Study of Economics of Ecological Agriculture

A Study of 4 types of land use with Adivasi communities in the Nilgiris, Western Ghats, India

I. Background – Area, People & Agriculture Practices

- Physical features of the area, information about people/ communities, their socio-economic status, etc.

The Nilgiris district is located in the Western Ghats, in the north western part of the state of Tamil Nadu. This is a hill district with elevations ranging from 400 to 2600 MSL. The region is dominated by plantations of tea/coffee and commercial vegetable cultivation. Approximately 55% of the land is under the forest department – including all plantations of eucalyptus, tea, wattle and the two wildlife sanctuaries and national parks of Mudumalai and Mukurthi. The average rainfall varies between 2000mm in the west to less than 500 mm in the eastern and northern sides. Nilgiris is home to many indigenous communities, including 6 primitive tribes. Most of them are either pastoral or have been hunter gatherers.

Land use change has taken place in the Nilgiris over the past 200 years, with a constant move towards commercial species, both in the forest and in agricultural lands. This project is designed for adivasi people in the Nilgiri region, whose lands are fallow, steep and with a very low soil cover. It has also been realised that the soil and water regime in these hill tracts is very vulnerable and requires inputs for improvement/conservation. This is mainly because these land holdings lie very close to steep forested areas of the Nilgiris Middle elevation (800-1000 MSL).

These communities are Kurumbas and Irulas- who were erstwhile hunter gatherers, collecting non timber forest produce from the forest, mainly honey. They also cultivated land, practicing shifting cultivation methods and growing a variety of food grains and vegetables. Today, they are settled and have been allocated some marginal lands. Land ownership varies between 1-3 acres per family and is usually steep with poor soils. Most families have to work as daily wage labourers to supplement the income they get from their meager farm produce. The average earning per month varies between Rupees 1200/- to 2000/-. They have poor access to facilities like education, health, markets, etc. Their farm produce – coffee, pepper, jack, silk cotton and spices are sold by each family in small quantities seasonally. Their villages are usually on inaccessible terrain, with no road access and close to forests, at an elevation of 1200 to 800 Metres MSL

- Sources of livelihood, food security and major issues:

The Kurumba and Irula community depend on a combination of agriculture, forest collection and wage labour as the source of their livelihood. Over the years the shift in cultivation practices and the increasing uncertainty of weather has resulted in more dependence on wage labour in closeby plantations, which in turn has drastically reduced their earlier practices of millet cultivation as food crops. This has resulted in a change in their diet and dependence on the Public Distribution System, which provides only rice. This has meant lack of nutrition, low food security and an unbalanced diet. This situation especially adversely affects women and children.

- Land holding pattern, soil type, rainfall, crops grown, cropping seasons, cropping systems (monocultures, mixed cropping systems, shifting cultivation, etc.), use of chemical fertilisers/ pesticides, etc. General Information (relates to the region where we work)
- Soils: Lateritic soils – gravelly and loose soil, thin soil cover with low humus content
- Topography/Terrain: Hilly terrain – slopes range from 20-70 degrees. The land belonging to the indigenous people are usually degraded and steep, with wild bushes.
- Land ownership amongst adivasi community – between 1-3 acres; Average 2 acres.
- Annual Rainfall: 800 mm . From the past 3 years it has been approx. 430 mm only.

Crops grown (with varieties within each crop):Traditional Agriculture by Kurumba & Irulas in the Nilgiris

Local Name	Common Name	Botanical Name	Variety (local)
Ragi	Finger millet	Eleusine corocana	Cent, Seevai
Samai	Little millet	Panicum sumatrense	
Tenai	Italian millet	Setaria italica	Muduga, Kongu Sukku, Semba, Kaar
Keerai	Amaranthus	Amaranthus caudatus	Joghi
Kadaghu	Mustard	Brassica juncea	
Milaghu	Chilli	Capsicum frutescens	Vara, Guda, Banmas, Jinimas
Macca Cholam	Maize	Zea mays	Matpal, Jinicholam
Pusinakai	Pumpkin	Curcurbita pepo	Kumbkai/ Sakarkai
Avarai	Lablab	Dolichos lablab	Karapu, Vellai, Soni
Tuvarai (dal)			
Takkali	Tomato	Lycopersicum esculentium	
Manjhal	Turmeric	Curcuma longa	

Other Crops promoted for cash and high value returns

Beans - Dorai avarai	Coffee – Arabica, Robusta, Liberica
Pepper – Panneer, Karimunda	Nutmeg -
Clove -	Silk Cotton – Nat, College
Silver Oak	Lime – Tapati
Gooseberry – local	Orange - local

Cropping Pattern/System

- No. of Crops – 1 - traditional agriculture
- Rainfed/Irrigated – Mostly rainfed, some lands have access to water
- Mixed Cropping: All the crops mentioned above under traditional agriculture are planted together as mixed crops. Usually ragi has a different plot with mustard and pumpkin & all other millets are sown together and have rows of corn, lab lab and pumpkins. Tomato and vegetables are grown in different plots in an inter-cropped manner. These crops promote increased nutrition to the adivasi family.

  The crops promoted from the nurseries are also planted with intercropping, balancing shade requirements in the land.

- Shifting Agriculture – Not practiced now,though an earlier practice of these communities. The lands are now restricted and they cannot follow shifting cultivation anymore. Some of their practices in traditional agriculture are the same but they do not move from land to land anymore and are developing the land allotted to them with agriculture/horticulture, spice and mixed cultivation crops.

- Other practices in Ecological agriculture – They leave the post harvest biomass in the soil itself. Land is allowed to rest for a 6 month period and biomass generated. Crops selected use different soil depths for root establishment. As these lands are rainfed, contour trenches and bunds are made to hold soil and water on the land. Mixture of crops creates different canopy levels and promotes a tier system of cultivation. Goat manure and leaf litter is put back into the fields. Low input is used from outside and all labour in the farm is of the family.

The area is largely full of plantations of tea and coffee, with some vegetable cultivation. These are a mixture of large privately owned estates and small farms – all of which is dominated by the monocrop of tea. There is a very high use of chemical fertilizers and pesticides in these fields. Mixed cropping is not commonly practiced, with a larger number of farms converting into tea cultivation. Coffee however, does have intercropping with shade trees of jack, silver oak, fruit trees and pepper vines. Amongst all the practices followed, these coffee plantations are the most bio-diverse plantations.

II. Definition of Problem, Proposed Study & Methodology

It is increasingly felt that mono-crop plantations of tea are a better land use option than mixed agriculture practices. This is resulting in land use change to tea and other mono-crops, leading to increase in the use of chemical pesticides and fertilizers, erosion and a high dependence on the market economy. This has a degrading effect on the soil and moisture balance and depletes biomass production. These negative effects are felt more by the indigenous community who are economically backward and have lands at an elevation of 800-1000 metres, not suitable for tea cultivation. This has also eroded into the cultivation of traditional food crops which not only provide food security and nutrition, but also adds to the diversity of crops, increases biomass and improves soil fertility.

It is necessary to promote traditional agriculture practices, improving them further with soil and moisture conservation activities and small technical inputs. It is necessary to maintain and document seed stock and promote the cultivation of indigenous varieties of seeds. This needs to be done taking into consideration indigenous practices, intercropping and organic farming principles. It is also necessary to document the economic gains from such a diverse farm and compare it to conventional fields of cash crops. This should include all inputs and valuate all outputs to judge the economic viability of the cultivation practice. That is, a social/environmental cost benefit analysis needs to be done. This will help farmers realize the real benefits of mixed agriculture and undertake it extensively.

The Proposed Study

1. A comparative study of 16 small land holdings belonging to *adivasi* communities, with different types of land use needs to be taken up. This will have 4 tea fields, 4 coffee fields, 4 mixed agriculture and 4 commercially grown vegetable plots
2. These fields will be monitored monthly for a one year period
3. They will be studied for environmental, social and economic costs and benefits
4. Results will be documented, collated and reported for wide dissemination. A farmers meeting will be held to disseminate the findings to the people.

Methodology

The study was designed by the programme team, which is experienced in agriculture/land development work. Reference was also made to the Manual on Economics of Ecological Agriculture sent to us by ADS. A combination of methods were decided to be used, like PRA mapping, Farm transects, Questionnaires, laboratory testing, Observation, etc. The detailed methodology adopted and the frequency of data collected is elaborated below.

One time Activity Tasks – Study Beginning

1. Farm Maps: Using PRA, GPS and GIS of 16 farmers.
2. Base-line data
3. Crop varietal classification information (The Traditional Crop Table: Act I-Table-1. p.1/4)
4. Ecological aspects- discussion
5. Traditional Practices & IK case studies
6. Water: Ecological study Table:-1: Water Information- Source Type Source Type (Act I-Table-2; p.2/4) and Water Information- Storage and Distribution (Act I- Table-3; p.3/4)
7. Soil : Ecological study Table-3: Soil Information- Ph Gradation: Ecological Table-4: Soil Information- pH, Soil Type, Soil Gradation, Moisture (Act I – Table-4; p. 4/4)

Once in Four Months – Quarterly Analysis

1. Farm Transects- Crop diversity and the Biomass (Cultivated and Uncultivated)
   - habit & uses

[Ecological Study Farm Transect crop Diversity Table-1, Act II- Table-1,p. 1/3 and Ecological Study Farm Transect Biomass crop Diversity Table-2, Act II- Table-2, p. 2/3]

2. Soil: Ecological study Table-3: Soil Information- Ph Gradation: Ecological Table-4: Soil Information- Moisture, Decayed Material and Soil Fauna (Act II – Table-3; p. 3/3)
- to cover 5% of the area + Spread

Once a Month

Data Sheets as follows:

1. Economic Study

1. Table-1: Weekly Household Requirement (the figures to be computed at monthly basis); Act III- Table-1; p. 1/7
2. Table-2: Economic Details of the Farm Produce- the Input-Output Values; Act III- Table- 2; p. 2/7

2. Social Study

3. Table-1: On-farm Employment Generation (to contribute to Economic Table-2); Act III-Table- 3; p. 3/7
5. Table-2: Off-Farm Employment Generation (to contribute to Economic Table-2); Act III-Table- 4; p. 4/7
6. Table-3: Time spent by working Members of the Family on Different Livelihood Activities; Act III – Table-5; p. 5/7

3. Ecological Study
Day Observation with the Farmer and Extrapolation:
6. Table-1: Fauna Based Practices of the farm; Act III-Table-6, p. 6/7
7. Table-2: Pollinators and Seed Dispersers of the Farm, Act III-Table-7, p. 7/7

(Please see data sheets and soil test details in Annexure 1)

III. Results, Analysis & Discussion

1. Selection of Farmers, Criteria and Basic Facts

Keystone has had a land development programme since 2000 and has been working in several villages. The farmers were selected from these villages, based on prior information and field knowledge. It was decided that all the major parameters governing agriculture will be kept as constant as possible. These were:

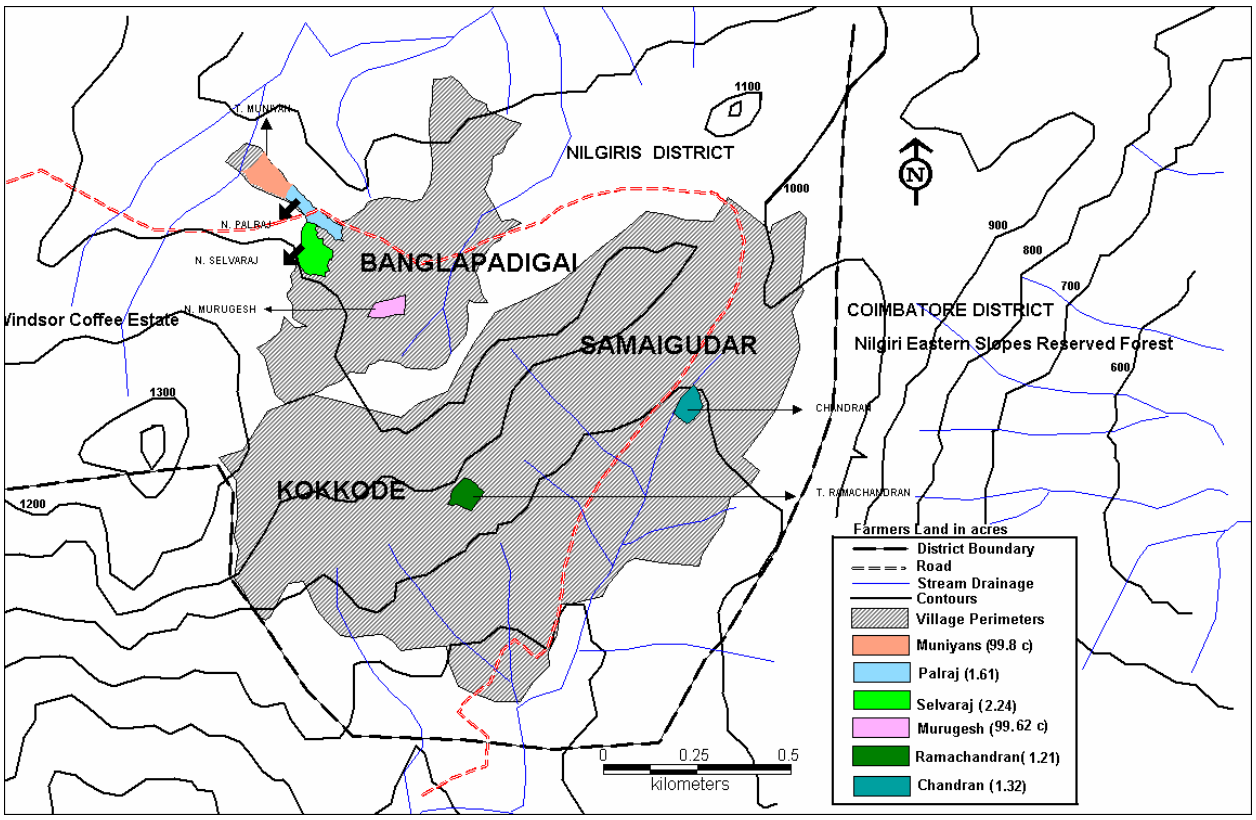
- All farmers belong to the *adivasi* community
- The farm size is approximately similar (or adjusted accordingly)
- They are in the same agro-ecological zone, with similar aspects, rainfall pattern and soil type
- The socio-economic profile of the farmers are somewhat similar

The final list of farmers selected and their family and land details are presented below.

