AN EXPERIMENT IN ECODEVELOPMENT IN UTTARA KANNADA DISTRICT OF KARNATAKA

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ABSTRACT

The main components of the ecodevelopment programme of the Indian Institute of Science in Uttara Kannada district consist of 1) Revegetating the degraded lands called 'Soppina bettas' and minor forests with useful plant species, 2) Developing fodder resources, 3) Propagating fuel efficient wood burning stoves, 4) Propagating a system of forest tree nursery establishment in schools and colleges and 5) Workshops aimed at diffusing the techniques in raising the tree nurseries and the fuel efficient wood burning stoves. The process of diffusion of these environmentally desirable technologies appear to be rather slow and it seems that a separate didicated voluntary agency is needed to take the technologies to the masses.

1.0. INTRODUCTION

It has been our privilege to work with the people of the enchanting, forest-clad hill district of Uttara Kannada in an attempt at rehabilitating their fast degrading environment over the last three years. In a heterogeneous society like ours this has implied interacting with many segments of the society, sometimes pulling in different directions. The experience, while occasionally frustrating has been a rewarding one, and we are hopeful of continuing progress on many fronts. Since both ecodevelopment and participatory research have been attracting more and more attention, we felt that it would be worthwhile setting down our experience of the dynamics of the social forces encountered by us, for exchange of ideas, comments and criticism from others. Other reports in the series may be referred to for the more technical aspects of our work.

The Setting

The district of Uttara Kannada is situated on the west coast of Peninsular India just to the South of Goa (lat.13°55' to 15°31'N; long. 74°9' to 75°10'E). Geologically it is a transitional zone between the younger basaltic rocks of Deccan trap formation and the older crystalline rocks of the Archean shield of

Indian Peninsula. The hills of Western Ghats are very low and broad in this transitional zone, and much of the district of Uttara Kannada is composed of gently undulating hills running all the way to the sea to the west and merging with the Deccan plateau to the east. The district receives an annual rainfall of 1500 to 5000 mm, and the natural vegetation ranges from evergreen through dry deciduous type. The district has the highest proportion of area under forest, and one of the lowest population densities of South India, primarily because of high incidence of malaria in the hilly districts till late 1940's. The coastal districts have been historically much freer of malaria, and have been more densely populated.

Paddy is the major cereal crop of the whole district. It is supplemented by coconut on the coast and arecanut, pepper and cardamom on the Ghats. The traditional agriculture and horticulture of the district heavily relies on the use of leaf manure and mulch collected from the tree clad hilly areas adjacent to the cultivated valleys. The villagers maintain large numbers of cattle dependent on free range grazing on these hilly tracts, primarily for the supply of dung used as manure in the fields. The coasts offer good fishing; with fish being traditionally used as a fertilizer in the coconut

gardens. The agricultural holdings are small on the more densely populated coastal tracts; they are larger on the Ghats. The bigger land owners on the ghats with cash crops of arecanut, cardamom and pepper constitute a rather well off segment of the Indian society. The peasants from the coastal tract, dependent on small holdings of paddy yielding but a single crop a year, work regularly as labourers on these farms on the ghats.

The traditional society is dominated by a group of priestly caste known as Havyck Brahmins who are adept at the management of the multistoreyed spice gardens with arecanut, pepper, cardamom and banana as the major crops. The peasant castes such as Naiks on the ghats and Patagars and Halakki Vakkals on the coasts are primarily paddy growers. Notable amongst artisan castes are Medars or basketweavers. The deciduous forest tracts harbour a group of buffalo-keepers known as Gavli Dhangars who have migrated from the Western Ghats of Maharashtra in large numbers after the eradication of malaria by 1950.

Forest Resources

The rich forests of the tract were a major support system for the traditional agriculture in the pre-British times and supported artisans like basket weavers and wood carvers. The wild pepper of the tract was a major

item of export in medieval times with British and Dutch factories at Karwar specializing in pepper. But there was little demand for timber as such till the British rule, and the limited demands of the rural population for timber were well regulated through traditional practices of the village communities. On their conquest, the British therefore found Uttara Kannada to be a rich reservoir of forest resources for their resource-hungry economy. Their primary interest in the early days lay in teak for ship building and other construction. The British reserved large tracts of forests for Government use and began to convert them into teak plantations. This was protested against by the local populations dependent on leaves from these forests for their lands. As a compromise, the British Government left about half the district area under forest (40 %) for the use of village communities, reserved the other half (40 %) for Governmental Reserved forests; the remaining 20 % being land under habitation and cultivation. The reserved forests primarily catered to the urban-industrial sector, and continued to be a focus of conflict between the rural population and the Government. The village forests were poorly managed by the villagers in British times, as their whole system was breaking down under the foreign rule.

The Indian Government continued the British policy of giving priority to urban - industrial interests from the forestry sector after independence. A major plywood and paper industry was established at Dandeli in Uttara Kannada district with the forest resources being granted at nominal rates, far below the market price. The industries were owned by outsiders who also had little stake in the long-term preservation of resources made available at throw-away prices. There was consequently a rapid depletion of the resource base of these industries, and a resentment in the local population against them.

