their diet because it takes longer to digest, thus giving a feeling of fullness that allows them to work longer periods in the field. Women deliberately mix seeds of *kullakadugu* – a variant of the *Brassica* species – in the finger millet mixed cropping systems. They collect tender leaves of the plant used as greens when other vegetable sources are scarce during the early period of the planting season.

**Medicinal quality:** In Wayanad, the rice variety that holds a high significance is *Njavara*, which is used in the Ayurvedic medicinal system for treating circulatory, respiratory and digestive ailments (Annex 5). This grain is widely known as medicinal rice for treating rheumatic ailments and for boosting the health of weak persons.

**Source:** MSSRF, Kolli Hills, Wayanad and Orissa

## **Conservation measures**

### **Promotion of on-farm conservation**

Productivity enhancement in traditional cultivars makes them more competitive than improved varieties, thus contributing to their on-farm conservation. The objective of on-farm management is the continuation of social and ecological processes within which farmers are key players. In the Kolli hills, the perception on issues related to minor millets reveals that women are concerned about the processing (manual processing), low productivity and pest and disease incidences whereas the men are concerned about shortage of farmyard manure, low productivity, pest and disease attack and market outlet for the surplus.

### ***Productivity enhancement***

The low productivity of the traditional minor millets is often considered to be the main reason for their disappearance in spite of their adaptation to biotic and non-biotic stresses. In the Kolli hills, participatory on-farm trials were carried out on seed density/method of sowing and seed hardening and on identifying alternate sources of nutrients, especially nitrogen. In the seed density/sowing method the line sowing gave a 25-60-percent higher yield with a 50-70-percent reduction in the seed rate over the traditional practice of broadcasting. The labour involved in the sowing operation,

i.e. walking over 50-100 km to sow one hectare of land by both men and women, and the requirement of draught animal were constraints in adopting the technology.

Nutrient and soil fertility management is important to realize a good harvest. Intensive cultivation and lack of organic manure sources have resulted in declining productivity. Alternative sources were identified through participatory on-farm experiments in farmers' fields. The experiment was monitored and evaluated. The yield increase was 25-35 percent for various land races over different periods of time. The availability of quality bio-fertilizer at the appropriate time was ensured by having the self-help groups take care of the supply.

#### **Box 9. Productivity enhancement**

In the Kolli hills, the low productivity of traditional cultivars of minor millets is one of the constraints for its continued cultivation. The traditional cultural practices were studied and analysed with the women and men farmers, and participatory on-farm experiments were initiated on sowing methods and soil fertility management, particularly nitrogen management. The experiments were monitored and evaluated by the participants (equal representation of women and men). In the sowing experiments, the technology was rejected because of the draught power and labour it requires, even though the yield increase was 25-60 percent and there was a substantial reduction in seed requirement.

Identification of alternate sources of nutrients, particularly nitrogen, using bio-fertilizers along with other traditional sources was experimented. Bio-fertilized treatment with *Azospirillum brasilense* gave a yield increase of 25-35 percent in different land races. Finally, based on the yield, cost of production, input availability, technology, time, energy involved in adopting the technology, preference of men and women, impact on soil and use efficiency, the farmer participants (men and women) selected the use of *Azospirillum lipoferense* over farmyard manure, poultry manure and urea.

**Source:** MSSRF, Kolli Hills

Thus yield enhancement in traditional cultivars using low-cost, women-friendly technologies could be the best strategy to motivate farmers.

#### ***Drudgery reduction in the processing of minor millet***

The drudgery involved in manual processing of millet, which is a woman's job and time and energy consuming, tends to deter from the consumption of millet. This was the major complaint expressed by the women members. Institutions working on developing post-harvest machinery, such as the Nittur Technical Training Foundation of Andhra Pradesh, were approached to develop hand- or pedal-operated simple machinery at the household level to unhusk the millets. The developed technology did not meet the purpose for which it was designed. The machine powdered the grain along with the husk instead of unhusking it. As an alternate option, a diesel-powered minor millet unhusking machine was installed, involving the self-help groups as entrepreneurs.