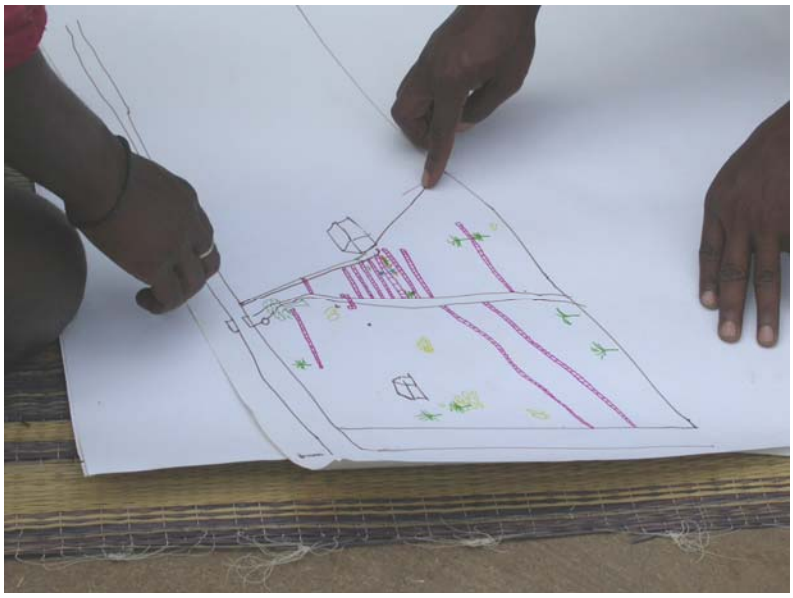
Male	Female	Village	Crop Type	Area (acres)
Dharmaraj	Devi	Semanare	Tea	0.72
Masanan	Marai	Semanare	Tea	1.70
Nanajan	Kamala	Nedugal Combei	Tea	1.48
Mahalingam	Nanjiamma	Thalamukh	Tea	2.70
Johee	Rami	Vellericombai	Coffee/mixed	2.50
Krishnan	Susila	Vellericombai	Coffee/mixed	2.05
Muniyan		Bagalapadagi	Vegetables	99.80
Palraj	Valliamma	Bagalapadagi	Vegetables	1.61
Murugesh		Bagalapadagi	Vegetables	99.62
Selvaraj	Ponnamma	Bagalapadagi	Vegetables	2.24
Sivaraj	Janaki	Samaigudar	Millet/ mixed	0.70
Maruthai	Neeli	Samaigudar	Millet/ mixed	0.70
Mani	Sivalaxmai	Samaigudar	Millet/ mixed	0.70
G.Rangaswami	Muthamma	Samaigudar	Millet/ mixed	0.70
R.Chandran	Santi	Kokode	Coffee/mixed	1.13
T.Ramachandran		Kokode	Coffee/mixed	1.21

Basic data on Farms studied

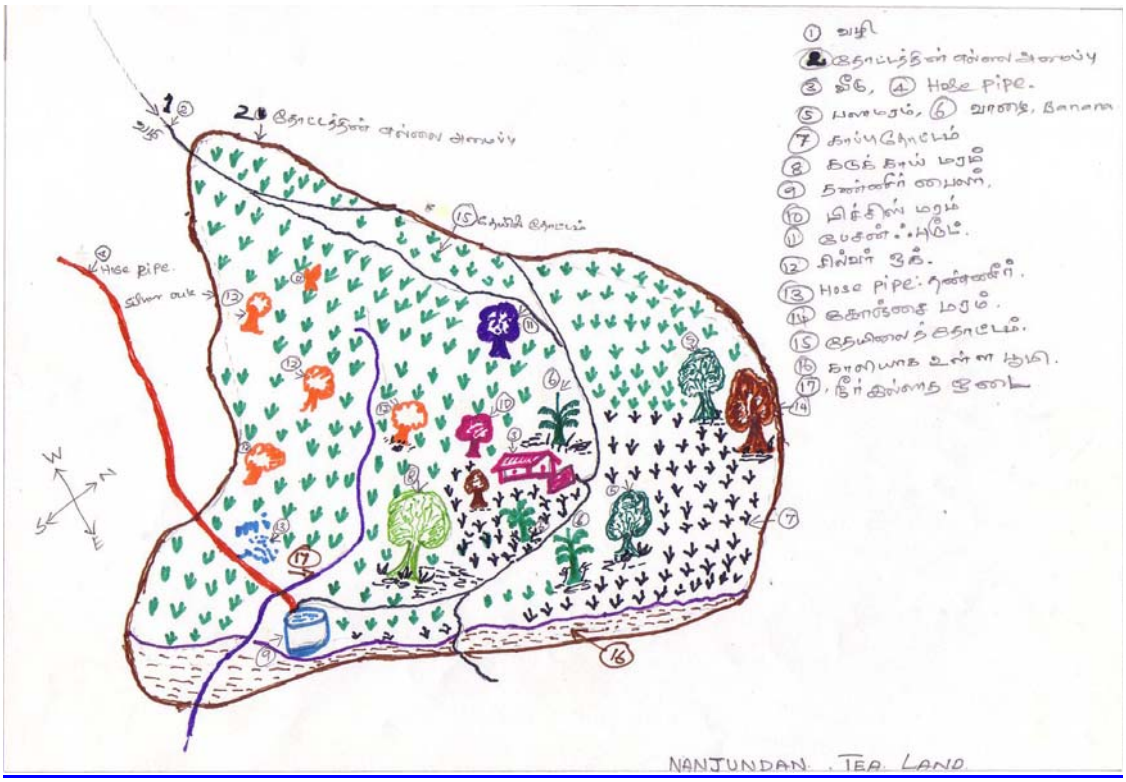
The farms were mapped by GPS and their area calculated. The following map locates the farm in the Nilgiri slopes. This is followed by a table with the basic data on the farms.

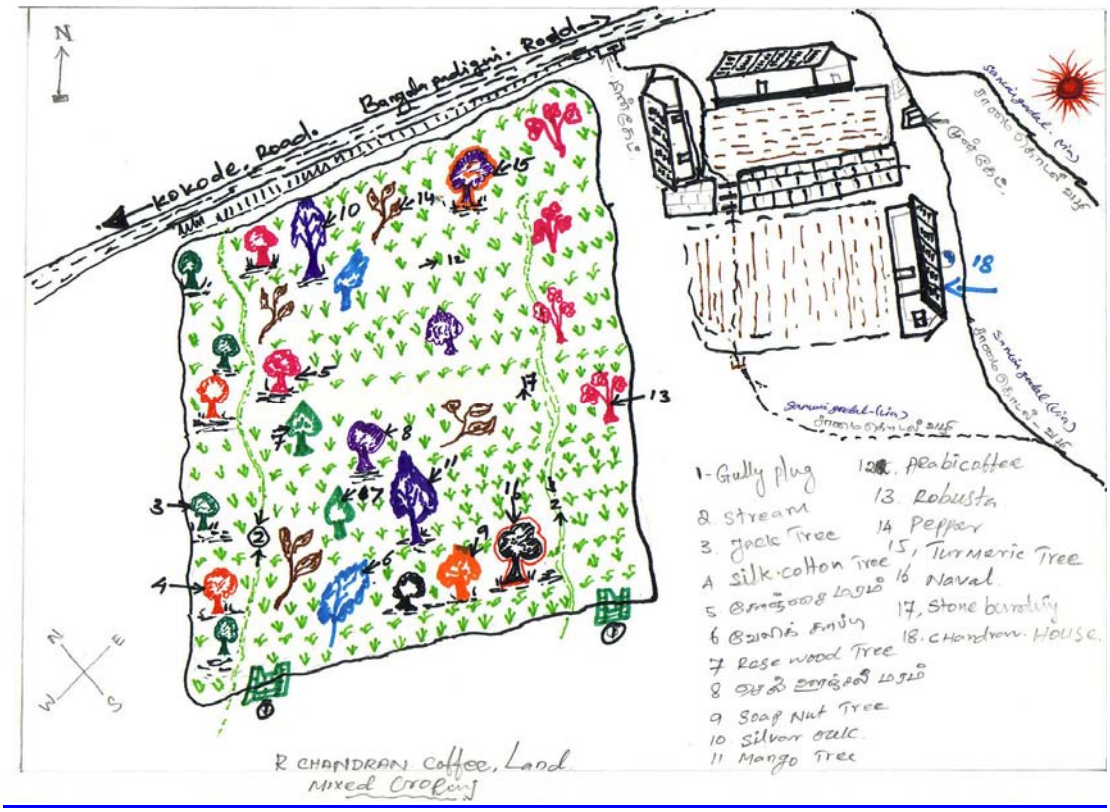


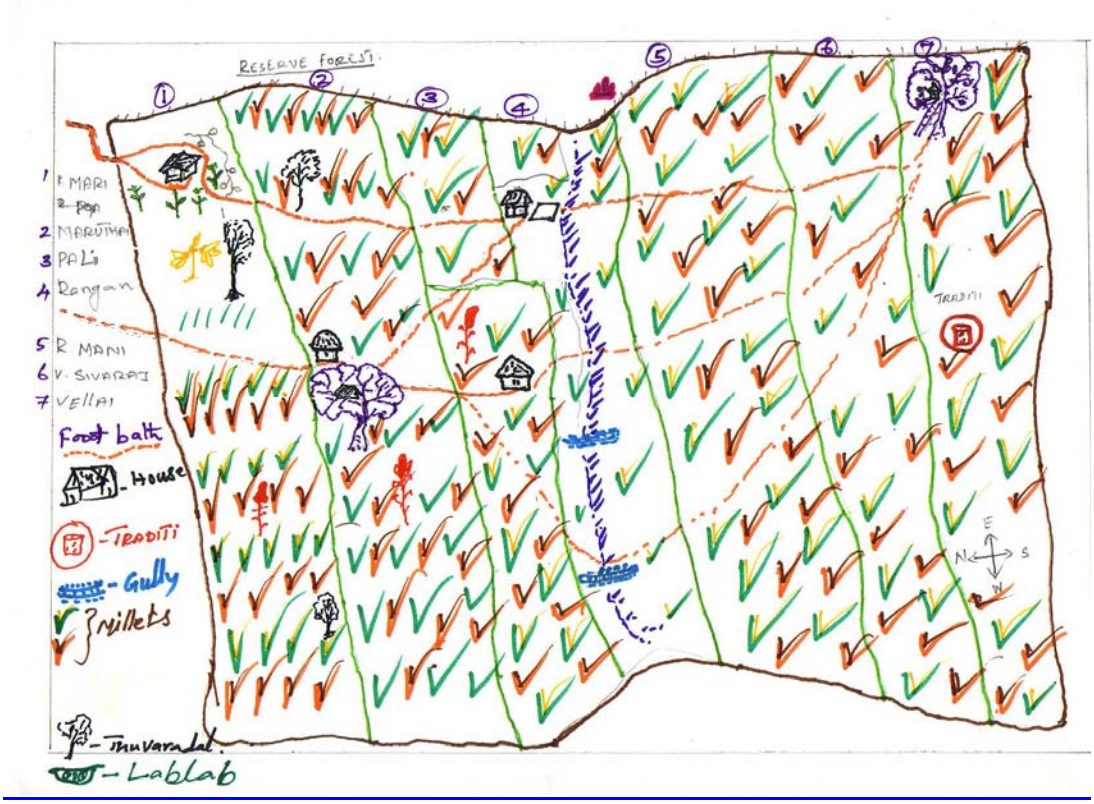
The farmers were also involved to draw their farms as a PRA exercise to map their resources, main trees, bunds and ponds. The area demarcated for different crops as also marked. This also helped the researchers discuss with the families, the reasons for selecting different crops and other inputs and difficulties.

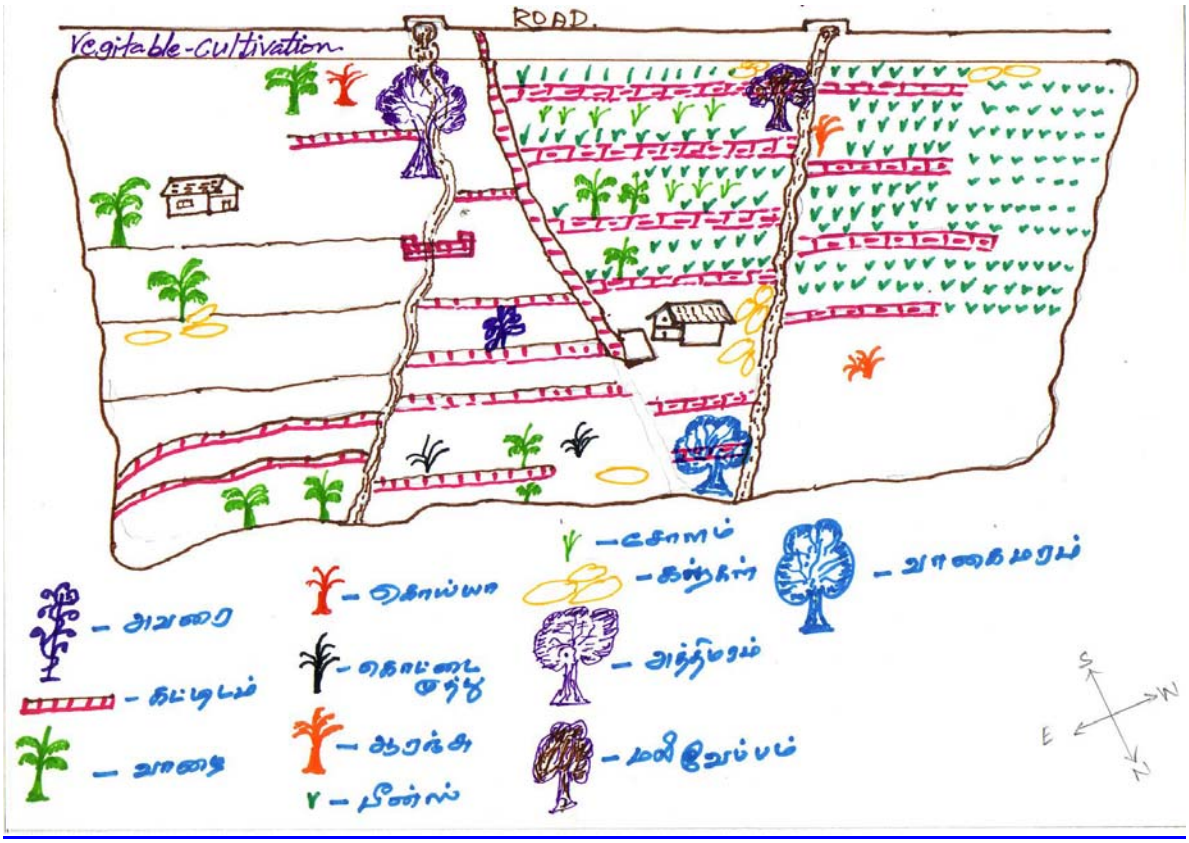


The maps and corresponding transect profiles are replicated in the following pages as examples of what the farmers perceive and what emerges and diversity in each field.


