PART II: *KURINJI* OR MONTANE - KOLLIHILLS

CHAPTER 3

INDIGENOUS OR LOCAL KNOWLEDGE FOR SUSTAINABLE BIO-DIVERSITY AND FOOD SECURITY IN THE KOLLIHILLS

Material for this chapter is drawn from research in the Kollihills region of Tamil Nadu. The *Malayali* tribes of this region remain the primary custodians of bio-diversity. However, their basic needs have often forced them to engage in activities that have led to a loss of bio-diversity. It is the thesis of this chapter that indigenous or local knowledge systems can be used to satisfy socio-economic needs, ensure food security, and conserve bio-diversity. This chapter suggests that the diverse forest and agro-forestry systems of the Kollihills have been degraded through deforestation, both by tribal and outside interests. In order to address this situation, those factors which force local people to engage in activities that degrade the agro-forestry systems are identified and strategies that could make effective use of indigenous or local knowledge systems to meet the needs of food security and conserve bio-diversity are formulated.

Introduction

……..
Those who give food give life to living beings
who cannot live without water.
Food is first for all living things, made of food,
and because food is but soil and water mingled together,
those who bring water into fields
create living beings and life in this world.
Even kings with vast domains strive in vain, when their land is dry
and fields sown with seeds look only to the sky for rain.
So Pandya king who makes dreadful war, do not mistake my words:
quickly expand watery places that are built to bring streams to your land!
For those who control water reap rewards
and those who fail cannot endure.

Sangam Tamil Poetry

For long years, tribal people have been the custodians of bio-diversity. They have been more so in the hill areas where they are confined even today. Unfortunately, however, their basic requirements sometimes force them into activities such as deforestation for monetary gains or for extending agriculture that lead to a loss of bio-diversity (Kumaran, 1983; 1991). This has happened through what we now believe is a resource process in the hills. It is now a common understanding that indigenous or local knowledge can be used to fulfil socio-economic needs as well as conserve bio-diversity (Rajasekaran, 1994; Mitchell, 1997). This chapter explores the diversity of the

indigenous agroforestry systems of the Kollihills, identifies the factors which force the tribal people to engage in activities that erode those systems, and also the farming systems in practice, and formulates policy interventions designed to make effective use of indigenous knowledge in bio-diversity building and agricultural development through a modified resource process.

Although material has been drawn from earlier research by the senior author (Kumaran, 1983; 1991; 1993), field work for the study reported was conducted during November 1995, with one week of interviews and another week of participant observation, and the method of data collection was in the form of book-keeping and diary method for indigenous or local knowledge and human time-budgeting. Elder tribals were closely consulted for their indigenous knowledge on agroforestry, tree cropping, and crops such as pineapple, jack, banana, rice and tapioca. Technologies, techniques and practices were studied in terms of crops, seasons and hamlet/village communities. Alternatives were considered in terms of resources and constraints analysed through conventional methods.

Relevance to Present Day Problems and Needs of Tribal Society

The subject of study is relevant to the present day for it takes on the 'bio-diversity and indigenous knowledge' paradigm, in geographical research. The researchers recognise that the tribals have systems of knowledge, which could solve the problem of bio-diversity better than any 'imposed systems'. The study thus forms a model research for similar efforts, especially with the scattered tribes in the state of Tamil Nadu. The policy options developed here will have wider applications. Food security and bio-diversity are the two very aspects of human survival and the human experience with them in traditional or tribal society could be a welcome addition.

Indigenous knowledge and bio-diversity are increasingly being talked about in geographical research (Mitchell, 1997, for example), there has not been any major efforts at research on the two areas. In Indian geography, this focus would hopefully usher in 'new perspectives and new methodologies' besides enriching the knowledge on human experience in space and time, as we take both a spatial and a temporal view of indigenous knowledge and bio-diversity and the agro-forestry systems and food security system in the Kollihills.

Indigenous or Local Knowledge System

As indigenous or local knowledge is central to the study, it is important that it is defined and elaborated in its use. The concept of indigenous or local knowledge systems has its roots in the traditional knowledge and resources and environmental management systems (Mitchell, 1997: 179). Indigenous or native or tribal people are found on every continent and in many countries. In the course of human history, there have been human groups whose interests were linked to the prudent use of their resource base and that such groups evolved approariate resources use practices, based on simple rules f thumb, that ensured the long-term sustainability of the resource base. These practices and the knowledge about them were arrived at through a process of trial and error. Such

knowledge is now known as the traditional or local knowledge (Gadgil and Berkes, 1991: 136).