**Box 10. Drudgery reduction for women of the Kolli hills**

A machine was identified for processing minor millets but it was found unsuitable at the household level. A mixed self-help group was chosen in a millet-producing area which was relatively isolated and without transportation facilities. The group was trained in entrepreneurial mores. A business plan was prepared by the members of the group, who assessed the suitability of purchasing a diesel-powered unhusking machine, negotiated, transported the machine to the Kolli hills and installed it. MSSRF provided technical support and training. The business plan also guided the group on the division of work involved in operating the unit. The men and women working in the unit had equal wages and an equal share of the profits. After a six-month period, the group had a net profit of Rs10 000, besides the fact that daily employment had been provided for four members of the group. Women's access to technology and asset ownership is the other important aspect. Following this success, six months later another unit was installed by another self-help group in another region.

**Source:** MSSRF, Kolli Hills

The main constraint reported by women was the difficulty they had in separating the smaller stones before processing the grain. Establishing a cement or concrete thrashing floor could reduce the problem to some extent.

**Seed exchange and community seed bank**

Agricultural production with predominantly traditional varieties in some regions is hardly sufficient to meet daily consumption in the villages. The seeds of traditional varieties are not available in the market. In such a situation, villagers resort to exchanging seeds within the village or from neighbouring villages. Thus, local seed exchange is an important instrument for seed supply and diffusion; it is usually based on kinship, traditional relationships and cultural practices. It helps the exchange of knowledge associated with its conservation and use. Seed exchange and diffusion is an important factor which decides the pattern of diversity (composition of traditional varieties). Lack of seed during the sowing season is reported to be one of the reasons for the decline of minor millet cultivation in the Kolli hills. In Jeypore, seed for the next crop is hard to come by as most households consume it in the dry season of March and April: they do not have any other source of food grain. Facilitating the access to seed, particularly for women, encourages the cultivation of traditional cultivars in many cases.

Seed exchange network through community seed banks is a strategy initiated to evolve institutional mechanisms for seed supply within a community to facilitate access to traditional varieties. Community seed banks pool the seed material, which is maintained and administered through the appropriate institutional arrangements to ensure the availability of planting material (relatively large samples of seed) at the appropriate time. They have forward and backward linkages with the community gene bank at Chennai, a backup storage facility which has an elaborative documentation

about crops, uses, contributors' details, etc, and follows the prior informed consent principle in dealing with the accessions.

The seed exchange system has adopted the traditional mode of transaction in which, if a person borrows one unit of seed before planting, he or she returns two units of the seed to the seed bank after the harvest. However, such an exchange takes place at the individual household level between two individuals. In Jeypore and the Kolli hills (Box 11), seed exchange was institutionalized through community seed banks as a common property resource managed by the self-help groups/*palli samithi*. (*Palli samithi* are public bodies which have the status of traditional hamlet-level institutions as well as formal links with the constitutionally elected panchayat.) The gender aspects were integrated in the activities of the community seed banks, such as planning, training and management. The strategies developed for community seed banks in seed exchange programmes understood the local seed systems in the aspects of location-specific varietal preferences, volume of seed requirement, and followed procedures to assess the impact through local institutions such as the self-help groups/*palli samithi*.

**Box 11.** Revitalization of the traditional storage technology

**Jeypore :** Interested households contribute a specific quantity of seed to the community seed bank. In the storage process, seeds are mixed with dried powder made up of Neem (*Azadirachta indica*) and Karanja (*Pongamia pinnata*) leaves to save them from storage pests. The *palli samithi* (village committee) forms the seed bank management committee, which consists of three men and women, who share the responsibility of managing the bank. The bank records the name and quantity of seed requirement of needy farm families and distributes the seed. The involvement of women as key players has strengthened the seed bank and the seed exchange system. The women do vital tasks such as periodic checking to monitor the quality of seed. About 200 farmers (both male and female) are actively involved in the programme. The seed bank stores primarily paddy seeds of 15 traditional cultivars. Seeds of millet, oil seeds and vegetable are also stored. The total quantity transacted was around 700 kg during the 2000 season.