NANJUNDAN . TEA. LAND


R CHANDRAN Coffee, Land
Mixed Cropping

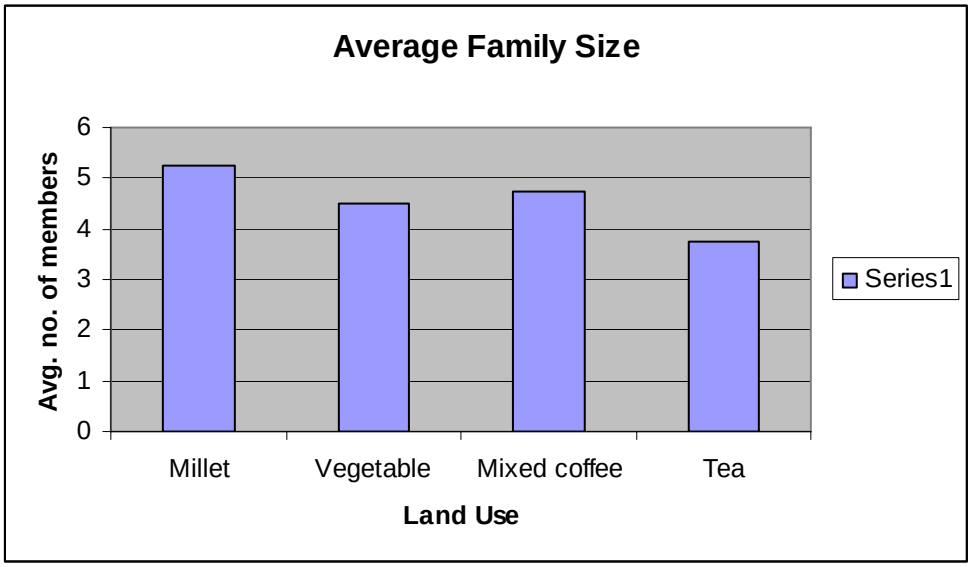

RESERVE FOREST
1 MARI
2 Pon
2 MARUTHA
3 PALa
4 Rangan
5 R. MANI
6 V. SIVARAJ
7 VELLAI
Foot path
- House
- TRADITI
- Gully
- Millets
- Thuvaradal
- Lablab


ROAD.
Vegitable-Cultivation
- அவரை
- கிழங்கு
- வாழை
- தென்னை
- கொய்யா
- ஆரஞ்சு
- பீன்ஸ்
- சோளம்
- கத்தரி
- அத்திமரம்
- மலை வேம்பு
- வாதைமரம்

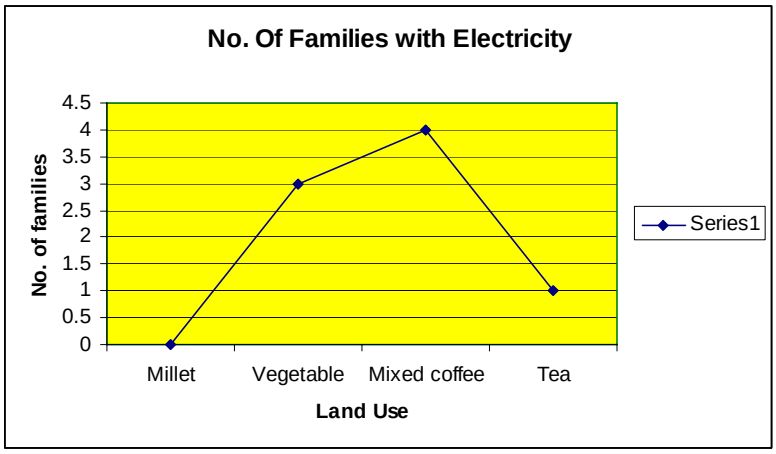
2. Basic socio-economic Indicators

The *adivasi* farmers selected for this study had largely a similar socio-economic profile. However, certain important aspects emerged on analysis of the basic data, when divided along the lines of the land use practiced by them.

The average family size amongst the farmers varied minimally. The exact differences are seen in the following chart. There is a marginal drop in the family size amongst tea growers, whereas the rest stay between 4-5 members on an average.



The house types of the selected farmers do not vary too much. It is however, seen that 2 farmers' with tea and a steady income still live in thatch houses & have not mentioned housing as a priority expenditure. This could be more based on preference of the particular family. Another socio-economic indicator– house lighting/electricity has the following trend:

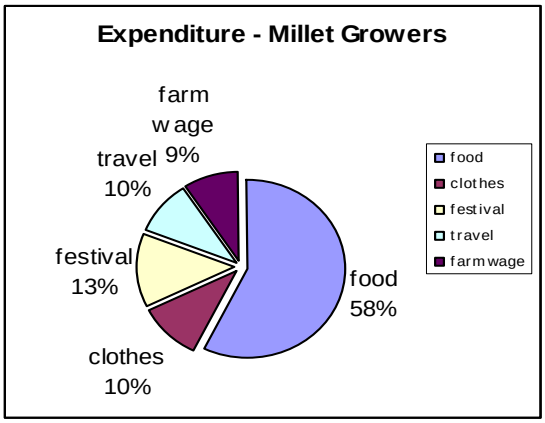


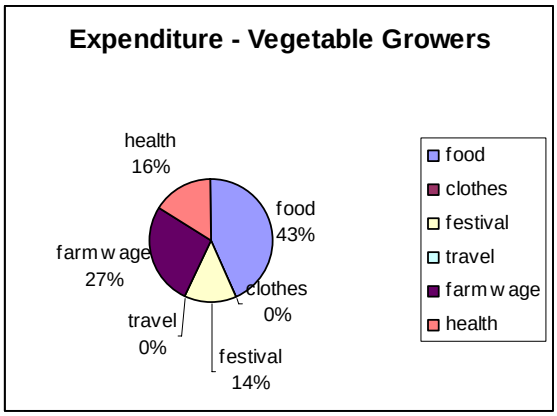
The priority given to aspects of housing and electricity are low, by the *adivasi* families. This is seen as something that has to be `provided' by the government. Many people live in group housing schemes and most villages have street lighting, though not house electrification. Other basic facilities like drinking water are available at a maximum of 350 metres from the house site, usually from wells or springs. All families, irrespective of land use type utilize wood and kerosene as fuel. Most villages are close to forest areas, which is the source of fuel wood. During some seasons, fuel wood from the farm is available mainly in the mixed coffee holdings and in tree based tea lands.

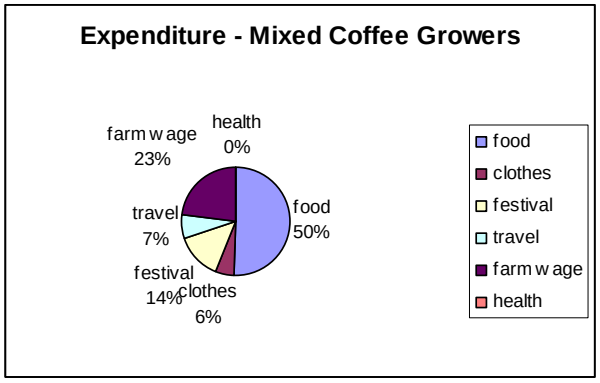
All families have 4-7 types of farm implements for their own use and sharing amongst themselves. Most families also have livestock, mainly goats and chicken. Few cows are also reared, irrespective of land use as all the animals are free grazing. Village commons and forest areas are used for grazing. The number of livestock reared largely depends on the number of members in the family who are free to look after the livestock.

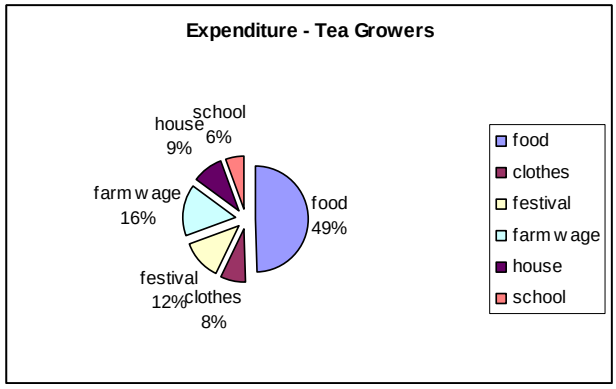
The income pattern shows that wage labour plays an important role in the income of the family. Whereas amongst the 16 farmers – 3 do not go for wage labour, others have between 5-8 man days per week. This means an income of Rs. 13,000 – 20,800 per annum (taking an average wage rate of Rs. 50 prevalent in estates in Nilgiris). Other sources of income include seasonal income from cash crops – coffee, pepper, beans, silk cotton and jackfruit. This varies between the families anywhere between Rs. 2000 to 10,000, the main money earner being pepper. However, income from this source fluctuates drastically, depending on the world market rate or the local *mandi*. Some income is also derived from sale of goats and chicken eg. 10 goats could earn upto Rs.9600 in a staggered duration, whereas 10 chicken about Rs. 1000-1500. Sale of livestock is done in time of urgent/special need for events like marriages, deaths, festivals, etc. Overall, the cash income of a family varies between Rs. 20, 000 – Rs. 30,000 per annum (giving between Rs. 1600 -2500 per month).

Expenditure pattern of *adivasi* families does not show much variation either – the maximum expenses are made for food (43-58%), followed by items like farm labour and festivals. Vegetable growers spend the maximum on farm wage, followed by coffee growers. All families spend 12-14% of their income on festivals. An interesting aspect with tea growers is the expense that they can make in aspects like education. The following 4 charts show the expenditure of the different land use groups.

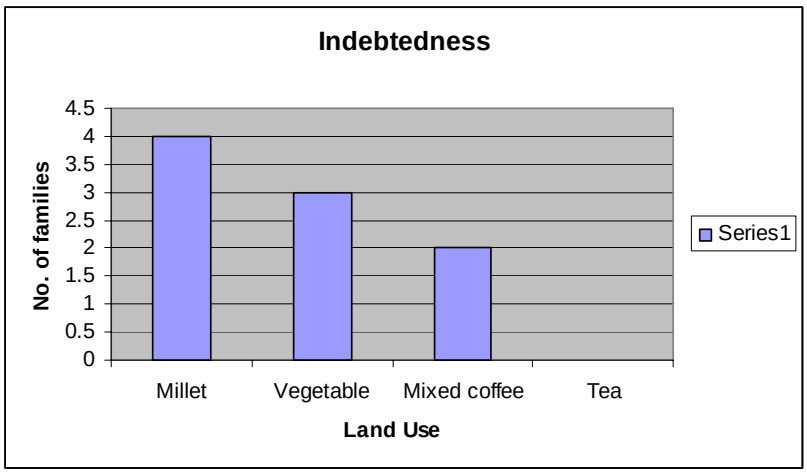








Another important socio-economic indicator is indebtedness – we find that amongst the 4 set of farmers, it was the tea growers who were not in debt & had not borrowed for either farm or personal reasons. The following chart explains the debt position of all the farmers:



Most loans are taken for festivals or emergencies and range between Rs.1000-3000. Farm loans are usually high and go upto an amount of Rs. 10,000. These loans are taken from private traders and usually tied up through repayment from one of the cash crops.

3. Social Analysis

The social aspects of the land use are covered by understanding the use of labour in the farm. This is covered by seeing kinds of work available, hired or family labour, gender aspects of work available and the time period for which labour is required in a year. Which crop generates more employment and of what kind was also analysed.

From the survey it was found that labour generation for 1 year is off the following kinds:

On-farm employment Generation

	Total Labour Days	HH Labour days Generated (Male)	HH Labour days Generated (Female)	Hired Labour Days generated (Male)	Hired Labour Days generated (Female)
Tea	695	225	312	51	111
Coffee	744	221	135	32	30
Millet	856	312	335	126	144
Vegetables	1003	428	239	185	172

Off-farm Employment Generation

Land Use	Total labour Days Generated in Post harvest Operations	labour Days Generated in Post harvest Operations (Male)	labour Days Generated in Post harvest Operations (Female)	labour Days Generated in Community through demand and services (Male)	labour Days Generated in Community through demand and services (Female)
Tea	19	5	14	4	3
Coffee	29	10	19	2	0
Millet	161	75	86	333	6
Vegetables	95	73	22	388	23

The main activities in each land use are as follows:

- Millet – Land preparation, interculture, weeding, guarding field , seed sowing, manuring, harvest, threshing, drying
- Coffee - Plucking leaf/berries/pepper/silk cotton/jack, weeding, manuring, harvesting, drying, selling & transporting
- Tea - fertilizer application, transport of tea bags and fertilizer, weeding, plucking leaf
- Vegetables – preparation of land, seeding, weeding, watering, application of manure, guarding fields, harvesting, sorting, selling

In *adivasi* communities, not much distinction is made between the work of men and women. This aspect is very clear in millet cultivation – where the family works together in all the activities to be undertaken. This also reflects in the data, where men & women have an equal share (312 & 335). However, some work division is followed in other crops eg.

1. Plowing the land (using a fork) is done by men
2. Tea leaf plucking is done by mainly women
3. Sowing, tree planting and harvesting millets and vegetables are done by women
4. Tree climbing activities are done by men – harvesting of jack, silk cotton, pepper
5. Market related activities – buying/selling is done by men

Vegetable cultivation needs the maximum amount of labour, approx. 60% of which is done by men. Labour needs are also high in millet cultivation, followed by coffee and lastly tea. Most of the hired labour also follows the same pattern, and is taken from the same village or nearby *adivasi* villages. Non *adivasi* people are not hired for work in these villages. Land clearing, fencing activities take a lot of labour in both vegetable and millet cultivation. In vegetable cultivation – marketing is quite crucial and hired labour is used for that.