Any knowledge is a process. It is a useful process. Indigenous or local knowledge cannot be understood independently from the ways in which it changes. it evolves through a process of experimentation, carried out by indigenous, traditional people, involving a diverse set of variables and objectives. This leads to innovations and adaptations. Observation is an important part of the process (Shah, 1993: 38).

Indigenous knowledge is not generated or acquired equally throughout a community; nor is the existing knowledge about products and processes equally distributed in a society. Differences in knowledge exist in and among individuals, in terms of their ability, opportunity or wish to observe and experiment, according to gender, age, social status or personal ability. Korah Mathen (1997: 175) tells about a ten-year old tribal boy who could identify 275 varieties of vegetation in and around his village, including 14 different types of grass. He is illiterate; but his knowledge about the plants, their characteristics, and their uses is more than worthy of a doctorate in agriculture. His is not of course a solitary example. There are several hundreds, may be thousands among the indigenous, traditional peoples who are equally knowledgeable.

Modern ones quite often supplant indigenous or local knowledge and technology. In traditional cultures, life was, and is, organised around a highly refined awareness of the environment. Indigenous knowledge system, which also goes by other names such as *local knowledge systems, traditional ecological knowledge, and indigenous technical knowledge*, represent experience acquired over several millennia of direct human contact with the environment. Although the term '*indigenous knowledge system*' came into wider use only in the 1980s, its practice is as old as ancient hunter-gatherer cultures.

There has been a growing recognition of the value of IKS in several areas, most importantly in matters relating to environment building, improving bio-diversity and sustainable development. Indigenous knowledge system represents also an intellectual process of creating order out of disorder, of practising art and science. The quantity and quality of indigenous knowledge varies among community members, depending upon gender, age, social status, intellectual capability and occupation.

The Kollihills: A Brief Profile

The Kollihills, an area of about 473.3 km², lies in Namakkal and Rasipuram taluks of Namakkal District. It has 14 Panchayats, 16 Revenue villages and 273 hamlets. On the basis of the Survey of India toposheet, it has been authenticated that Kollihills lie between 11◦ 11’ N and 11^{o} 30’N and 78^{o} 16’E and 78^{o} 30’E. The altitude varies from 300 m to 1,500 m, with the annual rainfall varying between 800 mm and 1,300 mm. A number of estimates on the extent and spread of Kollihills are in use but the current estimate of 473.3 km² (Surveyor’s Report 1994) corroborated by the analysis of topographical sheets for the region. Within this area, 272.54 km² are classified as forests Menon (1995) has estimated that over 20,000 hectares of forests in Kollihills are under the Reserved Forest (RF) system. The Revenue Department reports the existence of about 4,311 hectares of forests under its jurisdiction.

These hills are forested. The Kollihills are more than 1100 m above mean sea level. The typical village is called 'Nadu', seven of the 14 Nadus are in Rasipuram taluk while the other seven are in Namakkal taluk, of Salem district. The villages under the taluks are:

Namakkal taluk:	Valappur Nadu, Gundur Nadu, Ariyur Nadu, Valavanthi Nadu, Selur Nadu, Thinnanur Nadu and Devanur Nadu.
Rasipuram taluk:	Bail Nadu, Edapuli Nadu, Chittoor Nadu, Tirupuli Nadu, Alathur Nadu, Gundani Nadu and Perakkarai Nadu.

Valavanthi Nadu is the headquarters of the Kollihills Tribal Development Block, with Semmedu, a hamlet of Valavanthi Nadu being the administrative headquarters of the Block. The only weekly market centre on the hills is at Solakkadu.

The Tribal Population. According to 1991 Census, the population of the Kollihills was 33,888. The population constitutes 17,207 of males and 16,681 of females. Ever since 1918, when the total population of the Malaiyalis was 8,245 (Richards, 1918) there has been an approximate and even increase by 400 individuals / decade, indicating some form regulation or control. The Kollihills are populated by the **Malayalis (= hill humans)** living in the 14 Nadus. People here practice a clannish, kinship based social interactions.

The historical account of the people of the Kollihills (see Box 3.1), which the elders of the hill people remember well, suggest that they were, until they moved into the hills in the historical times, the peasants of the coastal areas near about Kanchipuram. People belonging to a lineage of three brothers were driven out of their lands and they took to heals to reach the Kollihills, the Pachamalai and the Kalrayan Hills.

Box 3.1: The Mythology of Kollihills (*Kollimalai*)

Kollimalai is referred to as the *Madhuvanam* (Forest of Honey) and an abode of the monkey-king Sugreeva, referred to in the Indian Epic Ramayana. The Kollipavai, a deity in a sacred grove, has been referred to in ancient Tamil Epics such as *Silapathikaram* and *Manimekalai*. According to the myth, sages were looking for a peaceful place to do their penance and chose Kollimalai as their abode. When they began their rituals, the demons invaded Kollimalai to disturb the sages. The sages prayed to Kollipavai and, according to the myth, She kept the demons out of the hills by fascinating them with her enchanting smile. Incidentally, the hills are named after the deity who did the sages proud. The history of Kollimalai took a major change with the arrival of Malayali community around 500 to 600 years ago.

