A REPORT ON

SUSTAINABLE DEVELOPMENT THROUGH NATURAL RESOURCE UTILISATION

(A Case Study in Karnataka)

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A C K N O W L E D G E M E N T S

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CHAPTER 1

INTRODUCTION

1.1 Definition and Scope:

For a major part of the last two decades, environmental concerns have occupied the centre-stage in all national and international agendas. The Report of the World Commission on Environment and Development (more commonly known as the Brundtland Commission Report of 1987) says that development is sustainable "if this generation secures economic development without compromising the ability of future generations to meet their needs".

The above definition stresses the need for conserving the resources for the future. The present developmental activities should not over-exploit them. In other words, it says that the future generations should inherit the wealth no less than that inherited by the current generation. Wealth inheritance refers to items such as the stock of knowledge and understanding of technology, of man-made capital (roads, factories, machines etc) and environmental assets (like soil, forests, wildlife, water and other natural resources).

Sustainable development is a development paradigm that manages all natural, physical and financial assets for increasing long term

wealth and well-being.[1] Hence, it rejects policies and practices that support current living standards by depleting the productive base that leaves future generations with poorer prospects and greater risks than at present. The focus of "sustainability" is on the issue of inter-generational equity. This implies at least an equal availability of options in terms of human well-being or production prospects to future generations as compared to the present one. Additionally, current development should be "sustainable" in a socio-political sense - that is to say, such as to avoid economic development becoming a source of social disharmony or political disturbances.

1.2 Need for the Study

The many debates around the issue of environmental conservation and preservation versus economic development continue to be central to international cooperation decisions made by government and multilateral agencies. Concepts such as "sustainable development" and "sustainable growth" are closely linked to these debates.

The desirability of development is undisputed. Recent years have witnessed a rising concern about whether environmental constraints will limit development, and, whether development in turn will cause serious environmental damage thus impairing the quality of life of

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[1] Repetto, R, (1988), quoted in Sustainable Development in Agriculture, ed.J.K.Parikh, International Institute for Applied Systems Analysis, Martinus Nijhoff Publishers, Lancaster, Boston.

this and future generations. Unfortunately, environmental values have been neglected too often in the past and today, humanity's stake in environmental protection has become enormous. Development and environmental conservation cannot be mutually exclusive. With this realization that a trade-off exists between development and environment, action for conservation becomes an integral part of continued development.

In this context, a micro-level study becomes important as a study of disaggregated micro-environments facilitates a better appreciation of macro-level relationships and problems. Micro-level studies help in planning at the macro-level. Though macro-policies are needed for the overall development of the economy, the linkages between development and use of natural resources become clearer from micro-level or case studies. An attempt has been made here to study the micro-environs in order to see the availability and utilisation for economic purposes, of both basic and non-basic resources.

Because of the locational and other differences in the availability of natural resources, conclusions from micro-level studies cannot obviously be assumed to apply automatically to the macro-economy as well. However, they offer useful guides to policies appropriate to the local system; additionally they are also useful pointers to the areas of trade-off which merit deeper study at the macro-level.

Various attempts have been made to explore these issues. Some have even come up with 'models' for sustainable development. These models describe the various interactions at the micro-level. Our study deviates from this model (See Fig.1) in that only some of the interactions have been considered here.

The purpose of any micro-study is to lay bare these interactions and adjustment possibilities in a system in which the efficiency, equity and resilience of an economy can be identified and handled more easily than for a macro-system.

There is a belief that inequitable distribution of command over productive resources leads to unsustainability. For sustainable development, help to the poor is necessary as they are left with "no option other than to destroy their environment".[2] The focus of any development paradigm has been on inter-generational equity. However, if a development paradigm seeks only inter-generational equity and does not address the question of social and political equity, then this paradigm is unlikely to meet the needs of inter-generational equity either.

One of the basic requirements of sustainable development is that there should be <u>efficiency</u> in the current use of resources. Unless

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[2] Markandaya A (1972), "Criteria for Sustainable Agricultural Development", in <u>Earthscan Reader in Environmental Economics</u>, ed. Anil Markandaya and Julie Richardson, Earthscan Publications Ltd. London, p.290-92.

resources are used in the most efficient, that is to say, cost-effective manner in the present generation, the future generations cannot have these full access to these resources. As is evident in the two villages of our study, Thokasandra (TKS) and Ajje Gowdana Valase (AGV) due to environmental damage and its resultant decrease in productivity of land, households that have been traditionally agricultural, have shifted to other activities like beedi-rolling and quarrying.

1.3 Objectives of the Study:

In the present study on attempt is made to look into the availability and rational utilisation of resources in the two villages of our study, Thokasandra and Ajje Gowdana Valase. Further, since the two villages are predominantly engaged in agricultural economics, we have concentrated on the factors relating to agriculture and allied activities.

The main objectives of the study are as follows:

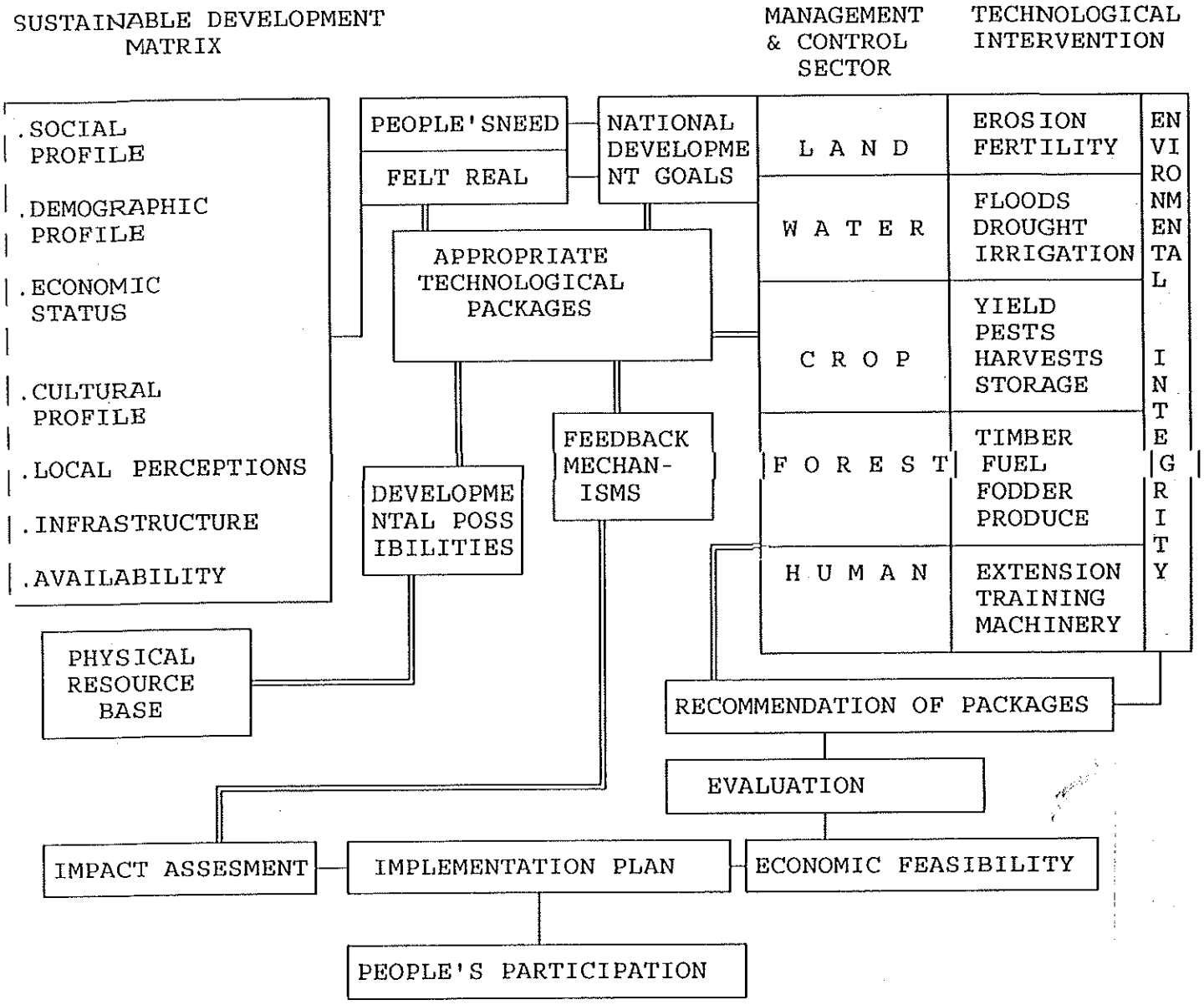
1. Analyse the availability of the basic and non-basic resources needed for development.
2. Analyse the utilisation of these resources.
3. Estimate the extent of dependence on natural resources.
4. Suggest measures for sustainable development using these natural resources.

In so far as agriculture and allied activities are concerned, the interactions between economic activity and environmental effects are in the context of cultivable land, water and forest resources. For the non-farming households, use of soil, granite and other natural resources for productive purposes are considered. For the population as a whole, note is taken of possible impact of life-styles and consumption patterns on the environment.

The report has been divided into two parts. Part I deals with the survey report. In the following Chapter II the methodology followed is outlined, together with a brief description of the study area. Chapter III deals with the farm households. Chapter IV analyses the occupations of the non-farm households. Chapter V reflects on the consumption pattern of the households. In Chapter VI, the conclusions of the study have been presented, as well as an action plan drawn up. Based on this plan, the findings of the study were disseminated to the villages in the villages of TKS and AGV of awareness generation camps. Details of these camps have been described in PART II of the report.

Part II deals with the report of the six awareness generation camps held in the two villages of Kanakapura taluk, Thokasandra and Ajje Gowdana Valase.

FIGURE 1: SUSTAINABLE DEVELOPMENT MODEL AT MICROLEVEL



Source: K.K.Nageshwara Rao in "Remote Sensing in Soil Resource Utilisation", ISRO, Bangalore.

CHAPTER - II

METHODOLOGY

2.1 Data Source and Sampling Design

Selection of Villages:

The present study covers two villages in Kanakapura Taluk of Bangalore rural district. The two villages were selected purposively from a list of villages with population in the range 450-1400. Actual selection of the villages was carried out in two rounds; in the first round 5 villages (that had been shortlisted through a survey of secondary data), were visited and Thokasandra was selected, and in the second round another 5 villages were visited and Ajje Gowdana Valase was selected. The list of villages visited is shown in the Appendix-1. The common criteria for selecting the two villages was:

1. existence of large number of small farmers
2. proximity to a forest which is now degraded
3. existence of varied cropping pattern
4. existence of non-agricultural activities
5. accessibility
6. absence of any other non-governmental organisations working in this village

2.2 **Selection of sample households**: In the first stage, a benchmark survey was conducted in both villages to get the latest information on the number of households, population and land particulars. This was preferred to collecting the data from the village accountant or

census data because it improved the quality of information and enabled selection on the basis of the situation as existing currently. Stratified random sampling technique was used for the selection of the sample households. Data from the bench mark survey was analysed and all the households were stratified on the basis of land ownership. The strata are:

1. landless households		- Group I
2. marginal farmers	(less than 1 acre)	- Group II
3. small farmers	(1 to 2.5 acres)	- Group III
4. medium farmers and	(2.5 to 5 acres)	- Group IV
5. large farmers	(5 and above)	- Group V

25% of the households from each category were taken as representative of that class and the actual households were chosen randomly by selecting every fourth one. The same procedure was followed in both villages.Detailed information was collected from the representative households through a comprehensive schedule which was pre-tested before final data collection. The reference period was the agricultural year 1992-93.

