

AGRICULTURE AND FOOD SECURITY
**Apatani Wet Rice Cultivation: A Highly
Evolved Traditional Agro-ecosystem**
ARUNACHAL PRADESH

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Introduction

Half of the world population is engaged in agriculture, the vast majority being in the tropics and the sub-tropics. Their agricultural practices are diverse, ranging from a variety of shifting agriculture systems, fallow systems, home gardens and sedentary systems such as wet rice cultivation (Ramakrishnan, 1992; Swift *et. al.* 1996). Small farmers in the wet tropics largely do rice cultivation to obtain their basic needs, because rice, like sugarcane, maize and others have a high calorific value (Finck, 1970). These traditional systems based on technology developed over many generations are often energy efficient, at the same time providing high economic returns to the farmer, as shown through many studies done by us in Northeastern India and subsequently synthesized in a UNESCO-MAB volume (Ramakrishnan, 1992). It is in this context that there is a renewed interest in these traditional agro-ecosystems. Though shifting agriculture (locally called *jhum*) is the predominant land use system in the Northeastern hill region of India (Ramakrishnan, 1992), the tribals here have other important agro-ecosystem types. Home gardens and wet rice cultivation are two other land use systems. The present paper looks at one of the most advanced traditional wet rice cultivation done by the Apatanis in Arunachal Pradesh in Northeastern India, in the context of valley cultivation as a land use system in the region.

Arising from this, the paper also examines at possible redevelopment strategies of wet rice cultivation so that it would meet certain basic criteria for sustainability, namely, that:

- (i) it should be possible to maintain them without major input of energy from outside the region,
- (ii) it should be compatible with environmental quality on short- and long-term basis,
- (iii) it should have the flexibility to meet not only present needs of the society but also the long-term demands through adaptive innovations and
- (iv) finally it should ensure equity with justice.

Rice Agro-ecosystem in North-east India

Like jhum, valley agriculture is practiced through out the hill terrain, both at low and high elevations of Northeastern region of India. It is a sedentary form of wet rice (*Oryza sativa*) cultivation and is a complementary system to jhum. It is done wherever the terrain permits, on flat lands between hill slopes. However, small terraces may also be built by some tribal communities all around the flat valley land extending into the foot of the hill slopes. This results in a saucer-shaped structure in which rice plots are organized. Obviously, this cropping system is restricted due to topography. The soil in valley lands is fertile due to nutrient wash-out from the hill slopes and therefore does not need added fertilizers. The main advantage is that the land gives sustained yield year after year, unlike the jhum system that is under cropping only once in a few years of fallow interval depending upon the jhum cycle.

The yield from valley cultivation of rice varies considerably depending upon the socio-ecological context in which it is done (Ramakrishnan, 1992). The ecological/economic efficiency of rice cultivation varies significantly. The Nepali migrants into the tribal areas, who are traditional rice growers often show a high efficiency in production. Differences between tribes are also to be found. Khasis and Garos often get economic yield comparable to a 5-yr jhum cycle where as the Karbis are able to obtain yield comparable to a 60-yr cycle; this is because Karbis take a winter crop of mustard which is highly yielding and thus a more efficient use of the land. From an energy efficiency point of view, these traditional systems, are generally better than most western agricultural systems, which yield only 1 or 2 units of food energy per unit of energy input (Spedding, 1975; Leach, 1976; Pimental and Pimental, 1979), compared to more than 10 units of energy harvested per unit energy input.

Wet Rice Cultivation by the Apatanis of Arunachal Pradesh

The Apatanis with a highly developed valley cultivation of rice perfected over centuries has often been suggested to be one of the relatively advanced tribal societies in the Northeastern region of India (Furer-Haimendorf, 1962, 1985). Wet rice land agro-ecosystems of the Apatanis, like those of other tribes, is also dependent upon nutrient wash-out from the hill slopes. With crop harvest, considerable quantities of nutrients are lost through economic yield and must be replaced for sustainable land use. Recycling crop residues and use of organic wastes of the village for sustaining soil fertility, as also done by the Apatanis is an effective way of restoring soil fertility.

Irrigation farming such as wet cultivation of rice require communal work to maintain it, and to improve the water delivery system. In the absence of a disciplined schedule and scale of water distribution among the beneficiaries, very often economic returns could decline drastically. The Apatanis with cooperative effort under the overall supervision of the village headman, have optimized water use along with nutrient use in their rice field. Therefore, an

understanding of the valley land agro-ecosystem function of the Apatanis becomes significant.

Cropping and Yield Patterns

Hari is an Apatani village in Arunachal Pradesh at an altitude of 1570 m. and has 418 families and total population of 2021. The average size of a family is about five, living in a large bamboo hut of 15x4 m. floor area. Wet rice cultivation is their only agricultural land use.

Apatanis, at Hari, make effective use of their irrigated land by planting early and late ripening varieties of rice. Early variety is sown farther away from the village where disturbance by animals and poorer irrigation facilities could be major constraints (Kumar and Ramakrishnan, 1990). Lower nutrient status on plots farther away from the village is another consideration. Thus rice plots closer to the village are nutritionally richer than those farther away. Closer to the village, where conditions are more favorable, late variety is preferred. Fish culture done here synchronizes well with late ripening rice variety. Further, rice is supplemented with *Eleusine coracana* cultivated on elevated partition bunds between the rice plots.

The early variety of rice had higher density but with reduced basal area compared to the late variety. Economic yield per plant and per unit area of the early variety was significantly lower compared to the late variety. The yield per hectare of *Eleusine coracana* grown on partition bunds of rice plots was higher in plots with early variety than in those with the late variety. Fish production done only along with late-variety rice was substantial.

With human labour as the major input (both men and women participating), the Apatanis obtain a high energy output. Labour input for rice/rice + millet where early variety of rice is grown was higher than for the late variety of rice. The Apatanis do not use draft animal power. The output from the system and the net return to the farmer was higher under late variety grown alone or with millet/fish, than under early variety of rice. The economic and energy efficiencies, and output per unit labour hour were also higher under the agro-ecosystem with the late variety of rice.

The exceptionally high energy efficiency of this valley land agro-ecosystem (60 to 80 units per unit energy input) is markedly different from the values discussed for other rice systems discussed earlier for other tribes in this region, with an output/input ratio of 4-18 (Ramakrishnan, 1992). The high-energy efficiency shown here also contrasts with that recorded for jhum in northeast India, which does not exceed 50. It is far superior to the traditional wet cultivation of rice of the Indian plains with an efficiency value of just about 9 (Mitchell, 1979) and that done elsewhere in the Phillipines (Nguu and Palis, 1977). With 27-35 MJ units of energy output per labour hour, this system compares favourably with similar systems of China (32.8 MJ) (Dazhong and

Pimentel, 1984) and more modern agriculture of industrialized societies (Leach, 1976), such as the United Kingdom, with an output of 40 MJ units. In the present context, it is significant that human labour is a free input being largely obtained from within the family itself, and for specific tasks alone through cooperative efforts.

With a highly developed wet rice cultivation, the Apatani economy is largely based upon agriculture alone (Kumar and Ramakrishnan, 1990). Widening plots by digging adjacent higher ground down to an irrigable level seems to be successful responses to population increase and new market opportunities. The net per capita monetary return through agriculture is high. As much as 40% of the rice produced is sold to the economically weaker neighboring tribes such as the Nishis and the hill Miris. However, the agro-ecosystem of the Apatanis could be improved through appropriate crop rotation and productive utilization of the land during the winter season. In spite of these possibilities, the Apatani village ecosystem is a good example of economic self-sufficiency of a traditional agricultural society that practices ecologically sound sedentary agriculture in the Northeastern hill region of India.

Incremental Pathway for Agricultural Development

Many traditional agricultural systems need to be redeveloped through incremental, rather than quantum change, based on traditional ecological knowledge; anything drastic may not find acceptance by the local communities. Apatanis like other traditional societies in the Northeast India, have a rich traditional ecological knowledge (TEK), as much as what the traditional jhum farmers have, on which their valley rice cultivation operates (Box 1). Capturing this traditional ecological knowledge can be done through an 'incremental pathway' for agricultural development, building upon the TEK, in a step by step fashion. Thus, one may have to consider a short-term compromise that may be constrained because of ecological, economic, social and/or cultural reasons, apart from a more ideal and perhaps desirable long-term strategy.

The most comprehensive application-oriented study on the 'incremental pathway', as a route for agricultural development is available through the case study on the shifting agricultural system from Northeastern India (Ramakrishnan, 1992), the conclusions of which have wider applications for this widely practiced land use system prevalent all over Asia, Africa and Latin America.

To elaborate one of the components in this developmental pathway, a keystone species such as the Nepalese alder (*Alnus nepalensis*), a socially selected and ecologically important 'keystone species', performing key functions in the natural and agricultural ecosystems, is extensively used by tribal societies for soil fertility management. This early successional tree species in the Northeastern hill region, which is traditionally conserved in the slash and burn plots conserve up to about 120 kg. Nitrogen ha⁻¹ yr⁻¹. We have shown that

under one cropping cycle, the system loses something like 600 kg. of nitrogen per ha. in one year of cropping. Under short agricultural cycles of 5 to 6 years, not more than 300 kg. ha² of soil nitrogen alone is put back into the system during the 5-year period. Introduction of Nepalese alder into the plot could recover all the 600 kg. N during a five-year period. Recovery of all the 600 kg. would otherwise require a minimum of 10 years of recovery period through natural processes of forest succession. In other words, introduction of Nepalese alder into the system under a 5-year agricultural cycle could stabilize the system, with adequate nutrient recovery. Apart from nitrogen fixation, the production of nitrogen-rich litter and mineralization also contributes to biological build-up of soil fertility. Thus, this species could be used for fallow management with community participation, since the people can identify themselves with a value system that they understand and appreciate, and therefore participate in the process of development. Similarly, the bamboo species that the Apatanis use around their agricultural plots is also a socially selected and ecologically significant keystone species.

Therefore it is not surprising that these considerations formed the basis for a decentralized village development plan in one of the Northeastern hill States of India. Over a thousand villages in the state of Nagaland has been organized into Village Development Boards (VDBs), with the specific purpose of rural development in mind. The VDBs were established taking into consideration the traditional village organization of the given cultural group; however, all of the VDBs had the same function, namely rural development. Using this institutional mechanism, the highly distorted shifting agricultural systems, which indeed is basically an agro-forestry system, but now operating at subsistence or below subsistence level, is now being redeveloped, by strengthening the tree component that has been weakened due to extreme deforestation in the region. The entire basis for this incremental build up is the rich traditional ecological knowledge base of these hill societies (Box 1). The project implementation by the Nagaland Government officials through Village Development Boards created by the Government of Nagaland and being implemented now aims at augmenting the traditional system of agriculture, rather than attempting to radically change it. The Nepalese alder based agro-forestry systems, with planting of trees done both in space and time (during the cropping and fallow phases of shifting agriculture) and maintained for hundreds of years, by some of the local tribes like the 'Angamis' formed the impetus for this initiative.

Reliance being placed on participatory testing rather than being transplanted into the field site by the extension agents, about a dozen tree species are being tested in over 200 test plots. Currently it is estimated that the agro-forestry technology is being tested in 5500 ha. of replicated test plots. Farmers have adopted this, for local-based testing in 870 villages, covering a total area of 33,000 ha (38 ha per villages x 870 villages); in these plots, local adaptations and innovations for activities such as soil and water management are emphasized.

Similar possibilities exist for redeveloping the Apatani wet rice cultivation in their valley lands. A variety of rice agro-ecosystem types exist in the

Northeastern hill areas of India, and this is indicative of the developmental possibilities. Many of them represent under-utilization of land and are inefficient. Traditional wetland cultivators of rice such as the local Apatanis of Arunachal Pradesh and the immigrant Nepalis provide are examples of a high degree of ecologic and economic efficiency for this system. In all these case, however, valley land cultivation is constrained by the availability of water for cultivation during the relatively dry winter months. Where tribes like the Garos at Lailad take two crops in a year, they essentially restrict their activity to the monsoon period.

A few possibilities exist for redeveloping this system so that the farmer is able to obtain better returns: (a) mere transfer of technology from one tribe to another could be helpful. The Apatani system of farming is one of the most evolved and highly organized system of wet cultivation of rice, (b) introduction of early maturing and improved varieties of rice would help in obtaining two or even three harvests in a year, (c) water is a major constraint outside the monsoon period. Rainwater harvesting and storage in tanks offers immense possibilities for irrigation. The run-off water from hill slopes could be collected in 70 to 80 m³ tanks lined with heavy-duty polythene sheets. They are cheap, easy to maintain and have a life span of 20-25 years (Kothyari, *et. al.* 1991). By harvesting surface run-off water of the rainy season and by diverting sub-surface seepage water through cheap rainwater harvesting tanks (Kothyari *et. al.*, 1991), we were able to link it with a verity of ecosystem rehabilitation efforts, which elicited enthusiastic community participation. This is only just the beginning towards an understanding Indian agro-ecosystem types and for their redevelopment on a sustainable basis.