Time Spent by working Members of the HH in Different Livelihood activities

	Self Employment-Male (Person Days)	(Self Employment-Female (Person Days)	Wage Labour-Male (Person Days)	Wage Labour-Female (Person Days)
Tea	576	373	212	227
Coffee	135	217	178	117
Millet	701	741	130	125
Vegetable	493	679	206	135

Most *adivasi* families here are engaged in the following main activities:

- cattle grazing
- casual labour – in nearby tea and coffee estates
- firewood collection
- collecting fodder
- ration shop for purchase
- cattle shed upkeep
- cleaning around house
- tuber collection
- collecting greens
- collecting herbs for own use
- collecting pole for fence/repair

From the data it is clear that because of high labour needs in millet and also the fact the families have to be in the fields, self employment amongst the growers is very high. This is also because uncultivated foods are available in the fields. However, due to cash needs usually both men and women take turns in going for wage labour, depending on the labour demand and the needs in the field.

Access to wage labour is highest amongst the tea growers – as they need to be in their farms once in 15-20 days depending on the season for tea plucking – the rest of the days are available for going out for wage labour. This also is one of the reasons that though tea is not profitable, the families are economically well off.

Coffee growing farmers are also free to go for wage labour – but are usually more involved in their farm as there is periodical need for harvest and a lot of uncultivated foods are available from the farm. Women prefer to be in these farms and go minimally for wage labour.

4. Economic Analysis

The economic aspects of a land use type are covered by input- output calculations; the periodicity and duration of crop yield determine the income periodicity. During the study the results and discussions with farmers revealed that all crops faced risks – fluctuating market prices affected tea, vegetable and coffee. Millet cultivation was affected by failing and untimely rains, raiding by wild crops and low outputs. Low outputs and pest infection was also high amongst the coffee growers. The berries were often eaten by the berry borer, which lowered the quality of the crop

An economic analysis of 4 farmers is presented in the tables below – these farmers were selected randomly from the 16 studied.

Name & Land Use	Input	Output	Profit	Adjustment to 1 acre	Remarks
Dharmaraj (Tea)	8710	7873	(837)	(535)	The year saw a drastic fall in the prices of green leaf tea. The income comes in at regular intervals, which is important for the *adivasis*. In some other tea farms, which are more diverse overall profitability is high eg. Mahalingam (see annex 2)
Krishna (Coffee)	2580	5022	2,442	1,221	Investments are high in the initial setting up of such a farm & it takes time to establish
Muniyan (Vegetables)	9,036	9,221	185	200	Needs constant high investments, with low profit margins
Mani (Millet)	1415	2159	744	1062	The crops could be undervalued, labour utilization for guarding the fields is excluded

Some features analysed per land use (see detailed calculations in Annexure 2)

	Input features	Uncultivated outputs	Market Vs. Household	Profitability
Tea	1. Most *adivasi* farmers do not use chemical fertilizers 2. Most labour is from the household – but during plucking time it has to be hired 3. Marketing and outside touch with agents and factories has to be high	1. These are usually low – but largely depends on the farmer – people like Mahalingam have a ecologically sound farm, providing firewood and fodder & many uncultivated foods	1. Besides the uncultivated foods, nothing is consumed by the household 2. Market price fluctuations in green tea is very high 3. Household has more cash income	1. Not profitable – if value of uncultivated items is excluded. 2. Sometimes not profitable even including all outputs from the farm (Dharmaraj)
Coffee	1. Once the farm is established, there is hardly any input by *adivasi* coffee growers 2. If input was provided, yields can be better	1. These are very high in coffee fields 2. Firewood and fodder is available in plenty	1. There is coffee, fruits, high value pepper, silk cotton, etc. both used for the market and home consumption 2. Price of coffee also oscillates in the market 3. Jack is a favourite food of the *adivasis* & grown along with this land use	1. Profitable as the income balances off, even if the price of 1 product is low. 2. Profitability can go up with some input of manure and pest control
Millet	1. Labour inputs are very high 2. There are no inputs towards fertilizing the land – organically	1. Food related outputs are high – tubers, greens, etc. 2. Firewood and fodder related outputs from the farm are relatively low	1. No aspect of the land use is connected with the market 2. There is high food security, nutrition assured for the household	1. The cultivation is marginally profitable, but depends a lot on the rain pattern and abundance 2. Excessive labour used brings up the cost of cultivation
Vegetable	1. This land use is both labour and material	1. Fodder and food are high in the	1. This is a market dependent land	1. Very marginally profitable, even

	intensive. Initial capital is required to start this activity	farm, mainly found along bunds and boundaries 2. There is not much output for fuel wood needs of the household	use – both for inputs and sale 2. Unlike other crops, where agents buy from the village – this has to be sold in a market mandi atleast 50 kms from the farm 3. There are plenty of vegetables available for the household	with the best farmer taken. 2. Profitability can be increased with better marketing facilities

5. Ecological Analysis

This aspect will be covered by analyzing data on biomass, fuel and fodder on farm; soil type and features; crop diversity; avi-fauna and pollinators; water usage and methods adopted.

These are a combination of studies, interviews, observation and lab tests. This aspect was given special emphasis by Keystone.

Soil Details

Land Use	pH (average)	Soil Type	Moisture in Soil
Tea	5.30	Loamy clay, Brownish-black	medium
Coffee	6.1	Reddish soils show a higher Ph, Soils - black, red mixed	medium
Vegetables	5.53	Black red mixed	low
Millet	5.55	Black clay	medium

The usual soil pH varies between 4.5 -8.5. pH 4-5 soils are very acidic or sour and support very few plants while, pH 7-8 soils are too alkaline or sweet for most of the plants to grow. The best soils for the growth of the most of the vegetation have a pH of 6.5 to 7, i.e. very less acidic to neutral. According to this, we can see that the soil under coffee plantations is good for plant growth. These soils also showed high biomass and mulched material. Other soils are acidic and need treatment for better plant health. Moisture was the lowest in the vegetable fields – this could be because of the lack of shade plants and excessive evaporation.

Soil Info- Moisture, org. matter, Soil Fauna

	Moisture	Organic Matter	Soil Faunal activity	Observation
Tea	20%-40%	low	black ants, dung beetle, Eekkal	Soil stone heavy
		to	Termites, white vandugal	Insects carry litter/small stone
		medium	Olaipochi/earthworms, thel poochi	Dry leaf into manure
			black vandu,	black soil mixed
			Silanthi pochi	roots heavy
			White polu	Hard soil
			Olaipochi	small stones
Millet	20-40%	medium	sethil pochi,earthworms, pouran	Dead plants composted
			Thelpolu, blackants,	Small roots, small stones break up
			Termites, ravanapulu	Insects carry litter
			white worms	big stones observed
			edukki pochi	Crystal stones
Coffee	15-30%	medium	white worms/silanthipochi	black soil, big stone
			Eekkal, ants, termites,	leaf&compost high,
			Olaipochi/blackants	manure, too many roots
			Earthworms, white worms	stone is difficult,roots heavy
			Kariyan, redants, naththaitiles	Insects carry litter /soil stone
			black kambalipolu	
			blackants thel kuttigal	
			Rail worms Olaipochi	
Veg	10-20%	low	Brown beetles & shells	Airgaps, fine crystal stones
			ants-black small	high sunlight
			Spider, many white eggs, Naththai	decomposed plant parts
			eggs-small whitish, Kodukku pochi	carbon
			Vellai pochi, Earuvu pulu	regular cultivation - without gap.
			Sethil pochi, Sitterumbu	aplication of manure is lacking
			Katterumbu	mulching is not practiced
			Earth worms, Pooran	small roots sand mixed

The maximum insect activity was observed in coffee soils. All the insects could not be identified and local names have been used. The presence of these insects is an indicator of an `alive' soil. None of the soils were completely devoid of insect movement. There were many roots observed – usually small, from weeding operations. Coffee lands were full of roots holding the soil well and making soil tests difficult.

Crop Diversity

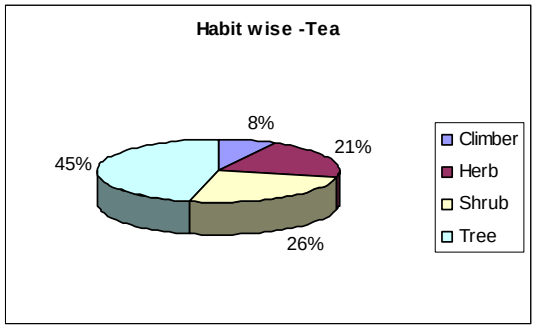
Land Use	Uncultivated	Use	Cultivated	Use
Tea	Sukuti	Food	Silver Oak	Shade/wood
			Tea	Market
Coffee	Nurai tuber	food	Coffee-arabica	Market/food
	Reya tuber	Food	Coffee-robusta	Market/food
	Kakai (cassia)	Medicine	Pepper	Market
	Jeeni (chilly)	Spice	Jack	Food
			Silk Cotton	Market
			Tamarind	Market/food
			Poocha Nuts	Market/food
			Pomegranate	Food
			Lime	Market/food
			Oranges	Market/food
			Mango	Market/food
			Liberica coffee	Food
Vegetable	sukiti	Food	Beans	Market/food
	Jeeni (chilly)	Food	Brinjal	Food
			Banana	Food
			Carrot	Food
			Chilly	Food
			Cappai	Food
			Papaya	Food
			Jackfruit	Food
			Silver Oak	Shade/Wood
			Turnip	Food
			Maize	Food
			Beetroot	Food
			onion	Food
Millet	sukiti	Food	Ragi	Food
	Noorai	Food	Tenai	Food
	Reya	Food	Samai	Food
	Povidagu	Food	Maize	Food
	Aral	Food/Oil	Chilles	Food
	Nannari	medicine	Amaranthus	Food
			Lab lab	Food
			Mustard	Food
			Tomato	Food
			Pumpkin	Food

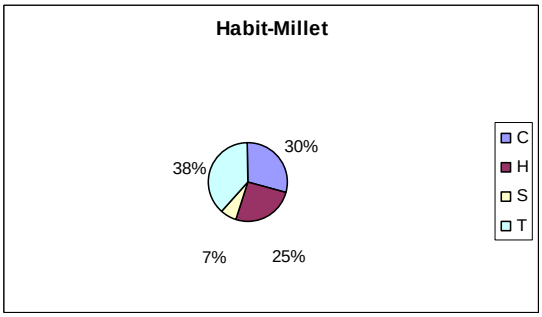
Crop diversity is the most in a coffee lands – providing a good mix of food and market items.

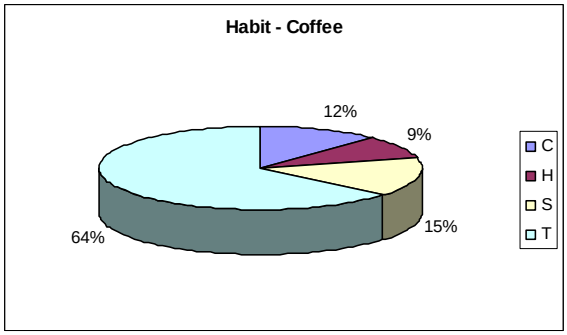
Maximum food grains and vegetables are obtained from millet fields and the most market oriented land use is that of tea. Vegetable growing also provides a lot of vegetables for the household. In an ecological analysis, the land use of coffee would be rated the best as it has many tiers, using vertical space efficiently, has the most diverse mix of trees and shrubs. This is also the closest to analog forestry (i.e. it imitates the forest) providing easy movement of wild life, especially of small mammals and birds. The bird diversity of a coffee was also observed to be high throughout the year.

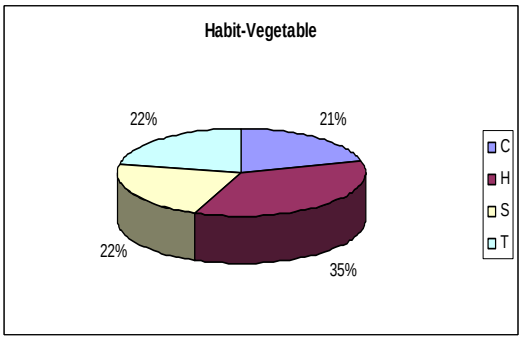
Biomass

In terms of biomass, every land use had a large number of plants. This is attributed to the adivasi temperament of growing trees and allowing all sorts of plants to grow in their fields. However, in observation a vegetable field is quite sparse of biomass, followed by a millet field, tea land and lastly by coffee lands. Tea fields had upto 90% of land covered with tea and silver oaks, the other plants being found in edges and boundaries. The same pattern could be seen in vegetable growing, which according to the farmer needed a lot of sunshine. Each of the plants, though only 1-2 in number, had a special use in the farm or household. The aspects, concerning the part of the plant and the number of uses is as follows:
(See Annexure 3 for details).

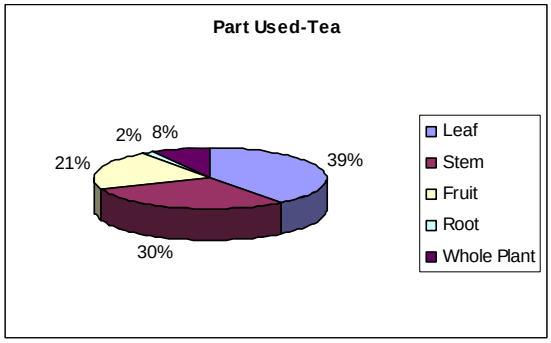


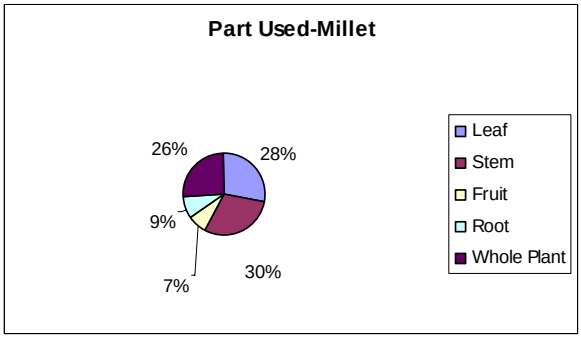


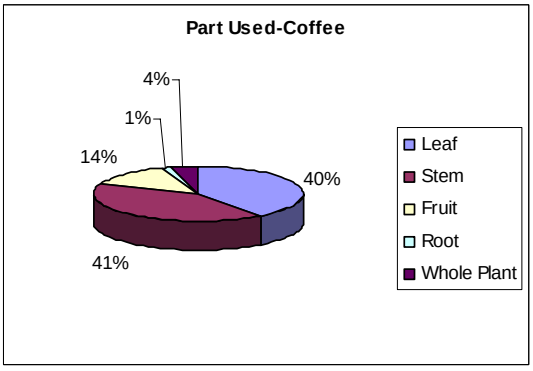


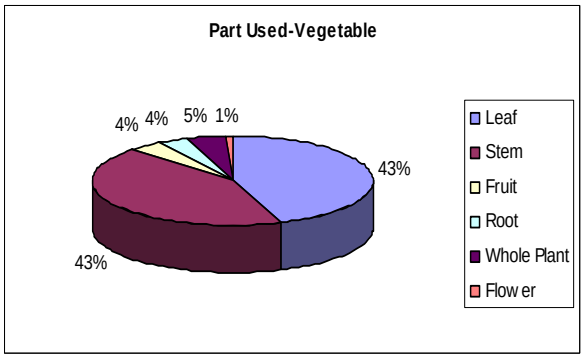


From the above charts it is evident that there is a preference of growing trees in all land use types – except for vegetables, where there are more herbs. Coffee has the maximum percentage of trees (64%). Millet cultivation has also a high number of climbers and shrubs. Trees have the maximum number uses in most households. From the data on `part used' it is evident from the following set of graphs that the leaf is used maximum, followed by stems. The use of whole plants is high in millet cultivation.