The benchmark survey also helped in developing rapport with the villagers and gaining their confidence. Apart from the schedules canvassed for all sample households, case study method was also used to elicit information from certain groups of people engaged in specific occupations. In Thokasandra this was done in the case of households engaged in beedi rolling and sericulture; and in the case of Ajje Gowdana Valase, the stone cutters were studied separately. The number of households

finally selected for our sample was 51 in Thokasandra and 27 in Ajje Gowdana Valase.

2.3 Analytical Techniques:

The main focus of the survey is to look into the production and consumption activities of the people living in these two villages and study their impact on the natural resources and environment. Since farming is the main occupation, land distribution, cropping pattern, water and fertilizer consumption are considered in the production process, whereas energy consumption patterns, dependency on the forest and common property resources are studied under consumption and non-farm activities.

Given the sample size and the village selection process, the primary data have not been such as to provide a basis for any quantitative extrapolation. Moreover, since such data have been secured through an interview process and oral responses, they are likely to be subject to sizeable margins of error. Even so, an attempt has been made to develop production functions for the farming activity in the villages, with a view to assessing the 'efficiency' of land-use (See Appendix-1) But by and large, we have resorted to meaningful tabulation of data for deriving judgements in terms of relative shares of groups or elements in the matrix. Besides being simple and understandable to non-

professionals, this method also avoids basing sophisticated models on magnitudes likely to be subject to wide margins of error.

2.4 The Study Area:

Thokasandra, Ajje Gowdana Valase are both small villages and as mentioned earlier, farming is the dominant activity in both of them. Thokasandra is located at a distance of 15km from Kanakapura. There are 201 households and 1051 people in the village. Apart from farming, agricultural labour, sericulture and beedi rolling are the other important occupations. The second village Ajje Gowdana Valase is located at a distance of 7km from Kanakapura. It has 108 households with a total population of 513. In this village a majority of the households depend on own-farming and agricultural labour, while some are dependent on quarrying. Farming is rainfed, with ragi as the main crop. Those farmers who have access to water-source grow paddy, mulberry, groundnut etc in small patches. While 38.22% of the population is literate in AGV, 45% is literate in TKS. In the bench mark survey the following characteristics are observed.

2.5 Population and Land:

Population structure in the two villages, grouped into five categories according to age, is presented in Table 2.1

Table 2.1

Population Structure

Age Group	Thokasandra Number	Thokasandra % to the total	Ajje Gowdana Valase Number	Ajje Gowdana Valase % to the total
0 - 6	156	14.80	70	13.65
7 - 15	250	23.72	100	19.49
16 - 30	284	26.94	140	27.29
31 - 60	294	28.18	162	31.58
Above 60	67	6.36	41	7.99

It will be seen that the majority of people in both villages are within the age group of 16 and 60 years. Those above 60 years age form 6% in TKS and 8% in AGV. However, children and adolescents in both villages constitute around a third of the total; thus there is considerable availability, and use, of child labour in the two villages.

Distribution of households according to size of owned holdings is shown in Table 2.2, under five categories- landless households, and those cultivating less than one acre, one to 2.5 acres, 2.5 acres to 5 acres and 5 acres and above.

Table 2.2:

Categorywise Distribution of Land Among the Households

Category	Thokasandra No. of households	% to total	Ajje Gowdana Valase No. of households	% to total
Landless	35	17.41	7	6.48
Less than 1 acre	31	15.42	15	13.89
1 to 2.5 acres	88	43.78	52	48.15
2.5 to 5 acres	35	17.41	29	26.85
5 and above	12	5.97	5	4.63
Total	201	100.00	108	100.00

From the table it may be observed that nearly half the households in both villages possess between one and 2.5 acres of land. Only 6% of the households in TKS and 5% in AGV have more than 5 acres, while 17% of the households do not possess any land in TKS, 6% are land less in AGV. Thus the majority of households in both the villages are marginal or small farmers.

2.6 Cropping Pattern in the Villages:

Due to the rainfed conditions and non availability of assured irrigation, the majority of farmers grow only ragi in the kharif season. The cropping pattern in the two villages is presented in the table below:

Table 2.3:

Area under Principal Crops

Crop	Thokasandra Area in Acres	Thokasandra % to the total	Ajje Gowdana Valase Area in acres	Ajje Gowdana Valase % to the total
Ragi	279.92	78.84	154.07	74.88
Paddy	37.57	10.58	23.11	11.23
Mulberry	32.32	9.10	21.98	10.68
Groundnut	5.25	1.48	6.58	3.20
Total	355.06	100.00	205.74	100.00

Nearly 79% of the cultivated area in TKS and 75% in AGV is under ragi. In both villages, paddy is being cultivated on only 11% of the area; whereas 32% of the area in TKS is under mulberry, only 11% of the area in AGV is under this crop. Avare, redgram etc are grown as intercrops with ragi. Coconut gardens are relatively small and the nuts are used mainly for trade.

2.7 Livestock

Several households in both villages owned livestock and these constituted for them a major component of their "other assets" (i.e apart from land). Apart from cows and bullocks, sheep and goats as well as poultry was maintained by many of them. Livestock ownership pattern is shown in Table 2.4.

Table 2.4

Livestock Ownership Pattern

Particulars	Thokasandra % of HH possessing livestock	Thokasandra No.of animals	Ajje Gowdana Valase % of HH possessing livestock	Ajje Gowdana Valase No.of animals
Cow	58.71	277	66.67	181
Bullock	12.93	51	21.30	47
Buffalo	8.95	20	9.26	15
Sheep	15.42	81	10.18	19
Goat	8.46	91	12.04	52
Poultry	6.96	113	47.22	196

Of the 201 households in TKS 59% have cows, whereas in AGV, nearly 67% of the households own them. The average number of cows per household comes to 2 in both villages. Bullocks which are the main source of animal power in unmechanised farming are less in number. Only 13% of the households in TKS and 21% in AGV possess an average of 2 bullocks per households. However, the majority of households use cows for all agricultural operations since they find it more economical to maintain cows than bullocks. 15% of the households in TKS and 10% in AGV rear sheep. Poultry appears to be dominant in AGV. As many as 47% of households own, on an average, 4 birds in AGV, whereas only 7% have poultry in TKS.

2.8 Occupational Structure:

A large proportion of households in both villages consists of owner cultivators, with very small holdings on the average. Since most agriculture is rainfed, they cannot depend only on these farms for survival; whenever possible, they also work as agricultural labourers. There are 17% of the households in TKS and 6% households in AGV without any land which depend mainly on agricultural labour and other occupations. The occupational classification of working men and women is given below in Table 2.5. In this classification, "agricultural labour" includes men and women who are engaged as workers by the land-owning households and excludes those who are owner cultivators-cum-agricultural labourers.

Table 2.5:

Occupational Structure

Principal occupation	% of population enagaged	
	Thokasandra	Ajje Gowdana Valase
Own Cultivation	40.63	48.15
Agricultural labourers (coolie)	14.08	11.31
Business (shops, flour mills etc)	0.29	0.78
Quarrying	--	5.07
Beedi rolling	7.52	--
Others	5.90	3.51

As is clearly seen nearly half of the population consists of owner cultivators, while agricultural labour accounts for 14% in TKS and 11.31% in AGV. Apart from these occupations, 5.07% people in AGV depend on quarrying activity for their livelihood. In TKS, 7.52% of the people are engaged in beedi rolling for their incomes. Others include those who are engaged in village industries, government jobs etc.

From the benchmark survey, the scenario that emerges is thus the following:

(i) Limitations of cultivable area have been such that even with their limited populations, not all of the households have holdings of their own. Even among the land-owning households, the majority are marginal - or small farmer households, which do not have access to plentiful water-supply. Because of these limited land and water resources, such households have to pay special attention to "efficient" cultivation, without impairing the future availability of these natural resources.

(ii) There are few households depending on the local forest area for any main occupation. However, in AGV, households depending on stone-cutting have been exploiting the stone quarries in the vicinity. Likewise, there is some brick-making in the two villages, which has an impact on surface soil.

(iii) Though there are no forest-based activities of significance, the livestock maintained by households occasionally graze in the forest areas, despite these being reserve forest. However, there are gomal lands in both villages, which constitute the principal grazing for the cattle.

(iv) From the stand point of production activities in the two villages, questions of environmental protection or improvement arise essentially with regard to land, water, stone and soil resources. Whether the life-style and consumption patterns of the households have any additional impact on these natural resources, as well as on the forest reserve, remains to be examined. This will be considered after taking a closer look at the production activities side.

CHAPTER III

FARM HOUSEHOLDS

The four natural resources of an agricultural ecosystem considered in our study are land, water, forests and human resources. Derived or output based resources are financial capital and capital assets. Each of these is mutually dependent on every other factor. For the criteria of sustainability to be satisfied, a harmony between these resources is imperative. This harmony can be achieved if there is within the farming ecosystem equity, productivity and stability.

3.1 Availability and utilisation of land

Land being the most important of all resources to agricultural operations, agricultural or allied production is dependent on the extent and quality of land available.

Land availability in Thokasandra and Ajje Gowdana Valase is classified under forest, irrigated area, unirrigated area, cultivable waste and area not available for cultivation.

Table 3.1

Availability and Classification of Land

Classification	Ajje Gowdana Valase		Thokasandra	
	1971 census	1981 census	1971 census	1981 census
Forest	169	160.92	00	00
Irrigated area	10.00	10.00	50	49.52
Unirrigated area	331	327.34	541	541.10
Cultivable waste	309	242.33	197	335.92
Area not available for cultivation	191	268.83	144	2.54
Total	1010.00	1009.42	932	931.1406

From the data presented in the table 3.1 it will be seen that AGV had a forest of about 169 acres in the year 1971; and over a period of 10 years, by 1981, the forest area has decreased to 160.92 acres. There is no forest within the boundaries of Thokasandra. The forest area in AGV and in the surrounding areas of TKS are "degraded". This may have been because of exploitation of the forest for produce (timber), fodder and fuel purposes.

There has also been large scale felling of trees by the traders from outside for timber and firewood. The denudation has also occured to a small extent, because of the grazing by the goats in the local area. From observation and from the information elicited from the locals, the denundation of the forest maybe due to soil erosion, ravine and gullies formation which has resulted

in trees being uprooted. Termite attack on the trees may have also contributed to this degradation.

For the maintenance of a sustainable forest ecosystem, regeneration on a large scale is necessary. Though efforts have been made in this direction it has been a failure due to improper care and neglect of saplings.

As shown in table 3.1, irrigation potential is higher at TKS than at AGV. From 1971 to 1981, the irrigated area in both the villages remain almost the same. However, there is a slight decrease in the irrigation potential at TKS. (from 50 to 49.52 acres) while overall land availability in the two villages has not varied, its composition has been changing in the two villages to some extent. Save for a minor decline in unirrigated farmland in AGV, these changes are in the distribution of the remaining area between "cultivable waste" and not available for cultivation" In AGV,considerable acreage has moved out of cultivable waste to area which is classified as not available for cultivation, however, the shift is in the other direction in TKS, from the latter category to the farmer.

