

## Format for Proposals of Candidate Systems

### For The Globally-important Ingenious Agricultural Heritage Systems (GIAHS) Programme

#### SUMMARY INFORMATION

a. Country and location	: KORAPUT, ORISSA STATE, INDIA
b. Project title / name of the system	: Conserving the Agrobiodiversity heritage of the Koraput Region, India and Establishment of a genetic heritage park.
c. Requesting agency	: M.S. Swaminathan Research Foundation III Cross Street, Taramani, Chennai.
d. Governmental counterparts and other partners	
e. Summary (max. 200 words)	<p><i>Koraput region</i> of the state of Orissa in India is known for its ecological wealth coexisting with poverty, generally referred to as the paradox of economic poverty in the midst of genetic prosperity. Koraput is a tribal district; more than 70% of the total population comprises of scheduled tribes. There are as many as 52 tribal groups in this district. The socio-economic indicators in these areas are comparable to the worst in the world with the percentage of people below the poverty line ranging from 72% to 83%. The genetic repository of the region is of great significance in the global context. About 79 plant angiosperm species and one gymnosperm are endemic to the region. Despite the genetic richness and poverty in plenty, no significant effort has been undertaken in the region to overcome the prevailing dichotomy between resource richness and rural poverty. The system could well be designed to provide opportunity for developing efficient people centred, pro-nature, pro-poor and pro-women oriented programmes in the region that could bring in rural prosperity and ensuring a long term biohappiness for the people and the region. The unique features of the system assumes global importance and initiatives need to be in place for local people to be a part of the conservation and, sustainable and equitable use of the bioresources which they have been bestowed with.</p>

## **DESCRIPTION OF THE SYSTEM**

### **1. Description of GIAHS**

Koraput district is the southernmost district of Orissa lying between 17° 50" and 20° 3" North latitude and 81° 27" and 84° 1" East longitude, covering an area of 27,020 sq.kms. (Figure 1). It is bounded on the North by Kalahandi district of Orissa and Raipur district of Madhya Pradesh; on the South by the districts of East Godavari and Visakhapatnam of Andhra Pradesh; on the East by Srikakulam of Andhra Pradesh and Ganjam district of Orissa; and on the West by Bastar district of Madhya Pradesh. The topography consists of high land plateau with a number of hills and hillocks forming part of the Eastern ghat, on an average height of 300 to 3000 ft. above mean sea level (MSL). The whole area is drained by five major rivers namely Vansadhara, Nagavali, Indravati, Kolab and Mackanad and several tributaries and small perennial streams. The average annual rainfall in the district in the district ranges between 1200 – 1400 mm.

The total population of the district according to 1981 census is 24,67,329 persons with a population density of 97/km<sup>2</sup>. The district has the highest population growth in the state. Koraput is primarily a tribal district; more than 70% of the total population comprises of scheduled tribes. There are as many as 52 tribal groups in this district. Some of the numerically large tribes in the district are Khond, Bhatada, Paroja, Bhumia, Bondas, etc. Their chief occupation is cultivation. Many of the tribal groups are still continuing with poddu (shifting) cultivation. Although the district is endowed with rich natural resources, the tribes live in abject poverty.

The socio-economic indicators in these areas are comparable to the worst in the world with the percentage of people below the poverty line ranging from 72% to 83%, compared to 47% for Orissa and 26% for India. Unlike the rest of Orissa and India, the poverty incidence in this area has increased in the last two decades. The extreme backwardness of these areas has led to a plethora of development interventions, including watershed development and other natural resource development projects.

The region consists of large areas of rugged hills with deep valleys interspersed with wide river valleys and large plateaus. The altitude ranges between 150-1500 meters above mean sea level. Mean average annual rainfall is 1521 mm, giving it a potentially productive agroclimate. Forest types range from semi-evergreen to dry deciduous. This region is endowed with impressive biodiversity and is one of the primary centers of origin of rice.