The depletion of the forest resources, especially bamboo used for the paper industry, reached serious magnitudes in late 1960's and early 1970's. At this time Medars, the basket weavers of Karnataka mounted a protest against the depletion of bamboos - their subsistence base. As a result the Government of Karnataka asked the Indian Institute of Science to look into the problem, resulting in two of us (SNP and MG) taking up ecological studies on bamboos and their utilization in 1976. Since the large livestock populations of Gavli Dhangars also affected levels of bamboo stock, we began to investigate the implications of forest grazing as well.

River Valley Projects

With annual precipitation of 4000 to 5000 mm on the crestline of the Ghats and the drop in elevation to the west coast , the hilly terrain of Uttara Kannada and neighbouring districts affords many opportunities for the utilization of hydroelectric power. A number of such projects have therefore been taken up over the last forty years beginning with the Sharavathy scheme on the boundary of Uttar Kannada with Shimoga district. Given the dominance of the urban - industrial sector at the national policy making level, it was natural that little attention has been paid to the loss of fertile valleys with arecanut orchards under these projects. The compensation for the land submerged has been inadequate, and those affected by submersion have contributed to further destruction of the forest, often in the catchment areas of the dams. This lack of consideration for preservation of vegetation in the catchments has resulted in rapid siltation of reservoirs, floods and other problems.

These problems passed unnoticed in early years of independence. However, as we approached 1980's, they began to draw attention and an assessment of the environmental impact of dams was made mandatory. It was at

this time that a project was mooted to be taken up on the Bedthi river in Uttara Kannada district. One of us (MG) was a member of the Government of India's Committee for assessing the environmental impact of this hydroelectric project. The committee cleared this project just with one day's deliberations without any careful thought. This appeared most unsatisfactory to MG, who felt that the detailed project report for Bedthi dam was incorrect in many details.

Some of the land to be submerged under the Bedthi hydroelectric project was arecanut orchard land owned by Havyak Brahmin farmers. Coming from a literate caste many members of this community are educated; in fact the Managing Director of Karnataka Power Corporation executing the Bedthi project belonged to this community from Uttara Kannada district. Others were in high political positions. This community was therefore in a position to challenge the assumption of the Karnataka Power Corporation that the project was justifiable on economic, social and environmental grounds. The challenge was spearheaded by the powerful co-operative sales society of orchard owners at Sirsi with backing from the Principal of the College at Sirsi. Since MG was convinced that the Government of India committee had given a clearance without due investigations, he, along with SNP agreed to work

on a scientific reassessment of this project. KMH, a practicing farmer, joined from the side of the co-operative Sales Society. There was participation in this study by several others, including an authropologist, an economist and an electrical engineer. The study demonstrated that the project was not justifiable on economic grounds, the benefit: cost ratio being around 1:2. The project has since been suspended by the Government as a result of this study.

Role of farmers in environmental degradation

The debate over Bedthi project brought to light many conflicting interests - arecanut growers, foresters, power engineers, It was pointed out that arecanut growers decrying destruction of forest by the power project were themselves instrumental in much forest degradtion. This point made particular impression on KMH who had been involved in a technically progressive co-operative of farmers, namely Hulgol Group Villages Co-operative Service Society at Bhairumbe in Sirsi taluk of Uttara Kannada. This society had been in collaboration with the University of Agricultural Sciences of Karnataka to evolve a package of modern technical inputs for their unique horticultural system involving multi-storeyed stands of arecanut, pepper, cardamom, banana and newly

introduced cocoa. Since this plantation system depended heavily on leaf material from surrounding hill forests and on grazing, the arecanut growers had become aware of the need to conserve the vegetation cover of hills. Furthermore, there existed a system in which hill forest called 'Soppinbetta' (Soppu = leaf, betta = hill in Kannada) is individually assigned to arecanut growers for rights over the usufruct, although the land belongs to Government. While a few farmers had protected these lands and planted up a majority had permitted the Soppinbettas to be degraded partly because the farmers permitted lopping by labourers without personal participation. The farmers had also been responsible for degradation of village minor forests and some reserved forests.

Soppin betta and jaggery, chula projects

It was thus literate and financially secure community of arecanut growers from above the Ghats that took a lead in expressing a concern about their own role in environmental degradation. They decided to do something concrete about it through the Hulgol Society. MG and SNP agreed to work with them from the Indian Institute of Science along with several other colleagues. Fortunately, the Karnataka Government had just then

established a Department of Ecology and Environment who agreed to step in and help with an experimental project. The project initially focussed on tree planting on Soppinbetta lands at the expense of farmers to improve their fuel and leaf manure supply. The Government grant funded scientific monitoring of the project, and the Forest Department agreed to provide free seedlings and technical help. The project was initiated in March 1982 with 15 participatory farmers from taluks of Sirsi(12), Yellapur(2) and Siddapur(1). It must be noted that all belonged to the Havyak Brahmin community and were fairly well off financially.