Source: Kumaran, 1983.

In fact, each of the three lineages of the brothers took to these hills such that the youngest landed here. It is widely claimed by the tribals themselves that they belonged to the Kongu Vellala caste, while they settled down in the hills in the 16th century. In the

centuries after their occupation of the hills, they acquired tribal characteristics. They are today known as the 'Malayalis', meaning the 'hill people'. They are distinctly different from the Malayalis of Kerala, as the hill tribes speak Tamil, which is their mother tongue. However, they speak Tamil with a slang, which often makes Tamil they speak sound more like Malayalam. They were given the status of the tribe and they are so treated by the government for all administrative purposes.

There are 6,840 families of which the tribal families number 6,613. By an earlier account (1981), agricultural labourers numbered about 10,600 while farmers numbered about 4,200. Small farmers were 1,500. Marginal farmers were 2,200 and others about 500.

According to 1991 Census, there were 32,080 tribal people and 939 scheduled caste people. The remaining 969 belong to other communities. Out of the population of 33,888, only 5,468 have been educated. Education of the tribes is taken care of by a high school, which is located in Valavanthi Nadu Panchayat and a number of elementary, middle and high schools in and around the hills. The children generally continue their education upto Standard 5 and drop out heavily at Standard 6, as this was the age at which they become farm help to their parents.

The Focus

The study focuses on three important areas of the Kollihills milieu:

1. Resource Process (RP) towards socio-economic development;

2. Indigenous Agro-forestry system (IAFS) meeting needs for a variety of goods and services; and

3. Indigenous Food Security Systems (IFSS), where crops fulfil caloric energy requirements

Connected to all of these are (a) bio-diversity and (b) indigeneous knowledge systems. Therefore the study is an attempt at connecting the three focuses of analysis to the two aspects above.

The significance of the study lies in the fact that the interrelationships between indigenous knowledge, bio-diversity and food security system and deforestation are looked at for the first time in the context of the Kollihills. The study also recognises the fact that the tribes have the ability to solve their problems in food security through the use of indigenous knowledge, if only their socio-economic conditions change and the compulsions of the times are overcome. It is important to note that the proposal envisages also a careful look at the sustainable policy options for sustainable bio-diversity and agricultural development. It is moreover a natural extension of the researches conducted by Kumaran (1983) and Kumaran and Aruchamy (1989).

Resource Process (RP)

A **Resource Process** is defined by its utility humans perceive in the substance and by the technology of transforming the potential of the substance into an actuality of satisfaction.

It is a function of **utility, substance and technology.**
That is, RP = f{ust}.

The substance for all practical purposes is fixed, finite and limited. But the utility factor and technology factor are not limited at all. Natural resources as functions rather than inventories are not the least bit limited (Rosell, 1979: 3).

It is with the premise above that the study looks at the **resource process and agricultural development** in the Kollihills of Tamil Nadu. Agricultural development in tribal areas is seen to be related to decision making on that part of the human environment which comprises of resources [for agriculture]. Current insights on and the present situation of agricultural development in tribal areas (for example, Kumaran, 1983; 1987; 1991) help us to arrive at policy interventions designed to make use of the resource process and the indigenous knowledge towards bio-diversity building. In this process, it would be useful to take into account the traditional habits and usages peculiar to tribal people concerned, the Malayalis of the Kollihills, and also pay attention to use of plants and crops by them. This naturally involves, in addition, a study of the natural resources that surround the people and form an integral part of their ecology.

Indigenous Agroforestry System

Indigenous agroforestry system involves an integrated approach to land use, characterised by deliberate maintenance of trees and other woody perennials in fields and pastures. The agro-forestry of the Kollihills are found on bench terraces (pine apple and tapioca), moderately sloping lands (citrus fruits, citron, guava and pomegranate) and steeply sloping lands (wild trees). Banana suckers are planted randomly inside the forest gardens and around the edges. In some places, the banana is intercropped with tapioca and pepper.