The official net sown area ranges around 25% of the total area of the region, and is concentrated in plateaus and the wide river valleys. In the hilly areas, permanently

cultivated areas can be as low as 10% of the landscape. 33% of cultivated area is irrigated. Paddy occupies around fifty percent of the cultivated lands. Upland paddy and ragi (finger millet) are cultivated on around one third of the cultivated area.

**Koraput region known for its ecological wealth coexisting with poverty, is generally referred to as the paradox of economic poverty in the midst of genetic prosperity.**

Currently, the population has increased, the forest cover has been reduced, rainfall has decreased and soil erosion had reduced the fertility of the soil and the people are facing challenges of unemployment and poverty. The majority of the people of these villages are tribal and illiterate. The family size is often large and the average farm holding is small.

The average income of a household from agriculture, poultry and employment as agricultural/ menial laborer ranges from Rs. 15,000/- to Rs. 20,000/- (USD 300-400) in a year. To supplement their income and sustain their livelihood, they depend on forest produce for fuel wood, material for construction of their houses, agricultural implements, timber, medicinal herbs. The tribal population depends on the low value non timber forest produces for their subsistence. They manage food from different forest produces including roots, tamarind, tamarind seeds, leaves, jackfruits and seeds, mango stones.

Rice is the predominant crop in Jeypore area both in terms of land as well as in terms of production. More than 40% of the lands are under paddy cultivation. The other crops grown are maize, Finger Millet (*Eleusine coracana*), green gram (*Vigna radiata*), black gram (*Vigna mungo*), mustard (*Brassica juncea*), sesame (*Sesamum orientale*), groundnut (*Arachis hypogea*), etc. The tribal people in the hills grow minor millets Littlemillet (*Panicum miliaceum*), Foxtail millet (*Staria italica*), niger (*Guizotia abyssinica*), Pigeon pea (*Cajanus cajan*) and horse gram (*Dolichos biflorus*) also.etc.

***The Jeypore tract (undivided Koraput district)***, is conceived by rice researchers as the center of genetic diversity and secondary center of origin of rice. During 1955-60, the Central Rice Research Institute, Cuttack (India) collected about 1,800 landraces of rice. In a similar effort during 1995-96 made by MSSRF, only about 350 land races of rice could be collected from the same area. This indicates the rate of loss of genetic diversity in a span of forty years. The area, therefore, makes an excellent case for ecosystem approach to agricultural biodiversity conservation and management.

### **Intellectual Property Rights (IPR)**

The M. S. Swaminathan Research Foundation has been taking a leading role in this region for enabling tribal and rural families to derive economic benefit from their past and present contributions to conservation of genetic resources and has been developing the operational content of the concept of farmer's rights developed by FAO and enacted by the Government of India. For this purpose, documenting the ownership of landraces and methods of their conservation and storage are a prerequisite.

Various studies carried out by MSSRF points out that farmers have been growing traditional varieties for generations and, in this sense, there has been on-farm conservation. The diversity recorded in the region include:

- ◆ 340 landraces of paddy, (24 aromatic, 27 flood resistant, 2 deep water and 1 drought resistant and some others are having characters like insect/ pest resistant, puffing quality, etc.
- ◆ 8 species of minor millets,
- ◆ 9 species of pulses,
- ◆ 5 species of oil seeds,
- ◆ 3 species of fibrous plants,
- ◆ 7 species of vegetables

### **Landscape and land and water resource management characteristics**

The land is highly uneven and undulating comprising of hills, plateaus, valleys and plains with varying slopes. The topographic diversity of the Koraput region has caused diversity in ecosystems under which rice is cultivated like upland (unbunded as well as banded), medium land (irrigated and rainfed), low land condition. Within each ecosystem, innumerable rice varieties are grown depending on the local preferences for morphological characters (such as plant height, pigmentation of plant parts, grain shape and size, presence of awns) or cultural practices such as broadcasting, transplanting, food preparations (such as cooked rice, popped rice, puffed rice), palatability (aromatic or non-aromatic, etc.).