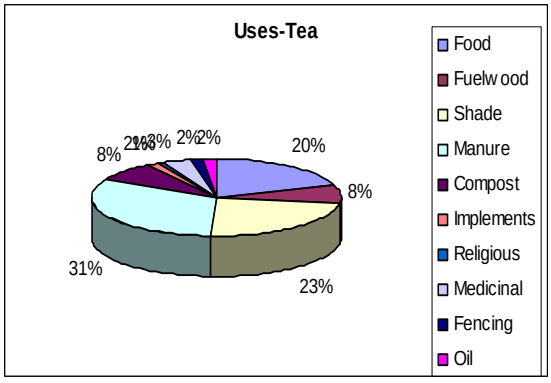


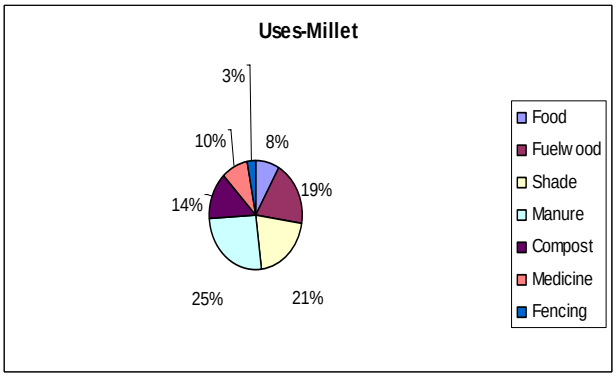


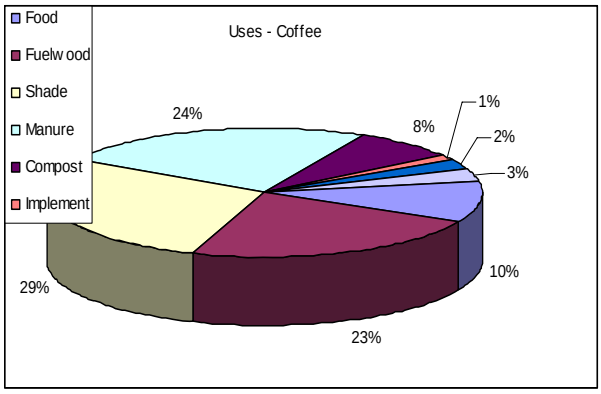


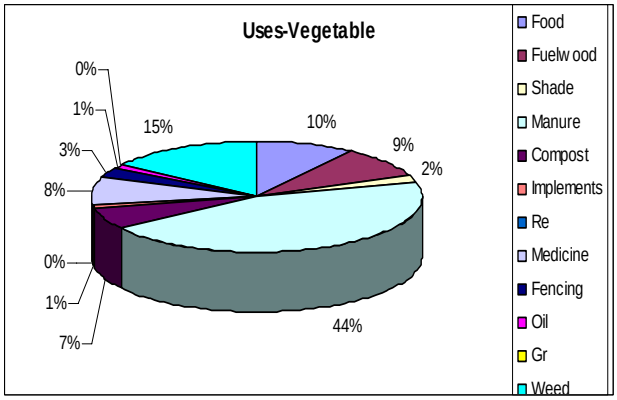


The different uses of these parts are for the purposes of food, fuelwood, manure, etc. These are elaborated in the following set of graphs.









The use of the biomass for manure forms a significant percentage in most land use types varying between 24% in coffee to 44% in vegetable cultivation. Coffee provides a significant amount of fuel wood and the biomass is also an important shade source for the crop. As vegetable cultivation needs an open area with more sunlight, shade trees are not a priority, which also reduces the amount of fuel wood available in this land use type.

However, it must be emphasized that with the exception of coffee, where a lot of biomass is available and grown amongst the crop, other land uses do not have much of the land area covered. Usually in tea, vegetable and millet cultivation this forms only 5-10% of the total land available.

Pollination and Seed Dispersal

Besides crop diversity, biomass and soil, information was also sought on pollinators and seed dispersers. These were found more in coffee and millet fields. Tea fields and vegetables had relatively less pollination activity. However, these fields are all close to each other and very close to forest areas. It was difficult to study this aspect according to land use, but an overall study was made. The results show a very high diversity of visitors to the seeds, flowers and of herbivores to the fields. The last aspect has its advantages and disadvantages as it is also crop damaging. This is a very big issue in our area, making it difficult to make an ecologically sound solution.

The details are elaborated in the following table.

Local Name	Common Name	Role	Remarks
Karadi	Bear	SD	Eats Jack, Coffee, Honey
Koravai	Whisker bul-bul	SD	Eats buds,tip and flower
Verugu	Civet	SD	Eats silk cotton, coffee
Pura	Spotted dove	SD	Eats fruits, millets
Anil	Squirrel	SD	Eats fruits
Katadu	Barking deer	SD	Prevents excessive weeds
Korangu	Monkey	SD	Crop damage; high population
Kooran	Mouse deer	SD	Damages crops/fields
Sambar	Stag	SD	Crop damage: eat & stamping
Kattu panni	Wild boar		Damages crops extensively
Doddu	Bison		Crop damage
Mullupani	Porcupine		Crop damage
Parast	Flying Squirrel	SD	
Punugupoonai	Small Indian civet	SD	Eats fruits
Situ Kurvi	Sparrow	SD	Eats insects
Thvuttupura	Spotted dove	SD	
Kutruke	Barbet	SD	Eats fruits insects
Thandhi	Hornbill	SD	Eats ficus fruits
Sikinna	Wood pecker	SD	Eats insects
Parandhu	Kite		Takes away chicks, eggs
Soratai Pambu	Rat Snake		Eats frogs, field rats
Ottu kurvi	House sparrow		Eats millets
Onan	Agama		Eats maize
Eliee	Field rats		Eats grains/samai
Muyal	Rabbit/Hare		Eats Ragi
Kattu kozhi	Jungle Fowl		Controls Insects
Theni puchi	Honey Bees	P	
Papathypoochi	Butterflies	P	
Kadanthe	Wasps	P	
Thumbi	Beetles	P	
Kadunthumbi	Carpenter Bee	P	
Vaouval	Bats	P	
Kilyee	Parakeet	P, SD	
Kalarkuruvi	Minivet	P	
Maina	Jungle Maina	P	
Cindi	Loten's sunbird	P	
Zeenivil	Srilanka white=eye	P	i
Pirki	Black headed Munia	P	
Paruvi	White rumped Munia	P	
Ettaka	Paper wasp	P	
Kagul	Common Miana	P	
SD – Seed Dispersal; P - Pollination			

6. Food Intake & Nutrition Analysis

This aspect is analyzes food practices and nutritional aspects. Which type of land use increases the food availability/variety in the family; who eats it – m/f older/children; what are the aspects of sovereignty in habits and processing; are the foods introduced or indigenous?

The data was examined across all the 16 farmers and in all cases rice formed the staple diet. In an earlier study – it was found that even those who grew millet had an average of 17 meals a month of millet – the rest being rice based. The following table gives an overview of the families studied -

	Rice	Other food grains	Fruits	Vegetables	Others
Tea	50-140 Kgs	Pulses	Guava, Banana, Papaya, Jack	Brinjal, Chilly, Uncultivated Greens, Beans, Gourds, Bitter gourd, Jack seeds, Pumpkin	Egg, Milk, Chicken, mutton, tapioca, maize
Coffee	20-80 Kgs	Pulses	Oranges, Guava, Pomegranates, Banana, Jack, papaya	Brinjal, Chilly, Uncultivated Greens and Tomato, Beans, lab-lab, Gourds, Bitter gourd, Jack seeds, Pumpkin	Egg, maize, Noorai and Reya tubers, Bamboo shoots
Millet	48-80 Kgs	Pulses, Tenai, Samai, Ragi (upto 8 Kgs a month)	Papaya, Jack	Brinjal, Chilly, Uncultivated Greens and Tomato, Beans, lab-lab, Gourds, Bitter gourd, Jack seeds, Pumpkin	Tapioca, maize, Noorai and Reya tubers, wild meat,
Vegetables	40-60 Kgs	Pulses, Ragi from the market, red gram	Jack, banana	Brinjal, Chilly, Tomato, turnip, chow-chow, radish, carrot, Beans, lab-lab, Gourds, Bitter gourd, Pumpkin + other vegetables	Eggs, Milk, Wild meat, maize

- Most rice is bought from PDS, though for some approx. 20% is bought from shops
- Consumption of milk depends on owning a cow, it is rarely bought
- Bananas and Jackfruit are gifted around to friends and relatives
- 45-60% of all income is spent on food items, kerosene
- Most tea and coffee growers can buy the products they need & from the expenditure patterns discussed earlier can address other needs of the family eg. education, clothes, medicines, etc.
- From the nutritional point of view, the millet growers are better off with a self sufficient sovereign food system. Coffee growers also have a diverse intake of fruits and vegetables
- The table also shows the eating habits and patterns followed by *adivasi* families and which is quite constant, not changing much depending on their land use. The aspects of wild food collection is decreasing amongst tea growers, who have adapted to more mainstream foods

Final Rating Analysis (Each land use is rated from 1-4 on each of the indicators against which they have been analysed. This rank is based on the data discussed above)

Aspects/Landuse	Social	Economic	Ecological	Nutrition	Score
Tea	4	4	4	4	12
Mixed Coffee	3	1	1	3	8
Vegetables	1	3	3	2	9
Mixed Millet	2	2	2	1	7

7. Discussion

The study undertaken over a period of one year revealed many interesting aspects as discussed earlier in the text. Some discussions with these 16 farmers and others in the village also added to the richness of the data. Tea farmers still insist that their land use is good and they fared badly because tea leaf prices were low in the market. The fact that tea provides regular income and cash gives them an option to choose how to use it – for food, education, medicine, etc. Time and again discussions revolved the need for cash income as a necessity of the times. Aspirations of people towards, education, better clothing and job access is natural in the needs pyramid and is something these communities are also looking for.

The other extreme is the millet cultivation – though scoring high, in the overall analysis is a land use with a closed economy and no cash flow. This situation though good in all the aspects proves difficult when there is cash need for medicines, education, buying clothes, etc. This option seems best from the point of view of nutritional status of *adivasi* families, especially that of women and children. However, in the current market based economy these families have low socio-economic indicators, spend the least in aspects of education and health and are still dependent on herbs and wild foods for their well being. These areas are usually remote and have no access to school facilities.

Our ecological analysis has also seen that coffee cultivation is most sound for that elevation and provides for a wide variety of crops, biomass, uncultivated foods, host plants and nesting sites for birds and animals. It also has a tier system, which mimics the forest and is homogenous to the surroundings. A factor which was not studied and needs to be analysed relates to soil erosion, in the different kinds of land use practices. From observation we know that both vegetables and millets cultivated on steep slopes is highly prone to erosion – while tea plantations also loose most of their top soil in the early stages of planting, unless intercropped. Coffee plantations would fare well in this matter, as they have the least erosion being, closely planted and high on leaf litter, mulch and biomass which acts like a sponge absorbing rain water.

Another advantage seen in the coffee mixed cultivation is the possibility of balancing the loss made by the market fluctuations of the main crop by the other crops like pepper, silk cotton and jackfruit. This seems like a good strategy for a farmer and more work needs to be done in the future to minimize their loss caused by pest attack, like berry borers. The land use seems to be the best option from a holistic point of view for the household. This provides ecological, economic, nutritional, fuelwood, fodder security to the family and is resilient to weather conditions. This can be further enhanced with high value spices and medicinal plants, which has been one of the approaches Keystone has been following in its programmes.

Government programmes and other land related schemes are promoting tea cultivation. This is because it is tied up to a chain of agents and agencies which would benefit both by backward and forward linkages. However, of late the low price of tea in the market is distressing small growers and often it is not economically feasible to even pluck the leaves and transport it to the factories. There is some trend towards organic tea fields, which will be an ecologically sound option. The marketing of this tea to provide further incentive and support to these small farmers may also be a good option.

There are also many issues involved with coffee plantations – mainly those related to pest attack, post harvest processing and market prices.

Given the above facts, the following options emerge:

1. Design an ecologically sound and diverse tea field, which takes into account aspects diversity, soil erosion and soil health.
2. Provide organic pest control measures for coffee growers and have a credit system which groups of farmers can access for buying post harvest hullers. This was addressed in Keystone's earlier land development programme, which provided for these machines and started revolving funds amongst these farmers
3. Millet cultivation is faced with the issues of crop raiding, uncertain rainfall, cultivation on steep slopes and burning of biomass. These aspects should be addressed by adequate soil and moisture conservation related interventions and improving soil nutrients, so that land can be cultivated over several years.

4. Vegetable cultivation is the most difficult land use – as it needs a lot of regular input in all the aspects on farm and in the market. Input in local marketing if the vegetables are produced organically and shared transportation costs will be helpful for these farmers.
5. Information and awareness on organic/ecological cultivation in the district is necessary, which has one of the highest consumptions of chemical fertilizers and pesticides
6. It is also essential to promote the use and availability of millets for the people. These can be promoted through the PDS system and appropriate machinery installed for easy de-husking.
7. The use of multi cropping for nutrition and food security needs to be emphasized, and steps taken to reduce the high labour costs involved in its cultivation.