Integrated Landscape Management

Agroforestry is an important and traditional land use system in the tropics, with large variations in terms of organization of crop-tree mixtures, and serving a variety of functions. With many tree species including bamboo around the plots, Apatanis also, in a sense, practice agroforestry. This option is attractive in that it combines improved food production, harvestable wood by the local poor, and in the process carbon sequestration through the forestry component, all within the same system. We have already seen the significance of redeveloping traditional agroforestry systems, as an option for agricultural and overall rural development too. In the context of global change - with a number of components to it such as climate change, biological invasion, biodiversity depletion, and land use and cover change which may ultimately lead to site desertification - and with all the uncertainties associated with the impact of global change (Walker *et. al.*, 1999) on agro-ecosystem functioning, agroforestry acts as a buffer and provides resilience to the system at the landscape level (Ramakrishnan, 2000). A more holistic approach to forest management in the tropics and agriculture redevelopment with emphasis on landscape management is crucial for sustainable management of resources, providing developmental benefits to local communities, based on equity and social justice.

With greater accessibility to external energy subsidies, the developed world may be able to maintain assured levels of production, at least in the short-run. Even here in the developed world and in the developing world too, modern agriculture needs to be buffered through landscape level heterogeneity, to counter undesirable impacts. Viewed in the above context, what we often have now in a landscape model, are small patches of pristine, often unmanaged, conservation areas (nature reserves) set in a sea of intensively managed monocropping agro-ecosystems.

There are many lessons that one could learn from traditional societies, in terms of effective agro-ecosystem/landscape management itself. Learning from adaptive social evolution of land use practices of these societies could be an important lesson one could learn to cope with global change related uncertainties. Realizing that biodiversity and ecosystem complexity do contribute in a variety of ways to ecosystem functions and that agro-ecosystems do harbour a great deal of biodiversity valuable for general human welfare, it is reasonable that we go in for a mosaic of natural ecosystems coexisting with a wide variety of agro-ecosystem models derived through all the three pathways. The relative area apportioned for each of these land use units would of course be determined by ecological and social location-specificities. In a landscape mosaic, agro-ecosystems form one, though important, of the components of a wide variety of ecosystem types: natural systems such as forest, grassland and fresh water pond or lake, interspersed with human-managed agricultural monocropping systems such as rice, wheat or maize fields, village woodlots, etc. A highly diversified landscape unit is likely to have a wide range of ecological niches conducive to enhancing biodiversity, and at the same time ensuring sustainability of the managed landscape itself.

The more recently evolved '*biosphere reserve*' concept of UNESCO, indeed, a rediscovery of the concept of the '*sacred landscape*' of traditional societies dating back to antiquity, is an attempt towards such an integrated management strategy to conserve natural resources for sustainable use, with inter-generational equity concerns.

Box 1. Biodiversity linked traditional ecological knowledge for soil fertility management (from Ramakrishnan, P.S. 1992)

- Traditional tribal societies in Northeastern India organize nutrient-use efficient crop species on the top of the slope and less efficient species along the bottom to match with the soil fertility gradient on a steep slope.
- With shortening of shifting agricultural cycle the farmer tends to emphasize more on tuber and vegetable crops, as compared to their emphasis on cereals under longer cycles.
- Operating under a mixed cropping system, where the species are sown at the same time soon after the first rain during the monsoon, the farmer harvests crops sequentially as and when the crop matures over a period of a few months; after harvesting the economically useful component, he recycles the biomass into his agricultural plot, which decomposes rapidly.

- Weed biomass pulled out of his plots are put back into the system for similar reasons; about 20% biomass of weeds which he leaves *in situ* without being pulled out serves important nutrient conservation role on a hill slope, which otherwise could be lost through erosive/leaching processes.
- Earthworms form an important component of many traditional agricultural systems. Under the Tropical Soil Biology & Fertility (TSBF) programme, some of our collaborators have designed an eco-technology for *in situ* management of earthworms for sustainable management of soil fertility, with reduced input of inorganic fertilizers in tea gardens of southern India; this technology is now patented by the investigators.
- Socially selected and/or valued species of traditional agricultural systems and those from natural systems often have ecologically significant keystone value; these keystone species often play a key role in nutrient enrichment of the soil; such species helps in redeveloped land use systems with community participation.
- Traditional eco-technologies, such as water harvesting systems and their use have been shown by us to be of value in altering soil biological processes and thus improving soil fertility, under a monsoonic climate.
- Apatanis manipulated sub-specific crop biodiversity (rice varieties) to capture nutrient differentials in the soil and optimize production from the agro-ecosystem
- Elaborate water management and nutrient recycling strategies represent a highly complex form of traditional ecological knowledge and technology linkages

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AGRICULTURE AND FOOD SECURITY
**A Peoples Movement for Conservation
and Livelihoods in Jardhargaon**
UTTARANCHAL

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Introduction

Situated in the hill district of Tehri Garhwal, Uttaranchal at an altitude of 1500 meters is Jardhargaon. It is part of the Chamba Block. Access to Jardhargaon involves a three kilometers trek from Nagni, which is the valley and nearest the road head on the Rishikesh-Tehri highway. Cutting across boundaries of administrative blocks people refer to this entire region as Hemvalghati. The name comes from the river Hemval, which originates from the Surkhanda peak in the Garhwal Himalayas and merges with the Ganges at Shivpuri, about 16 kms upstream of the town of Rishikesh.

Jardhargaon is a hill village nestling in serene and picturesque surroundings. On one side is the pine forest and village grassland. On the higher ridges is dense Reserved Forest covering an area of 429.5 hectares and comprising primarily of oak and rhododendron trees. Jardhargaon has about 17 settlements/hamlets. The different settlements are situated at quite a distance from each other, with about 3-4 families in every settlement, with the exception being Jardhargaon proper, which is the earliest and largest. With the growth in the population people from here spread out to various other parts of the village over a period of time. Cultivation is carried out in the valley, where most families own land, and on the terraced fields on the slopes. The total revenue land is 436.37 ha - of which 27.82 ha is irrigated land and 229.87 ha under Civil *Soyam Forest* (grassy wasteland in the vicinity of the village under the ownership of the Revenue Department).

Ecological Profile

The Garhwal Himalayas are located between the Shivaliks and the Higher Himalayas (to the South and North respectively). This part of the region consists of several fertile valleys with an agreeable climate and is densely populated. In this thickly cultivated area, deforestation has occurred to the greatest extent. The forests of Jardhargaon broadly fall under the 'Himalayan moist temperate forests' category. The forests are species rich. Dominating the forests are oak, rhododendron, *Kaphal*, *Chullu*. Oak (*Quercus leucotrichopora*) is the climax species. However the presence of *Chir* pine (*Pinus roxburghii*) amongst oak can be considered a potential threat to oak and associated species.

Studies done in this area by the *Beej Bachao Andolan* and the environmental N.G.O Kalpavriksh have documented the presence of and identified 77 wild plant species for food, medicine, fuel, fodder etc; 23 cultivated crops for food and medicine, 7 wild terrestrial animals for medicine, 6 domesticated animals for food, fiber, pack animals, etc and 7 fish and other aquatic species for food and medicine.

Pressure on Forests

Before the people's efforts towards protection of the forest began in 1980, heavy dependence on the forest for fuel wood and fodder had led to large-scale deforestation. Now, after almost two decades of conservation efforts, the regeneration of forest cover is visible. People report the reappearance of wild bears in the forest. However some factors continue to pose threats to the wildlife. These include damage done to crops by bears and monkeys, which might result in people turning against the animals. Forest fires continue to be a major threat. With an increase in pine trees the likelihood of fire has increased. Landslides due to quarrying and heavy rains also result in forest destruction. The continued reliance on forests, especially for fuel wood and fodder increases the pressure on the oak forests especially for meeting fodder requirements.

Livelihood Sources

The population of Jardhar is estimated to be around 3000 comprising around 300 families. The predominant communities are the *Rajputs* and *Harijans*. The *Rajputs* comprise of *Thakurs* and *Gorkhas* whose main occupation is agriculture. The *Harijans* comprise of *Kumhars*, *Mistri*, *Dalit*, *Lohar* and *Mochi*. Apart from these are *Bhakrias*, graziers belonging to the *Gaddi* tribe of Himachal who visit the forests of Jardhargaon to graze their flocks of sheep.

Agriculture and cattle rearing occupies the foremost position with the forest being an important source of sustenance in this primarily subsistence economy. The *Harijan* community and its sub groups are engaged in agriculture, house building, basket making, tailoring, black-smithy and making leather goods.

Important resource uses are the collection of fodder, fuel wood, fruits, leaf litter, and wood for wedding and house construction. Quarrying is done for house construction, but commercial sale is not allowed. Resin collection was done till a few years back but not practiced any longer. The bark of pine trees is used for making *mashaal* (torches) especially during the festival of *Diwali*.

Legal Status and Ownership Changes of Land and Resources

Jardhargaon has two categories of forests - the Reserved and *Civil Soyam*. The village was part of the kingdom of Tehri -Garhwal till its merger with the state of Uttar Pradesh in 1949. In the erstwhile kingdom all land were vested in the king. At least three-fourths of the villages were *hissedari*, cultivated by the

actual proprietors of the land. The peasants who formed a majority cultivated the land with the help of family labour. They had all the privileges of ownership except for the right to alienate land. Subsequently land came under the purview of the Indian Forest Act of 1927. However the legal position of these forests became clear only in 1965, when a new provision was added to the Act. Under the new provision all the Reserved Forests of the erstwhile kingdom were deemed 'Reserved' under the Act from the date of merger, with the same rights and concessions existing.

The Forest Department also recognises the *chaks* (fields) in the Reserved Forest under private ownership. The grassy wastelands near the village, or the *Civil Soyam* forests do not fall under any category under the Act. While the Revenue Department has proprietary rights over the land, the Forest Department's permission is required for felling any tree. Very recently (1998), these forests have been formally handed-over to the *Van Panchayat* (Forest committee instituted under the Van Panchayat Rules, 1976).

While the villagers have never had any rights in the forests, they have since long been getting all their requirements from these forests by way of concessions granted by the king. The same concessions have been allowed.

The people of the village do not have any legally recognised rights of ownership, control or management over the Reserved Forests. However, since 1980, the people through the *Van Suraksha Samiti* (Forest Protection Committee) and other institutions have been exercising de facto control over it, with absolutely no involvement of the Forest Department in conservation or management.

Bandhvan

A portion of the *Civil Soyam* Forest, next to the village pine forest, is closed from August to December to allow the grass to regenerate during the monsoons. This area is referred to as '*Bandhvan*'. When it opens in December, one member of each family is allowed to cut one headload of grass per day. This is monitored by members of the *Pani Panchayat* (committee for irrigation and grass cutting), who work under the supervision of the *Gram Sabha Pradhan* (village council chief). Grass is tied in pyramid fashion to trees in (the pyramid shape allows the water to drain off and prevents stagnation through moisture) individual household compounds, thus ensuring availability of fodder through the year.

Local Administration

Jardhar comes within the Chamba block of Tehri-Garhwal. The *Gram Sabha* elects the *Panches* (members of the village council) to the *Gram Panchayat* (village administration) from 11 wards. Five wards have been reserved for women and one for the Scheduled castes. Currently the *Pradhan's* post too is reserved for women. The Jardhar *Gram Sabha* meetings are generally held twice a year - after the *Rabi* and *Kharif* harvests. The Gram Sabha discusses various development-related issues under schemes like, *Jawahar Rozgar*,

Yojna Sunischit Rozgar Yojana etc during these meetings. The *Gram Panchayat* is assisted in its functioning by the *Panchayat Mantri* who functions as a secretary to the *Panchayat*.

Mobilising a Community - the Role of the Chipko Movement

One of the most significant events in the history of conservation in the Himalayan region is the *Chipko* movement. The movement started in mid-1981 with an indefinite fast by Sunderlal Bahuguna urging total ban on felling in the entire Himalayan region at an altitude of over 1000 metres. The response to the movement at the grassroots level was overwhelming. The movement led to the government imposing a 15 -year ban on commercial felling in the Uttaranchal region. Perhaps the most important impact of the *Chipko* movement has been the broadening of environmental consciousness in the people of the Himalayan region. The *Chipko* movement held commercial forestry and State support responsible for the deteriorating Himalayan environment. State forestry is not the only threat to the Himalayan environment. The location the Tehri Dam and mining operations also pose a severe threat to the ecology of the region. However, a sustained opposition led by *Chipko*, amongst others has matched increase in the level of ecological degradation almost step by step. The *Chipko* movement has had a broad ranging impact on *Jardhar* as well as some of the main leaders of the conservation movement in *Jardhagaon* and nearby areas. Some of these include Vijay *Jardhari*, Kunwar Prasun, Sahab Singh and Dhoom Singh. As a consequence many village level institutions have evolved and been influenced by the impact of the *Chipko* movement on this area.

Beej Bachao Andolan

In the *Hermval Ghati* of Uttaranchal, among the Himalayan foothills, some farmers under the banner of *Beej Bachao Andolan* (Save the Seeds Movement) have initiated a quiet revolution. Some of the *Andolan's* members like Vijay *Jardhari* and Raghu *Jardhari* have been traveling in the region collecting seeds of a large diversity of crops. Though the area has taken to HYV paddy cultivation, they report that many of the farmers get seeds from other farmers in the region who are using indigenous varieties.