### **Shifting Cultivation**

The hill forest is used as agricultural field by the tribal by slash and burn method of agriculture which is also called shifting cultivation or locally 'Podo' cultivation. From February onwards the process starts by felling the trees and burning them. The ashes are left to fertilize the lands. With the summer monsoon sets in they make ready the land by simply stirring with hand hoes. Seeds of dry crops like minor millets and oil seeds are shattered at the top of the cleared space and are washed down the hill slopes by the monsoon rains. Mostly tribal hold the land for shifting cultivation for 2-3 years and wait for 5-6 years for regeneration of forest cover. Owing to this sort of cultivation, not only the valuable forest wealth is destroyed but also the vegetative cover of the land is disturbed and soil is exposed. Rain water down the slope carrying the fertile topsoil causing hill and gully erosion.

Agriculture is mostly rain fed. Small streams are used for irrigation. Erratic rain fallen and its uneven distribution has often caused drought situation. Recently some areas in the

region have irrigation facilities originating from a major river has changed the traditional agricultural practices. The new crops introduced are high yielding paddy and cash crops like sugarcane, cotton, and sunflower and improved vegetable varieties.

### **Indigenous and Local knowledge systems**

Significant use of the indigenous knowledge system by the tribal can be seen in their various agricultural practices. Considering the ecological limitations, tribal use the lands in the best way. This is also reflected in their food habit. Tribal on the hilly area take more minor millets compared to the tribal of the plain. Using their indigenous knowledge they take the viability test for seeds before sowing, maintain the soil fertility and conserve the landraces of rice and other crops. This knowledge has been transmitted from generation to generation among the family members and rarely among the friends and relatives.

Tribal have rich traditional knowledge on the forest species also. They identify and use plants for food, fodder, firewood, medicine, etc for their subsistence.

### **Medicinal Rice & Plants:**

Jeypore area is also rich in genetic resources of medicinal plants. More than 1200 medicinal plant species are available in this area. Some of the endemic medicinal plant species in this region are used for curing different diseases like gastrointestinal disorders, malaria fever, bone fracture, etc. This healing system is apart of the Indian traditional medicinal system. Bioprospecting of such precious germplasm is likely to lead to development of new drugs.

Very little research have been done so far in the area of conservation, sustainable and value added use, and equitable sharing of benefits with reference to the medicinal plant heritage of Koraput district.

MSSRF has started documentation and conservation of traditional knowledge through Community biodiversity Registers to document public knowledge associated with local biodiversity so that local communities can benefit from legislation to protect biodiversity with IPR provisions. The exercise resulted in registering traditional knowledge associated with biodiversity, registering domain knowledge among local people, directly from the field, with the help of resource persons, direct involvement of old men\women in the community, by analyzing folk traditions and myths and study of manuscripts. The registers are now maintained by Community Biodiversity Conservation Corps drawn from among the primary conserver community.

**Sacred grove** is an effective method of preserving plant genetic resources. It is a biological heritage as well as social mechanism by which a forest patch is protected. The

concept of sacred grove is found deep rooted in the minds of different communities irrespective of their geographical locations may it be a plain area or a hilly terrain. The sacred grove has religious significance since it is believed that the vegetation is under the protection of their local deities. The indigenous people know the importance of the sacred grove. To give more meaning to the sacred grove as an effective conservation measure, they attached a religious tag to it. Even today we find forest patches left to local deities as a traditional custom.

Jeypore tract being the center of origin and genetic diversity of rice has drawn the attention of rice biosystematics, geneticists and conservationists for the last half a century. In recent years the place has gained again importance with regard to Farmer's Rights and on-farm conservation, which are new dimensions of genetic resources conservation. It is, therefore desirable that the situation should not only be reviewed but also understood in proper perspective. In addition, large repository of Medicinal plant resources can also be beneficially used for economic empowerment of tribal and rural communities.

## **2. Goods and Services Provided by the System**

The region is a reservoir of the rich floristic diversity consisting of about 2500 species of flowering plants belonging to angiosperms, well known gymnosperms, 30 species of ferns. Due to isolation and physical barriers, nearly 4 percent endemism in the plant species has been reported in the region. About 79 plant angiosperm species and one gymnosperm are endemic and spread over 58 genera and 25 families, Fabaceae and Acanthaceae, being the dominant families.