SANFEC Study: Fileld Information & Data Collection Forms

Section -1: Economic Study (Food Security)

1. Economic Study Table-1: Varietal Classification of Food Crops and Uncultivated Foods											
Periodicity: Once - In the beggning at the Time of Collecting the Base-line Information											
Village_____							Farmer_____				
S.No.	Traditional ood Crops/ Land races grown	Agro-morphological Characters									
		Nutition (Not To Be Filled)	Taste	Texture	Colour	Yield (kg)	Storage characters	Resistance to environmental stress	Resistance to disease and pests	Use values	Maturity time
	A. Cultivated Crops										
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
	B. Uncultivated Crops										
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

Note: 1. Nutrition - carbohydrates, proteins, vitamins and micro nutrients; 2. Taste - sweet, sour, bitter, salty, pungent; 3. Texture - smooth, rough, ridged, etc.

4. Color - white, silvery, black, brown, red, green, yellow, etc. 5. Storage - long shelf life: 1-3 years; medium shelf life: 1-2 years; short shelf life: less than one year

6. Resistance to environmental stress - resistance to drought, to frost, to excess rains, to low rains, etc.

7. Resistance to diseases and pests - farmers can give information about resistance of particular crops to diseases and pests.

8. Use values - farmers can provide specific use values of the crops; 9. Maturity time - 3-4 months; 4-5 months; 5-6 months; 6-7 months

SANFEC Study: Fileld Information & Data Collection Forms

Section -1: Economic Study (Food Security)

1. Economic Study Table- 2: Crop Production Details								
Village_____					Farmer_____			
S.No.	Name of the Crop	Month of Harvest	Total Yield and Value		Retained for HH Consumption		Sold in the Market	
			Yield (kg)	Value (Rs.)	kg	Value (Rs.)	kg	Value (Rs.)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

1. Economic Study Table-3: Weekly Household Food Requirement for the Week__ 1/ 2/ 3/ 4/ 5 of Month_____

Village:_____ Farmer_____

S. No.	Type of Food	Total Weekly Requirement (kg)	Quantity of Food Requirements Met from Different Sources (kg)			
			Own Production	From Market/ PDS	Barter	Others (food grains as wages)
A.	**Cultivated Food**					
	Cereals					
	Millets					
	Pulses					
	Oil Seeds					
	Vegetables					
	Fruits					
B.	**Un-cultivated Foods if any**					
	Milk Procucts		These are not agricultutal products do we need ?			
	Poultry, fish etc.					

SANFEC Study: Fileld Information & Data Collection Forms

Section -1: Economic Study (Input -Out put)

1. Economic Study Table-4: Economic Details of Farm Produce- The Input - Output Values for the Month ____January____

Village_____ **Farmer_____R. Chandran_____**

Input					Output				
S.No.	**Particulars**	**Input Source#**	**Unit (days/ quantity)**	**Value (Rs.)**	**S.No.**	**Particulars**	**Quantity (kg)**	**Value (Rs.)**	**Remark**
1	**Variable Costs**				**1**				
a	Labour	32 men		1,280.00					
b	Seed cost	?		-					
c	FYM/bio-fertilizers			-					
d	Bio-Insecticides			-					
e	Transportation costs			-					
f	Any other costs			-					
g	Prunning	20 men		800.00					
h	lopping	10 men		400.00					
i	weeding	25 men		1,000.00					
	Total Variable (1)			**3,480.00**					
2	**Fixed Costs**				**2**	**Uncultivated Foods / Greens**			
a	Rent			**-**					
b	Implements and their recurring costs			**-**					
c				**-**					
d				**-**					
				-	**3**	**By-products**			
				-	a	Fodder			
				-	b	Fuel			
	Total Fixed (2)			-					
3	**Total Input Costs (1+2)**			**3,480.00**	4	**Gross Output (1+2+3)**			
	# Notes: (Write about from where the inputs have been acquired and use of local and indigenous methods)								

SANFEC Study: Fileld Information & Data Collection Forms

Section -1: Social Study

2. Social Study Table-1: On-farm Employment Generated for the Month _____

Village_____ **Farmer_____**

S.No.	Activities	Labour Days Generated (Numbers)					Remark
		Total Labour Days	HH Labour		Hired Labour		
			Male	Female	Male	Female	
1	Ploughing						
2	Harrowing / bunding						
3	Manure Transportation and Application						
4	Sowing / Transplantation						
5	Nursery Preparation and follow up						
6	Irrigation						
7	Interculture (?)/ Weeding						
8	Spraying / Dusting of Bio-insecticides						
9	Harvesting / Plucking						
10	Threshing / Winnowing						
11							
12	Management of Post Harvest Farm Husk						
13	Post Harvest Follow up of Farm Management						
Total Employment Generation							

2. Social Study Table-2: Off-farm Employment Generated for the Month _____

Village | **Farmer____**

S.No.	Activities	Labour Days					Remark
		Total Labour Days	HH labour		Hired Labour		
			Male	Female	Male	Female	
1	**Post Harvest Operations**						
a	Transportation of the Crop						
b	Value addition through cleaning, grading etc						
c	Storage of Crop for Household use						
d	Storage of Crop for Selling to Market						
e	Selling of Crop to Market						
f	Post Harvest Pest Management of the Crop						
2	**Employment Generated in the Community through Demand for Goods**						
a	Farm Implements (plough, sickle, bullock cart etc,)						
b	Labour						
c	Marketing						
3	**Farm Inputs**						
a	Bio-fertilisers (Farm yard manure, green leaf manure vermi-compost etc.) Preparation						
b	Bio insecticides (e.g., neem oil) Preparation						
Total Employment Generation							

SANFEC Study: Fileld Information & Data Collection Forms
Section -1: Social Study

2. Social study Table-3: Time Spent (person days) by Working Members of the Family on Different Livelihood Activities (In No. of Person Days) for the Month_____

Village_____		**Farmer_____**						**Remark**
Number Working Members in the Family_____								
S.No.	**Activity**	**Own activity (self employment)**		**As Wage Labour**		**Total**		
		Male	**Female**	**Male**	**Female**	**Male**	**Female**	
1	**Miscellaneous Activities**							
a	Petty trade							
b	Livestock rearing/tending							
c	Casual labourer (construction, quarrying, road works)							
d	Migration							
e	Other (specify)							
	Sub Total							
2	**CPR Based Activities***							
a	Fuel wood							
b	Fodder-grass, leaves							
c	Food Items- tubers, fruits,greens, mushrooms, flowers etc.							
d	MFP (fruits, nuts and, honey, gum, leaves, thatch grass, etc.)							
e	Medicinal plants							
f	Small timber (fencing and construction material							
g	Raw materials available for artisans (fibre, bamboo, date palm branches, clay)							
h	Others (specify)							
	Sub Total							
Grand Total								

***CPR**

1. Fuelwood: different plants and bushes used as fuelwood
2. Fodder/ Grass: grass varieties used as: fodder grass, broom grass, thatch grass
3. Food: Tubers, green leaves, mushrooms, fruits and berries
4. NTFPs: Amala, mango, tamarind, Bahera, gums, raisins, colours, soap nuts, honey etc.
5. Green manure
6. Medicinal Plants
7. Timber: Agriculture Implement, construction material, fencing, stirage containers
8. Raw materials for Artisans: Bamboos, variuos fibers, leaves, wood, clay, colours

SANFEC Study: FileId Information & Data Collection Forms
Section -1: Social Study

2. Social Study: Other Social Aspects Related woth Farming (Case Studies, PRA, GD etc.)

1 Ceremonies/ Social Customs- (Time, process, significance, who are involved - man, women, children, animals etc; community, individual or both)

a Related to major cropping seasons
b Related with various crops
c Related to sowing/ harvesting/ post harvesting
e Weather/ good rains worship
f Plowing
g Agricultural implements
h For good crop, weather etc.
i Key worships/ deities

Gender related activities

2 Indigenous knowledge related to farming

Climatic/ weather indicators
Indicators of a good farm
Traditional system of cropping- what / how/ why?
Traditional Crop Calendar and its elements
What and why do they grow certain crops/ collect uncultivated wild food items
How critical is the role of goof forest aroud the forest- their perceptions/ beliefs
Role/ Association of plants- shrubs, herbs, grases, moss, fungi etc/ animals/ birds/ insects/ worms in farming
Seed selection/ preparation/ treatment/fertility
Sowing time
Sowing Techniques
Field preparation (pre-sowing) techniques
Soil characteristics/ indicators (including plant/insects/ animal)/ innoculation- is there any indigenous knowledge?
Manure knowledge
Composting knowledge
Plant disease control
Pest and pest controle methods
Weed knowledge- what are the weed categories, what and how do they treat them?
Harvesting techniques
Crop Storage and Protection Methods
Water conservation methods
Nakshatra based agriculture

SANFEC Study: Fileld Information & Data Collection Forms
Section -3: Ecological Studies

3. Ecological Study Table-1: Crop Production Practice in the Month_____										
Village:_____						Farmer:_____				
S.No.	Crop Type	Crop Species				Crop Variety				Remark
		No.	Name	Traditional/ hybrid	% of Land used	No.	Name	Traditional/ Hybrid	% of Land used	
1	Tea Farm									
2	Coffee and Associated Trees Farm									
3	Vegetable Farm									
4	Traditional Agriculture (Millets Aec,)									

3. Ecological Study Table-2: Biomass Crops of the Farm in the Month_______						
Village__________________				**Farmer______________________**		
S.No.	**Biomass Type/ Name**	***Type**	**Nature**	**Part Use**	**Usage**	**Remark**

***Type**

Tree- Slow Growing (T-SG)
Tree- Slow Fast Growing (T-FG)
Tree- Medium Growing (T-MG)
Tree- Legumenous(Pod) T-L
Shrubs (S)
Herbs (H)
Herbs(H-L)
Climbers (Cl)
Creepers (Cr)
Grases (Gr)

SANFEC Study: Fileld Information & Data Collection Forms
Section -3: Ecological Studies

3. Ecological Study Table-3: Biomass waste and Animal-waste based Practices of the Farm in the Month_____

S.No.	Practices	Species	Part Used	Methods	Purpose	Remark
	Documentation of Following Practices:					
	Biomass waste based practices					
	Agro-waste					
	Mulching					
	Weeds- their perception, believes; use of weeds at the time of cultivation, weeds which are weeded out, etc.					
	Compost					
	Green Manures					
	Others practices					
	With following points in mind:					
	Species used					
	Part used					
	Methods (including role/ special role of various persons involved in the practice)					
	Purpose/ effects					
	Animal Waste based					
	Use of various animal dungs					

SANFEC Study: Fileld Information & Data Collection Forms
Section -3: Ecological Studies

3. Ecological Study Table-4: Fauna Based based Practices of the Farm in the Month_____				
Village_____		**Farmer_____**		
S. No.	**Type of Fauna/ Names**	**Time (Morning, Afternoon, Evening, Night)**	**Role/ Usefulness**	**Remark**
1	Insects			
2	Worms			
3	Reptiles			
4	Birds			
5	Mammals			

SANFEC Study: Fileld Information & Data Collection Forms
Section -3: Ecological Studies

3. Ecological Study Table-5: Pollinators of the Farm in the Month_____						
Village_____					Farmer_____	
S.No.	Pollinators	Variety (Name)	Presence in the Field			Remark
			Yes	No	Timing	
	Bees					
	Butterflies					
	Beetles					
	Birds					
	Bats					
	Others					

SANFEC Study: Fileld Information & Data Collection Forms
Section -3: Ecological Studies

3. Ecological Study Table- 6 a: Water Information 'One Time'- Source Types Better if seasonally in three months									
Village_____						**Farmer_____**			
S.No.	**Source**	**Nos.**	**Perennial**	**Seasonal**	**If seasonal- how many months**	**Volume of water**	**Source Usage**	**Quality of water**	**Remark**
	River								
	Stream								
	Well								
	Rainfed								
	Bore wells								
	Ponds								

SANFEC Study: Fileld Information & Data Collection Forms
Section -3: Ecological Studies

3. Ecological Study Table- 6 b: Water Information 'One Time'- Storage & Distribution					
Village_____				**Farmer_____**	
S.No.	**Storage/ Distribution**	**Nos.**	**Period used- which months**	**Used for Crops**	**Remark**
1	**Storage**				
	Poly Tank				
	Shallows				
	Concrete Tanks				
	Drums				
	Others				
2	**Distribution**				
	Gravity- pipes				
	Gravity-channels				
	Sprinklers with pump				
	Sprinklers with out pump				
	Manual				
	Others				

SANFEC Study: FileId Information & Data Collection Forms
Section -3: Ecological Studies

3. Ecological Study Table- 7: Soil Information - "Once in Three Months" Month_____						
Village_____			Farmer_____			
S.No.	Parameters	Value	Obsevation			Remark
			High	Medium	Low	
1	*Ph					
2	**Soil Gradation					
3	Humous					
4	***Soil Faunal Activity					
a	Ants					
b	Worms					
c	Spiders					
d	Dung beetles					
e	Others					

Methods:
*Ph

**Soil Gradation

***Soil Faunal Activity
Dig 1' x 1' x 6" (depth) pit ----top------middle and ------end of the farm and collect information on the different faunal activity and humous of the soil

Sanfec Ecological Study: Soil- Type and pH

1. Type

Soil Type Test:

Soil Texture Test in Jar
Add half a handful of soil to a large glass jar, fill 2/3 rd with water, Stir well, Leave to settle on a leveled surface for two hours and then look:

a. Sandy: Most of the sandy particles will sink first and form a layer on the bottom, and the water looks clear. Mark this layer with crayon.
b. Clay or silty soil: The water is cloudy with a thin layer of particles on the bottom. The tiny clay particles take ages to settle.
c. Peaty soil: Lots of bits floating on the surface, the water is a bit cloudy and a small amount of sediment is sitting on the bottom.
d. Chalky soil: A layer of white, gritty fragments on the bottom and the water is a pale grayish colour.
e. Loamy soil: Fairly clear water with a layered sedimentation on the bottom - the finest particles on the top.

If one type of particles make up more than half of the amount of the soil in the jar, that is the dominant soil type. If three layers are relatively equal, the soil is probably loamy- the best soil texture for growing plants.