Indigenous Food Security Systems

Indigenous food security systems in the Kollihills form the basis of food and nutritional security. Cereal grains harvested from semi-irrigated agricultural lands form the bulk of the food consumed by the people of the Kollihills. Local landraces of beans and puchased pulses and oils provide the protein they require. The money used in the purchases come from the sale of fruits in the local market, mainly at Solakkadu. Changing socio-cultural values, population growth, poor revenues from the fruit markets and extravagance in cultural and religious activities have resulted in greater need for monetary income. Although the people are aware of the consequences of deforestation, the compulsions of their socio-economic priorities promote the cutting of trees thus leading to increasing disappearance of the indigeneous agroforestry system. It is also clear that the destruction of the forest ecosystem has placed people in a vulnerable

situation. These situations lead to the need for an understanding of the interrelationships between (a) indigeneous knowledge, (b) bio-diversity, (c) food security and deforestation.

Agricultural Development in the Tribal Kollihills

Agriculture is a resource process. Agricultural development in tribal Kollihills is related to decision making on that part of the human environment which comprises of resources [land, water, land utilisation types,crop combinations and mixes, crop protection and management and a whole gamut of related matters]. Expert opinion on decision making leading to agricultural development, reveals conflicting features which, by gross simplification, may be designated as clashes between 'the biological and the economic spheres of interest' (Kumaran, 1991; Weitz, Pelley and Applebaum, 1980; Norman, 1974; Weitz, 1971). This situation necessitates a search for a compromise satisfying either aspect. Current insights on and the present situation of agricultural development in tribal areas helps us also to arrive at such a compromise. For example, agro-forestry as an agricultural system comes to our assistance, where there is a 'building and strengthening of new and old ecosystems' in balance with nature and the tribal culture. Because the tribe depends on agro-forestry, it has a stake to upholding its own interest by support activities that compromise on the biological and the economic. In this process, it would be useful to take into account the traditional habits and usages peculiar to the Malayalis of the Kollihills and also pay attention to plant uses by them. This naturally involves, in addition, a study of the natural resources that surround the people and form an integral part of their ecology.

In recent years, we have become aware of the importance of every step in agricultural development and what each of them holds for the more distant future: food, especially subsistence, security and the fears about 'it' being hard to achieve. And yet it is here we find how little we know on the future, especially, of ecological pressures and their interaction. For this reason, we have to pay equal attention to both the general principles of ecology and the analysis of all points of departure including a framework for future oriented decision making for agricultural development.

It is pertinent here to note that, in the not too distant past, the economic approach to man and society has been a clearcut winner in disputes with ecology. But confirmed by the test of time, in spite of warnings of biologists, two strategies offer themselves invariably: **expansion in space and expansion in time.** In the Kollihills, for obvious reasons of the 'limits of the hills' expansion in space can be achieved only in terms of intensity of use. Intercropping systems (3-, 4-, 5- and 7-crop systems in the Kollihills, see Kumaran, 1983; 1993) very widely practised is the testimony to expansion in space. Expansion in time, however, occurs in the very 'characteristics' of agriculture, from traditional to modern, and from purely economic to both biologically and ecologically sound. These strategies are a survival mechanism that the tribe has been dependent upon, and in tune with the changing times and needs. Experience in the hills points out to limitations of short-range possibilities in the strategies. What is important, the course of social progress in time is gaining momentum. (It is inevitable to both economists and biologists to gain an understanding of the very substratum of their conflict. It is where geographers, as human ecologists, can help. The study of the Kollihills is best suited for

such an understanding and it is this understanding that the present study on the Kollihills attempts at).

The total area of the Kollihills is 28,293 ha. Of this, the cultivated land is of 14,609 ha (51.63 per cent). The net sown area is 12,009 ha (42.44 per cent of the total area). Cultivable waste is 1,223. Fallow is of the order of 2,669 ha while land put to other uses is 3,830 ha. Forest occupies 12,454 ha (44 per cent). Grassland is of the order of 985 ha.

The crops grown are paddy, ragi, tapioca, millets, pepper, coffee, cardomon, mango, guava, pine apple and jack. Agricultural Officer of the Kollihills has provided the latest data on the land area under different crops and they are given below:

> Tapioca 4,453 ha, millets 1,727 ha, paddy 1,502 ha, ragi 1,337 ha, pine apple 1,000 ha, mochai 599 ha, guava 381 ha, banana 300 ha, soya beans 279 ha, coffee 234 ha, pepper 100 ha, silver oak 332 ha and mangoes 107 ha. Crops such as cardamom, clover and turmeric are grown in areas less than 100 ha. Thus millets including ragi and pine apple have greater proportion of area under them, with plantation crops and tree crops occupying considerable area under cultivation.