Studies carried out by the Botanical survey of India and National Bureau of Plant Genetic Resources reveal that there is a rich assemblage of the species useful **for food** (*Amaraphophallus, Borassus, Cajanus, Caralluma, Cinnamomum, Citrus, Curcuma, Discoria, Glycine, Lablab, Limonia, Luffa, Mangifera, Momocardia, Musa, Oryza, Phylanthus, Phoenix, Piper, Rumex, Rubus, Sesamum, Setaria, Solanum, Sorghum, Syzygium, Zinziber* etc.); **for timber** (*Boswellia, Chloroxylon, Gmelina, Hardwickia, Pittisporum, Polyalthia, Shorea, Toona, Zanthozylum* etc.); **for medicinal purpose** (*Aegle, Caesalpinia, Costrus, Cissus, Embellica, Gymnea, Hypericum, Piper, Pogostemon, Psychortia, Rouvolfia, Sarcostomma, Solanum, Strychnos, Terminalia, Tinospora, Tylophora, Vanda* etc.); **for horticultural and ornamental** value (*Argyria, Bauhinia, Clematis, Cyanotis, Cycas, Dysophylla, Habenaria, Hardwickia, Oleo* etc) and **for fibre** (*Crotolaria* and *Decaschistia*).

According to Champion and Seth (1963) forest of Koraput can be divided into three major types: *Northern Tropical Semi-evergreen, Northern Tropical Moist Deciduous and Southern Tropical Dry Deciduous*. The forest was very rich in Sal, Peasal, Teak, Sisoo, Baja, Mohul, Bamboo, etc. However, during the last few decades, there has been rapid increase in deforestation rate leading to large scale degradation of forests. In 1960,

the district had more than 65% of the total area under forest cover, but in 1990, it has come down to less than 30%.

Large scale commercial exploitation of forest in the district seemed to have started in early part of this century. For instance, the Sal forests of Kotpad, Nowrangapur, Ramgiri, Malkangiri and Umarkot ranges were leased out to Ms. H. Deas & Co. in 1917 for 20 years to collect timber for railway sleepers. In early thirties, many forest-based industries (paper mills, plywood mills, etc.) came up in and around the district. The forests of Malkangiri, Mottu and Ranjis were leased out to Ms. Mottu Industries in 1937 for 22 years. Similarly, the forest of Bisam-Cuttack and Gudari were also leased to Ms. B.T.T. for exploitation of Sal trees. After independence, various development projects, industries and mining operations have also come up in the district.

All these have led to submergence of large forest and cultivable land, encroachment on forest land for mining and other purposes, large scale displacement of tribes, etc. Besides, there is large scale practice of shifting cultivation by tribes which also contributes to degradation of forest. Thus, the latest available forest survey report of 1993 shows that only 27.1% of the total area is under forest cover (FSI 1993). That means that during the last three decades more than 10,000 sq.kms. (>60%) of forest has been lost. What is more alarming is that more than 57% of the remaining forest is open (degraded) forest.

Forest assessment figures of Orissa state and Koraput district 1993 (Area in Sq.Km.)

State / District	Geographical Area	Forest cover 1993 assessment		Total	% of Forest Cover to Geographical Area
		Dense	Open		
Orissa	26961	3119	4195	7314	27.1
Koraput district	155707	27151	198194	47145	30.3

Amidst this large-scale destruction and rapidly dwindling forest cover in the Koraput district, it is highly noteworthy that in a large number of villages, the local communities have initiated the process of protection of degraded forest patches and allowed them to regenerate. This process of community initiated protection and management of degraded forestlands started since early seventies. One can see amidst vast degraded landscape, luxuriant tree growth. In addition, a large number of sacred groves in their primeval form are seen distributed throughout the Koraput district.