Ribbon Soil Texture Test
Hold the soil in the palm of the hand; squeeze gently so that it starts to come out between your thumb and the forefinger. Use thumb to press the soil out into a ribbon shape over the side of your finger. The longer the ribbon of soil, the more clay content your soil has. If the soil is too crumbly to form the ribbon, it has a good balance of sand, silt, and clay particles in it.

Ribbon Length	Feels Mostly Gritty	Feels Mostly Smooth	Feels Both Gritty & Smooth
Shorter than 1”	Sandy loam	Silty loam	Loam
1-2” long	Sandy clay loam	Silty clay loam	Clay loam
Longer than 2”	Sandy clay	Silty clay	Clay

Wet or Dry Soil Test

How quickly or slowly water travels through the soil is an important factor to determine the type of plants could be grown in the soil.

To get a reasonably clear picture of the soil drainage one require- a shovel, a garden hose/ bucket or a water container and a watch. Dig a 6-12” (l x w x d) pit. Fill the pit with water and let it drain. Soil with good drainage will absorb water in 15-30 minutes. If the water drains faster than that, means the soil probably has more san. If it drain slowly that means

the soil has poor structure and / or lack of pore spaces between soil particles- i.e. has lot of clay- either condition makes it harder to get plants grow with out improving the soil.

Soil-Type Characteristics

a. Clay soil:
- Feels lumpy, sticky and slimy and on release the pressure the lump stays in shape.
- Rocky and hard when dry
- Very dense with poor spaces and drains poorly
- Warms slowly in spring
- Few air spaces
- Heavy to cultivate

b. Sandy soil
- Feels gritty and the lump crumbles apart on release
- Free-draining soil and plenty of air spaces
- Gritty to touch
- Warms up quickly in spring
- Easy to cultivate
- Dries out rapidly

c. Loamy soil
- Feel smooth and retain their shape for longer than sandy soil, but not as rigidly as clay, it is a combination of sandy and clay soil.
- It is the perfect soil
- Drains well
- Retains moisture
- Full of nutrients
- Easy to cultivate
- Warms up quickly in springs and does not dry out in summer

d. Peaty soil
- Feels spongy
- Contains much higher proportion of organic matter (peat), inhibits decomposition
- Dark in colour
- Highly water retentive and may require drainage id water table is near the surface
- Very good for plant growth if manure is added

Soil consists of organic parts and inorganic parts. The organic comes from something that is or was alive i.e. peat, wood chips, grass clippings, straw, compost, manure, bios lids, sawdust and wood ash etc. a healthy soil has high organic content and is full of decomposing plant material and beneficial organisms that provide nutrients to the plants and help the soil to absorb and retain water. Increasing soil organic matter by adding organic amendments improve soil aeration, water infiltration, and both water and nutrient-holding capacity. The inorganic amendments include- vermiculite, perlite, tire chunks, pea gravels, and sand. They do not provide nutrients but do help build structure, which aids in flow of air and water. Organic matters are also source for bacteria, fungi and earthworms in the soil.
Naturally occurring organisms or the absence of them- worms, centipedes, ground beetles, and nematodes and the bacteria and fungi, can affect the soil fertility.

2. Soil pH

Soil pH is an important factor as it affects the availability of soil nutrients. If the pH is not with in the acceptable range, it affects the growth of the plant and as well as the erosion. The ability of the soil to provide adequate nutrients to plants depends on following four factors:

a. the amount of various elements present in the soil
b. their form of combination
c. the processes by which these elements become available to plant
d. the soil solution and its pH

The amount of various elements present in the soil depends on the nature of the soil and on its organic matter content, since it is the source of various nutrient elements. Soil nutrients exits both as complex, insoluble compounds and simple forms useable soluble in soil water and readily available to plants. The complex form must be broken down through decomposition to the simpler and more available forms in order to benefit the plant.

The pH value is a measure of acidity and alkalinity. pH 7.0 is the neutral, 0-7 is acid range and 7-9 is the alkaline range

The usual soil pH varies between 4.5 - 8.5. pH 4-5 soils are very acidic or sour and support very few plants while, pH 7-8 soils are too alkaline or sweet for most of the plants to grow. The best soils for the growth of the most of the vegetation have a pH of 6.5 to 7, i.e. very less acidic to neutral.

Soil pH Sample Preparation (for pH meter)

1. Scoop up loose soil samples with a clean, dry plastic jar. Avoid touching the soil with your hand to prevent contamination of the sample.
2. Remove any stones and crush any clumps of soil to prevent breaking the delicate pHScan glass electrode bulb.
3. Fill the sample soil up to ¾ and add distilled water to the jar. Cap the jar tight and shake it vigourously a few times. Let the mixes sample stand for 5-10 minutes to dissolve the salts in the soil.
4. Remove the cap of the jar and the pHScan. Dip the pHScan electrode into the wet soil slurry and turn the tester on. Take the reading when it stabilizes.

Soil pH: using pH paper

The following procedure is workable for both commercial pH indicator paper and the litmus paper. The commercial paper, which has a different colour for each pH, will be more informative.

Carbon dioxide must be removed from the water used in this activity, as it will lower the pH- CO_2 (aq) + H_2O <-> H_2CO_3 (aq) <-> H + (aq) + HCO_3-(aq). The hydrogen ion (H^+) released by this equilibrium increases the acidity and decreases the pH of the solution. To ensure the above the distilled water needs to be boiled to remove the CO_2 (aq) [carbon dioxide gas which is in the solution]. Store this water in a sealed container after boiling it to keep out CO_2.

Material required:

a. Soil: There may be considerable variation in the soil pH from one place I the field to another. To determine the average soil pH of a field, collect soil from several locations and combine into one sample.
b. Litmus/ pH indicator paper
c. Filter paper or coffee filter
d. Plastic cup
e. Boiled and cooled distilled water

How to test the soil pH:

1. Lay a strip of litmus or pH indicator paper in the bottom of the plastic cup
2. Place a piece of filter paper or a coffee paper over the indicator paper. The edge of the paper should form a cup shape with in the plastic cup.
3. Put the soil sample into the cup formed by the filter
4. add enough boiled, cooled distilled water to moisten the soil with out soaking it
5. Waite for five minutes. During this time, the water should move through the soil, filter, and reach the indicator paper. The acid-base or pH character of the soil will be transferred to the water.
6. Invert the cup over a container to catch the soil.
7. Check the indicator paper to determine the pH of the soil.

Soil Organic Matter:

1. Fauna: Presence of Ants, Worms, bugs, Beetles, Centipede, leeches,
2. Presence of mycelia, decomposed organic matters etc (High, Medium, Low)
3. Soil Moisture Condition- annuals (6-12" root depth, required dryness depth for water- 1-2" deep), Trees/ shrubs (12" or more, required dryness depth for water-2-4" deep)

ANNEXURE 2											
Input - Variable cost (Particulars)	In-put Source	Unit (Days/ quantity)	Value (Rs)	Input - Fixed Cost (Particulars)	Unit	Value (Rs)	Output (Cultivated) Particulars	Total Quantity (ks)/ Local Unit	Total Value (Rs)	Output Quantity Retained for HH Consumption kg./ Local Unit	Output Value Retained for HH Consumption(Rs.)
Maruti/Neeli	Millet										
labour	house	10	500	Knife	1	100	maize	20kg	200	20kg	200
labour	house	3	150				Beans	2kg	60	2kg	60
labour	house	15	750				Tenai	50kg	400	50kg	400
labour	house	8	400				Samai	30kg	240	30kg	240
labour	house	3	150				Avarai	3kg	45	3kg	45
labour	house	1	50				Kadugu	1kg	20	1kg	20
Seeds	house	5 kgs	250				tenai	84lit	840	84lit	840
		3.5 litres	135				avarai	6lit	60	6lit	60
							Tuvarai	6lit	60	6lit	60
							Maize	50cobs	50	50cobs	50
							Beans	2kg	120	2kg	120
							Thatta paeer	1kg	30	1kg	30
							Maize	20nos	40	20nos	40
							Millet harvesting	8 Padi	40	8 Padi	40
							tenai	84lit	840	84lit	840
							avarai	6lit	60	6lit	60
							Tuvarai	6lit	60	6lit	60
							Maize	50cobs	50	50cobs	50
							Beans	2kg	120	2kg	120
							Thatta paeer	1kg	30	1kg	30
							Maize	20nos	40	20nos	40
							Millet harvesting	8 Padi	40	8 Padi	40
											3445
Uncultivated outputs											
							Keerai	37 bundles	185		
							Firewood	10 bundles	200		
Total			2385			100			3830		
Total Cash Input/Output			2,485.00						3,830.00	**1,345.00**	

Vegetable - Muniyan											
labour	Family	50	2,500.00				Beans	550kg	2750		
							Beans	550kg	2750		
labour	family	6	300.00	hiring-transpo	4bags	200.00	Beans	4	200		
seed	shop	15kg	1,500.00	farm-spade	1no	100.00					
manure	village	100kg	500.00								
spray	shop	.500ml	50.00								
transport	fare	1bag	4.00								
travel	fare	1trip	27.00								
miscellaneous	fare	1trip	30.00								
labour	land clea	2	100				75	150	50	100	
seed		250g	15								
labour-land prepa	house	10dys	500	seeds	5kg	500	chilli	2kg	80	1kg	40
							drychilli	1kg	80	1kg	80
							brinjal	4kg	60	4kg	40
							pandalavari	3kg	30	2kg	20
weeding	house	4	160	0	0	0	chilli	2kg	120	2kg	120
							brinjal	3kg	48	2 kgs	32
							murngakeerai	1kg	10	2kg	10
seedling planting	house	6	300	beans	4kg	320	beans	145kg	1450	5kg	50
							brinjal	8kg	80	8kg	80
							avarai	5kg	50	1kg	10
							chilli	3kg	90	1kg	30
							Tappioca leaf	3bundle	9	3bundle	9
							tappiocatuber	5kg	50	5kg	50
seedplanting	house	5	250	Seedcost	5kg	250	brinjal	4.5kg	72	1.5kg	24
							tomato	1.5kg	18	1.5kg	18
							avari	1.5kg	30	1.5kg	30
							Tapioca	3kg	30	3kg	30
							Chilli	1.5kg	45	500gm	15
weeding	house	4	400	0	0	0	bitergard	4kg	80	1kg	20
							brinjal	4kg	80	1kg	20
							kothavarai	500gm	10	500gm	10
							avarai	3kg	48	1kg	16
							mekarai	1kg	10	1kg	10
							tomato	1.5kg	24	1.5kg	24
							chilli	1.5kg	42	500gm	15
weeding	house	6	300	0	0	0	brinjal	1kg	20	1kg	20
							Bittergard	1.5kg	24	1.5	24
							Avari	1kg	10	1kg	10
							tomato	1kg	16	1kg	16
							chilli	1.5kg	30	1.5kg	30
							murungaikeerai	3bundle	15	3bundle	15
							tapioca	6kg	60	3kg	10
				purchase of b	5	250					
weeding	house	5	250	knife	1	200	0	0	0	0	0
				sharpening	1	30					
Uncultivated outputs											
							Sukuti	60 bundles	300		
							Murungai	4 bundles	20		
							Poosani	2 kgs	20		
							Chilly-zeeni	600g	70		
							Fodder	12 bundles	240		
Total			7,186.00			1,850.00			9,221.00		928.00
Total Cash Input/Output			9,036.00						9,221.00	**185.00**	

Krishna - Coffee											
labour	NA	43	2,150.00								
							Coffee	12kg	480		
							Coffe robust	30kg	360		
weeding, pruning	house	8	400				Pepper	10kg	650		
							Jack fruits	15	225	5	75
							Coffee	65kg	650	5kg	50
				Knife maintan	1nos	30	Coffee	15kg	600	15kg	600
Uncultivated outputs							Coffee	10kg	150	10kg	150
							Firewood	27 bundles	1350		
							Tubers/greens/zeeni		557		
Total			2550			30			5022		875
Total Cash Input/Output			2580						5022	**2,442.00**	
Dharmaraj - Tea											
tea plucking	house	5	250				coffee fruits	500gm	30	500gm	30
		15	750				tea leaf	18kg	63		
			0				tea leaf	15kg	50		
		9	450				Tealeaf harvest	50kg	325		
labour -weeding	house	10	500	Fertilizer	9 bags	3260	tea-leaf	400kg	3600		
plucking wage	hired	8	400								
plucking leaf	house	12	600								
shifting fertilizer	house	2	100								
fertilizer applicatio	house	10	500								
manuring	house		0				Tea leaf	54kg	270		
manure shifting	house	2	100								
			0				tea leaf	270kg	780		
manure	own	5	250				leaf	60kg	180		
labour	own	25	1250								
labour	leafplucki	2	100				tea leaf	150kg	450		
	weeding	4	200								
Uncultivated outputs							Keerai	15 bundles	75		
							Firewood	41 bundles	2050		
Total			5450			3260			7873		30
Total Cash Input/Output			8710						7873	**(837.00)**	
Joghee - Coffee											
All labour		244	12200				Coffee	10	600	3	180
Implements and th	Gadaparai				1	35	Robasta coffee	50	600	0	0
recuring costs	Kathi				1	30					
	Kodarei				1	25					
							Pepper	8	480	1	60
							Silk cotton	57kgs	1140		
							Jack fruit	12 nos	240		
							Pepper	6kg	372		
							Orange	27kg	135	5kg	25
							Jack fruit	100nos	2000	16	320
							Silkcottan	17kg	340		0
							coffee fruitsarabica	11	550	1kg	50
							coffee fruits-robust	10	120		0
							Coffee fruits-arabi	35	1750	1kg	50
							Coffee fruits-robusti	30	360		0
Uncultivated Outputs											
							Greens/zeeni/tubers		600		
							Fodder	72 bundles	1440		
							Fuelwood	52 bundles	2600		
Total			12200			90			13327		685
Total Cash Input/Output			12290						13327	**1,037.00**	