The environments of AGV are quite rocky, outside of the cultivated area and forests; and increased quarrying and stone cutting in recent years has perhaps contributed to a reclassification of some cultivable waste differently.

Partly also, this may be due to the need for more grazing grounds for the considerable number of goats and sheep maintained by AGV households.

3.2 Distribution of land among sample households

Of the sample households, the largest proportion consisted of households with land less than 2.5 acres. Including landless households, these aggregated to 40 out of 51 households in TKS and 19 out of 27 in AGV. (Table 3.2) By and large, therefore, the sample consisted of very small farmers (classified in Karnataka as "marginal" farmers); and their farming practices were mostly traditional and labour intensive.

Table 3.2

Distribution of Land Among Sample Households**

Number of households	TKS	AGV
Group I- Landless	7	2
Group II - upto 1 acre	9	4
Group III- 1 to 2.5 acre	24	13
Group IV - 2.5 acres & above	11	8
Total	51	27

** While we had classified the households in the two villages into five-size groups according to landholdings initially, as per Karnataka State Department of Agriculture; we have changed the classification subsequently as the number of observations in Group - V were too few. Group-IV & Group-V have been clubbed together and classified as Group-IV.

Since both these villages are in a relatively dry zone, with rainfall ranging 660mm and 880mm much of the land cultivated by the sample households consisted of unirrigated areas. In the 1992-93 Kharif season, for example the distribution of the holdings of the sample households among different categories of land was as follows.

Tables 3.3

Land Distribution Among the Sample Households - Thokasandra

Size Group	Dry Land (acres)	% to the total	Wet land (acres)	% to the total	Garden (acres)	% to the total	Total land	%
Group II	3.08	91.12	0.30	8.87	0.00	0.00	3.38	100
Group III	29.50	83.95	5.64	16.05	0.00	0.00	35.14	100
Group IV	34.00	74.87	8.75	19.27	2.66	5.86	45.41	100
Total	66.58	79.32	14.69	17.50	2.66	5.86	83.93	100

Table 3.4

Land Distribution Among the Sample Households - Ajje Gowanda Valase

Size Group	Dry Land (acres)	% to the total	Wet land (acres)	% to the total	Garden (acres)	% to the total	Total land	%
Group II	1.47	66.22	0.75	33.28	0.00	0.00	2.22	100
Group III	16.00	82.56	2.51	12.95	0.87	4.49	19.38	100
Group IV	25.58	75.90	5.87	17.42	2.25	6.68	33.70	100
Total	43.05	77.05	9.13	16.51	3.12	5.64	55.30	100

Thus nearly 80% of the holdings in TKS and 78% in AGV consisted of unirrigated areas, suitable for cultivation of rainfed, dry crops. On the remaining areas

consisting of wet lands or gardens, other water-intensive crops or trees were cultivated. The resulting cropping pattern is shown in tables 3.5 and 3.6 below.

Table 3.5

Land Utilisation Area Under Each Principal Crop in Thokasandra

	Group II		Group III		Group IV	
Crop	Area	% to total	Area	% to total	Area	% to total
Ragi	3.08	91.12	23.75	79.46	30.00	70.74
Paddy	0.10	2.96	1.42	4.75	4.30	10.14
Mulberry	0.10	2.96	3.57	11.94	4.11	9.69
Groundnuts	0.10	2.96	1.15	3.85	4.00	9.43
Total	3.38	100.00	29.89	100.00	42.41	100.00

Table 3.6

Land Utilisation Area Under Each Principal Crop in Ajje Gowdana Valase

	Group II		Group III		Group IV	
Crop	Area	% to total	Area	% to total	Area	% to total
Ragi	1.47	66.21	16.00	85.65	22.50	74.82
Paddy	--	--	0.51	2.73	3.00	9.98
Mulberry	0.75	33.78	2.00	10.71	2.32	7.71
Groundnuts	--	--	0.17	0.91	2.05	7.48
Total	2.22		18.68		30.07	

As seen from these tables, farmers with the smallest holdings in both villages are cultivating ragi on a larger scale than the others. The crops like paddy, mulberry and groundnuts are grown by farmers having relatively large holdings, who have access to a common water source, or have invested on wells.

3.3 WATER RESOURCES

The farming community in TKS depends heavily on a distributary of the River Arkavathi flowing through TKS. This river dries up during the summer months. When this river is in flood, some of the farmers tap the water directly through pumpsets. Farmers have also tapped groundwater resources by digging deep tubewells in adjacent tracts.A few farmers have sunk shallow wells and installed pumpsets to irrigate their fields. Farmers who do not possess any other means of water, buy water from such pumps at rates ranging from Rs 500 to Rs 1000 per year for an acre of land.

In AGV however the same river water has been harvested in a tank for irrigation. The presence of this tank has encouraged farmers to take up pisciculture. In addition to this tank (called Mauthuramma kere) farmers depend on bore wells and shallow wells also. The following table shows the distribution of pumpsets among the different size groups in both the villages:

Table 3.7:

Pumpset Distribution

Size Group	Number of Pumpsets AGV	TKS
Group II	1	2
Group III	3	5
Group IV	5	6
Total	9	13

Expectedly, the larger farmers possess more pumpsets. Altogether only 33.33% of the households in AGV and 25% in TKS own pumpsets. This is clearly because of the prohibitive cost of installing a pumpset. Of necessity, the remaining households thus depend on rainfall for their farming. Drinking water requirement of both villages is met by a tank stored with tube well water, which is then distributed throughout the village. The SC\ST colonies in both the villages have a separate outlet.

3.4 Agricultural implements owned by sample households.

The farming community in both villages own traditional farming implements (Wooden plough, iron plough, axes, gudali, pickaxe, spades, sickles etc.)The main means of transporting farm produce from the fields to their houses is the bullock cart. However, there are very few bullock carts in both villages and these are concentrated in the hands of the better-off farmers.

The others resort to hiring them in times of need. There seems to be a trend towards replacing wooden ploughs by iron ploughs and an increased use of seed drills. No doubt iron ploughs give a good tillage this; but has its own drawbacks, by way of top soil erosion and the destruction of microbes beneficial to the fertility of the soil.

Farm produce is generally stored in "Vade" (an elongated vessel made of clay),"Kanaja" (cement structures within the house) and in gunny bags. During storage adequate care is not taken to prevent pest attack although rat poison is used extensively.

3.5 HUMAN RESOURCES

All the farmers in the sample use both family labour and hired labour in the production process. Details of hired and family labour used generally in ragi cultivation is presented below:

Table 3.8
Labour Utilisation Under Various Categories of Land Holdings for Ragi

	Ajje Gowdana Valase Average labour days/acre		Thokasandra Average labour days/acre	
Size of holdings	Hired	Family	Hired	Family
Less than 1 acre	25.25	30.00	31.47	49.68
1 to 2.5acre	25.17	23.46	37.08	28.41
2.5 & above	15.62	11.87	33.79	19.22

Analysis of labour utilisation in the production of ragi indicates that all the categories of farmers depend on hired labour irrespective of their holdings. Nearly 50% of labour is hired labour in all the categories; but a high coefficient of variation in the case of less than one acre category shows those hiring 50% of labour are not a majority. However the average number of man days required for the production of ragi is relatively low, and the majority of households in the first group contribute own labour. In the case of households with more than 2.5 acres, where 60% of the labour is hired labour, much less number of own labour days are used for production.

When land is used for paddy or vegetable patches, the labour input is somewhat higher. Part of the higher proportion of hired labour used by households with more than 2.5 acres of land is attributable to the cultivation of crops other than ragi.

3.6 CAPITAL RESOURCES

Capital availability is generally a limiting factor in the villages and farmers raise capital they need mainly through borrowings. People in both villages depend on local money lenders for the bulk of their borrowings.

The following table 3.9 shows the number of borrowers in each group in Ajje Gowdana Valase and Thokasandra.

Table 3.9

Number of Borrowers in Each Group

Size Group	Number of Borrowers Ajje Gowdana Valase	Thokasandra
Group I	2	4
Group II	2	4
Group III	11	17
Group IV	4	4
Total	19	29

Out of a total of 27 households in the AGV sample the number of borrowing households is 19 and in Thokasandra there are 29 households borrowing against the total of 51 sample households. Relatively therefore, the AGV sample shows a higher incidence of borrowing. It is also obvious that the maximum number of borrowers are from Group III, ie. households owning between 1 acre and 2.5 acres.

An analysis of the purpose of borrowing shows that 12 of the 29 borrowers in TKS and 10 of the 19 in AGV used all part of their borrowed funds for consumption purposes. The remaining, as may be seen in table 4.9, used the loan funds largely to purchase livestock or invest in wells, land development, or purchase of pumpsets. Altogether, it would seem that when capital resources are applied to land, they are mainly for

improving or supplementing water availability . There is not much evidence of any substantial outlay on modern agricultural implements in Table 3.10.

Table 3.10

Purpose of Borrowing

Purpose	Thokasandra No. of Households	Ajje Gowdana Valse No.of Households
Investments on land development (for agricultural purpose digging of wells/ borewells/purchase of pumpsets).	Group II - 1 Group III - 3 Group IV - 5	Group III - 1 Group IV - 3
Purchase of (dwellings etc)	Group IV - 1	Group II - 1 Group III - 2
Purchase of livestock	Group I - 2 Group II - 1 Group III - 8	Group I - 1 Group III - 2
Investment of self net (for a shop etc)	---	Group III - 1 Group IV - 1
Borrowing for self consumption (clothes festivals, and other domestic reasons)	Group I - 2 Group II - 4 Group III - 6	Group I - 1 Group II - 1 Group III - 7 Group IV - 1

Of the two villages, TKS has a dairy to which the people of AGV sell any excess of milk produced. However, the cattle are maintained not so much for milk as for other uses (draught,meat, manure and transportation). Among the cattle population, the proportion of local varieties is much higher than hybrids. There are only a few heifers and jerseys; hence the production of milk in the two villages is not substantial; while, on an average, a local cow yields less than 3 litres of milk

per day, a hybrid gives upto 10-12 litres of milk. The low yields may be due to lack of fodder, use of cows for draught purposes and low usage of concentrates. The following table 3.11 sheds some light on the production and marketing of milk in the sample villages.

Table 3.11

Production and Marketing of Milk (in litres)

	Thokasandra	Ajje Gowdana Valase
Milk produced per day	34	19.50
Milk consumed per day	9.50	8.75
Milk sold per day	20.00	5.00
Percentage sold	58.82	24.64

Milk production per day is higher in TKS than AGV, and of the total milk produced, 58.82% is sold to the dairy in TKS and 24.64% from AGV. The rest is consumed directly, or in form of curd,butter and ghee. The rate per litre sold to the dairy is Rs.5.30.

Villagers in both TKS and AGV depend on common property resources (gomal lands) for the maintenance of their livestock. While by-products like ragi and paddy straw or dry feed are used, they depend on the nearby forest for grazing. All the households in the sample who possess livestock indicated that they take the livestock for grazing in the nearby forest. The "gomals" or the common grazing land, exists in TKS, but it was reported

that it has been encroached by a big landholder and its size has diminished from 12 acres in the past to 8 acres now. The grazing of sheep and goats on Common Property Resources (CPR) have also added to their depletion. In the dry region where the forage and herbages decline due to the degradation of CPR, only small ruminants can survive. Very few farmers grow fodder crops which, in turn, has added to their dependence on fallow lands, grazing lands and meadows.