The district, as noted above, went through the process of rampant deforestation beginning from early part of this century. It is also noted that in many villages community initiated forest protection and management systems have been initiated. The exact number of such

villages and the total area being protected and managed is not known or documented, it can be safely inferred that the phenomenon is fairly widespread and in a substantial area of earlier degraded forestland biodiversity has been restituted.

MSSRF since 1998 has attempted to recognize community conservation and mainstream it into poverty reduction and enhancement of livelihood security with poverty. The major objective under this programme is to empower people and provide technical inputs for integrated natural resource management particularly of the rich genetic diversity of rice for poverty reduction. The initiative has helped impart and evolve techniques for quality seed selection, and for new 'formal' methods of cultivation to maintain soil fertility and increase crop productivity. The process started with a focus on enhancing the utility of people-preferred landraces (LR) of rice through simple, easily adoptable plant breeding techniques

The tribal people who were once finding it difficult to meet even their consumption needs from landrace cultivation have now been able to realize high yields that makes it possible to save considerable quantity of grain for sale. Recently market linkage has also been established to enable the tribal farm families' get some economic benefit.

MSSRF has been able to establish an integrated community managed and owned Gene-Seed-Grain Bank continuum as an approach for promoting conservation while ensuring food security.

The three banks have been integrated to support each other. The chain offers both ecological security and livelihood options. Loss of viability of seeds from the seed bank can be met by gene bank samples. The grain bank supplies excess grain as seed and gene material in times of need. Village councils or Palli Samitis and the Panchayats manage these banks, with support from MSSRF.

### **Marketing of landraces**

High yields from local landraces of rice having been established, their cultivation is being encouraged for sale in the market. Some are sold as grain and others after value addition as puffed rice, or other attractive food items. Awareness about market demand for local landraces with special characteristics like fragrance, taste, and medicinal properties has been created. Some farm families have been encouraged to take up organic farming, which has reduced the need for expensive purchased inputs and led to a renewal of interest in the cultivation of native variety.

As a result, the area under the local landraces has increased. Marketing of local landraces, medicinal plants and organic cultivation have had an impact on local incomes. Work is in progress to promote further production of seeds and grain of Kalajeera rice and marketing under a brand name.



### 3. Drivers of Change

*In-situ* on farm conservation of crop diversity and crop varieties is the best way not only to conserve the biodiversity but also to make the best use of traditional knowledge and experience for its utilization. This has been achieved by MSSRF through scientific support to conserve the local biodiversity particularly rice, evaluate its merits, document it, utilize it and safeguard the intellectual property rights of the community.

Koraput region is known for its valuable bioresources including the large repository of medicinal plants. Indiscriminate collection of the bioresources has led to severe depletion of bioresources including many unique land races and medicinal plants. Various developmental initiatives in the region those has taken places during the recent times such as industrialization and mining activities has further resulted in large scale exploitation of the invaluable resources of the region. However, all these developmental processes have ignored the local communities. The people have to walk now almost 10 to 12 kms to even fetch drinking water and other minor forest products. These changes are irreversible and requires immediate and concerted effort to conserve, value-add and ensure sustainability. These local resources need to be conserved for times to come.

Various developmental initiatives taken by the Government agencies do not always address resources of direct relevance to the local community. At the same time, there are several initiatives undertaken by the local Non-Governmental Organizations such as M.S. Swaminathan Research Foundation to develop bottom up approaches for the management of the bioresources and link them with enhancement of quality of life of these people.

With all these negative impacts of various top-down approaches to develop, the region provides opportunity for sustainable management of the local resources with people's participation. The new structures provided by the democratic institutions such as gram sabhas (village elected bodies) provides basic frame work for the people to get involved in various aspects of the management at the local level including bioresources, land use planning and ownership of the minor forest producers at local level.

The impact of change in the microclimate of the region is also evident during last few decades. Due to large scale degradation of the natural habitat, water scarcity has becoming a reality. In fact, the region with about 1600 mm of rainfall per year is affected by drought conditions almost for 7 to 8 months a year. This requires immediate attention for water resource management and productive land use planning based on water availability. By doing so, the people of the region can be benefited by brining in the degraded land to productive use thereby resulting in enhanced income level.