Another development from the coastal belt parallelled this programme. One of us (MSH), professionally a Chemist, comes from the Havyak brhamin community from a coastal village, Unchagi in Uttara Kannada. MSH had been deeply influenced by witnessing the degradation of the minor forest of Unchagi village over the past 25 years to the stage that people are now digging up roots for fuel. All domestic cooking, heating bath water, as also processing of agriculture produce such as jaggery making depends on wood fuel in Uttara Kannada. MSH was therefore much concerned with improving the efficiency of use of wood

fuel for these pirposes to reduce the pace of environmental degradation around his native villages.

This led to an interest in designing a more fuel efficient chula for jaggery making by the cell for Application of Science and Technology (ASTRA) of the Indian Institute of Science. This group came up with a highly efficient three pan design. The traditional jaggery making chula of Uttara Kannada needs considerable amount of fire wood as fuel . The new design dispenses with the need for fuelwood. This should be attractive for while fuelwood is being brought free for this purpose from minor forests there are other expenses including transport. A jaggery making chula of new design was therefore constructed in village Unchagi in January 1981 and has been functioning satisfactorily in the seasons of 1981, 1982, 1983 and 1984 using only bagasse as fuel.

While the jaggery plant was thus installed in Unchagi in 1981 at the initiative of MSH, there was no further spread of this technology. There were several factors involved: (1) The cost of new design is Rs.2000 as compared to about no cost for the old design. (2) In spite of land reforms, most sugar cane is cultivated by the weaker sections such as Halakki Vakkals as Sharecroppers.

They bring fuelwood at their own expense and give the owners 1/3 share after making jaggery. The dominant, literate caste of Havyak brahmins who own the large pans needed for jaggery making therefore do not have a stake in improving the efficiency of this chula.
(3) The new design requires more attention at the time of burning bagasse.

There was thus difficulties in the diffusion of this technology which remained stagnant in Unchagi over the years 1981 to 1983.

Ecodevelopment Project

The decade of 1980's had begun with the launch of World Conservation Strategy by Mrs.Indira Gandhi and other world leaders and emphasis on the theme of 'Development without Destruction'. In India Dr.M.S.Swaminathan, a renowed plant geneticist, an architect of India's Green Revolution and Member of the Planning Commission had been much concerned with this theme. He spearheaded the drive to create a Department of Environment at Government of India level, and launch of three Ecodevelopment Projects through Planning Commission. One of these related to Western Ghats. As a result, the Department of Environment of Government of India funded a

Centre of Excellence devoted to ecodevelopment effort for Western Ghats at the Indian Institute of Science, Bangalore. The result was the Centre for Ecological Sciences.

Because of the earlier background MG and SNP who were involved in this new Centre, we decided to foucs on Uttara Kannada district. The Soppinbetta Project in the Ghat taluks of Sirsi, Yellapur and Siddapur and the jaggery chula project in the coastal taluk of Kumta became nuclei around which the more applied components of the work of the Centre for Ecological Sciences were built up. It is to these problems we will turn our attention in detail.

2.0. SOPPINA BETTA PLANTATIONS

The dependence of these areca agro forests on Soppina bettas for the organic manure inputs has been in vogue for at least a century. The farmers themselves were lopping the trees to obtain leaf manure. Over the years, however, the labour component of collection of leaves has been passed on into the hands of hired labourers. The labourers do not have a stake in judiciously lopping the trees; for they would want to minimise the effort put in lopping the trees and maximise

their daily earnings by collecting as much of green leaf material as possible in as short duration as possible . This has resulted in the gradual deterioration of tree cover on the Soppina bettas. The farmers, in their turn, have not paid much attention to the problem: instead they began to exploit the neighbouring forest areas. The magnitude of problem could not be gauzed as there were plenty of forests till recent times. Though the farmers began to feel the shortages of these inputs as early as in 1960, no concrete steps were taken to replenish with the tree growth: nor did the forest department advocate the restocking of these bettas. Consequently there has been a steady growth in the area of barren tracts. It is at this juncture, a group of progressive farmers from the Hulgol group villages co-operative society in Sirsi Taluk took a lead in requesting the Indian Institute of Science (IISc) to address to the problem. The problem, in its simplest terms, is how to restock this barren areas and with what species? Unfortunately there was no prior information on the type of species suitable for replanting on these soppinbettas. The forest department has almost no information on this aspect. Therefore we at the IISc drafted a list of 50 different species that could possibly be raised on these bettas. The farmers along with the

IISc. approached the forest department in the year of 1982 to request : supply of saplings during the monsoon period of 1982. In order to scientifically monitor the revegetation of the bettas (in terms of relative survival and growth of each of the 50 species) the newly setup department of ecology and environment, Government of Karnataka, granted a small sum to the Hulgol group villages co-operative society. A monitoring committee comprising of the farmers, the administrators of various government agencies and the scientists was set up. In the programme of revegetation, the farmers would dig the pits, plant and protect against grazing by domestic livestock. This was sought to be done by means of digging a cattle proof trench. Initially 15 farmers were selected who showed a very keen interest in developing their degraded bettas. Subsequently the programme had been extended to other localities in the district.