3.7 Farm Production and Income

Since the availability of cultivable land in both the villages is limited, and there is not much evidence of any on-going public or private investment to convert cultivable wastes into farm land. Sustenance of even the low levels of agriculture depends vitally on an efficient use of the other productive resources. Amongst these, human labour is apparently adequate in both TKS and AGV, given the population structure (Table 2.1); limiting factors are mainly water supply and capital resources. The latter of these, in turn determine the extent to which the farmers purchase improved seeds, fertilizers, manure and additional irrigation or hire labour, bullocks or implements. Altogether, these households have compelling reasons to use their limited resources efficiently, and in the process ensure the continued usability of their holdings. Against this context, we have attempted an exercise to derive some

broad judgments about the efficiency of prevalent farming practices, and to speculate on possible changes in factor-combinations that might provide increased incomes without any major environmental cost.

In this exercise, farm business income and output per person-day are used to compare the efficiency of farms of different sizes in both the villages. Households owning larger holdings have varying cropping patterns when they have access to adequate water and capital resources. For physical quantity comparisons, therefore, we have used the output of ragi, which is the main crop of the two villages, as the common base. With cropping differences, the proportions of sales to retention of output also varies; likewise, changes in farm-size generate differences in the proportion marketed. For instance, while between 15 to 17% of ragi output produced in the two villages is marketed, the proportions comes down to less than 3% in respect of paddy and rises sharply to highs of 56% and 84% in the case of groundnut and coconuts. Consequently, the estimation of gross farm income involves, firstly the valuation of retained outputs at prices common to all households; and secondly, valuation of marketed outputs at prices, actually received by the farmers. Additionally, farm households derive incomes from other sources also - such as those from sale of milk and milk products, farm by products and rental from land,

livestock or implements - which are land-related. All these constitute gross farm income.

Given these ramifications, any "efficiency" analysis has to be related to the totality of output from the use of farm land and related assess, and this is possible only in income terms. Before we take this up, it will be useful to summarise briefly the data on some of the physical magnitudes which are implicit in the production function analysis. These help incidentally in a broad comparison of intensity of land utilisation in the two villages.

Tables 3.12 and 3.13 shows the output of ragi per acre in relation to fertilizer or farm-yard manure use broken down by size of holding in the case of sample households, in the two villages.

Table 3.11

Use of Fertilizer According to the Size of Holdings and Output of Ragi in Thokasandra

Size of holding	Average output Kg/acre	Average Fertlizer use kg/acre	Average FYM use cl/acre*
Less than 1 acre	525.65	109.41	9.34
1 & 2.5 acres	496.93	77.63	9.14
2.5 & above	478.30	55.50	6.37
Total	500.29	80.85	8.28

* Cl- Cart load

Table 3.13
Use of Fertilizer According to the Size of Holdings and Output of Ragi in Ajje Gowdana Valase

Size of holding	Average output acre (kg)	Average Fertilizer use kg/acre	Average FYM use cl/acre
Less than 1 acre	546	56	8.5
1 & 2.5 acres	406.54	61.69	6.85
2.5 & above	391.25	31.62	4.00
Total	447.93	49.77	6.45

In general, the households in TKS use more fertilizer or farm manure, and obtain higher yields of ragi per acre than those in AGV. As between households with different sizes of holdings, the yields on smaller farms are apparently better than those obtained on the larger holdings in both villages. Whether this is due to the very small farmers concentrating on ragi while the others have diversified interests, it is difficult to say.

However, when we look at output per person-day in terms of kilogrammes of ragi, the picture looks different. (Table 3.14) The tendency is for this index to increase with the size of holdings in both TKS and AGV.

Table 3.14
Ragi Output per Person-day (in kg/day)

Group	AGV	TKS
Less than 1 acre	11.09	6.83
1 to 2.5 acres	10.08	8.38
2.5 acres & above	15.53	11.05
Average	13.95	8.75

It is however not possible to conclude from this whether or not labour is more efficient in AGV than in TKS, or in large rather than small farms. But what it does imply is that the input of labour is heavier in AGV generally, and on the smaller farms in both places. This may be because these households have to depend much more on human energy than on animal or mechanical power. But as in the case of fertilizers and manure, the input of human resource also is relatively high on the small farms - and hence the larger yield per acre.

An intriguing element in all this is the heavy use of fertilisers on a dry crop like ragi. Whether this arises from ignorance, pressure from government or from the necessity to buy fertilizers in certain minimum packages is not clear. But such heavy applications of inorganic manures could lead, over a period, to a serious deterioration in outputs per acre.

Since the approach via physical outputs cannot be conclusive without a detailed accounting of actual farm operations- which the present survey does not attempt - a somewhat more inclusive analysis of production relations has been attempted in terms of the value of output and gross farm income. In this exercise, the gross value of farm output (See Table 3.15) is defined as including the value of the main product and by-products of the farm. The other variables in the

function are the value of hired labour (x_1) value of family labour (X_2), value of animal labour (X_3), value of seeds (X_4), value of chemical fertilizer (X_5), value of Farm Yard Manure (FYM) (X_6) and the total land (X_7) in acres. (Land in physical terms is included to analyse the share of the land in total production.) All the estimates of the coefficients, standard errors, t values and the R^2 and R^{-2} are calculated and presented in the table. Since all the independent variables (except land) are expressed in value terms, the regression coefficients themselves give the marginal value productivity (MVP) of the inputs. Marginal value productivity of the inputs and input cost determine the rationality of using additional resources. In the present context the ratio of MVP to input prices is used to see whether the resource utilisation is optimal or not in order to make adjustment for their optimal use. Clearly it is worth using more units of some input as long as the value of additional output generated by an additional unit is greater than the cost of the additional unit.

Both linear and Cobb-Douglas type production functions with various combinations of output have been fitted to the data; and the best among the results is presented in the table below.

Table 3.15

Estimated Values of the Regression Coefficients and Related Statistics for Linear Production Functions

Variables	Thokasandra		Ajje Gowdana Valase	
	Estimates	t values	Estimates	t values
Hired labour (X_1)	0.75 (0.45)	1.67	3.26 (2.48)	1.31**
Family labour(X_2)	5.27 (0.90)	5.85***	2.91 (3.33)	0.87
Animal labour (X_3)	0.83	0.65	2.85	0.28
Seeds (X_4)	2.78 (0.95)	2.92***	- 3.62 (7.38)	- 0.49
Chemical Fertilizer (X_5)	5.29 (0.61)	8.68***	- 0.73 (2.94)	0.25
Farm Yard Manure (X_6)	-0.13 (0.34)	-0.38	2.37 (1.58)	1.50**
Land (X_7)	498.48 (451.38)	1.10	2888.16 (830.05)	3.48***
R^2 = 0.94 DW= 2.17			R^2 = 0.81 DW=1.77	
$\bar{R}^{-2}$ = 0.93			R^{-2} = 0.73	
F = 69.72***			F = 10.45***	

*** - Significant at 10%
** - Significant at 5%

The independent variables included in the estimated function explain 93% of the variation in the gross output in the case of TKS, whereas only 73% of the variation is explained in the case of AGV. The corresponding F values are significant at one percent probability level implying that all the specified independent variables are necessary for explaining the variation in the dependent variable.

The results presented in the table reveals that land is the only important factor explaining the variation in the gross output in AGV. None of the independent variables has an equal influence on the value of the output. However, in the case of TKS family labour, seeds and chemical fertilizers are having significant influence on the output. Highly positive significant production coefficient with respect to family labour in contrast with the hired labour coefficient indicates that family labour is more productive. This is not surprising, given the self-interest of the family. Other important factors are seed and chemical fertilizers, with the coefficients with respect to chemical fertilizer being much higher.

In the case of AGV, though 73% of the variation in the output is explained by the independent variables considered, none of them except land has any significant influence on the output. Since land shows very strong positive relationship, changes in the size and type of the land alone is presumably the main cause of variation in the output. The other variables showing positive though not significant relationship are hired labour, family labour, animal labour and FYM. Seeds and fertilizer are surprisingly showing negative relationship with the output. Since the primary data indicate the applications of high doses of fertilizers in AGV, this probably means the use of fertilizers is

not as beneficial as it should be.

Since the coefficient of each variable indicates the ratio of marginal value product to its factor cost, it also shows whether the resource use pattern is efficient or not. If the ratio is less than one, it indicates that too much of a particular resource is being used under the existing price situation, and if it greater than one, too little use of a particular resource. Optimal utilisation occurs when the revenue from using one additional unit of input is equal to the cost of that additional unit i.e when the ratio of marginal value product and the price is equal to one. Estimated ratios of Marginal Value Productivity (MVP) and price are given in Table. 3.16.

Table 3.16

Ratios of Marginal Value Product to Factor Prices

Variables	Thokasandra	Ajje Gowdana Valase
Hired Labour	0.75	3.26
Family Labour	5.27	2.91
Animal Labour	0.83	2.85
Seeds	2.78	- 3.62
Chemical Fertilizers	5.29	- 0.73
Farm Yard Manure	-0.13	2.37

From the results it appears that farmers in TKS are using hired labour and animal labour close to optimal conditions, whereas farm yard manure use indicates use beyond the optimal level. A reduction in the use of FYM could add to the gross returns. Since FYM is generally from their own livestock for which they do not have to pay, farmers are prone to use whatever becomes available. Other inputs like family labour, seeds and chemical fertilizers show that they are being used at less than their optimal level; and every additional rupee of expenditure on these inputs can lead to more than one rupee increase in the gross return value. An increase in the use of these three inputs, is likely to raise gross returns. But for both seeds and fertilizers, farmers need more capital resources. Greater availability of this factor could add substantially to production.

In the case of AGV all resources other than land being used at less than their optimal level. In this village though none of the factors is significant in influencing the change in output, their usage is also less than optimal. There is scope for some increase in output by increasing the use of labour and farm yard manure. The negative sign of the seed and chemical fertilizer variables indicates excess of use of this factor; a reduction of expenditure on these inputs could help increase the gross returns.

CHAPTER - IV

NON-FARM ACTIVITIES

As pointed out in Chapter II above (Table 2.2) there were 35 households in TKS and in AGV which had no land of their own, and therefore had to derive their livelihood from other occupations. A good proportion of these households consisted of persons who worked as agricultural labourers and are hence exploiting the same natural resources as farm households. They also constituted the main part of the hired labour pool in other areas such as mulberry cultivation, construction, domestic work or, as was the case in AGV, stone cutting and quarrying. A few of the households pursued traditional or more modern service occupations - such as barber, tailor, flower seller, driver, teacher or hotelier. In TKS in particular, beedi-rolling was also an important activity, in which mostly the women of Muslim households were engaged.

While some of the these occupations tended to be associated with particular castes - such as Muslim households in beedi-rolling, scheduled caste ones as barbers or casual labourers, and bovis as stone-cutters-agricultural labourers or domestic workers were not so closely associated with caste considerations. The seasonal character of the demand for such labour also meant the drafting of women and children to work of

different types on the farm. What was particularly notable in both TKS and AGV was that there were no households dependent on any forest-based activity. This was due partly to the fact that the forests in the area were degraded, for lack of conservation in the past; and partly because such forests as existed in the vicinity were all 'reserve' forests. Thus the impact of production activities of non-farm households on the natural resource of the area were quite limited - mainly due to the waste-disposal part of beedi-rolling in TKS and to quarrying in AGV. We examine these in some detail below.