## 4. Policy and Development Relevance

### Information empowerment – genetic and legal literacy

Agrobiodiversity is a rich repository of many economically useful genes. The economic content of biodiversity and its public good value is deeply interlinked with the lifestyles, cultural value systems and associated traditional knowledge of the people. The conservation strategies are not restricted to the local community but find an echo at the policy level. In 1994, an initiative was taken to give recognition to the efforts of farmers as conservers and cultivators, resulting in the formulation of the Protection of Plant Varieties and Farmers' Rights Act 2001 (PPVFR) in the drafting of which MSSRF played a major role. In addition to acknowledging the important role played by farmers as cultivators, it also recognizes the role of tribal and rural farming women and men as conservers and enhancers of agro biodiversity, and legally provides for their recognition and monetary reward.

The PPVFR Act allows temporary ownership rights for specific period on plant varieties to those who develop them including farmers or community of farmers. The biodiversity Act 2002 establishes sovereign right over its biological resources, seeks to promote its conservation and sustainable use and entitlement for equitable sharing of benefits from commercialization of biodiversity or associated traditional knowledge to those communities, which had conserved or created them. These scientific advancements and legislative interventions have Implications on all communities, particularly farming and rural communities. The Gene Fund, National Biodiversity Fund and State Biodiversity Fund are some of the structures setup under the Acts to reward the primary consumers. The awareness on the role of biodiversity in biotechnology, the entitlements allowed to them by the two legislations and informed public participation in guiding responsible research in biological sciences are assuming increasing importance. Folk media like drama and street plays have been used to educate the communities on these issues.

A genetic and legal literacy movement has recently been launched under the banner of *Genome Clubs* of MSSRF targeting schools, youth, farmers, development functionaries and panchayat members in rural areas to address these issues. These clubs hope to create a cadre of young men and women with functional knowledge on genetics and legislations pertaining to biodiversity and rights of farmers on seeds. The programme envisages developing a cadre of *RURAL SCIENCE MANAGERS* in every village to sensitize and evolve methodologies for conservation, sustainable use and benefit sharing of the bioresources.

### Reward and recognition

The MSSRF's efforts in creating partnership in conservation of biodiversity and reduction of poverty involving tribal women and men at Jeypore, Orissa was one of 25 projects that were awarded the *Equator Initiative's* Innovative Partnerships Award for Sustainable Development in

Tropical Ecosystems at the World Summit on Sustainable Development held in Johannesburg in August 2002.

M. S. Swaminathan Research Station has also set up a Research and Development Centre in Koraput to undertake intensive and integrated study on medicinal rice and plants. The State Government has provided 6 hectares of land for the establishment of “Biju Pattanaik Medicinal Plants Garden and Conservation Centre” at Jeypore. The major aim is to establish an ex-situ genetic conservation center of medicinal plants of major tribes of the region. This center will develop a *heritage park* for medicinal plant species of the region used by the tribal communities and also identify the linkages between biodiversity and cultural diversity.

## **5. Global Importance**

MSSRF’s participatory work with the tribal farm families of Jeypore tract led to identification of best landraces of rice for upland, medium land and lowland ecologies. Sustainable and high production of landraces satisfied peoples’ consumption needs (reducing hunger) and marketing of surplus rice (because of improved productivity) gave economic benefits (reducing poverty), the principle dogma of MDG-1.

As already mentioned, the region is a rich assembly of unique floral and faunal diversity. As many as 79 species, are endemic to the region. In addition, people of this locality have been involved in traditional cultivation practices thereby conserving and preserving a large number land races of rice, millets, pulses and many medicinal plants. The changes in the traditional practices coupled with both natural and anthropogenic pressures require immediate attention for conservation of these unique species and genotypes for perpetuity. The initiatives of MSSRF in *in situ on farm* conservation of various land races, capacity building of the local communities for improved production methods, empowerment of the local communities to take their own decisions and establishment of the unique *ex situ* genetic heritage park, in this region will go a long way in developing effective systems and methodologies for conservation of this globally important agricultural heritage system.