Vijay *Jardhari* has a herbarium with over 120 cultivars of rice, giving details of local names, growing period and grain colour etc. Farmers still grow indigenous crops in small plots adjacent to commercial varieties. For the last few years *Jardhari* is trying out these indigenous seeds in experimental plots over about two acres. In all he has tried over 150 varieties of rice, an equal diversity of beans, 40 varieties of finger millet, 8 of wheat and a diversity of other crop species. Nor have these farmers restricted their activities to their own fields. They are actively encouraging other farmers in their villages to adopt some of the traditional seeds, which they have found useful for some characteristics or the other. Initially they met with resistance, since farmers using high yielding

varieties were not confident that traditional varieties would earn them a similar livelihood. However, some farmers who had begun to feel the pinch of rising input costs or were conscious of health and ecological implications of using chemicals, did take the advice. Some farmers are today in the process of completely switching back to organic farming with some of the indigenous paddy and other crop varieties, and interestingly expected to be economically much better off for it, since they could now forego expensive chemical inputs. Other members of the *Beej Bachao Andolan*, like Sahab Singh of Lasliyal village, Dhoom Singh Negi of Khadi village, and Bhupal Singh of Nahin Kalan village are now attempting to spread bio diverse organic farming in their regions and report results similar to those found in Jardhar. A series of *padyatra's* (foot marches) have taken them into remote areas of the region, collecting and spreading traditional varieties. They point out that some traditional varieties performed as well as high yielding varieties, needed lesser inputs, and produced more fodder material. The movement is growing and the *Andolan* has no doubt that as more and more farmers realise the treadmill that the Green Revolution has trapped them in, they will turn to a revival of bio diverse farming. (Kothari, 2000)

Origin of Jardhar's Van Suraksha Samiti

Jardhar's *Van Suraksha Samiti* (forest protection committee) came into being in 1980. It had its origins in the Forest Department's imposing a fine on a local villager for cutting a tree in the *Civil Soyam* Forest. The complaint was withdrawn under the initiative of Vijay Jardhari. He and others who had just returned after their involvement in the Chipko movement, discussed with the villagers the possibility of the forest being managed by the villagers themselves. These discussions ultimately resulted in the formation of the *Van Suraksha Samiti*.

The *Van Suraksha Samiti* has now imposed a total ban on cutting of greenwood and the bark of pine trees. In case of any violation, the offender has to pay the price of the tree, which is fixed by the VSS and the tree is not given to him. Trees that fall down are distributed to the needy for house construction and fuel wood at rates fixed by the VSS. The VSS has also issued notices to the *Gram Sabhas* of neighbouring villages of Hindwal and Bandhargaon prohibiting them from cutting green trees from the forests of Jardhargaon and also banned quarrying for commercial sale. A committee is being formed, which includes women members, for reporting offences. To enforce rules *Van Sewaks/Chowkidars* (forest guards) are appointed on payment of salary by the VSS. Currently this system is facing difficulty due to a lack of legal recognition and inadequate finances to pay salaries of *Van Sewaks*. Apart from using threat of punishment, violations are also tackled by means of discussions. As ex-*Van Sewak* Kripal Singh says, whenever he caught anyone cutting trees, he would confiscate the axe and at the same time explain the implications of cutting green wood.

With the formation of the *Van Suraksha Samiti*, the people have been exercising de facto control over both the reserved forests and the Civil Soyam forest. However, with the constitution of the *Van Panchayat*, the *Van Suraksha Samiti* has relinquished control over the *Civil Soyam Forest*. Now the *Van Panchayat* is legally entitled to manage the same. The people have decided not to hand over control of the reserved forest to the *Van Panchayat*. There seems to be an apprehension with regard to the consequences of doing away with the *Van Suraksha Samiti* completely.

Conflict Resolution

On 27th November 1998, the *Bandh Van* (closed forest) was declared open and one portion of the grassy area was opened to the villagers for grass cutting (one headload of grass per person) that day, as is the traditional practice. The other portions of this forest are opened only after the grass in the previous portion has been exhausted. However some people living in the lower region at Nagni started cutting grass from the portion that was to be opened only the next day. They were stopped by the *Thekedar* (supervisor) of the *Pani Panchayat*. These people complained to the *Pradhan*, whose husband issued a circular to say that the *Bandh Van* would be closed till such time that the dispute was resolved. This circular was given to the *Thekedar* only towards late evening making it impossible for him to inform the entire village regarding closure of the grass area.

The next day people who had arrived at the grass area were turned away by the *Thekedar*. They took their grievance to the *Pradhan*. After prolonged arguments it was decided that the issue would be decided at a meeting of the *Van Panchayat* scheduled for the 29th, pending which no cutting was to be allowed.

On the day of the meeting the turnout was substantial - there were 18 women present. When the issue was taken up, the *Pradhan's* husband at the very outset apologised for having issued the circular on behalf of the *Pradhan*. He admitted to have been in an inebriated state at that time. After a spirited discussion it was decided that the *Bandh Van* would be opened the next day and the people should not have been put to such inconvenience by keeping the *Bandh Van* closed for a day.

Results of People's Initiatives

After just over 20 years of starting the *Van Suraksha Samiti* - the result shows several hundred acres of mixed forest covering much of the slope above the village. A diversity of Oak (*Quercus incana*), *Burans* (*Rhododendron arboreum*), horse chestnut (*Aesculus indica*), Pine (*Pinus roxburghii*) and other species are present. Villagers also report that tiger, leopard, wild boar, deer species, and bear have made their re-appearance in the higher slopes.

That the people through the *Van Suraksha Samiti* have achieved regeneration of their forest only through regulated use of the forest over the last twenty years is remarkable. This has happened despite lack of formal recognition of the *Van Suraksha Samiti* by the state and in the absence of any legal right of the people to manage their forest resources. One of the main problems confronting the *Van Suraksha Samiti* is the lack of effective enforcement as there is no way of ensuring that offenders comply with the imposition of fines. Perhaps, the violations are not serious enough to undermine the initiatives started by the community.

Apart from the regeneration of the forest, the people through collective action have prevented environmentally disruptive activities. On the ecological front the primary strategy for conservation has been simply to allow the forests to regenerate by stopping green felling, grazing, and controlling fire. While very little planting has been done, some amount of management has ensured pine from taking over. The effects are now clearly visible, and once barren slopes are green again. A G.B Pant Institute study has found that the quality and diversity of the forests of Jardhargaon is better than most in the region, including those managed by the government.

Along with this regeneration, wild animal populations have also made a comeback. This includes endangered species such as bear, leopard, and tiger. Over a hundred species of birds are now inhabiting or visiting the area. The importance of the habitat for wildlife has been confirmed by observations of groups like Ecological Society and Kalpavriksh.

Certain factors such as forest fires, and landslides caused by quarrying and heavy rains, continue to pose a threat to the forests. However, it is worth noting that this was one of the few forest patches which was saved from being ravaged when the Himalayan foothills were devastated by incidents of forest fires in the 1990's, simply because the whole village rushed to douse the fire when it occurred. Clearly a sense of ownership and belonging were critical in Jardhargaon, where people have been alienated by official policies. The primary motive for these initiatives has been survival and livelihoods. As Mangal Singh Thapa, an elderly resident of Jardhargaon put it " it is necessary to protect the forests to fulfill one's needs and for the future generation. Protection of the environment is not a consideration in itself".

Possibly the greatest benefit of the community initiatives is the social empowerment and strengthening of the collective spirit is has bought about. This is seen in a number of actions. When the Forest Department took no action despite repeated requests to revoke the permit given to *bhakrias*, migratory graziers who had begun to affect forest regeneration in the area, the entire community was mobilised by the *Van Suraksha Samiti*, *Yuvak Dal* and *Mahila Mangal Dal*. The villagers marched up to the forest where graziers had put up their *dera* (settlement) and compelled the graziers to leave the forest. They have not returned since.

Subsequent to recent (late 1998) floods in the valley, contractors began collecting sand and rocks from the river- bank. The people Jardhargaon and neighbouring villages were mobilised and petitions were made to the District Magistrate asking him to restrain commercial quarrying. The District Magistrate issued orders staying commercial sale and allowing only the local people to use the material for their personal needs.

While it is difficult to quantify the economic benefits accruing from the protection of forests, some of these are discernible. Access to fodder, dry fuel

and other forest resources has considerably increased. According to the villagers, the number of water sources and the duration over which they hold water have increased. This, along with the availability of leaf fertiliser, has beneficial impacts on agriculture. Efforts are now on to process and market forest produce like apricot oil and scrub, rhododendron juice etc along with organic farm produce, but marketing and quality control problems have slowed progress on this.

Related Village Institutions

Pani Panchayat

Jardhar's *Pani Panchayat* (Village Water Council) has been a traditional and time-honoured system of irrigation to regulate water during periods of need and for equitable distribution amongst local farmers. Not many changes appear to have come into the system over the years. The term *Pani Panchayat* came about because this work is a part of the *Gram Sabha* responsibilities. Both the *panchayat* and the villagers keep an eye on its smooth functioning.

The local *Pani Panchayat* system covers the irrigated portion of Jardhar's agricultural lands, along with other villages whose lands meet at Nagni. The total area covered under this system is approximately 28 hectares. The method of irrigation is by the diversion of natural drainage streams, which are perennial or seasonal and diverted by simple methods through a system of channels known as *kuls* (or *guls*). According to Bharat Singh, now retired from the army and presently running a local provision store, Jardhar was inhabited, over 20 generations back, and the *kul* system evolved over the years keeping in mind the needs of this area. However Ram Bharose, now retired from the Horticulture Department, New Tehri, felt that the system evolved during the time of the *Raja* when tax was imposed on the peasants and a system was needed for calculating tax based on the farmer's irrigated holdings. Another view holds that earlier the villagers had their own *bandobast* (arrangement). With population increase, and water distribution problems starting, the villagers had to innovate in this direction.

For running the *kul* system, the *gram sabha* appoints a *mukhiya* or *thekedar* (headman) for its supervision and co-ordination. He has under him a team of 10 to 12 *kulwale* (channel maintenance men) who are appointed for one year from *kharif* (June) to *rabi* (May). The number of *kulwale* deputed to a particular site depends on the nature of the works to be done e.g seeding, harvesting or other agricultural operations. The main work of the *kulwale* is during the period June to September. During June the focus is on repairing the *kuls*, removing stones and otherwise bringing *kuls* to workable levels. During July the *kul* teams are on full alert, they have the responsibility of channelising water to the farms by rotation and during periods of water shortage to ensure equitable distribution of water, while working even during the nights.

While the main work of the *kulwale* is for a period of roughly six months, their responsibilities are not restricted to channelising the water or maintenance of *kuls*. Some of them are deputed to act as guards for the forest/grass or to

prevent animals from entering farms during a 4 to 5 month period. They are thus also known by the names of *Jagwale*, *Rakhwale* and *Bandarwale* for the protection and alerting functions they perform. The entire village takes part in paying the *kulwale* for their services, and payment is based in size of land holding. Wheat, rice, *jhangora* or *mandua* are given and no money is exchanged. At present the villagers feel that there is no need to tinker with this system as this arrangement just break down. However there is also the other viewpoint that not too many people want to do this work any more as it does not offer any kind of financial incentive.

The Mahila Mangal Dal

The post *Chipko Andolan* period (1986/87) saw the start of the *Mahila Mangal Dal* (Women's committee) in Jardhar. A social awakening had taken place during this period. While women had been participating in *Panchayat* activities since much earlier, their role had not been a very active one. According to Shri Vijay Jardhari of the *Beej Bachao Andolan* a process of *Mahila Shakti Jagran* (women's empowerment) was linked up with the programmes of forest conservation in the Tehri *Zilla* since the 70's. This along with encouragement to women's programmes by the government gave a major impetus to the creation of the *Mahila Mangal Dal*. This institution was most active during the period of 1990 to 1995 when the burning issues of saving the forest areas, illicit liquor, education and health were taken up. Again in 1997 the threat of limestone quarrying came up. The women in particular were concerned that dynamiting would dry up their water resources and life become insecure. Jamini Devi, Sonla Devi, Bachani Devi and Bimla Devi led the campaign during this period.

Forest Related Problems

At present the main issues concerning women are forest-linked problems: unauthorised cutting of grass & wood and maintenance of pathways. Women are affected directly by these issues, as they have to walk further for collection of firewood, water and grass. The previous *pradhan* (head), Phuldei had taken up the issue of illegal grazing by outsiders from Himachal. Goat and sheep coming in thousands were ruining the oak forests. She led protests and major demonstrations, which resulted in the Forest Department intervening and issuing strict orders against illegal grazing.

The *Mahila Mangal Dal's* forest related activities are mostly in collaboration with the *Van Suraksha Samiti*. Of the eight working committee members in the *Van Suraksha Samiti* three are women from the *Mahila Mangal Dal*. When the *Van Suraksha Samiti* looks into forest protection matters concerning damage done, fines to be imposed and surveys in connection with damage caused by the cutting of green wood, the *Mahila Mangal Dal* fully participates. It's *Adhyaksha* (head) Bachani Devi is part of the *Van Suraksha Samiti* working Committee. The *Mahila Mangal Dal* played an active role when a *Haryali Karyakaram* "Greening Programme" was undertaken during 1989 to 1993

under the *Harit Himalaya* Programme (Green Himalaya programme). Most of the tree planting work was undertaken by the *Mahila Mangal Dal* while the Forest Department had provided the plants.

Women's Protests Against Illicit Liquor

Women have been active in this direction and helped put a stop to all *kachi daru bhattis* (illicit liquor stills) in the area. In the late eighties when illicit liquor had assumed menacing proportions, women had ensured its eradication. Men's income was going towards liquor, leaving families in dire poverty. Leaders in this movement were local women like Bachani Devi, Sukhdei and Kwara Devi who along with the women of Patudi, Palas and Surkanda Devi villages had been part of the *Chipko* movement. While the women have been successful in closing illicit stills and government owned shops, the use of alcohol has still not abated in this area.