Thokasandra:

Of the 35 non-farming households in TKS, members of 9 households are engaged in beedi-rolling. As has been mentioned earlier, most of these are Muslim families. Beedi-rolling is done essentially in their houses, and constitutes a source of supplementary income.

A case study of these families brought out the following facts. While most families engaged in this occupation are without any land, there are a few owning very small pieces. Such families leased out their land. Another interesting feature is that only women are engaged in this activity; men of the household are engaged in petty trade or some other activity. Adoption of this occupation by women in Muslim families is due to

the obvious reason that they are not used to working outside their homes. With large families to be supported, they take up beedi rolling which helps them to stay home and earn to contribute to the family income. The majority of these families have been engaged in this occupation for more than a decade.

It was found that besides adult women, female children in the age group of 6-18 are also engaged in this occupation, since most of the girls married at the age of 18. In some families, older women also roll beedies. Girls do beedi rolling for nearly 8 or 9 hours per day apart from the other duties of fetching water and cooking.

Some of the respondents informed us that they learnt the art of beedi rolling from someone who had training sometime ago. Generally material like the leaf, thread and tobacco are supplied by the agent who comes from Kanakapura. Every week, usually on Saturdays, he gives the material to the worker and they are required to return the beedies the next Friday. Wages are paid at the rate of Rs.18/- to 19/- per 1000 beedies.

For every 30kg of leaf, they have to prepare 6000 beedies. If there is any shortage, for every 1000 beedies, one rupee is cut in remuneration. Workers told us that invariably there is a shortage of 100 beedies or more. They do not get any other benefits from the agent

except occasional loans during festivals. Such loan money with interest are deducted from the money due to them for beedi rolling. The workers are not entitled to any bonus, medical support etc. Earlier there used to be a company, "Ganesh Beedi", which was operating in the village, and which provided labour welfare services like bonus, maternity leave etc.

Health Problems/Occupational hazards:

Beedi rolling is very labour intensive. The workers have to concentrate completely on the rolling and take proper care to make the required number of beedies from the given material. This involves high skill and concentration. Since this job is very monotonous and involves no movement of the body except the fingers, it causes back pain and bent backs. The development of children in the growing age-group who spend a large part of their time on this job, is likely to be a effected adversely. Apart from this, the material with which they work is hazardous to health. Because of constant rolling and contact with tobacco, a number of workers complained of burning fingers and frequent headaches. There are instances of beedi rolling leading to tuberculosis and respiratory problems.

Impact on Environment

Beedi rolling not only causes individual health problems but also pollutes the environment. The tobacco waste and the unused leaves which are thrown in the village decompose, causing a pungent odour which affects both human beings and cattle in the neighbourhood.

Ajje Gowdana Valase:

There is a minority of small farm households in AGV, - only 7 out of 108 - and all these are involved in stone-cutting or quarrying. The village has a large quarry area, and this occupation has been practised for over 30 years. The activity consists of cutting large slabs or pillars of rock from the natural deposits, breaking them into smaller pieces or jelli, which is then transported for use in the construction industry elsewhere. Quarrying of stone, loading and transportation of stone blocks or jelli is generally done by men, while jelli breaking is carried out by women and children.

Households in AGV engaged in stone-cutting or quarrying have been in this trade for the past several years. Our enquiry revealed that the families engaged in this business mostly belong to the **'bovi'** caste, who hardly ever have land of their own.

Both men and women are engaged in this activity While men go to the nearby areas also for work, women generally operate in the areas near their house, or in the same village. Though both men and women cut rocks, there are some differences; men generally make big slabs, pillars etc., which fetch higher prices, whereas women cut jelli and small stones. The area in which they do their activity is part of the wasteland of the village and the contractors who buy the products come from different places. The contractors give the order sometimes with some advance or sometimes without it. When the product is ready, they get it loaded by their workmen into lorries for transportation. The jelli makers reported that they are generally not involved in loading. When there are no orders, they take up agricultural labour. Sometimes they prepare the jelli and keep it for sale later to some contractor. Members of these households are engaged in this activity throughout the year except during the rainy season. The average prices prevailing are Rs.500 or 600 for 1000 slabs and Rs.4 to 5 for a basket of jelli. The women said that they generally produce 5 to 6 baskets of jelli per day. Only men are engaged in using explosives for splitting the layers of rocks. Most of them do not know where the jelli/slabs go after loading.

Jelli making is a very hard job in which women and children are engaged for many years. From the field visits, it is observed that despite their working so hard, they live in utter poverty. Since they have to work with stones, they are exposed to many kinds of health hazards. Many of the people have complained of the risks of this activity like loss of eyesight due to the rock splinters, asthma and bronchitis due to the dust and general ill health due to continuous working in the hot sun. It is quite disheartening to see small children with tender hands working with hard rocks. Generally, the babies are also taken to the workspot where they will be exposed to many risks. Added to all these problems, they are exploited by the contractors also. Contractors make them to come to some place for payment and generally they have to make many trips before they get their full wages. Many of families have expressed their desire to change their occupation, and are willing to take up other activities.

Overall, in both TKS and AGV non farm households belong to the category of poor, landless workers, earning their livelihood from poorly paid and hazardous jobs. Non-farm households which pursue other trades in the villages, or which depend on self-employment of one kind or another are quite few. Some of these households have taken to poultry-farming or tending of sheep and goats in a small way. But such households generally treat

these as side occupations rather than the main activity. In terms of economic development, they are scarcely better-off than marginal farmers;

Save for the direct impact of stone-cutting on the environment, there was not much evidence of environmental costs directly attributable to the activities of these households. As mentioned earlier, the waste disposal by the beedi making households in TKS has some polluting effect; but given the magnitudes involved, this is more a public health or sanitation problem than an environmental protection issues.

CHAPTER V

CONSUMPTION PARTICULARS

As is indicative of all subsistence economies, production in both AGV and TKS is mainly for self-consumption. Ragi is the staple food in both the villages. And most of the ragi that is grown is for self consumption. Paddy too is consumed but in lesser quantity. What is bought from the market are the rest of the food articles. Most of the milk and the milk products (like ghee and curds) is produced within the household.

The landless households have, obviously, to purchase all their food requirements from the market, or obtain them in lieu of cash-wages. Amongst the farm households, the proportion of retained output varies with the size of the family and the volume of staple food grains produced. When these are valued at opportunity cost and added to expenses incurred in obtaining other food articles from the market, it is observed that in the case of all households, the outlay on food as a proportion of gross income was much larger than the proportion of outlay on clothing, fuel etc. Again, considering the overall standard of living observed in the two villages, this was not surprising.

Table 5.1:

Consumption Particulars of the Households

(annual expenditure in Rs.)

Size Group	Thokasandra		A G V	
	Avg. Exp. on clothing	Avg.Exp on fuel	Avg. Exp. on clothing	Avg. Exp. on fuel
Group I	2043	1057	500	67
Group II	1722	179	875	82
Group III	1467	232	1569	130
GROUP IV	2882	178	1925	83

The average expenditure on clothing is highest in Group IV. in both villages. As regards the cooking energy requirements, both in TKS and AGV, it is being met by dried mulberry twigs, coconut fibres, its leaves and twigs, as well as kerosene. Interestingly, cowdung cakes are not being used in either of the villages of our study. Cowdung is used exclusively as manure.

A very high proportion of their earnings go into buying alcohol and beedis. Alcoholism is one of the major problems in both villages and is the bane of their existence. In AGV there are as many as 6 shops selling arrack. They get their supplies from Kanakapura.

Until recently, the type of chullahs in their houses were smoky. However, there is now a trend to get chimneys installed to reduce the smoke within their houses.

In Thokasandra, the landless spend the maximum on fuels like kerosene. Our observations reveal that the landless depend more on forest litter (dried leaves/twigs) for their fuel requirements. Small, marginal and large farmres meet their fuel requirements from the wastes of their own farms.

It has to be emphasised that there has been no denudation of the forests by the villagers to meet their fuel requirements as they depend mainly on their farm residues and forest litter. The forest area is protected. The denudation has occurred mainly because of the government policy of allowing in the timber merchants.

HOUSING STRUCTURES:

The housing structure in both the villages is similar. Many houses have walls made up of granite slabs or bricks and mud. In some houses the walls have been whitewashed with lime, while in others with cowdung. Houses of the better-off farmers have flooring made of red oxide cement while those of the poor, have only mud mixed with cowdung. The landless, SCs and STs live in houses with thatched roofs and mud walls; the small and marginal farmers, in contrast, live in houses constructed with bricks, or stones with a tiled roofs. The cattle sheds have fences made up of thorny twigs.

Most of the construction material is produced within the village. Bricks are produced locally in Thokasandra only for self-consumption. Timber is brought from Kanakapura for the construction of the houses of the large farmers.

CHAPTER VI

SUMMARY AND CONCLUSIONS

6.1 Observations

In this study an attempt has been made to look into the availability and utilisation of resources in both production and consumption processes at a micro level. The study takes into account only the resources available at this level; the results and observations will therefore be specific to this region, where dry land farming is practiced. However, it gives some idea of the general trends and broad issues to be addressed when one is concerned with the macro environment. Production and consumption activities and resource utilisation in these processes are studied to bring out the linkages between them and the scope for economic and ecological sustainability. Since agriculture is the main production activity, land and water utilisation and cropping patterns are given importance; whereas in consumption, the consumption of energy, animal power etc., and the effect of these activities on the environment are analysed.

From the study it has been observed that the average size of the land holdings of farm households is very small; but it is their main asset and source of livelihood. They depend on it for employment and output for consumption. Situated in a semi-arid zone, these land holdings are too small to be viable, with the

average yield relatively low, compared to the district average.

Though the farmers are using HYV seeds, the yields are low due to the non-availability of the other complementary resources like water and fertilizer. The farming practices are not sustainable due to the absence of crop rotation practices. Farmers do not grow leguminous crops which are useful in improving the fertility of the soil. With very low yields, villagers are forced to take up some other non-farm activities like beedi rolling and jelli cutting.

The very small unviable land holdings are not able to provide the necessary fodder for the cattle. The majority of farmers depend on the nearby forest and common property resources (Gomal) for maintenance of their cattle. A large part of the livestock consists of cows, sheep and goats. During the study visit it is revealed that the common grazing land is being encroached upon by the politically and economically powerful villagers and of its area is considerably reduced, increasing the stress on forest-grazing.

Ragi is the major crop grown in the village and it is grown mainly for self-consumption. With the very low yields, the farmers have to spend a large part of their incomes on food. Though cultivators are using FYM which is available from their own cattle, most of them are of the opinion that yields can be increased only with chemical fertilizer. They said that recently yields have increased

on some holdings due to the usage of chemical fertilizer.

During the visit to the villages we observed that the method of preparing and maintaining the FYM-pit used is not proper. A majority of the villagers maintain their FYM-pit either very close to their house or in the field; and they do not actually maintain a pit for this purpose. Animal excreta are simply dumped in a place into a heap which is used later. This practice reduces the quality of FYM and also causes pollution.