The 7-System Management and Terraced Agriculture

The agriculture of the tribes is not only hill agriculture but also terraced agriculture. The tribes are capable of land management given the difficulties of slope cultivation. They have greater skills at land and water management by managing the slopes very well. They have developed the technique of bunding, and planting trees to avert soil erosion and landslides. The farmers of the Kollihills have also developed intercropping which benefit them most and helps them with balancing family labour schedule given the assets and assignments. The ayacut of the streams, which is irrigated by the waters from the springs along them, is very fertile. The area under well irrigation is only 28 ha, whereas land under irrigation along the streambed is 1,873 ha.

Family farm is the basic unit of agriculture, exception being the plantation agriculture (cardamom, coffee). Family farm is characterised by **family labour**. Tribal farmers we are concerned with are essentially owner-cultivators, who take occasional hired help, including women, especially during the weeding and harvest operations. Women's contribution is higher in terms of family labour contributions rather than through wage labour. Tribal agriculture as practised here is no distinct from the plains as the modern inputs (seed, irrigation and chemical technologies) are very much the same.

Terraced agriculture brings their traditional managerial capabilities to the fore and the tribe have mastered a system of management, involving soil, slope, water, microclimate, plant-vegetation, animal and space, the 7-system management of terraced agriculture (Table 3.1). What is more that the system has been in practice for more than a century. The table in effect is an elaboration of the internal, community support as no activity or practice is possible of the 7-system management, without the active involvement of the entire community. The spatial mosaic that emerges from the terraced agriculture can only be appreciated upon careful observation of the nuances of the 7-

system management. It must be mentioned that the 7-system management is part of the indigenous knowledge system of the tribal Kollihills, on a broader scale in agriculture than the ones that follow in other sections of this chapter. These systems are dealt with in greater detail and substance in the next chapter.

Table 3.1: The 7-System Management: Indigenous Knowledge System and Traditional Managerial Practices of the Kollihills

Management Category	Forms of Practices
1. Slope	Terracing, levelling, hedging, timber and rock heaping.
2. Soil	Bunding, application of green and cattle manure, tillage and field forms.
3. Water	Ayacut principle of irrigation, storage in checkdams, traditional lifts (manual, animal drawn), diversion devices and traditional delivery systems.
4. Micro-climate	Shade management (plantation and homeyard bushes of coffee), surface geometry management, tillage and wind management (hedging to keep off winds).
5. Plant-Vegetation	Crop selection, mixtures, intercropping, planting methods, agro-forestry practices, and predation management.
6. Animal	Domestication, and preventive measures against destruction of crops by animals and wild life.
7. Space	Spatial arrangement of fields and crops (land utilisation types) in relation to homes, distance minimisation and crop care maximisation.

Source: Kumaran, 1983; 1991; 1993.

The tribe possesses the expertise in executive and managerial aspects of agriculture and agro-forestry to an extent that is beneficial in the long run to the ecology and the society, in achieving certain production and welfare levels both for the tribe and for the ecology. The ills of hill ecology may thus be placed squarely on the externally influenced development efforts (by the government) and the ill-equipped bureaucracy of the tribal development administration. What is needed is the appreciation and encouragement of the wisdom of the tribe in formulating the 7-system management strategy for agriculture and agro-forestry.

Indigenous Agro-Forestry System of the Kollihills

The agro-forestry system of the Kollihills consists of semi-irrigated agriculture and foret gardens. Semi-irrigated agricultural lands are flat lands adjacent to streams. There is an intensive application of indigenous knowledge systems in this system of tribal economy. For example, the tribal farmers classify their soils in these areas into three types: red soil (*sem mann*), clayey soil (*kali mann*) and ash soil (*sambal mann*). Table 3.2 summarises the diversity, status and uses of trees in the forests of the Kollihills.

Semi-Irrigated Agricultural System. In clayey soils, they cultivate paddy (dry) and ragi. Ragi is also grown in red soils. Samai and thenai (a minor millet) are grown in ash soils. The soils are enriched by the application of the leaves of the forest trees such as *konnai, karu vembu* and *kattu murungai*. The availablility of water which depends on the rainfall determines the type of crops to be grown in the semi-irrigated lands. In the case of early or late monsoon and failures, the tribal farmers cultivate drought resistant crops such as legumes, cowpea, sesamum and mustard.