**Kolli hills:** *Thombai*, a traditional storage structure for grain built with mud, straw and wood, has been altered for storing a large quantity of seed to meet the requirements of the entire hamlet. The structure is 5' x 9' and has wooden racks inside with the capacity to store 500-900 kg of seed. Self-help groups manage the community seed bank and provide the land. Two women members selected by the group manage the activities, monitoring and lending. Willing farmers contribute seed to the bank. Norms and regulations are evolved by the self-help group members. Both men and women share the responsibilities. In the year 2000, through the community seed bank nearly 1 200 kg of minor millet seeds were transacted in and around the Kolli hills.

**Source :** MSSRF, Kolli Hills and Jeypore

## **Coping mechanisms/techniques used to restore plant or varietal losses during agricultural disasters, civil war, etc**

### ***Wild food management as coping mechanisms***

Understanding the place of wild and semi domesticated crops in the diet and agricultural system of rural families and how the latter dynamically manage these plants is critical to support farmers for food and nutritional security. A diverse food basket comprised of cultivated and wild food species buffers the families/women from depending on a single or a few food items. The tribal families in the Wayand region, especially the Kurichyars, have recognized this. Although they produce their own rice and vegetables, they still prefer to collect seasonal, wild food species to supplement their food. Foraging groups like the Kattunayakans, the Betakurumbans and the Paniyars, who work as labourers, traditionally and extensively depend on wild food resources to meet their subsistence requirement.

Within the tribal populations, women traditionally have greater responsibility in the domestic arena, which drives them to interact more with the surroundings. This greater affinity results in a deeper understanding of the complex microenvironments and in an accumulation of dynamic gender-specific knowledge. Tribal people use some 15 leafy vegetables and 20 varieties of fruit. The nuts and seeds of plants are used for consumption. Tuber is the other major item collected from the wild environment; about 10 species are used as food. Fifteen varieties of mushrooms are collected for consumption.

#### **Box 12. Women's knowledge, collection practices and norms – support sustainability**

Methods, frequencies and cultural norms of collection of wild edible food species are indicators of sustainable management of the resources with considerable in-built eco prudence by women. The top young leaves are harvested from plants that are used as leafy vegetables, thus allowing the plants to regenerate. Nuts and fruits are harvested when ripe and only when necessary to meet food requirements; this ensures that the seeds within the fruit mature with viable seed. In tubers, the portions adjacent to the climbing vines are left behind for regeneration. Similarly, areas where mushrooms usually occur are never disturbed; instead, they are made conducive by adding leaves and other forest litter to encourage better natural sporulation. Cultural norms discourage overexploitation; surplus food is shared with the neighbours.

**Source :** MSSRF, Wayand

The people of the Kolli hills recognize the use of a variety of plant species for food and primary health care. A number of tree species serve these purposes. Women know which wild tubers are edible and men are aware of the utility of these plant resources. Women are more familiar with plant species that are useful in primary health care, edible greens and tubers. Women and men go together for tuber collection.

## **Institutional partnerships**

The guiding principles of Swiss Development Cooperation – Natural Resource Management intervention (self reliance, equity, gender mainstreaming, ecological sustainability and economic viability) are applied by MSSRF. A consultative workshop was organized with the International Plant Genetic Research Institute on “enlarging the basis of food security: the role of underutilized crops”. Case studies for mainstreaming gender and biodiversity in all development activities related to natural resource management and household food security were carried out in collaboration with FAO RAP. The Kehati Biodiversity Foundation of Indonesia is interested in collaborating with MSSRF to study the gender aspects of biodiversity management in Indonesia. The proposal is under study.

At the national level, MSSRF has contributed by hosting the joint parliamentary committee on the protection of plant varieties and the Farmer’s Rights bill and by facilitating the formulation of a national biodiversity bill. Institutional linkages in which women play very active roles were established with national and local marketing agencies and institutions to ensure premium prices, especially for underutilized crops, and to carve niche markets such as the organic cultivation of pineapple and minor millets.

Several local NGOs and local bodies formed horizontal “action networks” for joint operations on local biodiversity issues. Educational institutions were extensively involved in organizing awareness camps on environmental issues for leaders of local bodies, women groups, farmers, farm labourers, traditional medicine practitioners, youths, teachers and students. Plate and photo exhibitions were also organized focusing on ethno-botanical aspects, gender and biodiversity.