Land erosion is observed in the villages. No attempts are made to reduce it and the bunds of the fields are not effectively utilised for planting trees which can be used for fodder as well as for controlling erosion.

Water is a serious limiting factor in making agriculture sustainable in these regions. Only a few farmers are able to irrigate land with pumpsets. Even the available water sources are not used effectively due to lack of check dams. The tanks are yet to be desilted. It appears that there is considerable potential for tapping ground water by proper means and using it for agriculture. This could cause a sea change in the lives of the people by increasing the yields and providing more employment. It also helps to reduce the stress on environment.

The study revealed although some villagers depend on the forest area for their fuel requirement, they actually utilise only the forest waste, like dried twigs and branches. Actual felling of the trees for obtaining firewood is rare. The forest is used mainly for grazing. However, the villagers told us that the extent of the forest area has shrunk and now they have to go farther for grazing the cattle and collection of firewood. With the protected forest policy, felling of trees is reduced though there may be some un-authorized felling. Since there are no forest based production activities or timber yards in these villages, the denudation of the forest cannot be attributed to the production and consumption activities of the villagers. A close observation revealed that improper management of the forest by the protecting authorities, natural erosion and similar factors which are outside the control of the villagers are the causes of depleted forest cover.

Energy requirements are also met from the by-product of mulberry and coconut. As explained earlier, though villagers depend on the forest for fuel, they collect only the dried twigs and branches, while the landless households generally depend on the forest for fuel, cultivating families use dried twigs of mulberry, ragi and paddy straw. In many households, attempts have been made to reduce pollution due to smoke by attaching chimneys to existing chullahs. Villagers did not seem to be aware that more efficient versions of the smokeless chullah are available.

6.2 Action Plan

Based on the findings of the survey, as well as on the information garnered during the awareness generation programme (Part II of the Report), the following plan for optimum utilisation of natural resources is suggested.

In both villages TKS and AGV, as there exists a common environment, the action programme would lie in this direction.

The findings of micro level research in the two villages eventually brought out some crucial issues which need an indepth multi-disciplinary appraisal. These issues are as follows:

1) Natural processes of regeneration or replenishment of natural resources and utilisation proportions.
2) Proposed utlisation rate in the given population, also keeping in view the growth in the population in the future decades.
3) Local mechanisms for natural resource management, which should be a sustainable system.

There is need to scientifically establish

a) * the rate of soil degradation and productivity (because villagers are using more of inorganic fertilizers and not applying as recommended; farm yard manure utilisation is very limited and its application is not yielding the expected

results.

* need for reclamation of lands for further cultivation
* FYM composting to be improved
* need to create awareness about organic fertilizer use because this does not damage the environment but improves the existing land resources.

b) The trends in rainfall, ground water, surface water resources from the past few decades and the ratio between net ground water utilisation and net ground water recharge has to be clearly established before making any ventures into futher exploitation.

c) The areas under trees and proportionate decline from the past five decades along with rise in population, the present exact bio-mass productivity and bio-diversity have to be established for proceeding with futher conservational work.

II. Based on the appraisal of all the natural factors i.e Land, water and forests it is essential to decide the utilisation rate i.e number of trees or quantity of wood by the end of every year, number of borewells or open wells can be dug per year, intensity of cropping in lands etc. This has to be forecast for the next five decades keeping in view the growth of population.

III. Analyse the Natural Resource Management. In the past, strong traditional local management systems at village level, helped to conserve nature for centuries. These have gradually been eroded because natural resource management has been taken over by the state government, with commercial exploitation of wood for timber and fuel for expensive use in the urban areas rather than for limited local use. Much of the degradation of the local forests is due to such harmful exploitation. It is necessary to undertake effective programmes of afforestation and involve panchayati raj institutions in forest conservation in the future.

Local participatory management systems has to be re-established on the principle of "users should also protect".

The indigenous technologies on land, water, forest management should be explored and re-established to replace wherever possible the modern chemical high technological ventures, which are detrimental to the sustainability of natural resources.

Specific actions need to be initiated towards sustainable development, as follows:

LAND

a) land use planning has to be done

b) necessary changes should be worked out in cropping patterns

c) fertilizer management and reclamation together with reverting to natural processes

WATER

a) moisture conservation measures in the lands (eg. rain water harvesting)

b) recharging measures such as gully plugging, check dams, percolation tanks, farm ponds etc.

c) rehabilitation of existing storage tank and other structures for more conservation and recharge.

d) optimum utilisation of water through open wells and bore wells (with suitable cropping)

e) better management in distribution of water

FORESTS

a) increasing fodder, fuel and fruit yielding species in the village forest lands.

b) bringing in wastelands and degraded ravines under fodder with mixed forests to ensure availability of timber, firewood, fodder and other minor forest produce for local consumption.

MANAGEMENT

Establish a highly motivated local institutional framework to look after the affairs, as visualised in the constitutional (73rd Amendment) Act, 1993.

In addition to the above suggested action plan, the awareness generation camps facilitated the expression of felt needs by the people in the study area. They developed a participatory plan of action for the improvement of these villages keeping in view the concept of micro level sustainable development (see Part II).

PART - II

Part II

1: REPORT OF THE AWARENESS GENERATION CAMPS

To disseminate the findings of our study "Sustainable Development through Natural Resource Utilisation" in two villages Thokasandra and Ajje Gowdana Valase of Kanakapura taluk, Bangalore Rural District, six camps were held at TKS in the month of March 1994. People of AGV and TKS participated in the Camps. The participants in these camps were the elected representatives of the local self government institutions, informal leaders, educated youth and progressive farmers, from all sections of the community in both the villages. The main objective of the camps were to dissemminate the findings to the villagers about available natural resources, its optimum utilisation and plan for conserving the natural resources in order to maintain a sustainable eco-system.

The awareness generation camps were organised by Malini Venkatadri and Sumy Thomas of ISST, Bangalore. The chief resource person for the camps was Mr.Mahadev H.R. from India Community Development Service Society. He was also responsible for contacting and arranging the facilitators for the various sessions.

CAMP - I

Facilitator	**: Mr.Mahadev H.R.**
Session - I	**: Introduction to the Programme**
Session - II	**: Review of the research study on "Sustainable Development through Natural Resource Utilisaton"**
Session - III	**: Conceptual clarity**
Session - IV	**: Findings and suggestions of the study: A Discussion**

In the first camp there was a review of the research study. The participants were made aware of the fact that the "focus of the sustainability is on the issue of inter-generational equity" which implies "equal availability of options, in terms of human well-being or production prospects, to future generations as compared to the present one". They were also given to ponder over the fact that "what is ecologically unsustainable is also economically unsustainable and why "sustainable development as a goal rejects policies and practices that support current living standards by depleting the productive base that leaves future generations with poorer prospects and greater risks than our own".

The participants were made aware of the findings of the study. The major conclusions were explained in brief to the participants who expressed their view on each of them. These have been described in chapter - VI of the survey report.

Camp - II

Facilitator:	Mr. Rajeev of India Community Development Service Society, Magadi Project, Bangalore.
Resource Person:	Mr.Puttaraju, Assistant Professor, Department of Sericulture, University of Agricultural Sciences, Bangalore
Session - I	Resource Mapping through Participatory Rural Appraisal.
Session - II	Sericulture Better ways to increase Profit.

In the second camp, resource mapping of both the villages, Thokasandra and Ajje Gowdana Valase was done. For mapping purposes elders, especially women of the villages were invited to get more information on the history, geography and other resources of the villages. The whole exercise was meaningful and lively.

First, of all resource mapping of Thokasandra village was taken up followed by the mapping of Ajje Gowdana Valase.

The actual process of Resource Mapping began with the participants going around the village keenly observing everything on their way viz., houses, streets, drainages, agricultural land, temples, mosques, shops, schools, water sources like wells, borewells, taps, lighting systems, domestic animals, carts etc., After this, the participants were asked to prepare a sketch of

the village locating in it everything they had seen, knew already and heard from others to be a resource that belonged to the village.

Once the sketch was ready, all the participants were asked to assemble together and a discussion on the origin and history of the village was initiated. It was very surprising that none of the participants and no one in the village knew the meaning of the name of the village, Thokasandra and its origin and history. But the participants from Ajje Gowdana Valase knew its meaning, origin and a little of the history. "Ajje Gowda was the head of a family who migrated to the present village and began a settled life with his family here". Gradually others joined him and a settlement was formed. **Valase** in Kannada literally means 'migration'. So the name Ajje Gowdana Valase literally means the migration of Ajje Gowda. The discussion continued with a change of focus towards the resources of the village. Once the discussion was over, participants were led to prepare the map of the village comprising everything that is there in and around the village.

The maps of both villages, drawn on the floor using colour mixes and things available around like leaves, twigs, stones etc., came out very well. The map of Ajje Gowdana Valase was simple as it was a small village with two streets surrounded by agricultural lands all around.

But the map of Thokasandra was complex with many lanes and bylanes and the villagers started wondering about the things identified and marked in the map that had not come to their notice.

It was quite surprising to the organisers that the participants, inspite of repeated enquiry, did not mark in the map the agricultural land and the surrounding hillocks as the resources of the village. They identified village streets, drainages, borewells, and tubewells, temples and mosque, houses and shops, overhead watertank and the taps all over the villages, school, co-operative milk producers society, big trees, common land (gomal) including that part encroached upon by village leaders, the stream and the tank as the resources of their villages. But they did not consider even the forest and the hillock around as the resource of their villages.

Analysing the maps, people were helped to understand that they could utilise the surrounding hillock for harvesting rain water on a massive scale and develop micro environments with increased vegetation which prevents soil erosion. Also, the importance of forests to village life was discussed along with people's responsibility in its development and preservation.

Resource Mapping made the people realise that they have sufficient water sources which have not been utilised at all so far. Such a realisation led to the discussion on

the ways to prevent wastage of water in the village stream and its better utilisation which was later linked to the suggestion of the study regarding the formation of check dams against the village stream in Thokasandra. In the case of Ajje Gowdana Valase, participants recognised that the big tank situated outside their village may get silted if no preventive measure is taken. Participants of both the villages, discussing the time cycle and changes in the topography expressed concern over deforestation and its evil effects on village life.

Sericulture: Better ways to increase profit.

Sericulture is the main occupation, providing farmers with reasonable income in the two villages. Though the income from the production of cocoons is reasonable, it is not regular, as the failure rate of the crop is very high. Failure of crop invariably leads to waste of natural resources in terms of water and soil fertility. Farm yard manure is used as well as both human and animal labour. A lot of care is needed at all the stages of cocoon production. The participants of the camp felt that more importance should be given to this aspect of farmers' economic life in these two villages.

Soon after the completion of Resource Mapping exercise, Mr.Puttaraju, Assistant Professor, Department of Sericulture, Agriculture University, Hebbal, initiated a

discussion on the common problems faced by the farmers in the process of mulberry cultivation and the cocoon production. Hailing from the same village (Thokasandra), Mr.Puttaraju understood the problems of the villagers better than anybody else. He dwelt mainly on the preventive measures to be taken at every stage for the successful production of cocoons from the day the layings are brought until the cocoons are taken to the market for sale.

