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Management of Agrobiodiversity Conservation, Facilitated Access and Benefit Sharing: Experience of M.S. Swaminathan Research Foundation

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I. INTRODUCTION

Indian agrobiodiversity has been undergoing widespread loss since last many years and the existing part is also under increasing threat of rapid loss. Intensification of agriculture and its commercialization, monoculture and accelerated development leading to conversion of agricultural land to non-agricultural uses are contributing to this loss. Many wild relatives of crop plants are disappearing due to the loss of their habitats like canals, marshy lands, forest fringes, etc and spread of alien invasive species. Similarly, habitat loss and destructive harvest are also causing loss of many medicinal plant species. Other important contributing factors to this loss include a number of underlying socioeconomic factors, such as population pressure, land fragmentation and insecure tenure and problems with production and distribution of seeds of native varieties.

In India, the Eastern Ghats – a broken hill chain in the Indian peninsula and an important center of agrobiodiversity is considered to be part of the primary center of diversity for rice (Sampath and Govindaswami 1958). A collection expedition undertaken by M.S. Swaminathan in 1954 in Jeypore area, a region noted for high variety diversity for local rice varieties, identified 1500 rice varieties. Forty years later Sharma (1996) conducted a survey in the same region and could identify only 326 varieties of rice. It clearly indicated the severe loss of agrobiodiversity in this region. According to Kothari (1999) fifty years ago the tribal communities of the Eastern Ghats were familiar with more than 1,000 land races of rice, but at the turn of the century, this number came own drastically. The Jeypore tract of rice diversity presents contrast between agrobiodiversity wealth and poverty of the local communities.

Similarly, the loss of agrobiodiversity is far greater in the Western Ghats—a recognized megabiodiversity region as well as a biodiversity hotspot, although the extent of loss of cultivated species, their landraces and wild relatives is not well documented. The need for an effective variety recovery and monitoring

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system for such vanishing crops is long overdue. MSSRF's studies in a small region in Wayanad showed that cultivation of about 103 landraces of diverse specialities such as medicinal, aromatic, etc, was common in the region in the past and this reduced to less than 16 varieties and are also under threat (MSSRF, 2007). Conversion of rice lands in to other crops land is aiding further loss of the existing varieties. In addition, the tribal communities of this region were found to have access to more than 362 species of wild edibles, 102 leafy greens, 19 species of *Dioscorea*, 40 species of wild mushrooms and also edible fauna like snails, crabs, frogs and fish from wetlands (Narayanan *et al.* 2004) These wild edibles, which were the principal food during famine months for the poorest communities of the region are also getting lost with the loss of wetlands and change in cropping pattern.

While agrobiodiversity is largely used to refer the plant genetic diversity relevant to agriculture, in broader terms this diversity must also include the genetic diversity of domesticated animals, fishery, agro-forestry and agriculturally useful microorganisms. Anil Kumar (2007) further classified the agrobiodiversity to include wild and cultivated plants as well as wild and domesticated animal diversity.

Agrobiodiversity includes landraces, folk varieties, traditional or farmers' varieties and wild relatives of cultivated crops. According to Biological Diversity Act (2002), "landrace" means primitive cultivar that was grown by ancient farmers and their successors, and "folk variety" means a cultivated variety of plant that was developed, grown and exchanged informally among farmers. (BD Act, section 41.1). "Farmers' variety", according to the Protection of Plant Varieties and Farmers' Rights Act (2001), farmers' variety is the one, which has been traditionally evolved and cultivated by the farmers in their fields or a wild relative or land race, about which the farmers possess common knowledge. Both these legislations place greater emphasis on *insitu* conservation of agrobiodiversity at farmer/community level and underpin the importance of conservation of farmers' varieties and associated traditional knowledge to the immediate and future food security. Arora & Nayar (1984) catalogued 334 wild relatives of crop plants from India, including 51 species related to rice and millets, 54 and 109 species related of vegetables and fruits, respectively. The importance of wild relatives in crop improvement is well documented in several species. One of the well known example is the "grassy stunt" resistance gene available in one of the wild relatives of rice, *Oryza nivara*, which is common in the waterlogged fields in U.P. as this gene has been transferred successfully in to IR36 bred in IRRI and also in to many more.