The Road Ahead

The background under which Jardhars's community based efforts started two decades back has changed substantially. People are able to fulfill their subsistence needs - adequate food and water is ensured which in turn helps agricultural productivity. The strength that has determined the sustainability of the initiative has been the moral factor; the people feel that the forest and the local resources are theirs; it provides them with their daily needs; and it is their responsibility to conserve the forests and resources for not only their own use but also for future generations. It is this that makes them raise issues, respect regulations imposed by the *Van Suraksha Samiti* and other village institutions, and move towards evolving yet newer directions.

AGRICULTURE AND FOOD SECURITY
From Food Security to Food Sovereignty
Autonomous Community Level Production Systems
ANDHRA PRADESH

P V Satheesh

The Deccan Development Society (DDS) has been working with the Dalit women for nearly two decades in the semi arid tracts of the Deccan plateau. The early efforts of the Society to create a more productive base for the dalit women to improve their lands through eco employment lead to a second initiative on enabling these women to lease in patches of lands from the richer landlords and work on it as a farming collective. Both these steps significantly contributed to the food security of the women. DDS started working towards *food sovereignty in place of food security*. This meant that it was not enough to empower communities to access food but to ensure their sovereignty to produce the food they want to produce. This was the goal of the following two initiatives of the Society:

Alternative Public Distribution System through Community Grain Fund

The Alternative PDS through Community Grain Bank was initiated in 1994 in Medak District of Andhra Pradesh where the Society works. The basic objective of this jowar based PDS programme was to ensure local production, local storage and local distribution. This was operationalised by advancing financial assistance to the marginal farmers in these 30 villages to reclaim their fallow lands through timely cultivation, application of farmyard manure and carrying out other timely farming practices. The agreement was that the money advanced will be returned in the form of grains which are stored in the their own village and sold at a cheap price to the poorest families in the villages. All the decisions were to be made by the community and nothing was to be imposed from outside. This programme was piloted in 32 villages involving about 1600 families covering 1000 Ha of marginalised farmlands. Through this alternative PDS the women brought over 1000 hectares of fallows under the plough.

They produced an extra 800,000 kilograms of sorghum in their villages in the very first year of the project. This meant that they were able to produce nearly three million extra meals in 30 villages or 1000 extra meals for each participating family.

Through this act they were able to explode the myth that it is only green revolution model of agriculture in high potential areas that can bring food security into this country.

The programme also generated a massive additional employment in every village that it was implemented. The extent was about 75 person-days of employment per acre which roughly worked out to about 8000 person-days of employment per village.

Such a massive and sustainable employment generation also has a direct impact on the purchasing power of the poor. The oft-repeated problem with the mainstream PDS is that even when there is enough food in ration shops, there is no offtake because people do not have the purchasing power.

The Alternative PDS of the Deccan Development Society has also found a solution for this vexed problem.

The fodder provided by the newly cultivated fields sustained over 6000 heads of cattle in 30 villages every year.

DDS Alternative PDS is much more than a food security initiative. It is a multidimensional activity involving

- Household food security
- Nutritional Security
- Fodder Security
- Livelihood Security
- Employment Security
- Sustainability

Two other points make it far more unique.

- In the mainstream PDS, for every seven rupees spent on the programme, only one rupee reaches the ultimate PDS consumer whereas in the Alternative PDS, out of every Rs 1.60 spent on the programme, one rupee reaches the ultimate consumer.

While a total of Rs.78 lakhs invested on the programme, it paid back Rs. 218 lakhs in the very first two years making the rate of return at 1:3, making it financially extremely viable.

- And finally the issue of management. The fact that this complex task was managed by groups of dalit women who are poor, illiterate and marginalised and were never allowed to manage anything in their lives is the most emphatic socio-political statement the women have made.

What we confronted was a simple truth that if these fallows had been put under production, they would match the amount of grains distributed under the PDS. The lesson was loud and clear. Even in harsh dryland conditions, every village community can be self sufficient in food production and can look after its own food security. But it must have access to resources and credit. Once it is made available, there can be vibrant food producing, food secure communities in this country.

- # Crop varieties have increased. Over 80 varieties have been under active cultivation now as against 25-30 varieties when we began the programme in 1996. Diverse cropping which was becoming an exception has started becoming a rule.
- # Extremely marginal lands have become productive. Lands which used to produce crops worth Rs.250-300 per acre have started producing crops worth over Rs.5000.
- # Seeds that can crop about 2000 Ha have been stored in villages within a span of five years.
- # Safe food and a variety of options are on the women's menu. A much changed circumstance than before. Forgotten foods from the past like Korralu, Saamalu, Aargulu, Bailodlu are in the kitchen. More pulses have added more proteins, more vegetables add vitamins have become available.
- # A rethinking on the harmful effects of the new agricultural practices has started. Tractor ploughing is no more the dream in many minds. Bullocks have come back to occupy the centre stage. {Deep plough through tractor upturns the fine and fertile top soil and brings up the hard subsoil while people's traditional shallow ploughing through bullocks keeps the fine soil on the upper layers itself.
- # Many people have started approaching the sangham women for seeds. This process helps make people move away from the organised, externally controlled market and helps a self-reliant seed economy.
- # Marginalised lands have found new value because of the upgradation of their productivity through manuring and tending
- # Marginalised crops have started moving centre stage defining new relationships with people. Low-status foods which have greater nutritional value but due to market and media manipulation have receded to the background are gaining new strength and are in the process of becoming Status foods.

- # Pricing policies for these foods among the sangham women has liberated them from the market perceptions. This has the beginning of a new market for the poor.
- # Marginalised people, the dalit women, have found a new status as seed providers, not receivers.
- # In the process of growing mainly food crops, women have regained control of family farming economic processes. The cash crop was the domain of the men who went to market to sell them. Food crop is the domain of the women. They get back to the centre of decision-making.
- # Agricultural processes have become internalised. No external input is being sought and obtained. There is an internal cycle of inputs which is being restored.
- # Seed control returning to women means the reestablishment of their intellectual leadership in the community. Seed keeping is not just a physical activity. It is an intellectual activity and forms the fulcrum of farming processes.
- # For Dalit women, it is a process of struggling out of their triple jeopardy. From the position of being dalit, poor and women, they are now managers of germplasm for the community. The upper caste rich men are coming to them seeking seeds: a position, which has an extraordinary historical significance.
- # This is also a process of strengthening the community against the new seed colonialism replete with TRIPS and IPR regime which are going to manifest themselves very heavily on the food and farming scene. The fact that poor women are fortressing themselves and their communities through their own control of seeds is the first victory in this long struggle.
- # Viewed from a simple economic angle, farms, which earned hardly Rs.300 a season, have started earning Rs.4000 now.
- # Cultivation costs have come down. Self-mulching crops like Niger, Little Millet and Horsegram which do not demand weeding are an integral part of this farming practice. Therefore they cut down the costs significantly.

AGRICULTURE AND FOOD SECURITY
Dryland Farming in Bundelkhand
UTTAR PRADESH

Parshuram Ray

The economy of Bundelkhand region is based mainly on agriculture. The soils here are mostly fertile and in spite of many projects of irrigation, the uncertainty of irrigation and its dependence on rains has made this region adopt mostly the traditional farming.

There are two main crops; Kharif and Rabi. Crop rotation and crop-mixture are synonymous with Bundelkhand's dry-land farming. Due to the soil condition and lack of adequate irrigation facilities, the general tendency in this district has been towards taking a single crop in the year with Kharif and Rabi alternating. Leaving the land fallow for one season has also been a tradition here.

The Bundelkhand region consists of 13 districts, namely Sagar, Damoh, Chhatarpur, Panna, Tikamgarh, Datia, Banda, Chitrakoot, Jhansi, Lalitpur, Hamirpur, Mahoba and Jalaun. Cultivated area in the U. P. part of Bundelkhand is about 60 percent and in the M. P. part about 42 percent. Because of the uncertainty of water availability to the crop, people in the greater part of this region have to depend mostly on dry-land farming.

It is true that Bundelkhand is also introducing one after another element of green revolution. However, it is still an area where highest percentage of agricultural land is under traditional farming and highest number of elements of traditional farming are practiced. Interview No. 1 Shri Santosh Singh is a farmer of Tai village in the Gursari block of Jhansi district. He has 46 acres of cultivable land. His entire family is dependent on agriculture for livelihood. He is doing modern agriculture in ten acres. The remaining 36 acres of his land is still under traditional agriculture. Wells are the only source of irrigation in this village. Santosh Singh says "Every farmer in my village is still doing dryland farming in more than half of his land. We use chemical fertilizers and pesticides only in those crops which are meant for sell. We do not put fertilizers in the crops which are meant to be consumed at home. The farmers of Tai village cultivate Kathia Wheat (traditional wheat variety) at a large scale. It does not require chemical fertilizers, in fact it cannot tolerate chemical fertilizers. We use organic manure made from dung. We get two sacks of Kathia wheat or Masoor in one *Bigha* through traditional cultivation. Whereas we get 6 sacks of

wheat from the same patch of land if we use the chemical fertilizers and pesticides. Still we do not find the later method as beneficial and benign, as it is presented to us. That is why we still cultivate our traditional varieties. The input cost of the chemical agriculture increasingly becomes prohibitive while the yield keeps declining. In fact it becomes a vicious circle. We do not want to fall into that trap".

Gursarai block of Jhansi district has 9 Judicial Panchayats, 59 village panchayats and 116 villages. Prabhu Dayal Goswami who is Assistant Development Officer in Gursarai says, "The entire area of Gursarai is unirrigated, therefore Kathia wheat is very popular here from time immemorial. It does not require any chemical fertilizer. Very low input cost of Kathia cultivation is the main reason behind its popularity in this area . In almost hundred percent of Kharif crops only traditional seeds are sown without any fertilizer or irrigation. Even in RAVI cultivation, more than 60% of agriculture is under dry-land farming with negligible external inputs.

Conclusion

Bundelkhand despite being one the most backward and poorest regions of the country has many lessons to teach how to live in harmony with nature and how to use nature's bounty for building sustainable livelihoods. Because, first of all, in a country where many farmers from Andhra Pradesh and Punjab find suicide as the only exit route from the debt trap laid out by chemicalised and high-tech agriculture, farmers of Bundelkhand are free from that trap. That is why, despite their poverty and backwardness, you would not find Bundelkhand farmers committing suicides. It is not incidental but intrinsic to their sustainable and equitable livelihood systems.

Secondly, when agriculture is fast becoming a "side-business" and not a full time occupation for the large number of farming families of Punjab - grain bowl of India, more than 95% of Bundelkhand's population is still directly dependant on agriculture for its livelihood. Thirdly, while there is mass exodus from rural areas of the country and people are migrating and settling in urban slums, people of Bundelkhand are still able to survive off their meager resources and leading a happy and fulfilling life in their own communities.

Fourth, despite government promoting hybrid varieties of seeds, farmers of this region have not only preserved their traditional seeds, but continue to cultivate the traditional varieties on a large scale. Fifth, despite encroachment of chemical fertilizers , there is still a very high proportion of organic manure made from dung used in this region. Sixth, though tractors are not absolutely absent from this area, very high percentage of land is still ploughed by bullocks. Every house has some or the other cattle. Animal husbandry is still a major pillar of Bundelkhand's agrarian economy and livelihood systems. Finally, there is almost hundred percent traditional farming done during Kharif season. This is not to romanticize and paint a rosy picture of Bundelkhand .Bundelkhand has its own set of problems and constraints. However, after

visiting Bundelkhand I have also begun to believe Satish Kumar, editor of Resurgence when he says, "Poverty is not the problem, our sense of prosperity is".

AGRICULTURE AND FOOD SECURITY
Kakching¹ Ethei²: 'The Soul Of The Soil
MANIPUR

Ksh. Kennedy

Introduction

The Kakching Irrigation canal locally known as “*Kakching Ethei khong*” has been serving as a source of sustenance for Kakching and its adjoining villages viz Pallel, Unapal, Bijoypur, Irengband, Mairambam, Hawairou, etc. since the earliest settlement of these villages. Our founding fathers with a rare foresight and vision dug up these 10 kms. long canal for their future generations. Since then, generation after generations has been looking up to this canal as a god send bliss for feeding the millions of mouths. In recent years, with the advancement of traditional agricultural technology, the importance of this canal has increased manifold. This canal has indeed earned Kakching the apt sobriquet, the “Granary of Manipur” and it is also due to Kakching’s agricultural products that the Thoubal District is regarded as the most productive district in Manipur.

That, besides irrigating several thousand hectares of agricultural land, this canal has also been catering potable water and other domestic purposes to the people. In the last survey operation of the year 1960, the canal (*khong*) was recorded at village no. 52 Pallel and village no. 58 and 59 Kakching Khullen along with various areas recorded in different dags originated from place commonly known as “Ethei Maru”. Unfortunately some of the villagers of Tuisimi village have settled recently in and around the canal and as such encroached upon the areas of the canal thereby causing a lot of changes in its character. Their plantations and other standing structures have narrowed the canal to a great extent and blocked the flow of water in the canal. However, the farmers of Kakching and its surrounding villagers numbering about 2000 removed the blocking of flow of water inside the canal in 1999. Even then the encroachment is still holding on the embankment along the canal. The cleaning of this canal and restoring it to its earlier shape is a must in view of the livelihood of its beneficiaries. Any insufficient supply of water in the canal will automatically result in the reduction of crop yields. In such an eventuality, the

¹ Kakching Village is in the Thoubal District of Manipur

² Ethei in Meeteilon means diverted water channel

loser is not only the people of Kakching and its adjoining areas but the whole of Manipur as well. Thus, it will be a good thing for one and all to restore the original character of the Ethei. Any change of its earlier set-up will be detrimental to the concern people and will also be an irreparable loss to the whole of the state of Manipur.