Mr.Puttaraju explained to the farmer in very simple but clear language the care to be taken by the farmers while carrying the layings/eggs from the grainage to the place where they would be nursed for further growth. He advised farmers to bring the layings/eggs early in the morning or after 5:00 PM so that they would not be damaged by being exposed to sunlight. Layings should be transported in such a way that they are not damaged for any reason. Most of the instances of crop failure are due to the carelessness shown in transporting the layings to the rearing place.

According to him, the place planned to be used for rearing silkworms should be sprayed with disinfectant, preferably formalin and closed for two days. The trays used for the purpose should also be disinfected. The temperature range for good cocoon production is 20 degrees celcius to 28 degrees celcius. Temperatures above or below this range are harmful. The silkworm

rearing place should have good ventilation facilities as the worms need clean air for proper growth. Dim lighting during day time and darkness at night is conducive for a good crop.

Mr.Puttaraju also dealt with better methods for growing mulberry leaves. Clay soil was the best soil for mulberry cultivation. Sufficient (nitrogenous, phosphatic and potash) fertilisers should be added to the soil. Regular supply of water in any form is a must for mulberry plants.

At the end of the discussion, Mr.Puttaraju answered questions on the diseases affecting silkworms which render months of hard work useless. He gave details on precautions to be taken to prevent fatal diseases like Pebrine, Flacherie, Muscardine and Grasserie.

At the end of the day a video film on Bivoltine Production was shown.

Camp - III

Facilitators : **Mr.Prakash, Assistant Director Dept. of Horticulture, Kanakapura Taluk, Bangalore Rural Dist.**

Mr.Siddaraju, Assistant Director, Dept. of Agriculture, Kanakapura Taluk, Bangalore Rural Dist.

Mrs.Sunita Seenappa, Research Scholar, University of Agricultural Sciences, Bangalore.

Mr.Chandrashekar Holla, President, Milk Producers,Co-operative Society, Harohalli.

Mr.Prabhu, BSc (Agri), Harohalli, Kanakapura taluk, Bangalore Rural Dist.

Content

1. Horticulture: Less Labour More Earning
2. Agriculture Practices Need Improvement
3. Alternatives to Chemical Fertilisers:Vermiculture
4. Co-operatives - Panacea for Better Life
5. Soil Testing - A Demonstration

The third camp for generating awareness on Sustainable Development was designed to deal with better land use patterns and improved agricultural practices. A discussion on 'co-operatives' was also held. At the end of the day a brief lecture and a demonstration on testing of soil was conducted. The day was hectic but very fruitful.

Horticulture: Less Labour, More Earning

The first session of the day was led by Mr.Prakash, Assistant Director, Department of Horticulture, Kanakapura. He stressed on the advantages of horticulture for both small and big farmers. He

explained to the farmers that garden cultivation brings periodical but stable income to the farmers. He convinced the people that horticulture leads to conservation and efficient utilisation of water, prevents soil erosion. Besides assuring a steady income to the farmers for a long time, garden cultivation leaves the farmer with lot of time to undertake other work. More important is the fact that it would preserve means of development to future generations by making possible better and judicious utilisation of land and related resources.

Mr.Prakash advised the farmers to plant Mango, Sapota, Guava and Pomegranate alternating with each other. These fruit bearing plants, according to him, require care and attention only in the early stages for a year or two and then become self supporting requiring minimal care.

According to Mr.Prakash, planting cashew trees is ideal the prevailing conditions of weather and soil. Growing grapes, particularly seedless varieties, would fetch more income. However he strongly emphasised the fact that before taking a decision on the type of fruit trees to be planted, it is essential to ascertain the pH of the soil and treat it suitably.

Mr.Prakash strongly recommended the cultivation of roses for commercial purposes. Soil and water condition in

Thokasandra and Ajje Gowdana Valase were conducive to their growth. Roses are a profitable and easily marketable commodity. Even a small farmer with a reasonable water source can grow roses. At the end of the session, Mr.Prakash explained ways and means of getting more yield from the existing coconut trees.

Agriculture Practices Need Improvement

The second session of the day was on better agricultural practices and it was deftly handled by Mr.Siddaraju, Assistant Director, Agriculture, Kanakapura. Mr.Siddaraju's conversation with the participants of the camp touching several aspects of better land use and new agricultural practices.

It was noted that most farmers in the area have not been practicing all agricultural operations like ploughing, sowing and inter cultivation activities along the contour. Where the land is inclined, contour bunding should be practised. This prevents soil erosion, loss of nutrients and seeds.

Urine and cattle dung are not conserved properly by the farmers. Urine from cattle, sheep, and goats is wasted since it is not being collected properly. Urine must be collected in pits and transferred to FYM pits. This will enrich the nutrient content of the manure. FYM should not be exposed to sunlight. This results in loss of nitrogen (N) through volatalisation. The manure

should be conserved properly by not exposing it to sunlight. Phosphorus content of FYM can be improved by adding single super phosphate. FYM should not be left in the field in heaps. To avoid loss of nitrogen through volatalisation, it has to be mixed thoroughly in the soil immediately after it is transferred to the field. FYM should be mixed into the soil at least 15 days before sowing to ensure complete decomposition.

Instead of going for local varieties of Ragi like 'Karikaddi' Indaf variety may be used. This ensures higher yield in a short time. Farmers should go for double cropping with cow pea and ragi, sesamum and ragi, groundnut and ragi, depending on the availability of moisture and rainfall. This ensures higher income and enriches soil fertility.

Instead of sowing ragi with a seed drill alone, it is better to use a seed-cum-fertiliser drill which helps in the proper placement of seeds and fertilisers. In this method, fertiliser is placed below a layer of soil on top of which seeds are sown. This avoids direct contact of seed and fertiliser. This ensures good germination and better growth of plants.

Farmers in these two villages are using only urea which gives only nitrogen to the crops. For better crop growth and good yield of any crop, P_2O_5 and K_2O are essential. Depending on the crop and soil type,

fertilisers containing these elements should be applied.

Farmers in the two villages do not harvest excess rainfall water. This water can be collected in farmponds. If this water is used for critical stages of the crop growth, the expected yield can be harvested.

To prevent the soil from becoming saline, alkaline or saline-alkaline, judicious use of fertilisers and irrigation is important.

Other important observations made by Mr.Siddaraju in his discussion with the farmers are;

- 2-4D can be used as a weedicide in paddy fields.
- Mixed cropping is more beneficial than single cropping
- Rotation of crops maintains soil fertility status over the years.
- a considerable portion of food grains are being wasted due to improper storage facilities. Hence, having better storage facilities is very important.
- EDB tablets available at concessional rates may be used to store the grains for a long time in good condition.
- before storage, grains should be brought to optimum moisture content which prevents microbial attack. A simple method of testing optimum moisture content is that when grains are pressed, two halves should be obtained.
- insecticides, pesticides, mould board plough, disc plough, harrows, sprayers may be purchased at concessional rates from Agriculture Department.
- Rats spoil or eat away a lot of precious grains. Killing rats is one way of saving grains. Rat holes should be identified in the field and covered with soil. Where holes are found open next day, Aluminium phosphate tablets should be kept and sealed. AP is a highly poisonous and effective rat killer.

Alternatives to Chemical Fertiliser: Vermicomposting

The third session of the day was devoted for a lecture-cum-demonstration on vermiculture as an effective cost saving alternative. Mrs.Sunita and her husband, Mr.Seenappa gave a vivid account of developing and utilising vermicompost for self use as well as for commercial purpose.

Mrs.Sunita explained to participants the utility of vermicompost. Although known to farmers for a long time, it had been completely neglected by them after the introduction of chemical fertilisers. Worms and the compost at its different stages of development were shown to the participants. She demonstrated simple methods of developing vermicompost preparing pits for the purpose and materials which can be turned into compost. According to her, everything, except rubber, plastic, glass and other hard substances can be used for vermicompost. She helped the participants to understand how worms live in three layers and activate the process of composting leading to highly fertile manure which is less costly but highly productive compared to chemical fertilisers. Vermicompost, more than anything else, is natural and ecofriendly. It is easy to prepare in any size and quantity.

There is a demand for the commercial production of vermicompost inside and outside the country.

Vermicompost is cost-effective, harmless and its application leads to marked improvement in soil fertility. Therefore not only is it á highly sought after manure, its production is a profitable commercial venture. Certain business houses in Karnataka are actually exporting the same to foreign countries by packing them in polythene covers.

Participants in the camp appreciated the value and significance of vermiculture and took interest in it. A young farmer from Ajje Gowdana Valase requested the facilitator to give him the worms and the compost brought by her so that he would develop it in his farm. Several participants requested that more information be made available on vermiculture.

It was made clear that vermicompost should be used initially with chemical fertilisers, the use of which may be gradually reduced and eventually stopped. Participants found the programme useful and relevant.

Co-operatives: Panacea a for Better life

The successful adoption of the concept and principles of co-operatives essentially depends on mutual trust and integrity of those who take interest in it. Co-operative societies are usually formed in villages for economic purposes and should be run on profit or on no-profit-no loss basis. There is no field of life where co-operatives as a method of achieving set goals is

irrelevant.

Collective/co-operative farming has vast scope in our villages since it enables small and marginal farmers to utilise their land judiciously and apply modern techniques of cultivation.

The Karnataka State has nearly a hundred year history of the co-operative movement. The state has witnessed the emergence of multipurpose co-operative societies. Therefore, establishing a co-operative society for a specific purpose in line with co-operative credit societies, milk producers co-operatives is ideal.

There is a 'Milk Producers co-operative Society' in Thokasandra and it has vast scope for further development. The 'Agricultural Co-operative Credit Society' situated in Banavas village caters to the needs of the farmers of Thokasandra also. Sadly that more farmers have misused the facilities provided by this society than those who used it for good purposes. In Ajje Gowdana Valase, there is no-coperative venture at present.

The people of Thokasandra and Ajje Gowdana Valase can form a 'Small Forest Products Co-operative Society' as has been done in Dakshina Kannada district. Establishing co-operatives for Fish farming, Piggery, Poultry, Bee Keeping etc is also profitable for the farmers. Bio-gas

plants can be established for the entire village as has been done in the villages of Haryana and Gujarat.

Women of the villages can form co-operative societies for their own development. They can involve themselves in health, sanitation and income generating activities etc through their co-operatives.

A novel effort could be that the villagers undertake small public works under programmes like the Jawahar Rozgar Yojana by forming a co-operative society for the purpose. What is needed is the encouragement and active assistance of the Grama Panchayat. Such an effort would ensure high quality work which has been impossible in the present system.

The most successful co-operative ventures in the country and the state are Amul Products, Gujarat, Nandini Milk, Karnataka, Janata Bazaar, Arecanut Producers co-operative society, Sirsi North Kanara, Sugar Factory Mandya, IFFCO fertiliser factory. All these efforts had small beginnings but have grown into large successful conterprises.

Soil Testing: A demonstration

Mr.Prabhu at the beginning gave a detailed explanation on the need for and method of soil testing. After that, he took the farmers to the field to collect soil sample for testing, based on guidelines given by him.

Following is the summary of the deliberations;

Soil testing helps in:

a. determining land use capability

b. determining fertility status

c. recommending fertilisers

d. in ascertaining whether soil is saline, alkaline or saline alkaline and in managing problematic soils

Procedure for Soil Testing

Soil sample should be collected based on the objective of sampling. For eg: if a farmer wants to go for deep rooted plants, soil sample should be taken from appropriate depths. For shallow rooted plants, sample may be taken closer to the surface.