Table 3.2: Tree Diversity and Uses of Forests

English Name	Local Name (in Tamil)	Status	Uses
Trees			
Acid lime	Elumichai	rare	fruit; pickle
Banana	Vazhai	available	flowers food; fruit for cooking; leaves for social occasions and ceremonies
Citron	Narathai	available	fruit; pickle
Eucalyptus	Thylam	introduced	firewood;charcoal; medicinal;posts; ornamental; windbreaks
Fig	Athi	rare	fruit; (fresh,dried) medicinal
Guava	Goiyya	available	fruit; firewood and tool handles
Jack	Pala	endangered	timber;groundwater recharge
Mandarin tangerine	Kamala	rare	fruit
Moringa	Kattu murungai	rare	leaves as plant nutrients; avenues; firewood
Jambulana	Naval	endangered	fruit; firewood; avenues
Orange	Sathu kudi	available	fruit
Pomegranate	Mathulai	available	fruit
Sissoo	Visiri	endangered	firewood; timber
	Perikka	endangered	avenues
	Kola	endangered	avenues
	Enuga	endangered	groundwater recharge
	Konnai		rare leaves as plant nutrients; avenues; firewood
Spices and Beverage			
Cardamom	Elakkai	rare	spice
Clove	Kirambu	rare	spice
Nutmeg	Jathikkai	rare	spice
Pepper	Milagu	available	spice
Coffee	Coffee/ Kappi	rare	beverage

Source: Field work 1983; 1995. See Rajasekaran and Warren 1994: 14.

Forest Garden System. This is known locally as the *kattu kazhani*. It is of three types, depending on whether the crops are planted on terraces, moderately sloping lands and steeply sloping lands. The soils of the terraces are enriched by the wild tree leaves, while lines of stones are placed at the bench edges to prevent soil erosion and to conserve moisture (see Reij, 1993). Pine apple and tapioca are cultivated mainly on the terraces, while citrus fruits, citron, guava and pomegranate are cultivated on the

moderately sloping lands above the terraces. Wild trees such as *konnai*, *karvembu*, *naval* and *kattu murungai* are found on the steeply sloping lands above the moderately sloping lands. Banana suckers are planted randomly amidst the forest gardens and also around the edges. In several hamlets, banana is intercropped with tapioca and pepper.

Indigenous Knowledge Systems in Agro-Forestry. Tapioca, it must be mentioned, was introduced to the tribal farmers by the agro-industry, while the intercropping of tapioca with banana was innovated by the people through their informal experiments. The farmers have shown that the banana grows in any type of soil in the garden. The farmers of the hills also grow local landraces of beans (*karuppu mochai and avarai*) and different types of root and tuber vegetable crops (*senai and karunai kizhangu*) as intercrops in forest gardens.

The Malayalis of the Kollihills are knowledgeable in the harvest of fruits, methods of ripening, classification of fruits for sale in the market and preservation of fruits. They know a great deal about the fruit trees and their adaptability to altitudes of the slopes. Traditionally, the methods of cultivation are different for different tree crops and the seasons. Jack trees, the fruit of which is known for its flavour and taste, are grown in the higher altitudes of the terraced lands. In the tribe's knowledge, the jack trees are believed to significantly recharge groundwater, and the recharging of the groundwater by jack trees is locally referred to as '*sunaippu*'. The farmers of the Kollihills claim that the jack trees encourage monsoon rains. The tribe has laid down laws and regulations towards minimising the cutting of trees and these are underpinned by religious and spiritual belief systems. They have a sacred forest site, known locally as the kovil kaadu (temple forest), which has a variety of fruit and spice species (Rajasekaran and Warren, 1994).

Indigenous Food Security System of the Kollihills

Agricultural and agro-forestry systems of the Kollihills are a basis of food and nutritional security in the tribal enclave. Cereals from the semi-irrigated agriculture form the bulk of the food while local landraces of beans play an important role in providing protein and the tuber crops satisfy the caloric energy requirements. The tribe often deny themselves the luxury of eating their own home grown fruits as they sell them in the markets. But they provide for their protein and fat requirements from the pulses and oil they buy using the income from the sale of the fruits. The portion the people set aside for home consumption is limited and thus it meets their vitamins and mineral salts requirements in a limited way (Box 3.2).

Disappearance of the Indigenous Agro-Forestry System. The disappearance of the indigenous agro-forestry system in the Kollihills over the decades, due primarily to changing socio-cultural values, population increases, poor income from the marketed agricultural produce and extravagance of the tribal people in their social and cultural activities and celebrations. These have resulted in the depletion of forests and self-denial of the food requirements of the people. All through the events, however, the tribal people have remained aware of the consequences of deforestation and self-denial of food security. Besides, their socio-economic priorities have resulted in the cutting of trees and sale of vital agricultural produce in the markets around the hills.

The problem is further aggravated by the middlemen of the markets, who lend money to the tribal farmers, with the view to take their products at the harvest in repayment for the loan and interest. Their prices are the marginal which make the ventures unprofitable. Now that the agro-industries (sago industry, for example) have moved in with the large scale changes in the cropping pattern (especially of tapioca), they have persuaded or forced the tribal farmers to grow tapioca instead of fruit and wild trees. True, tapioca offers immediate income but has a devastating effect on the indigeneous forest systems.