While the India has already created a legislative framework for conservation and sustainable use of biodiversity including agrobiodiversity in broader terms, efforts at grass root level to foster the goals of these legislations are yet to generate an impact. The establishment of State Biodiversity Boards and Biodiversity Management Committees at panchayat levels and a massive awareness programme to empower the grass root institutions and communities are expected to achieve the goals enshrined in these legislations. The national efforts required to bringing in grass root level institutional capacity building and awareness at community level are challenging. Considering that it is the local communities and institutions, which alone can contribute to the on-farm conservation of agrobiodiversity and its sustainable use, the efforts so far put in to empower them are far inadequate, if not negligible. Therefore, such actions and institutional supports, on priority basis, with the participation of rural communities are essential to immediately check further erosion of agrobiodiversity.

II. THE MSSRF APPROACH

MSSRF approach on agrobiodiversity conservation places focus on integrated gene management with intervention in community conservation (Swaminathan, 2005) Agrobiodiversity is being conserved by

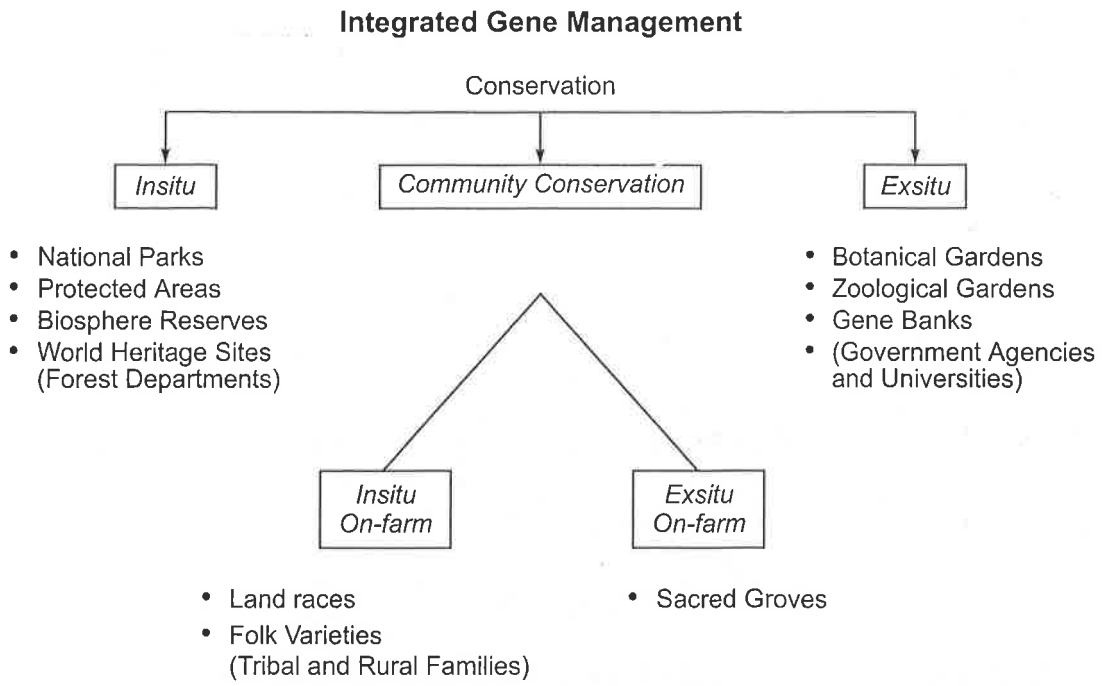

Fig. 1: *The MSSRF approach on conservation of agrobiodiversity by Integrated Gene Management in partnership with community (Swaminathan 2005)*

three principal pathways (Fig. 1). Two of these pathways namely, *insitu* and *exsitu* conservation are being promoted by the government with substantial public funding. The third and most important pathway of conservation, particularly in the case of agrobiodiversity, is the community conservation. What is notable is that neither any institutional support nor any financial incentives is offered to promote community conservation. This is notwithstanding the fact that the on-farm conservation being under taken by the rural and tribal communities. This involves repeated seed selections and generation of new variability arising from natural processes. Farmer selection is the most important pathway for conservation as well as enlarging the genetic diversity in all crop plants. It is also important to note that much of the community conservation is being undertaken by the economically poor farmers with small holdings. As many components of genetic diversity are economically less attractive to the growers, their conservation involves high economic cost.

Another feature of such on-farm conservation is its association with marginal as well as low input farming in rainfed, hilly, mountainous and economically backward areas. By not choosing to high yielding varieties, conservers of traditional varieties also suffer an opportunity cost. In other words, on-farm agrobiodiversity conservation by the communities is being carried out at heavy personal or community cost. Absence of an institutional mechanism to support such conservation and pay compensation for the economic cost is the major reason for rapid erosion of agrobiodiversity in the context of high yielding varieties and alternate economic opportunities available to farmers.