Out of the 50 different species requested for planting, initially the forest department could supply 25 species only.(In the later years the list has been expanded to a total of 37 species - Table 1). The number of seedlings supplied was about 25000. There were two components of the planting programme. The first programme

consisted of raising live fence around the proposed main planting. The planting programme of 1982 has been a success in that as much as 70 - 80 percent survival of the saplings was obtained. Looking at the success of the programme, more and more farmers wanted to be members of ecodevelopment programme. The programme has now been extended to a total of 121 farmers in the five taluks of Yellapur, Sirsi, Siddapur, Kumta and Honavar. It aims at understanding the factors contributing to the relative success of different plant species in wide range of ecological conditions . In the 1983 planting season, all the 121 farmers participated in the plantation programme. The response of farmers were qualitatively ranked as good, moderate and poor. For each of these responses, weighted ranks were given between 1 to 3. For the Kumta and Honavar taluks data on response to chula programme could not be ranked.

The interest in ecodevelopment (ranked as good, moderate and poor) vary from 15.3 to 100 percent among the five taluks. The actual development of bettaland due to replanting varies from 21 to 75 percent. In the measure of protection against cattle grazing, it varies from 6.06 to 100 percent (Table 2). The cause for this

wide range of results are several fold. During the two planting seasons of 1982 and 1983 a vast number of the saplings supplied were of inferior quality and were plucked straight from the nursery bed. The resulting damage to the seedling root system contributed to higher mortality rates. The percentage of saplings supplied in this fashion would be 30. Secondly many farmers preferred to plant these saplings after completing the agricultural operations. The late planting thus caused mortality as the rains by then had ceased, giving little moisture to the seedling to establish itself. Thirdly, the effective protection provided to the saplings against cattle grazing was in most cases very poor. The cattle could damage the saplings by way of grazing as well as by trampling. In some of the farmer's plantations ground fires killed the major portion of the plantation in the dry months. In addition wild pigs, porcupines, and insects damaged the plantation to some extent.

In most cases of failure the avoidable reasons could have been supply of better seedlings and early planting in the months of June. The farmers have as yet not thought of investing the resources in such a programme. For the forest department the supply of good seedlings would mean foregoing their own requirement of healthy seedlings. They were not willing to undertake such a course of action.

The observed variation in the responses is also due to unequal and perhaps inadequate sample size. This is especially true in the case of Yellapur, and Siddapur taluks.

Responses from local people vary from mild curiosity to active involvement in the ecodevelopment oriented programmes. In the taluk of Yellapur the planting programme has evoked mixed response. Most people whom we met felt that the activity of planting need not be pursued as the process of regeneration itself would replenish the vegetative cover. It is to be mentioned that the process of degradation in Yellapur taluk is relatively less compared to the other four taluks. It is but, natural, that the farmers would not want to invest in restocking the bettas. In the remaining taluks, though, the farmers face acute shortages of leaf manure, fuel and fodder, they do not have the technical know how of revegetating the barren areas. It is rather paradoxical that the farmers who have specialised in growing sophisticated type of agro forests, do not attempt to grow suitable plant species on the betta! There were however,instances of farmers trying to revegetate these bettas prior to the intervention of Indian Institute of Science. They obtained saplings from the forest department and planted them in a very casual fashion. The

assumption behind their planting was that the forest trees do not require much attention like that of an areca agro-forest ! When the programme of ecodevelopment began, a proper way of planting was resorted to by the participating farmers. In this monsoon season of 1984, a group of eleven farmers from Yedalli have planted saplings of various tree species in 8 hectares by themselves.

The farmers realised the magnitude of damage due to grazing in the plantation. In most cases, however, they could not fully prevent the tresspassing by cattle. This was especially so in the bettas of Kumta and Honavar taluks. As a result only a fraction of the plots could progress in the direction specified in the programme. In these taluks since most farmers are marginal land holders, effective protection against cattle grazing could not be taken by way of trenching. In the summer months of February to May shortage of fodder was very acute. Eventhough there is a protection during day time the cattle would graze during night. This has resulted in the low survival of saplings.

3.0. MINOR FOREST PLANTATIONS

In many localities the natural tree cover on the minor forests has been depleted due to over exploitation and due to over grazing. There have been no serious

attempts to revegetate these lands with suitable plant species to meet the demands of the local villagers. Consequently, whenever there has been attempt by the forest department to revegetate these lands with industrial softwoods, it has met with stiff resistance from the local villagers. They construe this effort as an attempt to rob them of their grazing lands or to curtail their access to whatever tree cover that has been left out. As a result, the plantation effort of the department in the past has been, by and large, an unsuccessful effort. It is in this context, the development of minor forest assumes importance and poses a greater challenge. We attempted to develop such a programme in selected localities in the five taluks. To begin with we undertook this activity in the village of Masur in Kumta taluk.