## **Relevant policies advocated**

Tribal and rural farm women and men have been cultivating and managing the crop genetic resources at their personal expenses for the public good. These are the foundation for the modern plant breeding and biotechnological sectors. They have to be recognized, supported and rewarded in accordance with the provisions given in the legislations.

The Protection of Plant Varieties and Farmer’s Rights Bill, 2000, approved by the Indian Parliament in August 2001, has an element of gender sensitivity. The act provides for the establishment of an effective system to protect plant varieties and the rights of farmers and plant breeders, to encourage the development of new varieties of plants with due consideration of the rights of farmers in respect of their contribution made at any time in conserving, improving and making available plant genetic resources for the development of new plant varieties. Gender justice is ensured by the provision on the representation of women in the bodies (under Chapter II, section V-b, clause xiii, as “one representation from a national- or state-level women’s organization associated with agricultural activities to be nominated by the central government”) that will work on biodiversity issues for the effective implementation of the act. The act makes the representation of women in the authority committee compulsory, a unique feature which is unprecedented worldwide.

## **Lessons and challenges**

Building a synthesis of a range of gender-sensitive experiences and linking crop conservation and development with integrated approaches strengthens local management mechanisms and encourages greater crop genetic diversity. Gender-sensitive activities in the sphere of crop development through participatory productivity enhancement, seed supply through network, creating an economic stake in conservation, reducing drudgery for women, gender-sensitive policy and policy advocacy, capacity building and enhancement of the skills of women farmers and finally empowerment are guidelines integrated to enhance conservation of agrobiodiversity.

### **Lessons learned from the case project**

- The process mode helps to integrate divergent perspectives and interests, provides flexibility in thinking and facilitates reorientation of the approaches towards conservation and management of agrobiodiversity.
- Integrating different conservation strategies to support each other offers scope to deal with unpredictable ecological and social dynamics of the crop resources managed by farming families.
- Community gene banks with backup linkages with community seed banks at the local level, with women's active role, ensure the availability of germplasm during unpredictable situations.
- Training and capacity building, including awareness generation instilling a sense of partnership, guarantee collaborative planning, implementation, sharing, and refining of the results.
- Conservation enterprises managed by women grass-roots organizations with stable market linkages inspire women conservers to continue cultivation.
- The drudgery of women's tasks has been a major contributing factor in the erosion of agrobiodiversity in some areas. By tackling drudgery it may be possible to slow down agrobiodiversity erosion.
- The People's Biodiversity Registers prepared in the projects are gender sensitive. The knowledge of rural women is recognized and documented in the process, opening up the possibilities of being supported and rewarded.

### **Constraints/problems encountered and measures undertaken**

- Traditional gender differential roles and responsibilities curtail women's mobility, and prevailing social norms keep women away from controlling the resources.

### **Gaps and challenges**

- There is immense scope to enhance the productivity and stability of yields among local cultivars by creating partnerships within local communities, thereby making local cultivars competitive with high-yielding varieties.
- It is necessary to develop exhaustive gender differential knowledge databases on women's role and knowledge to promote women's role and equitable sharing of benefits while

implementing the community gene banks and national legislation related to farmers' rights and biodiversity.

- There is a need to establish monitoring methodologies using simple indicators taking into consideration gender perspectives to monitor on-farm genetic erosion at the village and regional levels.
- It is necessary to incorporate women's knowledge in seed technology development, particularly in the areas of selection and storage.
- In addition to the community seed banks, the sustainability of the seed sources may be ensured by gradually developing small seed enterprises after an analysis of market demand.
- There is a need to strengthen the relief and rehabilitation network to provide locally adapted traditional cultivars to communities during and after natural calamities such as floods, droughts, cyclones, etc.
- Incentives (direct, indirect, perverse and service) are to be promoted to meet demand and motivate local people to conserve biodiversity, such as revolving funds, risk and trust funds to farmers through grass-roots institutions.
- There is a need to evolve a management and methodological framework for sustainable extraction, evolving localized participatory monitoring indicators to measure the sustainable use of bio-resources at the village level.
- There must be a backflow of knowledge and information from international to national to local levels in the form of synthesized outcomes/outputs for planning conservation and development of plant genetic resources to facilitate locally specific actions.