Over the last 18 years MSSRF has been extensively undertaking programmes to conserve diversity of crop plants, medicinal plants and mangrove systems in the Western and Eastern Ghats and the eastern coast in participation with local communities (www.mssrf.org). An important principle of such community conservation in creation of an economic stake in conservation with understanding and promoting the cultural linkages the community has with the local biodiversity. Such conservation processes are also integrated with rejuvenation of vanishing crops, bring in to focus the economic and nutritional importance

of vanishing or under utilized crops like millets, tubers, grain legumes and leafy vegetables and revival of associated "dying wisdom". Thus, conservation concurrently seeks to address enlarging the food basket diversity, enhancing the income of farm/tribal families, strengthening their food and nutritional security with social and gender equity. Such integrated community conservation also applies concern on conservation of soil and water, which are indispensable for conservation with economic stake.

Farmer participatory agrobiodiversity conservation being undertaken by the MSSRF also integrates the *insitu* on-farm conservation and *exsitu* conservation. An essential feature of the community conservation approach promoted by MSSRF is that the on-farm participatory conservation is institutionalized at local level under a gene-seed-grain (GSG) bank continuum with its linkage to the *ex situ* community gene bank located at MSSRF headquarter in Chennai. At least one gene-seed-grain bank is established in each panchayat, which is managed by the local communities, often under the banner of a woman or women-men self help group (SHG). A representative seed sample of all the varieties familiar to the local farmers of the area is deposited in this bank and these are periodically rejuvenated and re-deposited. These collections represent the genetic diversity of the region in a given crop. Not often all these varieties are regularly cultivated by farmers, only certain varieties are widely preferred and more frequently cultivated and these seeds are stored in the seed bank. This seed is accessible to the depositors as well as those who had not. The latter is required to buy or loan the seed. The seed loans are returned after crop with 30 to 50% seed interest. Local availability of seed on loan ensures timely sowing also by farmers who has no financial means to buy seed from market on time. These transactions on seed are recorded in a seed register maintained in each GSG bank. Similarly, the GSG bank builds up a stock of locally available grains, paddy or millets. The initial stock built with the help of a fund provided by the MSSRF and also donations collected from well to do farmers of the area. This grain is accessible to members, particularly the poorest, on loan when they have no capacity to buy grain from PDS sources or market. The grain loan is retuned with interest, as in the case of seed. These transactions are also maintained in the register (MSSRF, 2004).

Economic stake in conservation is created through multiple ways. Some of these approaches are enhancing the productivity of local varieties through improved seed selection, better agronomy suited to the local and cultural norms on the community, selective propagation of varieties commanding high market value or niche market demand, value addition for enhancing farmer income, and collective marketing of similar varieties to achieve better price in market. It is important that one or more of these approaches have to be used on location specific manner. The MSSRF examples in this respect are the Njavara and Gandhakasala rice cultivation in Wayanad, Kalajeera rice cultivation in Jeypore and medicinal plant cultivation in Wayanad (MSSRF, 2007).

Exsitu Community Gene Bank

Voucher samples of all varieties collected and conserved at the GSG Banks are also maintained as *exsitu* collections in the Community Gene Bank (CG Bank) at the MSSRF headquarter in Chennai. The CG Bank functions under the umbrella of Scarascia Mugnozza Community Genetic Resource Centre established in 1994. This gene bank is one of the components of the integrated gene management system practiced by MSSRF. The seeds are maintained at medium storage conditions at 4°C and 20% R.H. Apart from the collections in the field GSG Banks separate collections made are also added to the CG Bank. The data on each collection include passport data of the accessions covering details of the family or community, which has deposited the seed and GIS data, traditional knowledge associated with the accession, and technical data on the characterization. All these data are constituted as the Farmers' Right Information System

(FRIS) to facilitate access and benefit sharing potentially possible on each accession. Currently the CGB has over 1037 accessions of rice, millets and pulses collected from Orissa, Kerala, and Tamilnadu. The farmers have the freedom to fall back to the CGB for regenerating any of the accessions which is lost during on-farm conservation. MSSRF ensures that a set of all these accessions are also deposited with National Bureau of Plant Genetic Resources (NBPGR). MSSRF also facilitates farming communities to register their varieties under the Protection of Plant Varieties and Farmers' Rights Act with the help of data on characterization and traditional knowledge.