Box 3.2: Food Security: Some International Facts

- 841 million people in developing countries have inadequate access to food.
- Although the estimated number of under-nourished persons in the developing world fell from over 900 million in the early 1970s to over 800million in the early 1990s, progress has been uneven and bypassed many countries and population groups.
- Unless a major effort is undertaken to eradicate inadequacy of diet, between one sixth and one third of the population in some countries will be undernourished by 2075.
- Some 30million infants are born each year in developing countries with intra-uterine growth retardation.
- There are 150 million under-weight pre-school children worldwide and more than 200 million stunted children.
- 80 per cent of women in the developing countries suffer from maternal anaemia.
- 100 per cent of infant deaths in India are due to malnutrition and 50-59 per cent of children under five years of age suffer from various degrees of malnutrition.
- 40-60 per cent of all Indian mothers suffer from iron deficiency and anaemia (UNICEF, 1998).

There has been a large scale cutting of the wild trees and forests to make way for the tapioca cultivation in recent years. This is fast endangering the agro-forestry of the Kollihills. Apart from the socio-cultural constraints, there are some external factors which are unfavourable for the sustainability of the agro-forestry systems, even while the Forest Department has moved with a large scale investment on social forestry. But the social forestry schemes, which favour eucalyptus species deplete groundwater at an alarming rate.

Undoubtedly, the deterioration in the agro-forestry systems has placed the people and the natural ecosystems (plant, animal) in a most vulnerable position. It has been found that the deforestation has already resulted in the drying up of some forest streams, which in turn has reduced the yield of cereal crops such as the paddy and the millets. These conditions also inhibit the growth of the spice crops such as cardamom, coffee, cloves and pepper which require shade and cool environments for vegetative growth and reproductive functions.

The rate of deforestation has had a direct impact on the food security system and nutrition availability. Intercrops have suffered by the removal of shade trees. The declining fruit production in the recent years is blamed on the increasing area under

tapioca, catering to the industry. Importantly, there has been a change in the rythm of monsoons which has reduced the availability of water in the streams and the recharge of groundwater from the surface runoff. This has particularly affected the yield of paddy which is the staple food of the Malayalis. In sum, the climatic change, deforestation and deterioration of the agro-forestry systems have resulted in a threat to the food security. What is more worse is that the tribe known for their 'altruistic tendencies' are slowly turning themselves into people who have no compassion for others, because of the hard times (see Kumaran, 1987). With the youngsters finding jobs in the towns and cities of the country, the cultural values have been changing very fast.

It is now a common sight that the children of the hills suffer from malnutrition, due to the combined effects of the deforestation and deterioration of forest systems, monsoon failure, inadequate water, loss of food production and inadequate revenues from the markets.

What needs to be done in the Changing Resource Process

It is imperative that the changing resource processes, in agro-forestry, forest garden systems, cropping patterns of the modern agriculture and agro-industrial development, have spelt, as Table 2 indicates, disaster for some species of trees which are endangered and depletion of the agro-forestry and crop systems to the detriment of food security of the Malayalis. While the tribe appear to 'climb a foot along the pole of development, they seem to slide down by three feet': the path of development is indeed slippery and the slide in the health of the ecosystems and the people gives cause for worry. It is the contention of this study that the resource process in action is faulty and has to be drastically corrected with the participation of the tribal community. Commitment on the part of the community to a balanced, ecosystem supporting resource process is the need of the hour.

It is important that the efforts at such participatory development of the hills take into account the relationships between the indigenous or local knowledge system and indigenous agro-forestry system on the one hand and the indigenous or local knowledge system and the bio-diversity on the other. If these can be taken advantage of, in the interests of the Malayalis and sustainable development of the Kollihills, then indigenous food security system can be shored up and sustained. 'There is a need for a large scale awareness campaign, stimulating action at the community level' needs no mention. But the planners and the policy makers of the state must rethink their inputs to a socio-economic development and formulate schemes with participatory approaches which will benefit the tribe in the long run while sustaining their indigenous knowledge system, indigenous agro-forestry system and indigeous food security system through maintenance and management of bio-diversity.

Some suggestions that emerge from the study are:

1. Allowing indigenous or local knowledge system full scale sway over new and modern systems of agriculture, including indigenous agro-forestry system and forest garden systems. NGO initiative in this regard would be much welcome, provided the NGO is hill-based and not an outsider to the hills.

2. It is a fact that unless the tribals satisfy their food needs, fuel supplies required and curbing their population at the same time, deforestation cannot be stopped. NGO initiative and government cooperation could accomplish this provided joint management of the forest cover and alternatives to satisfying food and fuel needs could be found. Such initiative and cooperation should take into account, and clearly understand, the interrelationships between indigenous knowledge system, bio-diversity, food security and deforestation.