Land and People

Kakching, since time immemorial had been inhabited by a group of hard working people mainly engaged in agriculture and strive for a cooperative society. The people of Kakching are known as “Lois” by the outsiders and their official community status is Scheduled Caste. The place, in the due course of time, has advanced itself from the village level and now it has been upgraded to the status of a town and subsequently became the most populated and developed town next to Imphal, the capital of Manipur. The social, economic and political position of Kakching has changed dramatically. Thanks to the hard-working people of Kakching.

Chandel surrounds Kakching in the east, in the north by Irenban and Loushi Pat (*a local natural lake which was once agriculturally abandoned because of stagnant water*), in the west by the villages of Hiyanglam constituency.

The total agricultural area of Kakching is around 6411.83 acres. The place came under the jurisdiction of Thoubal District and is looked after by the Kakching Municipality. The inhabiting area under Kakching Municipality is around 1744.12 acres.

The history of Kakching, its origin etc. has been a matter of interest for the inhabitants as well as outsiders. However, there is still no up-to-date or accepted theory about the origin and development of this place and their inhabitants. But this is not to say that there are no writings about this place. For that matter, it will be worthwhile to quote hereabout Kakching from some of the available sources. In his book ‘The Metheis’(1908) T.C. Hodsun writes... “The Lois in the South-East of the valley of Kokching, who live by iron smelting, were once under the rule of Heirok King whose dominions stretched from Kakching to Imphal River. Mc Culloch states that the appointment of an official with the style and title of Budhiraj to govern Kakching dates from the reign of Garibniwaj”. (P9)

Kakching, the second largest town in the valley of Manipur is situated 45kms away from the capital city Imphal on the National Highway 39 and is inhabited by the lois (a scheduled caste community) numbering around 30,000. They are traditionally believed to be people exiled by the rulers of Manipur and were

treated as lower castes. Their socio-economic setting is strikingly rural based which still subsist on age-old agricultural economy. Kakching has been an important business center for the people of the surrounding villages and thus acquired a tremendous importance for the well being of the people of the region. Presumably, the settlement was one of the results after much thinking keeping into consideration the viability of productions, work avenues and many other future prospects. This could be seen from the very fact that this place is neither very far from the hills nor from the valley areas and it has enough land for agriculture. One very unique and peculiar landscape of Kakching is that in most of the valley areas in Manipur is inclined from North to South whereas this area is inclined from South to North. Because of this peculiarity, the main river Sekmai and many other canals flows from the Southern to the Northern parts. This extra ordinary landscape exclusively helps in controlling flood in this area. In short, the way of settlement of Kakching is indeed unique in nature and as such there had been so far no large-scale damages caused due to flood in this flood prone state of Manipur.

Ethei

By '*Ethei*' we mean a particular area where the Sekmai River is blocked to divert water to other areas. The people of Kakching with the help of the villager of the surrounding areas have been over the years doing the job of blocking the river annually so as to supply waters to the agricultural lands. However, during the reign of Churchand Maharaj the job of blocking the river has been entrusted to a few selected persons who were duly approved by the people. Since then, this selected group of people has done the major works of blocking the river and distributing the waters. The farmers are charged annually according to their land holdings. The chargeable amount changes from time to time. The concerned persons bear all the responsibilities of blocking vis-à-vis the materials; manpower etc. and they arranged the requirements in advance. But then, most of the works or any issue related to the '*ethei*' are under the strict control and supervision of the King and his officials of Kakching.

Ethei Committee

The main responsibility of the *Ethei* rest solely on the shoulder of the "Kakching Ethei Committee". The committee has an Advisory Committee with the local M.L.A. as an ex-officio member and other public leaders and social workers. The Committee as its Office bearers has a President and a Secretary. They are chosen among the farmers and the cultivators and will be in office for a term of one year.

Source of Income

The Ethei committee collects in cash or kind from time to time from the farmers and cultivators to meet the necessities of maintaining the Ethei. The

aid and grant from the govt.'s side is minimal. And it is run purely with the contribution of the people and the sympathizers.

Ethei and its Usefulness

A major canal directly from the 'ethei' runs through the Kakching area from these major canals. According to the location of the agricultural areas and conveniences other smaller branches of canal were made so as to give enough waters to the agricultural lands. The committee (person selected for blocking) also charges the farmers for making these small canals too.

Some of blockings (*Thingels*) that came up in recent years are:

1. Sagolthong Thingel
2. Wairi Thingel
3. Uyathong Thingel
4. Anganlou Thingel
5. Tera Lou Thingel
6. Heibi Lou Thingel
7. Uthum Lou Thingel
8. Khongangcha Thingel
9. Ucha Lou Thingel
10. Noyoni Thingel
11. Akutpi Thingel
12. Naodam Thingel
13. Mangkhongnang Thingel etc.

In the due course of time, taking into consideration the viability and the conveniences, the situation, the blocking areas shifted and subsequently some of the blocking areas are no more existing. Among the important *Thingels* Sagolthong, Wairi, Uyakhong, Khuman Khongnang and Naodam can be mentioned. At Kakching, there is a particular religious place known to the locals as '*Sengrong*' where the people blocked the water annually with religious rites. This is done particularly because there is a belief that it is a boon for the people if the water is conserved there permanently. With this view, a permanent blocking is done at this Thingel. But, there was a crisis in 1936 when some people tried to open this permanent blockade however with the interference of the Kakching king Thanil Budhiraj and its officials the matter was resolved stating that the particular place is closely related with the local deities. And as a result, the permanent blockade at this place exists till date.

The king made laws of water sharing from time to time. In 1939, the issue of water surfaced in the Panchayat and thereby after much deliberations and discussions agreed that every northern part of the mouth of the *Thingel* should be 2 fts. in breath with the depth of $\frac{1}{2}$ ft. this shows that the water is used and shared under certain rules.

With the change of time and relative increase in the population, people were compelled to find more areas for agriculture. And thus, the wastelands were turned into agricultural lands. This means that the need for water multiplies. With these developments there was an imperative need to make new canals and branches so as to cater the ever-increasing demands of the farmers and cultivators. Therefore, many new canals and branches came up during this period. In 1947, one Nongmaithem Pitamber Singh, a dukandar (shopkeeper) by profession, of Kakching Bazar requested the Kakching Panchayat to allow

him to dig a canal from Heikakpokpi to Wairi Thingel at his own expense. The panchayat accepted the request and thus a new canal came up and was christened as 'Dukan Khong' acknowledging the contribution of the said dukandar.

Ethei and Agriculture: Fairen *Tha* (the month of February), people started venturing out of their homes towards their 'Lou'(paddy fields) for agriculture. The farmers of Kakching and its surrounding areas solely depend on the nature for agriculture. In this regard, the *Ethei* plays a vital role in accessing water to the farmers. It could be well said that *Ethei* is the Nile of Kakching and the people will really have a hard time in their existence in its absence. The *Ethei* is truly the soul of Kakching and because of this, the major percentage of the agricultural products particularly, our staple food - rice - comes from this part of Manipur. From this very fact, the outsider knows Kakching as the 'Rice bowl of Manipur'.

AGRICULTURE AND FOOD SECURITY
**Doodhatoli Lok Vikas Sansthan (DLVS) --
A Silent Revolution in the Himalayan Foothills**
UTTARANCHAL

Parshuram Ray

Introduction

*'Ghas, Jungle, Khet, Pani
Yoo ka bina Yojana Kani'*

(No development plan can succeed unless it includes conservation of grass, forests, farmlands and water).
DVLS's ecological 'battle cry'

Chipko to many of us may look a thing of the past. But the spirit and legacy of this world famous environment movement in the hills of Gharwal Himalayas which ushered India into a new era of environmental activism and awareness are not only alive, but growing strong and spreading wide.

The legacy of lessons and ideals left behind by Chipko are creating waves of environmentalism, ecological regeneration and peoples movement regain control over their lives, livelihoods and lifestyles all over India. However, seat of Chipko, the hills of Gharwal Himalayas are now witness to a series of initiatives, campaigns, struggles and Peoples movements which have been directly inspired by Chipko. The Chipko's ghost seems to be stronger than the real Chipko. Among the innumerable inheritors of Chipko's "green legacy" The Doodhatoli Lok Vikas Sansthan (DLVS) under the dynamic and dedicated leadership of Sachidanand Bharati seems to be the most remarkable and successful. DVLS has done the pinnacle work of ecological regeneration and environmental protection in the most inhospitable terrain of Pauri Garhwal and Almora districts of Uttarakhand.

In more than 136 villages, DVLS is directly involved in the formation of Mahila Mangal Dals (Women's Welfare Groups) spreading ecological awareness among villagers afforestation and protection of forestation from the axes of unscrupulous 'forest department' and forest Mafia, management of watershed through digging water - pits. In another 150 odd villages, DVLS has been instrumental in inspiring villages to form Mahila Mandal Dals and ecological regeneration. DVLS has also helped more than 30 inaccessible villages in

installing solar power and making these villages completely self reliant for their energy requirements. In the last two decades DVLS's incessant efforts to revive and regenerate the once degraded ecosystems the once degraded ecosystems of Doodhatoli with barren hillsides, isolated tree trunks and parched lands to a stretch with lush green forests enough to tract the fodder and fuel needs of villagers without any damage to the ecological niche and not only regenerating the dried and not only regenerating the dried and depleting streams, but giving birth to many new waterbodies and streams (locally known as gaghara) resulting in increase of water volume in Ganges' two major tributaries, Pasol and ... The most remarkable thing about this incredible saga of ecological regeneration is that there is hardly any financial support that has come from outside. In all these 20 years, DVLS has received a total amount of Rs. 16 lakh from all the sources put together. The real capital of DVLS is the villagers. Their incessant effort to receive their village forests and water bodies has been the only "funding" that has created waves of environmental regeneration in more than 300 villages of Doodhatoli.

Beginnings

Though DVLS was formed in 1980, the germs of this green movement were laid way back in mid seventies the hey-days of Chipko movement. The man behind the DVLS, Sachidanand Bharati was a student of Gopeshwar College and Gopeshwar being the hotbed of Chipko movement, Bharati has plunged head long in the movement.

Shri Sacchidananda Bharati, a young lad who had been witness to the rampant and agonizing destruction of this homeland, was then a student at the Gopeshwar College (Gopeshwar was the center of the Chamoli district and the hotbed of Chipko movement). The outreach of the non-violent movement had extended beyond the arms of women activists and infused the youth of the region in equally the new form of struggle, that has come to be regarded as one of the foremost environmental movements of the country.

Enrolled as a student of Science in the Gopeshwar University, Chipko lent a unique opportunity to the young mind, to interact with the realities of his immediate environment. In '74, he was instrumental in forming a Saturday club of his fellow students, serving as an open platform for discussion, debate and generating awareness about environmental and developmental issues. But not to rest easy within the confines of college life, he actively participated in the Chipko campaign. Often travelling long distances in the adjoining villages and far-flung hill districts, along with his young college friends and Chipko activists. He helped form many 'Yuva Nirman Samitis" or youth organisations, committed to the task of saving and planting trees. He was also the force behind, the building of the 'Uttarakhand Sangharsh Vahini', a volatile students forum, comprising of young college students, of the entire Uttarakhand region. In '76, he formed Daliyon Ja Daghra' (literally meaning friends of trees), an

informal youth group, which played an important role in spreading the Chipko word and highlighting the need for environmental conservation and networking for people's interests. Many a times, the team of young lads, would travel to neighboring villages around the Gopeshwar town. Interact with the village people in an evening meeting and raise the slogan of environmental protection in an early morning 'Prabhat Pheri' (Prabhat = morning, Pheri= procession) with the people. But the spirit of activism was not just limited to oral vocalisation of the cause. It was followed by voluntary physical labor or Shramdan. Planting of tress, digging of earthen pits or protection walls. And this enthusiasm was not deterred, by the long walks in the hilly terrain to reach into even villages. This initiated Bharitiji into the realm of local interaction, planning and participatory action.

With this experience of committed action and fearless initiative, Bharitiji returned to his village in Ufrainkhal, in the Pauri district. Ufrainkhal in the hill dialect finds meaning in 'Ufrain' denoting 'uppar' or up, upper and 'khal' implying a small body of water. 'Chaals' or 'Khals in the hills, are synonyms for small ponds or lakes or reservoirs, similar to small talaabs in the plains.

Curbing deforestation was one aspect of the fight, the real challenge lay in reviving the lost process of regeneration and restoring the blanket of green on the bare hillsides, involving active participation of the people. In the spirit of triumph, the people were motivated to initiate the spirited endeavors of afforestation. The atmosphere was ripe for honing the empathy of the tempered forest official lobby and the heartfelt need and concern of the people. The reality of co-existence and mutual benefit was conducive for the launching of the first major joint afforestation activity of the people and the government lobbies. The destroyers had joined hands with the nurturers, to become saviors of Doodhatoli.

In the pre-monsoon season of '80, the ideal afforestation period, more than 50,000 young saplings of indigenous species were planted in the catchment area of the native river Pasol, the tributary of the Nayar river, in the villages of Gadhkharak, Bhatbo, Kundanpur, Ukhlieu and Kafalgaon.