## **Recommendations for country action to promote women's role in local agrobiodiversity**

### **Conservation**

- The potential economic value of biodiversity should be translated into tangible economic benefits for the communities whose livelihood depends on biodiversity by taking advantage of the investment and trade opportunities that are emerging for biodiversity-based products and which should be enhanced through incentives.
- Group-based conservation enterprises should involve women by developing their entrepreneurial skills to ensure a fair deal in conservation. Facilitating women's access to technology pertaining to yield enhancement, value addition through the processing of farm products and drudgery reduction encourages the cultivation of local cultivars.
- The internalization of the nexus between bio and cultural diversity should be sought to ensure communities' and women's greater say and active participation in developmental interventions and policymaking.

### **Research and development**

- Participatory evolution of technologies for productivity enhancement through agronomic and genetic means needs to be integrated into agricultural research. Location-specific technology for drudgery reduction and value addition to farm products needs to be developed.

- Identifying and creating new market channels and access to information to use niche markets such as organic/biodiversity products facilitates conservation.
- Benefit sharing methodologies need to be evolved to provide incentives for conservers and communities to meet the economic requirements, by recognizing and rewarding their contribution in accordance with the provisions given in legislation such as the Biodiversity Bill and the Plant Variety Protection and Farmer's Rights Bill.

### **Policy**

- Recognition of women farmers' capacity in seed management is the primary step in building an integrated and effective system for use, enhancement and conservation of on-farm crop genetic diversity.

### **Other**

- Promote the participation of local communities through a process of community research and development in activities related to agrobiodiversity conservation based on the assessed minimum viable population for specific cultivars.
- Develop win-win solutions to balance conservation and management of agrobiodiversity and the economic development of the farming families through women's empowerment.

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**Annex 1: Available rice genetic resources/germplasm in the Jeypore tract**

<i>Upland cultivars</i>	<i>Medium land cultivars</i>	<i>Lowland cultivars</i>
1. Mora	1. Sapuri	1. Gatia
2. Bhatagunda	2. Osagathiali	2. Baiganamanjidhan
3. Dangar dhan	3. Bhatakubudi	3. Kalamalli
4. Pandakagura	4. Haladichudi	4. Bayagunda
5. Sankara	5. Meher	5. Machhakanta
	6. Dubaraj	6. Barpanka
	7. Limbachudi	7. Patadhan
		8. Umiriachudi
		9. Kandulakathi
		10. Gadakuta
		11. Sitalachini
		12. Kalajira
		13. Liktimasi
		14. Cheptimasuri
		15. Tikichudi
		16. Sunaseri/karsali
		17. Dhobkhuji
		18. Baigani
		19. Kalachudi
		20. Sindhikoli
		21. Basubhoga
		22. Kharakhaili
		23. Baghanisha dhan
		24. Assmchudi
		25. Bansaganthi
		26. Pathangudadhan
		27. Muktabali
		28. Rajamuan

**Annex 2.** Inter-specific diversity in minor millets

Sl. No	Crop species	Land race
1.	Little millet (Samai) – <i>Panicum sumatrense</i>	1. Sadansamai 2. Thirukulasamai/karunsamai 3. Malliasamai 4. Kattavettisamai 5. Kottapattisami 6. Perumsami 7. Vellaperumsamai 8. Ellansami
2.	Italian millet (Thinai) – <i>Setaria italica</i>	1. Senthinai 2. Karumthinai 3. Palanthinai 4. Perumthinai 5. Killan/koranthinai 6. Mossakkanthinai 7. Mokkannathinai
3.	Common millet (Panivaragu) – <i>Panicum milliaceum</i>	-
4.	Kodo millet (Varagu) – <i>Paspalum scorobiculatum</i>	1. Peruvaragu 2. Thirivaragu 3. Karungalivaragu 4. Sengalivaragu