3. There is need to increase the income of the people from their current sources of income, as poor income from fruit harvests marketed is a rule rather than exception. Efforts must be made, in a participatory way, to explore the realistic possibilities for increasing farmers' income through fruits and forest produce.

4. At the regional level, it would be worthwhile to set up a structured market in tune with the demands of the tribe, by making the tribe responsible for running it so that middlemen, who gives loan for exhorbitant interests, could be eliminated. What is more important is that the tribal farmers must be organised into an 'Association" so that they could take on the responsibility of running this market as a collective and not individual owners. This is quite possible and can be done in the hills, if an NGO could be identified and assigned the job.

5. There is need to create an awareness among the population about the need to keep their indigenous agro-forestry system intact so that their indigenous food security system could be taken care of. This would be a challenge to the tribal population and not easy to accomplish unless they realise the worth of the forests and stay away from them. In fact, they should be helped to develop forests both as a community and as individual farmers.

6. It has been found that much of the indigenous knowledge system remains dormant and must be revived towards developing the agro-forestry systems, forest gardens and cropping systems. NGO could not only do it but also assure community participation by developing dedicated village groups.

7. Agro-industry must be encouraged to set up industries but be made responsive to ecosystems conservation and upholding bio-diversity of the hills.

8. Considering the agro-ecological and biophysical conditions of the hills, suitable indigenous landraces or hybrid varieties which were developed using traditional varieties may be advocated for cropping. As for forests, the rate of reforestation should be high.

References

Gadgil, M. and F. Berkes (1991): Traditional Resource Management Systems, **Resource Management and Optimization**, 8(3/4): 127-141.

Kumaran, T.V. (1983): **Agricultural Development in the Kollihills**, A Project funded by Indian Council of Social Science Research, Department of Geography, University of Madras, Madras.

Kumaran, T.V. (1987): Agricultural Systems and Foodwebs in the Kollihills of Salem District, **The Journal of Madras University**, LIX(1): 1-11.

Kumaran, T.V. (1991): Community, Supporting Services and Crop Diversification in Tribal Agriculture, **Proceedings** of the Eighth Afro-Asian Regional Conference, Bangkok, International Commission on Irrigation and Drainage.

Kumaran, T.V. (1993): Is Externally Influenced Tribal Development Viable? A Case of the Kollihills, **The Geography Teachers, India** (new series), 4(1): 17- 32.

Kumaran, T.V. (1998): **Indigenous Knowledge Systems: Concepts, Cases and Assessment**, A Workshop, Department of Geography, University of Madras, Chennai and Centre for Alternative Energy and Rural Technology, Chengalpattu.

Kumaran, T.V. and S. Aruchamy (1989): Human time budgets in Agriculture: A Case of Kambam Valley, in L.Vidyanath and R.M. Rao (eds)**, Patterns of Resources Use in India,** New Delhi: BH Publishers.

Mathen, K. (1997): The Burden of Literacy - A Letter from India, **The Ecologist**, 27(5): 175-177 (September - October).

Mitchell, B. (1997): **Resource and Environmental Management**, Essex, England: Addison Wesley Longman.

Norman, D.W. (1974): Rationalising Mixed Cropping under Indigenous Conditions: the Example of Nigeria, **The Journal of Development Studies**, 11: 3-21.

Rajasekaran, B. (1994): **A Framework for Incorporating Indigenous Knowledge Systems into Agricultural Research and Extension Organisations for Sustainable Agricultural Development**, Technology and Social Change Series No. 22, Ames, Iowa: Iowa State University.

Rajasekaran. B. and D.M. Warren (1994): IK for Socio-Economic Development and Bio-Diversity Conservation: The Kollihills, **Indigenous Knowledge and Development Monitor**, 2(2): 13-17.

Reij, C. (1993): Improving Indigenous Soil and Water Conservation Techniques: Does it Work? **Indigenous Knowledge and Development Monitor**, 1(1): 11-13.

Rosell, D.Z. (1979): Appropriate Technology: the Philippine Setting, **The Philippine Geographical Journal**, 23: 1-10.

Shah, P. (1993): Participatory Watershed Management Programmes in India: Reversing our Roles and Revising our Theories, in IIED: **Rural People's Knowledge,**

Agricultural Research and Extension Practice, Asia Papers, Research Series, 1(3): 38-67.

Weitz, R. (1971): **From Peasant to Farmer: A Revolutionary Strategy for Development**, New York: Columbia University Press.

Weitz, R., D. Pelley and L. Applebaum (1980): A Model for the Planning of New Settlement Projects, **World Development**, 8: 705-723.