Masur is coastal villa e located at the confluence of river Aghanashini and the Arabian sea on the west coast. The marsh lands are cultivated on community basis for raising paddy crop in the season of June-December. In the summer season the fields are closed for the egress of water by an intricate system of bunds to raise prawns. The nearby minor forests are devoid of the tree cover mainly due to excessive exploitation and due to heavy

cattle grazing. As a result the villagers are forced to go over to the minor forest of Mirzan to collect green manure, fuelwood and small timber. These farmers were keen to develop these lands with suitable plant species to meet their requirements without jeopardising the access to grazing lands. The villagers agreed to the suggestion of restricted grazing in localities other than that was taken up for planting. In June 1983 with the help of the forest department, the villagers of Masur along with teachers and students actively involved in digging a cattle proof trench, dug out the pits and planted with seedlings of Acacia auriculiformis, Artocarpus integrifolia, Anacardium occidentale, Casuarina equisetifolia, Dalbergia lapfolia and Leucaena leucocephala.

It has been observed that the farmers took the programme quite seriously and allowed no cattle to enter into the plantation. As a result the survival and growth of the saplings has been very promising. This year (1984 July) infact, the area of planting has been doubled.

4.3. FOODER DEVELOPMENT

The farmers also face acute problem in getting adequate fodder for livestock especially during the summer period. It was decided hence, to introduce

suitable fodder grasses and legumes and was also decided to advocate stall feeding so that free ranging cattle problem would not arise for the plantations in the bettas.

So far, the response of farmers to the programme of fodder development has been very poor. In the taluk of Sirsi only 4 out of 51 farmers has a 'good' programme of fodder development. The farmers are however enthusiastic to grow the sunhemp crop in the fallow lands of paddy. In fact, the response has been so over whelming that we have to order this year triple the quantity of seeds! Here again the agriculture and animal husbandry departments could step in a big way to encourage the farmers to grow fodder. When we contacted the agriculture department to supply the seeds they replied they would do so for the green manure requirements and not for fodder resources! They felt that the programme of fodder resource development has to be taken up by the animal husbandry department and nor by themselves. The agriculture officials would not agree to the point that the sun hemp could be used for both the purposes. Hence, the seeds were obtained from private sources and were distributed to the farmers.

5.0 SCHOOL AND COLLEGE NURSERY PROGRAMME

In order to increase the awareness of tree planting among the students and to inculcate interest in them from the beginning a programme of raising the seedling nurseries was envisaged in the ecodevelopment activities. As many as 7 schools have been involved in this programmes in four taluks of Yellapur, Sirsi, Kumta and Honavar. It was also decided to involve the forest department and the district rural development society for inputs such as the polythene bags, seeds, fencing and lastly a watchman to guard the seedlings in the vacation period of schools. The schools were to involve the students in filling up of polythene bags with prescribed quantities of earth, sand and manure and the seeds were to be sown by the students and watered every day.

The forest department agreed to purchase seedlings from the schools after deducting the expenses of polythene bags, and the cost of seeds. The total number of seedlings raised in these 7 schools was 1,50,000. Though the programme began with many hurdles, it took off very well and the schools are looking forward for raising nurseries in the next season.

essentially a community venture. People of one village have to cooperate in order to make it successful.

Since wood is collected from nearby forests (essentially at the collection cost) a change from existing practice is resisted. There is a myth that jaggery produced by burning bagasse is not good. Above all, money to errect the new furnace is large (Rs.2000/- per unit) and hence support from Governmental agencies is looked for. Crop sharing by the land lord (1/3) and the actual cultivator (2/3) is yet another factor hindering the propogation process; land lord (who has to take the lead) collects 1/3 of the jaggery produced and he is not concerned as to how the cultivator collects the wood for making jaggery since he gets his share any way. Therefore, an interaction between the ecodevelopment agency, funding Governmental agencies and the village community is necessary to save wood for making jaggery. If in Uttara Kannada all the villages absorb this new technology, 30,000 tonns of wood (mostly logs of diameter higher than 25 cm) can be saved annually. Observations also showed that certain species (Strychnos nuxvomica) in the forests around the villages are cut for this purpose since it is a taboo inside the house.

Present position is that this species has almost vanished in jaggery cultivating area and this needs to be saved. A systamatic training and education programme, a good counselling by elders of the village and the financial support seem essential for propogation of community jaggery unit in Uttara Kannada.

7.0. ECODEVELOPMENT ORIENTED TRAINING PROGRAMME

In order to train members of youth associations (Yuvak and Mahila mandals), National Social Service (N.S.S.) volunteers, school teachers and the participating farmers of ecodevelopment programme, in tree nursery raising techniques, fodder development and construction of fuel efficient wood burning stove , a workshop has been held at Yedalli in Sirsi taluka in October 1983. The training programme has generated a lot of interest among the local public and more persons were seeking such a training programme in future. Two more training programmes have been conducted to train local people to construct ASTRA stove at Unchagi and Bangalore. 30 people have been trained during these two camps who are now propogating the ASTRA stoves.