In the meantime Bharitiji had also taken on the responsibility as a teacher in the local Inter College (an intermediate school) in Ufrainkhal. His interaction with the teachers, the imparters of knowledge and the students, the receiving, perceptive minds, was a meeting of right timing. The new generation was in the process of being prepared, to take on the mantle of people's struggle. The seed of people's crusade was ready to be sown on fresh minds, a new force was in the making.

On 26 July, '80, an environmental camp of three days was organized by the Inter College, Ufrainkhal in which 150 people young and old from the neighboring villages participated. Actively cooperating in the spirit of mutual

concern and fraternity. It became the forum of free exchange of ideas, comprehension, information to bring together, the people of Doodhatoli, for years of strife in future.

Facilitated by the people's commitment for 'Rachnatmak' or creative and constructive mandate. This camp saw the formation of a people's organization called the Doodhatoli Lok Vikas Sansthan' (Doodhatoli People's Development Organization), a humble effort of the people named after their mountain, Doodhatoli as a tribute to conserve and safeguard their benefactor. (The Doodhatoli Lok Vikas Sansthan was formally registered in 1982). Thus the people of Doodhatoli had survived on a closely linked agro-pastoral lifestyle.

Ecological Challenges

The people of Doodhatoli, have been practitioners of indigenous agricultural systems, aimed at sustaining the long-term productivity of their lands, for local consumption and not short-term maximization of yields for sale. And though in the contemporary jargon, this may be indicative of subsistence farming patters, what needs to be acknowledged and appreciated is that, since mountains are often comprised of narrow altitudinal belts of complex ecosystems, successful mountain agriculture requires much higher level of risk management than is required in less diverse lowland systems.

In the shrinking resource base of the mountains and the receding forest line of Doodhatoli, many villages like Gadhkharak, Ufrainkhal had not only lost their surrounding village forest and thus hungered for their daily fuel and fodder needs, but had also come under the direct attack of the mountain wildlife. The large-scale deforestation of the mountain hills had displaced not just the flora but also the fauna, from the deep recesses of their natural habitat. As the forests grew incapable to meet the food needs of the wild animals, they had started to enter the village limits, into the areas of human habitation and wreck havoc on the farmlands. Destroying the grain stocks or preying upon the smaller cattle heads, carrying away goats or sheep at night. In earlier times, the bounty of the forests had assured adequate fuel and fodder resources for the people and game for the wildlife but in the early '80's, most of the villages had not only to deal with scarce fuel and fodder but also the growing menace of wild animals. Cases of man-eating tigers were becoming common.

This recurring hardship became the focus of the Doodhatoli Lok Vikas Sansthan's activities and the strategy employed, brought the women strength to the fore. Concerted effort required active cooperation and organization of the people. And the strength of the people lies in the strength of the women of the hills. The women of the villages readily came forward to shoulder the responsibility of change, starting with the formation of 'Mahila Mangal Dals or women collectives.

The women of the region, have been the custodians of immaculate knowledge and wisdom of the indigenous species of plants and trees that needed to be planted, to meet their fuel and fodder needs. And to safeguard the green cover from the animal menace, it was collectively decided that stone protection walls were to be built between the forest line and the agriculture fields, on the band of 100 - 200m. of uncultivated land, as a security net surrounds the farm lands of the village. This obstructed the entry of the wild animals into the cultivated fields. In Daera village, which was severely in the grip of animal fear, a stone protection wall of 9kms in length with a height of 2m. and a width of 50cm., was built on the strip of uncultivated land between the forest line and the last outpost of the village farmlands. Along the wall, indigenous species of trees were planted to regenerate the lost forest cover. The wall proved to protect the village lands against the entry of wild animals while the regenerated trees supplemented the fuel and fodder needs of the village.

But the human endeavors required monetary support to nurture the impoverished land. Though the local forest departments had been supportive in supplying young saplings, still most of the species were unsuitable for the climatic conditions of the high altitudes. Brought from far-flung areas, these tender saplings had poor survival rate, till they reached the mountain forest nurseries. The village people were keen to propagate the indigenous species, home to the mountain climate and best suited to meet their fuel and fodder needs. The breakthrough came, with forest department extending funds, to help establish a nursery of indigenous mountain vegetation species. Afforestation activities found new roots and Gadhkharak became the fertile ground of people's efforts and dreams.

Gadhkharak is a small village, balanced precariously within one of the rolling slopes of the Doodhatoli range. Perched at a height of about 6000 ft. it lies about 2 kms. downhill from the motor head at Ufrinkhal. (In effect Ufrinkhal village is more of a sub-village at the vertical head of Gadhkharak). The cluster of 20 households had been residents of Gadhkharak, for generations. Home to Bharatiji's childhood. The lands of Gadhkharak are bordered by the small river of 'Pasol' (a tributary of river Nayar), snaking through in the valley at its feet and covered by the village forests at its head. Interspersed between the village settlement and the river, stretch out the terraced farms.

The people of the village recalled the earlier times, when the forests of Gadhkharak, offered a dense canopy of 'Banj' (Oak), 'Uttis' (Alder), 'Burans' (Rhododendron), all endemic to the region and was sanctuary to diverse flora and fauna. But much of the green density was lost in the last few decades, when the needs of the people exceeded, far beyond the largesse of the forest. Slowly but surely the land had lost its firmament. In fact in the name of the village, 'Gadhkharak' (Gadh in the Pahari dialect literally means river and 'kharak' implies cattle shed) denotes the time, when the dense green cover of the region, had sheltered large cattle heads in the close proximity of the river

Pasol. The site of the nursery was selected at a thinned -out patch in the Gadkharak forests, lying between Ufrinkhal at the top and the main village settlement below. It was a challenge for the people, to nurture about 25,000 young saplings. Rows of shallow trenches lined the terraced landscape, infusing life into the various indigenous species of plants, lovingly tended by the people.

Simultaneously, stone protection walls were also built between the forest border and the terraced slopes. Along the wall, the people planted fuel, fodder and fruit trees. The main objective of the people was to curb, further degradation of the remaining forest cover and complement the regeneration of the stark, barren hillsides. Afforestation was also undertaken on the impoverished lands that had become too poor to be brought under plough and required special care to recover their lost vitality. The trees that had once stood tall and upright were reduced to stumps, poorly anchored to the ground. The lush, green hillsides wore a gnarled, isolate look. A picture of decay greeted the eyes. The village of bounty had been reduced to remorse. Could the land bear the test of time, patience and once again reward the people of their efforts, and recover its lost ground, was the lurking doubt, upmost in the village minds. But this once, the people had avowed to try their best.

The conservation of land was not just in raising a nursery and planting trees. The fortitude of the people was set to trial, with the decision to enforce a 10-year restriction on one part of the village forests, to lend a hand to the game of nature, to facilitate the process of natural regeneration. Untouched by external forces, to allow nature to take its own course. Both the land and its people underwent a test in time. While it was the potential, the latent power of the land, it was the patience and self-discipline of the people on trial, charged by the selfless labour and service of the Mahila Dals.

Gurli Devi of Gadkharak has been the epitome of the women's strength. The women's collective had members from each household. And a security network was adopted to ensure, that unwanted trespassers were kept at bay and the imposed restrictions, not violated. The women took on the task of being clever watch keepers; vigilant and determined. To the beat of the 'Khankar' (a wooden pole or 'jhanda' served with 'ghungroo' or Khankar bells at its top), the women patrollers announced their presence in the vicinity. A rotational system of responsibility ensured the patrolling the protected area in the morning till the time of the afternoon meals. Placing the 'Khankar' on their return outside the door of the next team, to take over the change in duty from the afternoon to evening. The division of duty and the sharing of responsibility is planned out in the monthly meetings of the Mahila Mangal Dals. The courtyard of the houses or the Panchayat Bhavan, become the scene of a women's meal every month.

The sustained efforts of the people bore fruit. The village nursery raised more than the required healthy plants. And the successful experiment in

Ghadhkharak raised the hopes of the dejected neighboring villages. The surplus, young plants were bought by the forest department and the endeavors of Doodhatoli Lok Vikas Sansthan, won the confidence of its monetary funders. A scheme to replicate the nursery plantations with stone protection walls and environmental awareness camps was granted for 10 more villages, for a period of three years and by late '85, the hill people began their tryst with destiny.

Community Organization

The outreach of the Doodhatoli Lok Vikas Sansthan, in more than 136 villages within a decade of its inception has been the out come of local interaction and participatory action facilitated by the four annual environmental camps held in different villages. Two camps in the winter season and two camps in the summer. The environment camps are an exercise in awareness generation, understanding, learning and educating, but the crucial element of this comprehension it put to task in the long hours of 'Shram' (labour), selfless voluntary physical service. The month of Jeth (June), pre-monsoon period), heralds the first camp of the year. Dedicated to the repair or renovation of the stone protection walls and watering of the growing plants, in the thirsty season of summer heat. But with the first shower of rain, the land is ready to accommodate, fresh new saplings in its fold. The months of July or August are peak seasons for afforestation and plantation activities are in full swing.

The third camp of the year is again in the pre-winter period. Generally held in the month of Ashad (October) Sharad is slowly creeping in. This is the time to dig out the earthen pits, required for planting the winter saplings. The last camp of the year is scheduled for the month of February (Magh), in keeping with the time for winter plantation. Thus, the schedule of the environment camps, is governed by the needs of the plants. Two summer camps, one in preparation and the next for direct planting, in keeping with the species to be planted in the monsoons and two winter camps for plants requiring winter plantation. The environmental camps are planned for a period of 3 - 10 days, depending upon the leisure period of the native agro-pastoral communities. Often one village becomes the camping ground while Shramdan extends well into 2 or 3 neighboring villages, according to the need and the enthusiasm of the participating villages. Mostly participation is not just limited to the host village. People travel long distances to contribute and dedicate their services.

Mahila Mangal Dals of the various villages come together and it seems as if floodgates of communication and interaction are opened. The camps are the notes of hopes and despair. These camps in the hills have become symbolic 'Jan Sammelans' or people's Mela. The beginning of the camp is marked by a joyous procession, complete with Dhol and Shenai announcing the people's festival, in active labour and services. The sweat and toil of the bare hands is rewarded with the springing to life of barren lands. And the constructive and

creative efforts of the people have never gone to waste. For even wasted land has come to life.

The seeds of life are a treasured asset. There can be no plantation without the crucial seed that nurtures the sprouting plant in its womb. The Doodhatoli Lok Vikas Sansthan and its people have been self reliant in raising plants for afforestation. With the initial grant and the sale of their saplings, the organization declined external support, only accepting nominal funds to realize the actual costs of the four annual camps. Much of the plantation activities are replicated with the corpus raised from the sale of the surplus saplings, saved beyond the needs of the villages. This sum has been used as a revolving fund, complimented largely by the spontaneous seed collection activities, adopted by the villages to ensure enough seed stocks to facilitate the formation of nurseries and plantation activities.

These camps are more of a culmination of events and efforts, that silently go on in the villages, throughout the year. The beat of the Khankar everyday, is not just a protective exercise, the time to check out the growing plants but to also observe the efforts of season at play. The period of flowering to the period of fall, the season of bearing fruit and the time to collect the fallen seed. The actual planting of trees is a continuous process in distinct stages. Beginning with the identification and collection of the right seeds. Each indigenous species is bound to its individual timing. The seed of the most auspicious hill tree the Deodar (Cedar) used for the doors and roofs of temples, is very light and excellent. Along with the Banj (Oak) and the 'Pangar (Horse Chestnut), the 'Paniyan' (Mountain Cherry), 'Burans' (Rhododendron), Poplus, the 'Uttis' (Alder); all require six months to a year, of gestation period and after the seed germinates, the young saplings are ready to be transplanted. Some require the winter months for plantation, others the monsoon and still some like the Poplus, propagated by their cuttings and grafting, can be planted in both seasons. Grass varieties of indigenous species like the 'Bhimal' and the 'Chamliu' are again suitable for both the seasons. Yet still, fruit trees like the 'Akhrot' (Walnut) is a hardy species, capable of withstanding many odds and can be propagated by direct sowing. The preparation of seeds and saplings for plantation has seen the development of many spontaneous nurseries in the villages. Some even as large as to support more than 25,000 young plants. In such cases, the Doodhatoli Lok Vikas Sansthan contributes to the efforts of the people and the host family, which may have allotted the land for the nursery. A small honorarium renders to support full-time gardeners' help, in tending to the young plants.

Green Results

Within a span of 10 years, the people of Gadkhkharak managed to successfully restore 50 hectares of their forest cover. Enough to meet the fuel and fodder needs of the small village and not only lifted the ban on entry, after the

stipulated period of 10 years. Still the process of conservation and judicious use continued. The home of the people truly extended from individual homesteads into the forests. The forests, over the period of time have become the 'Bijak" (inventory) of people's efforts. And the efforts continued despite the fulfillment of the village needs. In the daily routine of collecting fodder and fuel-wood from the forest, the people were extremely conscious of what, and how much they took from their forests. Even the old and decaying trees were not left untended. The people sustained their interdependence, by regular sowing and protecting stem and rootstock of old trees. Forest conservation and regeneration had become a way of life for the people of Gadhkharak.

With the visible restoration of the forestlands, the people even took to large-scale fruit tress plantation. In the past, the village of Gadhkharak had been witness to the failed experiment in raising apple trees. The government block officers had lured the village into planting apple orchards, assuring of them good returns. But the first plantation of 2000 trees had failed to produce any of the expected results. The ripening fruit became food for the birds, even before they were ready to be plucked. Secondly, the village people were ill equipped to protect or maintain the fruits. More so, because the people had been promised the quality or variety of the apple, conducive to high altitude climate conditions but eventually supplied with a mixed lot. Gadhkharak and Dulmoth are two villages, perched on two distinct hillsides, on almost diametrically oppose hill slopes, facing each other.