Another important feature of the CGB is the maintenance of Community Herbarium as an important reference source of the accessions available in the *in situ* and *ex situ* banks. This effectively helps in identifying the accessions when the grain samples and FRIS data are inadequate for establishing the authenticity of a variety. The Community Herbarium gives special attention to species declared as endangered and listed in the "Red Data Book of Indian Plants". Over all, the Community Herbarium have 1000 classified voucher specimens and 500 pictorial diagrammatic presentations. These include *Phaeanthus malabaricus, Capparis rheedi, Euonymus serratifolius*, *Crotolaria longipes*, *C. clavata* and *Indigofera constricta* listed in the red data book. Thus, the CGB serves as an important link of the integrated gene management system being perfected and promoted by the MSSRF for serving the community in accessing entitlements provided in the Convention on Biological Diversity and the Indian laws on biological diversity and plant variety protection.

The soul of integrated gene management system is farmer participatory management, empowering them with 'know how' and 'do how' and strengthening them with self managed or regulated institutional support systems. The *exsitu* conservation forming part of this integrated gene management is different from the government supported national *exsitu* or field germplasm banks. These national germplasm banks have no community participation. The data on the collections made by these banks do not give even mention of communities responsible for the on-farm conservation, do not recognize and collect traditional knowledge associated with each accession. These banks also do not easily allow communities to reach out to their varieties when ever these are fortuitously lost from the village. Therefore, the *exsitu* collection under MSSRF integrated gene management is pro-farmer and more equitable in all respects of recognizing farmers' rights.

III. ACCESS AND BENEFIT SHARING

MSSRF has made significant contributions towards the establishment of international and national regimes on access to the biological diversity and associated knowledge and equitable benefit sharing arising out of the utilization of biological resources (Anonymous, 1990; Swaminathan, 1996). Apart from providing initial draft for two national legislations, which eventually came into force as the Biological Diversity Act, 2002 and the Protection of Plant Varieties and Farmers' Rights Act, 2001, MSSRF provided draft rules on the latter legislation (MSSRF, 2002) and inputs to engender both these legislations (MSSRF, 2003).

CBD is the primary international instrument endorsing national sovereignty over biological diversity, access with prior informed consent and equitable sharing of the benefits arising out of the utilization of genetic resources. While the Biological Diversity Act, 2002 (BD Act) vide sections 4 to 7 has stipulated specific requirements for accessing Indian biodiversity, the data base on them including associated traditional knowledge for bio-survey, bio-utilization and commercial utilization, the access to agrobiodiversity for uses in conventional breeding or other traditional practices in any agriculture,

horticulture, poultry, dairy farming, animal husbandry or bee keeping is exempted from these regulatory provisions. Similarly, the Protection of Plant Varieties and Farmers' Rights Act, 2001 (PPVFR Act) vide section 30 allows unrestricted freedom to use any variety registered under this Act by any person for conducting experiment or research including using such variety as an initial source for creating other varieties. Thus, for the purpose of conventional breeding, access to Indian agrobiodiversity is unrestricted. It is also provisioned that where ever gene splicing technology is used by genetic engineering, the access to such genes has to be in conformity with sections 4 and 7 of the BD Act.

Both the above mentioned national legislations are concerned about the benefit sharing. In the case of BD Act, section 6.2 provides the requirements for benefit sharing. Accordingly, when ever the National Biodiversity Authority accords approval for an intellectual property rights for any invention on a biological resource obtained from India, it is required to impose benefit sharing fee or royalty or both or impose conditions including the sharing of financial benefits arising out of the commercial utilization of such rights. According to this Act, "benefit claimers" are those conserving a specific biological resource or its byproducts or the creators and holders of specific traditional knowledge or information relating to the use of said biological resource or innovations and practices associated with such use and application. Section 21.1 of this act further stipulates that equitable sharing of benefits shall be in accordance with mutually agreed terms and conditions between the person commercializing a product or knowledge and the local bodies concerned and the benefit claimers. Section 21.2 suggests that the benefit sharing shall be in all or any of the following six options. These options are (1) grant of joint ownership of intellectual property rights to the National Biodiversity Authority, or where benefit claimers are identified, to such benefit claimers, (2) transfer of technology, (3) location of production, research and development units in such areas which will facilitate better living standards to the benefit claimers, (4) association of Indian scientists, benefit claimers and the local people with research and development in biological resources and bio survey and bio utilization, (5) setting up of venture capital fund for aiding the cause of benefit claimers, and (6) payment of monetary compensation and non monetary benefits to the benefit claimers as the National Biodiversity Authority may deem fit. BD Act excludes from its purview all benefit sharing arising from commercial utilization of agrobiodiversity, except those involving genetic engineering.