8.0. ESTABLISHMENT OF SAHYADRI PARISARA VARDHINI

It is quite apparent that the ecodevelopment programme has generated substantial amount of environmental awareness among a large section of the society. This is reflected by the growing number of persons seeking to participate in various programmes of the ecodevelopment. In order to bring into its fold, more number of such interested persons, the programme has to be extended to all those who seek help and technical know how. A time has come now to promote and extend these environmentally desirable technologies to a wider section of the society in an integrated and well organized fashion. Such an approach would be feasible if a number of interested people come together to form a formal society to help in the spreading of these technologies. In fact, a handful of well motivated people of the region have come forward to establish such an organisation by the name Sahyadri Parisara Vardhini. This organisation comprises of local farmers, teachers, men of excellence in art, culture, scientists. The parisara Vardhini will have its technical knowhow from the research work being carried on by IISc. These proven technology would then be professed, propogated and proliferated by the Parisara Vardhini.

9.0. CONCLUSIONS

(a) Fodder development was critical to success of any effort at raising trees. In fact, all such efforts would fail unless this grazing could be controlled.

(b) It would be worthwhile to develop decentralised nurseries as there might be difficulties in ensuring supply and transport from the Centralized nurseries of the forest department.

(c) It would be worthwhile to develop other fuel efficient devices such as chulas for domestic cooking and heating bath water.

(d) Diffusion of these environmentally sound technologies would require special efforts in extension.

(e) The benefits will remain restricted to the literate and better off Havjok brahmin community in the absence of more deliberate efforts.

TABLE - 1

NAME OF THE SPECIES FOR MAIN PLANTING

1. Acacia auriculiformis
2. Acrocarpus fraxinifolia
3. Albizzia lebbeck
4. Albiziz odoratissima
5. Artocarpus integrifolius
6. Cassia fistula
7. Dalbergia sissoo
8. Gmelina arborea
9. Mangifera indica
10. Mimusops elengii
11. Mesua ferrea
12. Pongamia glabra
13. Pterocarpus marsupium
14. Sapindus emarginata
15. Sesbania grandiflora
16. Leucaena leucocephala
17. Sterculia sp.
18. Syzygium cumini
19. Terminalia tomentosa
20. Terminalia bellerica
21. Vateria indica
22. Anogeissus latifolia
23. Tamarindus indica

24. Anthocephalus cadamba
25. Albizia procera
26. Bauhinia sp.
27. Butea sp.
28. Phyllanthus emblica
29. Bamboo
30. Cassia siamea
31. Dalbergia latifolia
32. Abrus precatorius
33. Anacardium occidentale

NAME OF THE SPECIES FOR LIVE FENCING

1. Agave
2. Glyricidia
3. Casuarina equilisetifolia
4. Subabul
5. Duranta

TABLE - 2

YELLAPUR TALUK

Sl. No.	Name of the farmers	Interest in eco-development	Actual development of Betta land	Protection	Fodder Development	Chula
1.	ShriG.T.Bhat, Bommanahalli	1	2	3	3	1
2.	Shri.R.G.Hegde Bedhahakkal	1	1	1	2	2
3.	Shri.R.S.Shastri Kosguli	1	1	1	2	2
4.	Shri.V.G.Hegde Kosguli	1	2	2	NA	3
5.	Shri.N.G.Hegde Bhatrakeri	1	2	NA	NA	3
		5/5	2/5	2/4	0/4	1/4

Grades: 1. Good 2. Moderate 3. Poor

NA - information not available

Table - 2 (contd.)

SIRSI TALUK

Sl. No.	Name of the farmer	Interest in eco-development	Actual development of Betta land	Protection	Fodder Development	Chula
1	2	3	4	5	6	7
1.	Shri.G.T.Hegde Hulgol	2	2	3	3	2
2.	Shri.S.N.Bhat Arasapur	1	1	1	2	1
3.	Shri.S.G.Bhat Golikoppa	2	2	3	3	2
4.	Shri.V.S.Hegde Keshinmane	1	1	1	1	1
5.	Shri.G.M.Hegde Hulgol	1	1	1	2	2
6.	Shri.M.R.Hegde Hhlgol	1	1	1	2	2
7.	Shri.K.M.Hegde Bhairumbe	1	1	1	1	Biogas plant
8.	ShriN.V.Hegde Ashisar	1	1	1	1	Biogas plant
9.	Shri.V.N.Hegde Bommanalli	1	1	1	3	2
10.	Shri.R.V.Hegde Bugadimane	1	1	1	2	1
11.	ShriV.D.Hegde Sambimane	2	3	3	3	2
12.	Shir.G.V.Hegde Targod	1	1	1	2	1
13.	ShriG.V.Hegde Bhairemane	1	2	2	3	2
		10/13	9/13	9/13	3/13	4/13

Table - 2(Contd.)