**Annex 3.** List of traditional varieties of rice known in Wayanad

1. Kalluruthi	2. Kalladiyaran*	3. Kodagu veliyan	4. Kochu vithu
5. Kanni Chennellu	6. Padu kuliyan	7. Kodiyan	8. Valichoori*
9. Kara vala	10. Pala chemban	11. Kothandan	12. Valia kaima
13. Kariyam kari	14. Palliyattu	15. Kozhi vala	16. Vattan
17. Karum kaima	18. Palthondi	19. Kumbalan	20. Veliyan*
21. Karuthan*	22. Pal veliyan	23. Kuttadan	24. Vellari*
25. Katta modan	26. Parambu vattan	27. Kutti veliyan	28. Velumbala
29. Aryan	30. Cheru vellari	31. Manjuvari	32. Villi
33. Anakomban	34. Cheriya Aryan*	35. Mannadan	36. Poothadi kaima
37. Aryankali	38. Chettu veliyan*	39. Mannu veliyan*	40. Ponnariyan*
41. Athiyan	42. Chitteni*	43. Marathondi*	44. Poothala
45. Chembavu	46. Chunna modan	47. Mullan munda	48. Puncha
49. Bhoothakali	50. Chomala*	51. Mullan puncha	52. Thavala kannan
53. Chempathy*	54. Gandhaka sala*	55. Mundakan*	56. Thaichoonal
57. Chendadi*	58. Jeeraka sala*	59. Njavara*	60. Thekken cheera*
61. Chennellu*	62. Kaima*	63. Onavattan*	64. Thondi*
65. Cheriya kaima	66. Kakka thondi	67. Adukkkan*	68. Thonnuran thondi*
69. Kochu ooty	70. Peru vazha	71. Ponnari mala	72. Uruni kaima*
73. Wayanadan thondi*	*Varieties collected during the study		

**Annex 4. Gender roles in little millet cultivation in the Kolli hills**

Roles	Women		Men		Both	
	Role	DM	Role	DM	Role	DM
<b>Crop/variatal selection</b>						
1.	Crop/land-race selection	-			✓	✓
2.	Seed for sowing from own source/seed borrowing	✓	✓	-	-	-
<b>Production</b>						
3.	Manuring – cattle penning	-	✓	-	-	✓
4.	Land preparation – tilling the soil	-	-	-	-	✓
5.	Bush clearance (cutting)	-	-	-	-	✓
6.	Collecting and firing the bushes	✓	-	-	-	✓
7.	Seed bed preparation – hoeing and removal of stones	✓	-	-	-	✓
8.	Preparing the seed for sowing – drying	✓	✓	-	-	-
9.	Sowing	-	-	✓	-	✓
10.	Weeding – hand pulling	✓			-	-
11.	Cross-ploughing	-	✓	✓	-	-
12.	Monitoring for pests and diseases and general growth	✓	✓	-	-	-
13.	Pruning (overgrowth)	✓	✓	-	-	-
14.	Checking the physiological maturity	✓	✓	-	-	-
15.	Harvesting		-	-	-	✓
16.	Collection for bundling	✓	-	-	-	✓
17.	Making bundles	-	-	-	-	✓
18.	Transporting	-	-	-	-	✓
19.	Preparing the threshing ground – cleaning, hardening, smoothening the floor using cow dung slurry	✓	✓	-	-	-
<b>Threshing</b>						
20.	Cattle-tramping		-	-	✓	-
21.	Turning the straw for better threshing	✓	✓	-	-	-
22.	Collecting the straw and the grain	✓	✓	-	-	-
23.	Transporting the straw	✓	✓	-	-	-
<b>Winnowing</b>						
24.	Blowing		-	-	-	✓
25.	Collecting and handing	✓	✓	-	-	-
26.	Separating grain and chaff	✓	✓	-	-	-
27.	Drying (for three to four days )	✓	✓	-	-	-
28.	Packing	✓	✓	-	-	-
29.	Transporting to the house		-	-	-	✓
30.	Cleaning the storage bins/making arrangements for bags	✓	✓	-	-	-
31.	Storage			-	-	-
<b>Seed management</b>						
32.	Identifying good-quality grain (selection)	✓	✓	-	-	-
33.	Separating good-quality grain for seeds	✓	✓	-	-	-
34.	Drying	✓	✓	-	-	-
35.	Seed treatment (using plant leaves and others)	✓	✓	-	-	-
36.	Getting special storage containers	✓	✓	-	-	-
37.	Monitoring for storage pest and periodic drying	✓	✓	-	-	-
<b>Utilization</b>						
38.	Monitoring – storage pests			-	-	-
39.	Drying	✓	✓	-	-	-
40.	Winnowing – to remove stones	✓	✓	-	-	-