Dulmoth is a large village of more than 50 households, with the village forest extending much beyond a single hillside. The march of 3300 hectares of the village forest lands, leaps and strides across several hilltops ending in almost close proximity of Ufrainkhal. (Though some part of the forest is shared by another village, Dandkhil). Thus, the large expanse of Dulmoth forest had reared the populous agro-pastoral families of Dulmoth in its cradle. The numerous cattle hers of Dulmoth had no dearth of forage in the wide, verdant spaces of the forest canopy.

The village pattern of Dulmoth is similar to Gadhkharak, only perhaps greatly magnified. The agricultural fields rise from the base of the foothill, in the valley next to the river, to the middle of the hillsides occupied by the village dwellings. The upper reaches of the hillsides were furnished with the thick canopy of the forests, encircling consecutive summits. Though a large part of the forest was sacrificed in the last two decades, to make the high terrain accessible by road. The forests of Dulmoth in the past, had been home to many 'Kharaks' (cattle sheds) in the summer months. When the people of Dulmoth, migrated into the recesses of the forests with their large cattle herds returning back to the village, only with the advent of winter. Dulmoth was truly symbolic of the abundance of Doodhatoli and its equation to a basin of milk.

But Dulmoth had also suffered acutely in the grip of deforestation. Rampant logging, removed the forests far away from the easy reach of the people and the number of kharaks dropped. Migration to the kharaks had been replaced by out migration of the Dulmoth youth to the plains.

The first environment camp of Doodhatoli Lok Vikas Sansthan was organised in Dulmoth in '91 and by '92, the villagers were eager to begin afforestation activities and started with 50 hectares of depleted forestland. The Mahila Mangal Dal of the village, again fostered the land. While the village people actively dug out earthen trenches, DVLS supplied the initial saplings of Banj (Oak), Deodar (Cedar) Burans (Rhododendron) and Uttis (Alder) and large quantity of indigenous species of grass (Chamliu) were planted.

Water Difficulties

By '90 - '91, the Doodhatoli Lok Vikas Sansthan became concerned with another critical problem in the hills. Many hill districts were in the grip of acute water scarcity. The land of Ativrishiti, of heavy rainfall was fast becoming a case among water thirsty regions. In the early '90's, the neighboring district Almora, once considered a water content region, had about 85% of the area, facing severe water shortage. While the hill states thirsted for water, the nation blamed the Himalayan mountain farmers, for causing massive downstream floods in the Ganges and the Brahmaputra rivers, as a result of upstream deforestation.

In the early '90s, DVLS had started to make small interventions to sustain and conserve the ample water reserve of the mountains. Beginning with Gadkhkharak in early '90 - '91, the village forest had prospered into a dense canopy of indigenous species, abundant in the clusters of Banj, Uttis and Deodar that are all custodians and rechargers of groundwater and anchored the soil firm against erosion. Still the mountain Gadhera (nallah, drain), that in earlier times had sustained its flow throughout the year, had begun to run dry during the summer months. It required extra input of water to run its full course all the year round. The people of Gadkhkharak made small 'Jal Talais' (Jal = water, Talai = pond, reservoir), in the upper reaches of the village forests, to stall the immense surface run-off, that otherwise rapidly meandered downhill. The vast, top ground tree cover facilitated the natural process of infiltration and augmented the water holding capacity of the land. Uttis is known to give out roots that almost spread like a network, reaching far into the soil, serving almost like capillaries supplying nourishment and water into the deep recesses of the earth. These small water bodies helped to augment the moisture level in the soil and became a source of replenishing the drying watercourse for the entire year. In '94-95, water conservation was initiated in earnest.

The watershed management system adopted by DVLS, is typically unique to their home in mountain watersheds. Quite unlike the other, ongoing experiments in the hills and vastly distinct from those in the plains. In the past ten years, the people of Gadhkharak and Dulmoth have developed, an ingenious network of Jal Talais, along the face of the hillsides, to tap the rainwater. What appear like small basins or trenches of shimmering water from afar, are in effect rectangular earthen pits measuring 2m. in length with 1m. width and a depth of 1m. The excavated soil serves to like the periphery in raised earthen mounds, planted with indigenous species of grasses like Chamliu, Munj. Built almost equidistant, in symmetrical rows along the landscape. The distance between two Jal Talais is marked by another smaller earthen pit of about 2ft. by 2ft. and a depth of 1m. , to anchor indigenous species of mountain trees.

In Dulmoth, these Jal Talais dot about 30 hectares of large tract of a hillside, considered absolutely 'Banjar' (unproductive wasteland) and barren, along a steep slope with a 800 m. decline, stretching to the river Pasol, gushing in the valley below. Encompassing the hillface are about 1500 Jal Talais, interspersed with about a 1000 young saplings of the Walnut tree. The manure for the plant pits was mostly supplied by the individual households, who own the plot of land on which the Jal Talais and the trees are planted, while the plants were provided by the people's organisation. The monetary cost of digging out the small Jal Talais was borne by the organisation at a humble sum of Rs. 50 extended to the people in lieu of the services rendered in excavating the Jal Talais and Rs. 5 for the earthen plant pits. An almost unheard of fraction of the expenditure borne by the government departments undertaking similar watershed management practices!

This tract of hillside has been harnessed, to curb the massive surface drainage and the rampant soil erosion, which had washed away much of the topsoil, in the absence of adequate vegetative spread, converting the fertile landscape into totally unproductive. The large erosion of silt and sediment making its way, directly into Pasol at the foothill, was also checked. Besides, the regeneration of fodder grasses on the sides of the Jal Talais, provided the daily sustenance of the cattle hers, within easy reach.

In Gadhkharak, most of the Jal Talais have been built in the village forestland within dense vegetative outgrowth. Almost serving like an upper watershed or catchment, for perennial water supply to the Gadhera of Gadhkharak. A total of 500 Jal Talais lie mostly camouflaged under the heavy shelter of grasses and shrubs.

As one descends into the village settlement, another level of thick foliage greets the eye. This once served as the narrow band of the uncultivated land, lined by the stone protection wall on the outer side. But today it ahs changed into a flourishing fodder reserve of the village. The foliage of indigenous fodder and

fuel-wood trees planted in the early '80s, have grown tall and thick, within a decade. Nature has taken its natural course and the land has prospered. Today the cattle that are to be stall fed, do not have the women traversing miles to fetch the needful. All the needs are fulfilled, right at their threshold.

Interspersed within this tier of the fooderbank, are the orchards of the people. The people of Gadkhkharak, inspired by the coming back to life of their poor soils, have planted many mountain species of fruit trees, along with the indigenous species of Banj, Tilonj, and Burans. Apricots, plums, Peaches, Pears, Citrus varieties of Oranges (Narangi, Malta), Lemon, Bananas and yes even Apples. But it is the Walnut that stands the tallest amongst them all. Its rise so majestic, its branches stretched out so straight and aligned and its crown of unfurling green leaves; it is tree not to be easily swayed by the mountain breezes. An edifice of beauty, perhaps matched only by the mystical vision of the Deodar.

Resting below this ramp is the cluster of the slanting roofs of the village dwellings on one side, while the Gadhera lines the western flank of the farmlands reaching down to the Pasol. From its source in the forests at the head of Gadkhkharak, it has been recharged by the water seeping into the water course, by the numerous Jal Talais that retard the excess surface drainage and nourish the land with moisture throughout the year. So much so, that the farmlands are irrigated by water of the Gadhera through 'Guls' or irrigation channels. These narrow canals run like horizontal water paths, cut across the main watercourse of the Gadhera. Intercepting and diverting the waters of the Gadhera at four different levels, in accordance with the various tiers of the terraced fields. The proximity and use of irrigation broadly divides the farmlands into irrigated or 'Panchar' fields (pan=water) and 'Ukhar' or un-irrigated fields.

Conclusion

But the efforts of Doodhatoli Lok Vikas Sansthan is not clouded by monetary gains. The objective of water conservation, goes much beyond soil and land management, magnify the sustained endeavors of the mountain communities to nourish and revitalise the thinning headwaters of the Himalayan rivers and recharge and augment their volume in the upper watersheds. These Jal Talais serve in restoring, the lost and crucial link between upper and lower watersheds. Their small sizes may be misleading but the cascade of water from hundreds of Jal Talais along the hillsides, evokes a powerful image of small water bowls, employing out their pockets in humble tribute, to the large vessel of milk, their benefactor, their Doodhatoli. And Doodhatoli in itself, is an ode to celestial harmony. A foothold into heaven. In mythology, the mountains are often referred to as the cosmic pillars, by which people or gods can ascend to or descend from the sky. In human civilizations, the mythology may have translated into the reality of the movements of air, water, soil, animals and people from the mountains to the plains and that too largely to landscapes even further below. It has been much of a downhill story, descending from the high reaches to the lowlands and none of the 130 villages of Doodhatoli, the

people of Gadhkharak, Dulmoth, the marginalised communities, strive to restore the eternal balance and harmony in their virtual cosmic domain.

AGRICULTURE and FOOD SECURITY
The Green Foundation –
Biodiversity Conservation in Traditional Agriculture
SOUTHERN KARNATAKA AND TAMIL NADU

Nikhil Anand

Agricultural Profile¹

The upper drylands of central India have not experienced as radical a change in agriculture as the coastal and river basins. In the hill regions of the Mudumalai range on the border of Karnataka and Tamil Nadu, farmers practice their traditional forms of agriculture. The farmers in Kanakapura and Denkanikota taluks in Thally district of Tamil Nadu have only partially moved to high yielding varieties of seeds. Here, nearly 65 percent of the land consists of red sandy soil and 30 percent of sandy loam soil. Since these upper drylands cannot sustain high yielding varieties of rice, many farmers still grow their traditional crops. Millets are the staple crop in these dryland areas. These include finger millet, kodo millet, foxtail millet, proso millet and barnyard millet.

In the conservation of biodiversity and agriculture, women play a critical role. As food producers, women are a significant contributors. They do most of the inter-cropping, harvesting, threshing and livestock rearing. Women are critical in growing food for home consumption. Subsistence farmers depend upon women for cultivating vegetables and other foods used at home. Because of their gender roles in the home and the farm, women are most sensitive to the need for on-farm biodiversity conservation. Since women take the lead in the plantation of intercrops, they are more willing to reintroduce indigenous varieties of seeds back onto their farms. The roles as seed storers place them at the center of community seed barter and exchange institutions. For these and other reasons, women have a central role to play in biodiversity conservation and the viability of agriculture. The additional importance they give to healthy, nutritional and tasty food in the home also increase their interest in local seeds.

The rituals and practices of traditional farmers describe an elaborate system of biodiversity conservation. Prior to sowing every season, seed quality is ascertained by a variety of rituals that test the germination properties of stored

¹ Based on Green Foundation, 2002.

seeds. In southern Karnataka, a germination test is carried out during *Ugadi*. On this day, farmers place all the seeds that have been selected for reproduction in the next agricultural season on wooden planks. These seeds are then covered in dried manure that has been collected from their own farms. After sowing the nine kinds of seeds, pulses and oilseeds, the seeds are worshipped. On the seventh day, the plank is carried near the nearest water body for examination. If the seed sprouts are not of good quality, or too few, then the seeds of that particular variety will not be selected for sowing in the following season. The farmer will try and obtain other more successful seeds for the following crop.

Seeds are stored using a variety of indigenous and contemporary storage techniques. To keep them away from rats and rodents, seeds are most frequently stored in containers that are suspended from the roof. Neem and dung cakes are frequently applied to keep away termites and rodents. *Madakis* or earthen pots are used to store pulse seeds. These seeds are first cleaned, mixed with ash, neem cake and tobacco leaf powder to keep pests away. They are then kept in airtight pots and opened only in the following season. To store their bajra, paddy or jowar seeds, farmers usually store them in containers made from bamboo peels called *kanajas*. These can store up to four tons of grain. Sometimes farmers cover the outer surface of the structure with thick slurry of silt for additional protection. The grains are stored in a mixture of dung, neem and lakki leaves. Farmers also used hollowed out dried gourds to store their oilseeds. The opening of the gourd is similarly sealed with dung and neem cake. Oil seeds are highly prone to disease and insects and require airtight conditions.

Just prior to the sowing season the containers are emptied and the seeds are cleaned and sorted. The selected seeds are dried and placed before the deity for a small puja. A small quantity of seeds is offered to each of the seven deities of the village. Farm instruments and cattle are also worshipped prior to the sowing. At the end of the ritual, the offerings made to the village deities are given to the poor. High yielding varieties that are procured from the market are not part of this ritual. They are given directly to the men for sowing.

Farmers generally practice mixed cropping as a means to insure themselves against failure of particular crops. Besides providing insurance against individual crops, they also intercrop plants in certain combinations to keep away certain types of pests. For example, intercropping sorghum with cowpea prevents the spread of leaf beetles; intercropping chilies with coriander keeps away flies. By intercropping, farmers not only keep away devastating pests, their 'pesticides' are also part of the productive output of the farm and consequently far more efficient. Unlike monocultures that tend to drain nutrients from the soil, intercropping also increases the biomass produced on the field and enhances soil fertility for subsequent generations.