SIRSI TALUK

1	2	3	4	5	6	7	
14.	Shri.S.R.Bhat Jummanakana	1	1	1	2	1	
15.	Shri.S.R.Hegde Mandamane	1	1	1	2	3	(Gas Plant)
16.	Shri.G.N.Hegde Mandamane	2	2	2	2	2	(Gas Plant)
17.	Shri.G.S.Hegde Kaggundi	1	2	1	2	3	(Gas Plant)
18.	Shri.G.D.Bhat Honamovu	1	2	1	2	2	
19.	Shri N.S.Hegde Chapparmane	2	2	3	2	2	
20.	Shri.G.S.Hegde Chavadi	2	2	1	3	1	
21.	Shri.N.R.Bhat Chavadi	1	1	1	2	1	
22.	ShriG.D.Hegde Onikere	1	1	1	3	3	(Gas Plant)
23.	ShriS.R.Bhat Onikere	1	1	1	3	1	
24.	Shri.S.V.Hegde Hulemalagi	2	2	2	3	1	
25.	Shri.S.K.Hegde Hulemalagi	2	2	2	3	1	
26.	Shri.Y.S.Hegde Onikere	1	1	1	2	3	(Gas Plant)
27.	Shri.A.V.Bhat Bengli	2	3	2	2	1	

Table - 2 (Contd.)

SIRSI TALUK

1	2	3	4	5	6	7	
28.	Shir.S.G.Hegde Hegadekatta	1	3	3	2	2	
29.	Shri.M.T.Hegde Kalgadde	1	2	2	2	1	(Gas Plant)
30.	Shri.S.S.Hegde Balgarmane	2	2	2	3	2	
31.	Shri.S.G.Hegde Bettannemane	2	2	1	3	2	
32.	Shri.R.M.Hegde Hallikoppa	1	2	2	2	1	
33.	Shri.N.N.Hegde Kalgadde	1	1	1	2	1	(Gas Plant)
34.	Shri.R.P.Hegde Sirsimaakki	2	2	2	3	2	
35.	Shri.U.R.Hegde Sirsimakki	1	1	1	2	1	
36.	Shri.N.S.Hegde Sirsimakki	2	2	1	3	2	
37.	Shri.L.S.Hegde Sirsimakki	2	2	1	3	1	
38.	Shri.G.G.Hegde Sirsimakki	2	2	1	3	2	
39.	Shri.P.S.Hegde Bandi	2	2	2	3	1	
40.	Shri.G.S.Hegde Bandi	1	2	2	3	2	
41.	Shri.B.S.Hegde Bandi	2	2	2	3	1	
42.	Shri.R.S.Hegde Bandi	2	2	2	3	2	

Table – 2 (contd.)

KUMTA TALUK

1	2	3	4	5	6
1.	Shri.Ishwar R.Bhat	2	3	1	2
2.	Shri Vishwanath S.Bhat	1	1	1	1
3.	Shri.Vithal R.Bhat	3	3	3	2
4.	Shri.Satyanarayana R.Bhat	3	3	3	3
5.	Shri.Narasimha G.Bhat	3	3	3	3
6.	Shri.Gopal M.Bhat	2	3	2	3
7.	Shri.Krishna V.Bhat	2	3	3	3
8.	Shri.Subramanya G.Bhat	1	2	1	2
9.	Parwati Kom.N.Hegde	3	3	2	3
10.	Timmana Vishweshas Hegde	1	1	1	2
11.	Vishwanath G.Hegde	2	3	1	3
12.	Ramakrishna G.Bhat	3	3	3	3
13.	Ramachandra S.Hegde	2	2	1	2
14.	Nandi I.Hegde	2	2	1	2
15.	Ishwar R.Joshi	2	2	3	2
16.	Vishnu L.Hegde	1	1	1	2
17.	Shankar K.Hegde Muroor	2	2	3	3
18.	Subray V.Bhat Muroor	1	1	2	1
19.	Umamaheshwar R.Bagwat Muroor	2	3	2	2

Table - 2 (contd.)

KUMTA TALUK

1	2	3	4	5	6
20.	Laxman Jattu Gouda	1	NA	1	2
21.	Mahabla Gouda	1	NA	1	3
22.	Manjunath Hegde	1	NA	1	1
23.	Narayan G.Hegde	1	NA	1	2
24.	Ishwara S.Hegde	1	NA	1	1
25.	Heramba T.Bhat	1	NA	1	2
26.	Vinayak Bhat	2	NA	2	2
		11/26	4/19	14/26	4/26

TABLE - 2(Contd.)

HONAVAR TALUK

1	2	3	4	5	6
1.	Shri.S.P.Hegde	1	2	2	2
2.	Shri.S.V.Bhat	2	2	2	3
3.	ShriS.R.Hegde	1	2	2	2
4.	Shri.P.V.Shanbhag	1	1	2	2
5.	Shri.V.G.Hegde	1	2	2	NA
6.	Shri.M.V.Shastri	1	3	2	NA
7.	Shri.G.V.Shastri	2	3	3	NA
8.	Shri.N.G.Hegde	2	3	3	NA
9.	Shri.G.G.Hegde	2	NA	1	NA
10.	Shri.V.S.Shanbhag	2	2	2	NA
11.	Shri.Laxmi K.Goud	2	2	2	NA
12.	Shri.G.N.Hegde	2	3	NA	NA
13.	Shri.G.S.Bhat	1	1	2	NA
14.	Shri.V.S.Hegde	2	2	NA	NA
15.	Shri.Ganesh P.Hegde	1	3	2	3
16.	Shri.DattatrayV.Hegde	1	3	3	3
17.	Shri.Vishva P.Hegde	1	3	3	NA
18.	Shri.Subray M.Shetti	3	NA	NA	NA
19.	Shri.Venkatraman S.Bhat	1	1	NA	NA
20.	Shri.Narayan T.Bhagwat	2	1	NA	2

TABLE - 2 (Contd.)