41.	Pounding	✓	✓	-	-	-	-
42.	Winnowing to separate the husk	✓	✓	-	-	-	-
43.	Polishing – rarely	✓	✓	-	-	-	-
44.	Powdering of unhusked grain for some food items	✓	✓	-	-	-	-
45.	Preparation of different food items	✓	✓	-	-	-	-
46.	Serving the foods	✓	✓	-	-	-	-
47.	Storing and using the husk as pig meal	✓	✓	-	-	-	-

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DM - decision making

## Annex 5. Medicinal uses of *njavara*

### Uses in Ayurveda

- Increases the growth of muscles and stimulates the nerve endings.
- The grains with the quality *brihadam*, which silence rheumatism, are sweet, acrid, oleaginous, aphrodisiac, diuretic, carminative, anti-dysenteric and tonic. Used mainly in disorders like muscle wasting and cervical spondylitis.
- The roots of this rice are said to be cooling, diuretic and febrifuge and are useful in burning sensation, dyspepsia, bilious fever and diabetes.
- *Njavara* is usually used in external application as *njavara kkizhi*, a type of “warm sweating” treatment and as *njavara thaeppu*, covering the body with hot *njavara* rice.

### Local uses

- Regular consumption of *Paal Kanji* (rice gruel made in cow’s milk with sugar added) once a day ensures longevity. It is believed that this was the food of holy leaders in ancient India.
- Consuming this rice boiled in some vessel made of copper prevents rheumatic complaints and gives exceptionally high energy.
- For acute complaints of piles, consume the rice roasted with small onions in cows gee for 21 days on an otherwise empty stomach. (Cook the rice separately in a clay pot and then roast it with onion.) Another method is consuming the cooked rice mixed with curry leaf, sour buttermilk and pepper.
- Roots are employed in the form of decoction, which is useful in children’s urinary complaints.
- Eating *njavara* rice flakes, pounded with *Aswagandha* roots and sugar, will increase vitality and body weight and act as an aphrodisiac. Recommended for young couples.
- Regular consumption of this rice surely increases body weight.
- Consuming *Payasam*, a sweet dish made of this rice in jaggery and gee, increases mother’s milk.
- Apply warm rice paste once or twice for a week for burning sensation of foot.
- Consumption of *Marunnu Kanji*, *njavara* gruel, along with several other medicinal herbs prevents ailments common in the monsoon season. Recommended for all, especially women and children.
- *Njavara* rice is recommended for diabetic patients.
- For small burns and cuts, apply the ash made from *Njavara* husk. Quick healing!
- *Njavara* rice is a safe food for snake-bitten patients.
- Applying rice paste in the pustules formed due to the biting of a viper reduces pain.
- For stomach ulcer, consume regularly a dish made of *njavara* rice flour and squashed banana.
- For premature falling of hair, cleansing the head regularly with washed-away water of *njavara* is useful.
- For cough, boil *njavara* rice along with *Moringa* leaves, pound it and take it with the flakes made of *njavara*.
- Eat the bran of *njavara* mixed with jaggery to recover from peptic ulcer. It also said to be ideal for anaemic patients.
- Eating *njavara* rice increases semen and fertility in males. Recommended for childless couples.
- For swelling in foot, apply warm *njavara* rice paste.
- For growing babies, from six months old onward, the dish made out of flour of *njavara* and *Kunhan Vazha* is invariably recommended by mothers.
- Regular massage with a special rub prepared in coconut and gingili oil mixed with pounded *njavara* grain, and herbals like *piper longum* boiled in equal quantity of cow’s and buffalo’s milk, relieves polio in children.