Stipulations regarding the benefit sharing related to agrobiodiversity deployed in the plant varieties registered under the PPVFR Act are dealt under section 26. According to this section, the PPVFR authority on grant of registration to a variety and publication of its details including parentage and geographical location, the distinguishing characteristics of the variety and the details of the 'initial variety in case of 'essentially derived variety'. Benefit sharing claims in the prescribed form with prescribed fee can be submitted by interested person or group or firm or governmental or non-governmental organization with evidence on the nature and amount of the contribution or the community knowledge used in the development of the plant variety. On satisfaction of such claims, the PPVFR Authority shall order the amount of the benefit sharing to be paid to the party (ies), who had contributed to the development of the registered variety. Such amount is payable by the breeder of the registered variety to the National Gene Fund, from where the benefit share will be transferred to the party (ies) concerned.

The variety registration application is designed to provide a fair understanding on the origin of the new variety and genetic material gone into its breeding. The application is required to contain a complete passport data of the parental lines used and the geographical location in India from where they were accessed. The disclosure has to include other information on the contribution, if any, of any farmer, village community, institution or organization in breeding, evolving or developing the variety. The application is

also to contain a declaration that the genetic material (parental lines) accessed for developing the variety has been lawfully acquired.

IV. COMMUNITY GENE BANK TO FACILITATE ACCESS AND SAFEGUARD FARMERS' RIGHTS

The Community Gene Bank at MSSRF functions as the trustee of farming communities who have deposited their varieties (Geetha Rani, 2000). These varieties are not only conserved safely, but also characterized for all morphological and agronomic traits. Some of them are also being studied for their DUS (distinctness, uniformity and stability) characteristics. The database also has the passport data and farmers' knowledge on these varieties. This information is constituted as the FRIS. FRIS facilitates potential users of genetic resources to choose specific accession for use in crop improvement (Fig. 2). During such access, material transfer within the country is facilitated through material transfer agreement, which may have different provisions including benefit sharing with the communities who are the holders of the variety under transfer. MSSRF further monitors use of transferred accessions to ensure that wherever such transfer is leading to commercial utilization, the communities are equitably shared with the benefits. CGB also facilitates farming communities to register their varieties under the PPVFR Act and also to access reward and recognition provided in this Act. Recently, the PPVFR Authority in accordance with section 39.1.(iii) of the Act instituted the 'Genome Saviour Award' to reward and recognize farmers and farming communities for their tangible role in conservation of land races and wild relatives of economic plants and their improvement through selection and preservation (Bala Ravi and Ajay Parida, 2007). MSSRF recently, in 2007, facilitated the tribal communities of Jeypore in receiving Genome Saviour Award for their role in conserving and making available rice genetic resources.

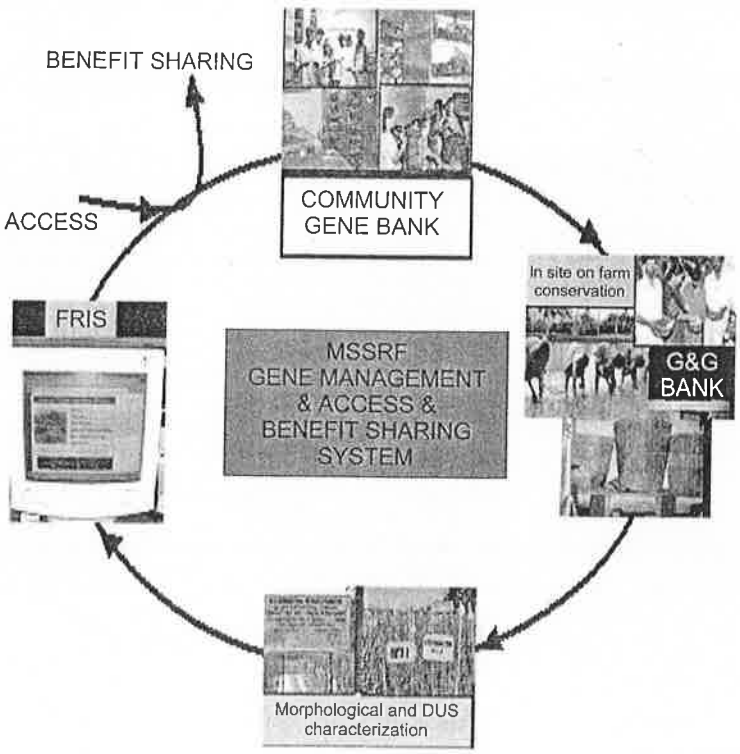

Fig. 2: *Community Gene Bank linked access and benefit sharing system*

Acknowledgement

Author wishes to express her sincere thanks and gratitude to Prof. M.S.Swaminathan for his constant encouragement and guidance. Thanks are also due to Dr. S. Bala Ravi and Dr. N. Anil Kumar for their timely help in drafting this paper.

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