HONAVAR TALUK

1	2	3	4	5	6
21.	Shri.Ramakrishna S.Kamat	2	2	NA	NA
22.	Shri.Subray G.Hegde	1	1	2	NA
23.	Shri.Devidas V.Kamat	1	1	1	NA
24.	Shri.Vinayak R.Bhat	3	3	NA	NA
25.	Shri.Ganapati V.Hegde	2	3	NA	NA
26.	Shri.Mahableshwar N.Hegde	2	2	NA	NA
27.	Shri.Timmappa R.Hegde	3	NA	NA	NA
28.	Shri.Gajanan T.Hegde Kalbag	3	3	NA	NA
29.	Shri.Eshwar G.Hegde	2	3	NA	NA
30.	Shri.Gajanan T.Hegde Nadbag	2	3	NA	NA
31.	Shri.Satya V.Naik	3	NA	NA	NA
32.	Shri.Vishwanath S.Bhat	1	1	NA	2
33.	Shri.N.L.Hegde,Hosabali	1	2	2	2
		14/33	7/29	2/18	

APPENDIX - 1

Fuel efficient wood burning stove (or chulla)

The new type of stove was developed by ASTRA group of Indian Institute of Science. Fuel efficiency of this stove was found to be around 45 %. The specific fuel consumption (weight of wood required for a kg of cooked food) was as low as 100 gms compared to 420 gms of traditional stoves. The schematic diagrams of the stoves fabricated in numbers in Uttara Kannada is shown in fig.1.

A simplified method of construction using locally available stones, mud and tile pieces was introduced for the first time in Uttara Kannada. The stove consists of a fuel feeding chamber where fuel is kept closed by a lid. The fuel is fed on a cast ion grate of 15 cm x 15 cm dimension. Controlled amount of air for combustion is let in through the grate and fuel burns on the grate. The pot above the grate receives heat through radiation as well as convection. Then the flue gas goes through the second hearth where the pot receives heat mainly through convection and a part of radiation. The flue gas passes below the third pot and finally let out through a 10 cm dia., 3m high chimney. There is no gap between the pots and the

stove wall. The distances between the pot bottom and the stove are very critical; first pot is 12 cm above the grate; the second pot is 4 cm and the third pot is 2.5 cm above the top layer of the sand the third hearths respectively. The inner part of the stove is packed with rice husk-mud mixture to reduce conduction heat losses to the wall. In the case of round bottom vessels, atleast half of the vessel is dipped inside the hearth. The flat vessels can be kept, on the stove with a slight modification. A secondary air inlet is provided just above the grate to burn the volatiles.

Experiments on 25 stoves built in the villages of Uttara Kannada gave specific fuel consumption 160 $\pm$ 20 gms for a kg of cooked food as against 420 $\pm$ 110 gms for conventional stoves. Thus, the reliability of the new stove isvery good terms of fuel consumption compared to the conventional stoves. Saving of 60 % of wood is achieved in villages of Uttara Kannada.

In addition, the stove is smokeless, any kind of fuel can be burnt and time for cooking is also reduced. In one hour, standard food can be cooked. This is possible because in all three pots water boils in this stove.

APPENDIX - 2

Community Jaggery Unit with bagasse as fuel

This is a precursor to the fuel efficient chulla described in part 1 developed by the Indian Institute of Science and installed in the village Unchagi in Kumta Taluk. The most important feature of this 2 pan furnace is that it entirely dispenses away with the use of wood and only uses 75 % of the bagasse (residue after crushing sugar cane). In this method, dry bagasse is fed through a 12 to 15 cm dia feed hole on to the 30 cm x 30 cm cast ion grate. The first pan is heated by both radiation and convection. Controlled amount of air is let in through the grate and a proper combustion volume is provided. Flue gas generated pass through a duct (30 cm x 15 cm) and then heats the second pan by convection. The second pan is dipped inside the second hearth to increase the heat transfer area. Distance between the bottom of the first pan and the grate is 75 cm where as the bottom of the second pan and the top part of the second hearth is only 10 cm. There is no air gap between the pans and the wall of the furnace. Flue gas is let out through a 30 cm x 30 cm x 5m chimeny, Fig.2 shows the cross-sectional view of the 2 pan jaggery unit.

Efficiency of these stoves is above 52 % i.e., 52 % of the heat generated by burning bagasse is utilised for evaporation of juice. The furnace is built out of locally available stone and mud. Only component that is brought from outside is a 30 cm x 30 cm x 2.5 cm cast iron grate.