Following the monsoon in July, the fields are ploughed and then raked, using *andaluve*'. Following a puja to the field, mustard is mixed with ragi and forms

the basic crop in the field. The farmer hand sows these seeds, scattering them in an arc. Following this, jowar, avare, alsande and castor are mixed together in the desired proportions and sown in rows. For this the farmer uses a 4 cms. bamboo pipe with a wooden cone on top. Cattle draw the pipe along the ground in straight lines along the field. In alternate rows, tuvar, sorghum avare and castor are planted. Niger is planted around the field to repel pests. This also enables an easier harvesting of the ragi.

The Green Foundation

Recognizing the necessity of biodiversity to provide security for the farmer, the Green Foundation has worked in the villages of Thally district, Tamil Nadu to restore and renew traditional institutions and cultural practices that place the farmer at the center of biodiversity conservation. Before and even during the green revolution, farmers have maintained a series of biodiversity friendly practices and rituals on their farms. These practices not only preserve biodiversity, they give agency and choice to grow crops that suit particular ecological conditions of that season. Founded in the context of disappearing biodiversity and a spread of unsustainable industrialised agriculture, the Green Foundation has increased the biodiversity in agriculture both in terms of species and varieties used by farmers. With community based biodiversity conservation serving as the basis for sustainability and security of agriculture, the foundation seeks to place the farmer at the center of the community seed supply system. This is done both by reviving the traditional role of the farmer as the steward of biodiversity as well as introducing new institutions that would facilitate this transformation.

Critical to this program is the concept of 'Cosmo-Vision', which sees the integration of the social spiritual and natural worlds to realise endogenous development goals. To facilitate distribution, the Foundation organises a *seed mela* every year. Here, besides sharing their seeds, farmers celebrate their culture and agriculture. The Green Foundation cultivates and distributes traditional varieties of staple crops, millets, vegetables pulses and oilseeds among farmers. It distributes these seeds on the understanding that the farmer contributes to the effort in the following year for distribution to other farmers. The Green Foundation encourages farmers to engage in on farm conservation of their seeds. Farm conservation provides a critical integration between community seed banks and sustainable agricultural practices. Finally, the Foundation documents the usages and practices of the traditional resource base of the people.

To do this, it attempts to use the visual and oral means of communication in its interactions. Using puppetry and street theatre, it contributes to the oral literary traditions of these forms. Research and knowledge building exercises normally build on the experiences and knowledges of local communities. Participatory rural appraisals are initiated to understand biological heritage and relationships, desirable crop properties or seed diversity. The organisation

sees itself working within a 'project to movement' paradigm- part of a process by which village level sanghas and village level committees eventually managing the administration of their own biodiversity conservation efforts.

Interventions and Traditions- Biodiversity Conservation in Agriculture²

Industrialised agriculture has resulted in a rapidly disappearing seed diversity on traditional farms. According to Dr. H. Sudarshan, while over 50,000 varieties of rice were cultivated fifty years ago, only 50 or so varieties of rice will be cultivated in twenty years, with only 10 of these occupying three fourths of the country's rice acreage. High yielding varieties of ragi and sorghum are also threatening the biodiversity of these dryland cereals. The Green Foundation has engaged in programs at a number of different levels to address this problem.

Seed Conservation Centres - In 1992, the Rio Convention on Biodiversity recognised the critical role for farmers who worked with biodiversity on a daily basis. Recognising the ex-situ gene banks could not be successful on their own, community level genetic management needed to be integrated with this effort. At around the same time, Green Foundation initiated a people's movement for in-situ conservation to synergise with the efforts of the formalised gene banks.

Despite finger millet being widely cultivated in the region, only three or four cultivars were in active use in early 1990. Green Foundation approached the Seed Bank at Institution for Crop Research and Investigation of the Semi Arid Tropics (ICRISAT) for access to the 14 varieties it had conserved. The Foundation distributed these seeds to farmers on the condition that the farmers return a larger amount from their harvest. Every year, the workers of the Green Foundation go through a meticulous process of collection, multiplication, monitoring and evaluation of different grades of seed. Along with farmers, the workers select, rate and subsequently distribute seeds for the next season. This process ensures only the most viable seeds are given to farmers for the next generation. In this manner, the Green Foundation proceeded to build up Community Seed Conservation Centres in villages in southern Karnataka. Over the course of the last decade, the Foundation has built up an impressive collection of 39 ragi varieties, 29 dryland rice varieties, 25 wetland rice varieties, 25 varieties of vegetables, 25 types of vegetables and 16 kinds of millets.

Where community seed conservation centers were successful, they also had the effect of organising participating farmers into self-administering collectives. Farmers' sanghas generally have a membership between 15 and 25 individuals. Given the central role of women in seed conservation, these are frequently

² Based on Green Foundation, 2002.

'women only' organizations. These collectives take an active interest in the preservation of viable seeds and also in their distribution. Village level collectives in three villages have now taken over the management of the seed conservation, production and distribution. The sanghas identify their seed requirements for the next season, and select and purchase their required stock from the savings of Sangha members. For the purposes of seed storage, members identify a storage room and pay for its maintenance costs. Financially autonomous, these units are active organizing centers for the practice of biodiversity conservation.

On Farm Conservation. Village level seed conservation centers ultimately depend on the enthusiasm and participation of farmers in biodiversity conservation. Over the last forty years, most farmers have been accustomed to a dependency on high yielding varieties of seeds, especially those for ragi and wetland rice. As a result, many are reluctant to reintroduce endogenous seeds on their farms. Since the early 1980s seed companies were active in Karnataka, distributing free seeds and using the drylands to experiment with drought resistant crops. The larger farmers owning irrigated lands have not been receptive to the work of seed conservation and community seed banks. Greater successes have been attained with marginal farmers, especially women, cultivating smaller pieces of land.

Influenced by decades of propaganda through universities, government departments and industry, farmers were repetitively told about the commercial benefits of hybrid seeds. Now, over seven hundred farmers are switching back to harvesting their own varieties of seeds. Farmers switching back to traditional seed varieties do so for different reasons. Many of them do so because hybrid seed varieties are not resistant to varying environmental stresses. Indaf varieties are heavily rain dependent; yet spoil completely if it rains during harvest times. Local varieties of ragi like Hullapare or Majjige are far more drought resistant, and able to withstand significant environmental fluctuation. Commercial seeds are also highly dependent of fertilizer and pesticide and farmers like Mr. Govinda, while reintroducing nati paddy was doing so because it did not require health damaging pesticide or fertilizer.

The farmers are not only the first location of biodiversity conservation, their knowledge is essential to actively select successful cultivars from one generation to the next.

In-situ conservation is critical to conserve the process of local adaptation of crops to their environments, 2) conserve diversity at all levels, the ecosystem, the species and the genetic diversity within the species, 3) improve the livelihood of the farmers, 4) maintain or increase control and access of farmers over their genetic resources, 5) involve farmers directly in the value addition process, 6) integrate farmers into the national plant

genetic resource system for conservation and 7) maintain evolutionary processes.³

As the principal links in the process of *in situ* conservation, all farmers play a critical role in the conservation of biodiversity. In doing so they also reduce the food security threat they face as biodiversity shrinks.

All farmers therefore are participatory seed breeders for the collective. Farmers identify their seed on the basis of grain quality, drought and pest resistance, fertiliser requirement, taste, cooking quality, husk quantity, straw yield and other growth and factors that are deemed critical. Based on these, and the resource availability for the next harvest, they can specifically choose varieties that meet the agro-climatic conditions. While this is a simple revival of older traditions, feeding these into newly organised sanghas gives farmers the power to control and access a critical input for successful agriculture.

The patient and consistent engagement of Green Foundation on the issue of biodiversity based food security has borne remarkable results. From only ten farmers in 1994, today over 600 farmers use community seed conservation centers to acquire their seeds. Ragi, wetland rice and vegetable seeds are especially successful. Now, farmers from over one hundred villages are participating in the building of community seed banks. Now at the centre of the development and protection of viable seed varieties, farmers have significantly more control over their agriculture and the biodiversity that sustains it.

Community Biodiversity Registers. Despite such proactive and synergistic efforts to protect agricultural biodiversity, efforts can be frequently undermined by the changing nature of intellectual property rights law. These laws can appropriate entire traditions of seed cultivation contained in the genetic properties of seed cultivars and permit the ownership and trade of these cultivars to be awarded to the first private corporation that lays a claim to them. Under the WTO, member countries are required to recognize patents or special uses of plant varieties. Patents give exclusive rights to these organisations to create, market, sell or distribute the patented product. Since indigenous communities document their histories typically by oral tradition, they risk losing control of seeds they have been cultivating for generations. Predatory seed companies that first lay claim to the uniqueness in biological products can make profits at the cost of cultivators that have been breeding these varieties for thousands of years.

The Green Foundation has initiated a program through which communities document their biological resources as a way to prevent their unfair appropriation. The Convention for Biological Diversity (CBD) was signed by

³ Jarvis et al (1998) in Green Foundation 2002.

representatives of 170 countries in 1993. Recognising the importance of biodiversity then, the CBD enjoined upon its member states to encourage communities that were practicing lifestyles consistent with the imperatives of preserving biodiversity. The CBD also recognised that these usages cannot be appropriated by private entrepreneurs that assert a proprietary right on their trade. Community Biodiversity registers were at once an organising tool and a necessary intervention to document prior use of natural resources in agriculture. Once prior use is established or documented, private corporations would find the expropriation of these techniques difficult to assert their intellectual property rights over. The biodiversity register asserts the community's rights, as custodians, over the resources documented.

Beginning with the villages that the Green Foundation was already active in, they held discussions with village leaders about the need and concept of a Biodiversity Register. Where village elders and leaders were receptive to the idea, they formed a committee called the Jeeva Vaividya Samrakshana Samithi, or the Biodiversity management Committee to oversee the process of documentation. From the village, people would also constitute a People's Biodiversity Conservation Corps. This Corps would be responsible for actually listing the biodiversity in the area and their heterogeneous applications. The process of researching the inventory of biodiversity in the village is helped by a participatory rural appraisal. Here all members of the village participate in the process of creating a resource map- a biodiversity directory of the entire village. This appraisal is critical not only because of the large number of species and their applications that emerge, but also because the process serves to create awareness and ownership of the listed resources among the people that participate.

When the documentation of individual villages are complete, a Panchayat level meeting is called and the findings of biodiversity are discussed. The district authorities present note these down and assert the right of the people to preserve their biodiversity. Once the content of the resource is described, and members of the community hold the rights to the resource on behalf of the past, present and future members of the community, any invention derived from the resource cannot be claimed as private property. This means that the biodiversity registers act as documents to prove prior use, and can be used to reject claims of innovation or novelty that seed producers may make on their biological resources.

Local and Regional Networks

As conservationists and agriculturists, farmers' networks at the village level give farmers access to large varieties of seed strains. By contributing to the village level seed conservation centres, farmers are assuring themselves access to locally adapted varieties of cereal and vegetable crops. At the same time, farmers are making democratic linkages with other organisations in Karnataka and beyond to share best practices, genetic resources and support for *in situ*

conservation of agricultural biodiversity. One prominent partnership is with the Soliga tribals in the hills of Mysore. Their organisation, the Vivekanand Girijan Kalyan Kendra is actively engaged in tribal development. Similarly interested in conservation of agri-diversity and indigenous knowledge, farmers are able to support each others' efforts across the state.

Farmers are also part of an international network of farmers dedicated to conserving their genetic resources, COMPAS. A forum for endogenous development, COMPAS attempt to provide a space for understanding the different systems of knowledge, beliefs and practices of rural communities which play a determining role in their ways of living.⁴ Under this programme a comprehensive documentation of the practices of farming communities, their healers and culture has been built that reinforce and share culture and practice of agriculture. These support the farmers with theoretical and empirical experiences.

Conclusion

The advent of globalization and the liberalization of agricultural goods are taking place even as producer and consumer subsidies for food and agriculture are being slashed. Farmers that have been weaned and wooed on a diet of these inputs now face troubled and uncertain times. The prospect of paying more for fertilizer and pesticide inputs come even as farmers cannot be certain of a market for the produce as state price supports are being dismantled. At the same time, highly subsidized (sometimes as much as 60 percent) food from the developed countries is flooding the markets. And finally, new intellectual property rights regimes threaten to deny farmers access to the seeds that they have cultivated for generations. This is to say nothing of the day-to-day challenges of an agriculture paradigm where entire crops can be lost because of ecological variability or pesticide poisoning. Small wonder then that suicide is a viable option for so many farmers.

When placed in this context of the multiple attacks on agriculture and the farmer, on-farm biodiversity conservation becomes immediately relevant and critical. Farm based biodiversity conservation is a means by which farmers can move to a paradigm of agriculture that is living and constantly evolving, unlike that of industrial agriculture. Ultimately dependent on the biodiversity of the farm, farmers can spread their risk over multiple crops themselves having a wide genetic base. This prevents recent phenomena like complete failures of crop like those plaguing drought hit regions of Andhra Pradesh, Karnataka and Maharashtra. By focusing on endogenous natural inputs of biological fertilizer and pesticide, the enhanced nutritive value of millets becomes even more financially attractive than commercial hybrids. Food security can be attained not by a dependence on the state for price control and distribution efficiency (themselves increasingly difficult in an era of World Bank Structural Adjustment), but on small farms and farmers themselves as they

⁴ Bhat, 2000.

begin to produce for local markets. In conjunction with community biodiversity registers, on farm biodiversity conservation is the basis for a renewed paradigm in agriculture, which places the farmer as the guardian of the biodiversity that sustains him economically and ecologically in the long term.

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