Mahalingam - Tea											
weeding	house	26	1300				leaf	130kg	845	0	0
labour for manurir	house	2	100								
plucking	house	15	750				tea leaf	60kg	420		
leafplucking	house	7	350				tea leaf	130kg	910	0	0
							tea leaf	200kg	1000	0	0
weeding	house	5	250				tea leaf	450kg	2025	0	0
plucking	house	25	1250								
leafplucking	house	3	150	Spade	4nos	160.00	leaf	150	450	0	0
		24	1200	Knife	2nos	80.00					
planting	house	3	150				tea leaf	400kg	1200	0	0
plucking	house	46	2300								
				Knife purchas	1	120	Tealeaf	500kg	1500	0	0
				Knife maindar	2	80					
manuring	market		3500	Knife maintan	3	180	Tealeaf	208kg	728	8kg	28
panchakaviya	Keystone		250				Tealeaf	204kg	1428	0	0
							Tealeaf	50kg	460	0	0
							Tealeaf	60kg	360	0	0
Uncultivated Outputs											
							Keerai	135	675		
							Tubers	80 kgs	800		
							Zeeni	3 kgs	120		
							Fuelwood	123 bundle	3690		
							Fodder	30	300		
Total			9050			620			14736		28
Total Cash Input/Output			9670						14736	**5,066.00**	
Mani-Sivalaxmi - Millet											
							tenai	84padi	840	84padi	840
							keerai	50gm	50	50gm	50
							maize	200nos	200	200nos	200
							mustard	250gm	25	250gm	25
							beans	15kg	300	15kg	300
land clear and sov	house	20		seed	5kg	40.00					
land clearing	house	9	450	seed	2.5 pac	25.00	0	0	0	0	0
land clearing	house	3	150	seeds	3.5 kgs	40.00	0		0	0	0
land tilling	house	9	360		0	-	0	0	0	0	0
Labour	Thenai ha	2	100								
Labour	weeding	4	200				Thenai	20 padi	160	20 padi	160
							Ragi	10 padi	80	10padi	80
							Keerai	12 padi	84	12 padi	84
							Maize	45 nos	45	45nos	45
							Musted	100gm	5	100gm	5
Labour	Boundari	1	50								
Uncultivated Outputs											
							Sukuti/Povidagu	40 bundles	200	40 bundles	200
							Zeni chilli	2.5 Kgs	150	2.5 kgs	150
							Tomato wild	2 kgs	20	2 kgs	20
Total			1310			105			2159		
Total Cash Input/Output			1415						2159	**744**	

ANNEXURE 3

Tea - Biomass & Crop Diversity

Biomass Type		Habit	Part Used						Uses											
Local Name	**Botanical Name**		**Le**	**St**	**Fr**	**Ro**	**WP**	**Fl**	**Fo**	**Fw**	**Sh**	**Ma**	**Co**	**Im**	**Re**	**Me**	**Fe**	**Oi**	**Gr**	**We**	
Kaapi sedi	Coffea arabica	S	1	1	1				1	1	1	1									**4**
Adaka	Areca	T	1	1	1				1		1	1	1								**4**
Babli mus		T	1	1						1	1	1									**3**
Bae mara	Musa	S	1	1	1				1		1	1									**3**
Keskil ullu	Phoenix spp.	S	1											1							**1**
Amanaku	Ricinus communis	S	1	1	1						1	1						1			**3**
	Chilly-Big	H	1	1	1				1			1									**2**
Chithai maram		T	1	1	1				1	1	1										**3**
	Cinnamon	T	1	1	1				1	1	1										**3**
	Cocos	T	1	1	1				1		1	1									**3**
Konnai	Cassia fistula	T	1	1						1	1										**2**
Dhupam	Canarium strictum	T	1	1	1						1	1	1		1						**4**
Thadpode	Passiflora spp.	C	1	1	1				1		1	1									**3**
Koyya	Guava	T	1	1	1				1	1	1	1									**4**
Ullu		H					1					1									**1**
Helakkai			1	1	1				1			1									**2**
Jack	Artocarpus heterophyllus	T	1	1	1				1		1	1	1								**4**
Janauarypoosedi							1					1									**1**
Jatropha		S	1	1	1							1				1		1			**3**
Kadukkai	Terminalia chebula	T	1	1	1				1	1	1		1								**4**
Kuchikilangu		S	1	1		1			1		1	1									**3**
Lantana	Lantana camara	S	1	1													1				**1**
Libarica coffee		S	1	1	1				1	1	1	1									**4**
Mango tree	Mangifera indica	T	1	1	1				1		1	1	1								**4**
Mera kodi		C	1	1	1				1			1									**2**
Murungai		T	1	1							1	1					1				**3**
Nayuruvi sedi		H					1					1									**1**
Nelli maram	Phyllanthus emblica	T	1	1	1				1		1	1									**3**
Ottai sedi		H					1						1								**1**
Pappaya		T	1	1	1				1		1	1									**3**
Pattupochisedi		H	1	1							1	1									**2**
Pepper	Piper longum	C	1	1	1				1			1									**2**
Peaches		T	1	1	1				1		1	1									**3**
Puluccha keerai		H	1	1					1							1					**2**
Rosewood tree	Dalbergia spp.	T	1	1						1	1	1	1								**4**
Silai kuththi							1					1									**1**
Silkcotton	Ceiba pentandra	T	1	1	1						1	1		1							**3**
Silver oak		T	1	1							1	1	1								**3**
Sundai sedi	Solanum torvum	S					1					1									**1**
Sundaimul							1					1									**1**
Thagai sedi			1	1								1									**1**
Tharve pull/grass		H					1					1	1								**2**
thogary sedi			1	1	1				1		1	1									**3**
Thaduvasedi							1					1									**1**
Vetty ver	Vetiveria spp.	H	1	1		1					1					1					**2**
Weeds							1					1									**1**
Zeenichilly		S		1	1				1							1					**2**
			48	**36**	**25**	**2**	**10**		**23**	**9**	**27**	**37**	**9**	**2**	**1**	**4**	**2**	**2**			

Millet

Local Names	Botanical Name	Habit	Part Used						Uses										
			Le	St	Fr	Ro	WP	Fl	Fo	Fw	Sh	Ma	Co	Im	Re	Me	Fe	Oi	Gr	We	
Vengai maram	Pterocarpus marsupium	T	1	1						1	1		1								3
Sennory maram	Mallotus phillipinensis	T	1	1						1	1										2
Parththiniya	Parthenium	H					1					1									1
kalakodi		C					1					1									1
thalaikuththasedi		H					1					1									1
goummul		H					1					1									1
Nannary	Hemidesmus indicus	C				1										1					1
kaiviry	Helicteres isora	S	1	1							1		1								2
poola		T	1	1						1	1										2
naracade sedi		S					1					1									1
Ulumai maram	Grewia tiliaefolia	T	1	1						1	1		1								3
Cakkai maram	Cassia fistula	T	1	1						1	1										2
lentana	Lantana camara	S					1										1				1
karaimaram	Randia dumetorum	T	1	1													1				1
Raiyan kodi	Dioscorea spp.	C				1			1							1					2
pulisorai sedi	Oxalis spp.	H					1					1									1
Ranne kodi		C					1					1									1
silaikuththi		H					1					1									1
Thandi maram	Terminalia bellerica	T	1	1						1	1		1								3
soorakodi	Zizyphus spp.	C					1					1									1
chingai	Acacia spp	C	1	1						1	1										2
noorai kodi	Dioscorea spp.	C			1				1							1					2
Ponthogary		H					1					1									1
ottai		H					1					1									1
nelli	Phyllanthus emblica	T		1	1				1	1		1									3
naval	Syzygium cuminii	T		1	1				1		1		1								3
mango	Mangifera indica	T		1	1				1		1		1								3
sundakodi		C	1	1		1										1					1
goingi		C					1					1									1
rose wood	Dalbergia spp	T	1	1						1	1		1								3
ral vagai		T	1	1						1			1								2
kolagasedi	Elaegnus kologa	C					1					1									1
sukktikeerai		H	1			1			1							1					2
cundey		T		1						1	1										2
malakanny	Breynia retusa	T					1					1									1
grass		H					1					1									1
Selaiththaththary	Clematis spp.	C	1									1									1
kalakodi		C	1			1										1					1
kotta maram		T	1	1						1	1										2
selai maram		H	1	1						1	1		1								3
maghali kodi	Decalepis hamiltonii	H				1										1					1
vekky maram	Elaeocarpus variabilis	T	1	1						1	1		1								3
sooli kodi		C					1					1									1
Kodangally							1					1									1
kaduka maram	Terminalia chebula	T	1	1	1																
			19	20	5	6	18		6	14	15	19	10			7	2				

Coffee

Local Names	Botanical Name	Habit	Part Used						Uses										
			Le	St	Fr	Ro	WP	Fl	Fo	Fw	Sh	Ma	Co	Im	Re	Me	Fe	Oi	Gr	We	
Nilal vagai		T	1	1						1	1										2
Rose wood	Dalbergia spp.	T	1	1						1	1		1								3
Mururgai		T	1	1							1						1				2
Selaiunjal tree		T	1	1						1	1		1								3
Thiruvangur		T	1	1							1	1					1				3
Zeenichilly		H		1	1				1							1					2
lentana	Lantana camara	S	1	1							1	1					1				3
sennory maram	Mallotus phillipinensis	T	1	1						1	1	1									3
arabicoffee		S	1	1	1					1	1	1									3
Jack	Artocarpus heterophyllus	T	1	1	1				1		1	1	1								4
Ciththamaram		T	1	1	1				1	1	1										3
Orange		T	1	1	1				1	1	1										3
Noorai kodi		C	1	1		1			1			1									2
Pepper	Piper longum	C	1	1	1				1			1									2
Robusta coffee		S	1	1	1				1	1	1										3
Libarica coffee		S	1	1	1				1	1	1										3
Selaimaram		T	1	1						1	1		1								3
Navalmaram		T	1	1						1	1		1								3
weeds		H						1				1									1
Grass		H						1				1									1
Silk cotton		T	1	1	1						1	1		1							3
Navalmaram		T	1	1						1	1	1	1								4
Kainai kodi		C	1	1								1							1		2
Sennory maram		T	1	1						1	1	1									3
Thadasu maram		T	1	1						1	1	1									3
Uppoukattymaram		T	1	1						1	1	1									3
Kaiviry	Helicteres isora	S	1	1						1	1		1								3
Nilal vagai		T	1	1						1	1	1									3
Vattagani mara	Macaranga indica	T	1	1						1	1	1									3
miningai kodi	Argyreia nervosa	C						1				1									1
Nelli	Phyllanthus emblica	T	1	1	1				1			1				1					3
thadasu maram	Grewia tilifolia	T	1	1						1	1	1									3
Uppukatty maram		T	1	1						1	1	1									3
			29	30	10	1	3		9	20	25	21	7	1		2	3		1		

Vegetable

Local Names	Botanical Name	Habit	Part Used						Uses												
			Le	St	Fr	Ro	WP	Fl	Fo	Fw	Sh	Ma	Co	Im	Re	Me	Fe	Oi	Gr	We	C
weeds,crop stalk		S	1	1								1									1 C
bean crop stlk		S	1	1								1									1 C
banana stalk		S	1	1								1									1 C
Bidens spilosa		H	1	1								1									1 C
mukuthi		H	1	1								1									1 C
Lucus		H	1	1								1									1 C
sukuti		C	1	1								1									1 C
vanasorai		C	1	1								1									1 C
soapnut	Sapindus emarginatus	T	1	1								1									1 C
laplap		C	1	1								1									1 H
Kallangodi		C	1	1								1									1 H
Coffee		S	1	1								1									1 H
Sanappu		S	1	1								1									1 H
Kakaki		T	1	1								1									1 H
Chenniri		T	1	1								1									1 H
Kottarubber		T	1	1								1									1 H
Othapoondu		S	1	1								1									1 H
Castor		H	1	1														1			1 H
Sundai		S	1	1																1	1 H
Guommul		S	1	1																1	1 H
Parthiniya	Parthenium	H	1	1																1	1 H
Bidenu		H	1	1																1	1 H
Senna		H	1	1																1	1 H
Seengai	Acacia spp.	C	1	1																1	1 H
Polisorai	Oxalis spp.	H	1	1																1	1 H
Punthogari		S	1	1																1	1 H
Mustai		C	1	1																1	1 H
Sennory	Mallotus phillipinensis	T	1	1						1											1 H
Lentana	Lantana camara	S	1	1													1				1 H
Naracade		H	1	1									1								1 H
Mukthi sedi		S	1	1									1								1 H
Kattapalagai		S	1	1													1				1 H
Grass		H	1	1									1								1 H
Suktikeerai		H	1	1					1												1 H
Rosewood tree	Dalbergia spp.	T	1	1							1										1 H
Buthisundai		H				1			1							1					2 S
cuvery			1									1									1 S
local				1								1									1 S
local				1								1									1 S
graftd			1																	1	1 S
zeenichilli		H			1				1												1 S
sundaikodi		H	1			1			1							1					2 S
amanjikodi		C					1													1	1 S
kolikokai	Thunbergia spp.	H	1					1												1	1 S
Muttori	Physalis spp.	H			1				1											1	2 S
karadisallai	Coridia spp.	T			1				1												1 S
sooraikodi		C					1													1	1 S
selioonchalmaram		T	1	1						1	1		1								3 S
nooraikodai	Dioscorea spp.	C				1			1												1 S
kolakai	Elaegnus kologa	H			1							1									1 S
Karambai	Clausena spp.	S	1	1												1					1 S
Sinnamutori	Physlais spp.	H	1													1					1 T
pokamaram		T		1													1				1 T
Curryleaf		S	1						1												1 T
thgarai		H				1										1					1 T
ugina		C					1					1									1 T
kalakandrai							1							1							1 T
poonimutori		H			1				1												1 T
Ottai sedi		H					1					1									1 T
Boothisundai		H				1										1					1 T
Kainai	Wedlandia spp.	S					1					1									1 T
bush bean		C		1								1									1 T
Silvar oak		T	1	1						1		1	1								3 T
Tomato		C	1	1								1									1 T
Avarai		C	1	1								1									1 T
Pappaiya		T	1	1								1									1 T
Goa		T	1	1						1		1									2 T
Nelli	Phyllanthus emblica	T	1	1						1		1									2
Kappai		S	1	1								1									1
Jack	Artocarpus heterophyllus	T	1	1						1		1	1								3
Orange		T	1	1						1		1									2
Thatta pair		H	1	1								1									1
malligai		C	1	1								1									1
Manthavarai		C	1	1								1									1
Chilly		H	1	1								1									1
Koththavarai		H	1	1								1									1
Silai kuththi		H	1	1								1									1
Aththi maram	Ficus spp.	T	1	1						1		1				1					3
			59	57	5	5	6	1	9	8	2	41	6	1		7	3	1		14	