The soil sample should be:

- representative of the entire area
- not be taken near bunds
- not be taken when there is standing crop
- not be collected near the root zone of trees
- not be taken when moisture content in the soil is high
- For slopes, the whole area should be demarcated into several plots so that each plot will represent the entire area and then soil samples should collected.
- not be taken near FYM heap.
- not be taken near electric poles in field

In each representative spot of the area a 'V' shaped cut will be made to a depth of about 30cm. Then, using a spade, the sample should be collected along the depth in

'V' shaped cut. Depending on the nature and size of the given area, samples should be collected in 8-10 spots.

Quartering Technique:

The entire sample so collected should be brought to a clean place in the field. Mix the entire sample thoroughly and make a heap. The heap is then divided into four portions. Two portions should be discarded. This process is continued until one gets about 500gm of soil sample which is used for analysis.

The sample should be collected in a cloth bag and the following infromation given in the prescribed format (available in Department of Agriculture)

1. Name of village
2. Name of Taluk
3. Date of Sample collection
4. Name of farmer
5. General crop grown in the area
6. Name of person who collected the sample
7. Type of soil
8. Crop grown last year
9. Fertiliser used for last crop
10. Proposed crop to be grown

The soil sample bag along with the format should be handed over to the Soil Testing Laboratory mentioned below where testing is done free of cost.

1. Zuari Agro Chemical Laboratory, Malleswaram, Bangalore
2. State Department of Agriculture, Seshadripuram Bangalore

Camp - IV

Facilitator : **Mr.Prabhu, B.Sc.(Agri) Harohalli, Kanakapura.**

: **Mr.Basavegowda, Dept of Social Forestry, Kanakapura.**

: **Ms. Shyamala Devi, Sericulture Technical Officer, Kanakapura.**

1. Watershed Management
   a. Soil and water conservation
   b. Rain water harvesting
2. Joint forestry planning and management
3. Sericulture what the farmer should know?
4. FYM - Better than Chemicals

1. Watershed Management

a. Soil and Water conservation

The first session of the fourth camp was on the important subject of Watershed Management. The main focus was on two important aspects of the subject; one is soil and water conservation, and the second one is on Rain water harvesting.

Land and water are the two basic resources of a nation. Economic stability and wise use of land are inseparable. The future of the country and its teeming millions depend to a large extent on the conservation of land and water through the proper use and treatment of land. There is no doubt that we have been negligent and wasteful in the use of our land resources. The protective forest cover has been destroyed in several

parts of the country. Overgrazing by cattle, sheep and goats is one of the major causes. Excessive deforestation is due to increased demand for fuel and timber and also due to increasing land under cultivation. Agricultural land in the major part of the country suffers from erosion. Thokasandra and Ajje gowdana valase are no exception. Apart from reducing the yield due to loss of nutrients, erosion destroys the soil resource every year. Soil erosion may be due to social reasons or geographical reasons like wind and water erosion.

Agronomic practices for soil and water conservation help to intercept raindrops and reduce the splash effect, help to obtain a better intake of water by the soil by improving both the content of organic matter and soil structure.

During intense rain storms soil cannot absorb all the rain water as it falls. Excess water flows down the slope under the influence of gravity. If farming is done up and down the slope, the flow of water is accelerated, because each furrow serves as a hill. The major part of the rain is drained away without infiltrating into the soil. The top fertile soil along with plant nutrients and seeds are washed off. All this results in scanty and uneven growth of crop.

A simple practice of farming across the slope, keeping the same level as far as possible (which is technically called contour farming) has many beneficial effects. The ridges and rows of plants placed across the slope form a continual series of miniature barriers to water moving over the soil surface. The barriers are small individually but as they are large in number, their total effect is great in reducing runoff soil erosion and loss of plant nutrients.

Apart from conserving water and soil, contour farming conserves soil fertility and increases crop yields. Cultivated legumes, in general, furnish a better cover and hence better protection to cultivated land against erosion than ordinary cultivated crops. Among legumes, cowpea and groundnut have proved to be important crops for providing good cover for the land during the rainy season.

Rainwater Harvesting and Recycling

Wherever excess runoff of water occurs, water can be collected in ponds water in dugout from ponds. With a rainfall of about 750mm and a runoff of about 20 to 250 cum, a pond of 250 Cu.m capacity is essential for each hectare of land to collect at least 50% of the runoff water. For a catchment area of 4 ha the size of the pond works out to 25mx25m at the top, 15mx15m at the bottom and about 3m depth.

The farm ponds are especially suitable for areas with hard surface or high clay sub-soil, since the percolation losses would be minimum. In red soil areas, the percolation losses are more especially during the first 2 to 3 years after conservation. To avoid this loss, the ponds may be lined both on the sides as well as at the bottom using cement and soil (1:8 proportion) to a thickness of 5cm. Farm ponds can normally provide two protective irrigations to about 1/4 to 1/3 of the catchment area in a cropping season with about 30% increase in crop yield in years of below normal rainfall.

A discussion was held on the rehabilitation of the village tank in Thokasandra by desilting it. It can be undertaken by farmers who can transport the silt soil (which is very rich in plant nutrients), to their lands. Besides increasing the soil fertility of agricultural land, desiltation increases the storage capacity of the tank. Precautionary measures to be taken to prevent silting of the Mavatturamma tank in Ajje Gowdana Valase were discussed. The idea of developing micro environments around the village tank, as done by MYRADA in some villages in South India and referred to in Part-I of this study was also given to the participants. It was decided to have a separate discussion on the importance of checkdams in the next camp.

Joint Forest Planning & Management

- Joint forest planning and management is a new programme designed and brought into operation by the Government of Karnataka. The programme is based on the guidelines given by the Ministry of Environment and Forestry, Government of India. The guidelines are intended to develop degraded forest lands with the active involvement of village communities and NGO's.

- The programme involves establishment of village forest committee's as proposed in the action plan involving these committees in the planning and management of forests.

- The programme proposes to give patta (right of ownership) to the participants over the trees planted on roadsides, channels and other places. The returns of such trees are to be distributed among the individual beneficiaries, village forest committees and the forest department.

- The programme proposes massive afforestation with the active co-operation and involvement of the NGO's, village communities and government departments on lands other than revenue lands. The expenditure involved in such activity should be incurred by the Forest Department.

- He also gave the details on methods of forming village forest committee, its membership, management committee,

election to management committee, its responsibilities and functions, role of government and the department officials in JFPM, method of distributing forest products as dividend among the interested parties, role of NGO's in JFPM, formation of 'village forest development fund' etc.,

The participants, especially the Panchayat representatives showed keen interest on developing forests on a large scale, by forming "village Forest Committee" in Thokasandra and Ajjegowdana valase. They felt that the benefits accruing from it are immense.

Sericulture: What the Farmer should always remember

Bivoltine crop compared to multivoltine crop produced commonly in these villages, women's role in sericulture and precautions to be taken in collecting mulberry leaves.

She urged farmers to diversify their activities towards the production of Bivoltine crop which was both cost-effective and profitable.

Farmers were given the following hints on collecting mulberry leaves for a successful crop

- leaves required for the whole day should not be collected at one time.
- leaves should be collected twice a day; preferably early morning and in the evening.

- It is a myth to believe that if the leaves are covered with a wet cloth worms get Haluroga, a disease commonly associated with silkworms
- wet cloth cover for leaves is not necessary during rainy season.
- if water drops are found on the leaves, air dry them.
- keep the windows open when the moisture level in the room rises due to leaves kept there.
- do not keep mulberry leaves in large heaps
- low temperature and high moisture level is good for the collection of leaves.
- low moisture in the air spoils the leaves.
- sunrays falling directly on the leaves spoils them
- splashing of wind into rearing room should be prevented
- do not keep the windows closed always
- do not press down leaves into the basket
- do not keep the leaves for a long time
- faded and shrivelled leaves bring disease to the worms, the worms should be fed well in order to get a good

At the end of the session the facilitator drew the attention of the farmers to a 'co-operative silk producing farmer's society' functioning nearby in Malavalli (Maddur Taluk, Mandya district). The society is said to have been undertaking the whole process of silk yarn production giving its members more profit, giving reasonably good and stable price, to farmers, and also undertakes reeling and twisting of silkyarn; finally selling yarn for cloth production. Farmers were urged to look in this direction, take up innovative projects and earn more.

The major role played by women and children in the whole process of silk production was emphasised. The facilitator strongly advocated a greater say for women and an equal share in the family earnings.

Organic Manure: Alternative to Chemical Fertilizers

Good quality FYM is perhaps the most valuable organic matter that can be applied to a soil, Traditional methods of preparing and storing FYM has generally been faulty. Loose heaps lie exposed to the sun, with the result that the organic matter dries up quickly and does not decompose properly.

Very often, a part of the dry dung is blown off by the wind or washed away by rain. Cattle urine is either not conserved or is stored in a defective manner. Studies have revealed that urine contains 95% potassium, 63% nitrogen and 50% sulfur. The wastage of nitrogen rich urine, the loss of N due to the volatalisation of exposed cattledung, and the washing away of soluble mineral elements by leaching reduces its manurial value.

The above loss can be checked by using an absorbent bedding for cattle, storing dung in stone or bricklined pits, mixing large quantities of straw and other vegetable matter with cattle dung, and keeping the heap compact and moist. Thus, if urine is properly conserved, the loss of soluble mineral elements through seepage is prevented, bacterial decomposition of raw

organic matter is encouraged, plant nutrients are made soluble, and nitrogen losses are minimised. For bedding material, saw dust, soil, sand or dry leaves can be used.

If urine is not conserved in the bedding used for cattle it must be collected in a covered earthen pot and then added to the dung on the manure pit. Nitrogen in the urine is mainly in the form of urea, which readily changes into highly volatile Ammonium Carbonate through bacterial action, and quickly loses Ammonia thereafter by evaporation. Such a loss can be reduced to a great extent if the manure and urine soaked absorptive litter for bedding are kept compact in a pit. The pit may be one meter in depth, 1.3 to 1.5 m in width and 4.5 to 6m in length, depending on the number of cattle in the farm. The filling of the pit should be sectional and when each section of the 1.3m length is filled to about 45cm above the ground level, it should be plastered with 2.5cm layer of mixture of mud and an equal proportion of dung.

Before plastering 4 to 5 buckets of water should be added to the manure pit. This conserves moisture and also prevents the housefly nuisance. This becomes ready for use in 4-5 months after plastering.

The application of FYM too long before sowing of crop will either cause drying up of the rotted manure or too quick decomposition will take place. If the manure is

well decomposed it is advisable to apply it just before sowing. After the manure is carted to the field, it should be evenly spread and worked into the soil soon to avoid loss of nitrogen. The existing practice of leaving the manure in small heaps scattered in the field and incorporating it into the soil, results in serious deterioration of its quality, particularly when a strong wind blows.

FYM improves soil tilth buffering capacity and acrasion, increase water holding capacity of soil, stimulates micro - organic activity and the availability of plant nutrients.

CAMP - IV

Facilitator : Mr.G.T.Kumar, Progressive Farmer Kanakapura Taluk

Mr.Narayan, Bhyramangala Hobli Ramanagarm Taluk

Mr.Krishna Murthy, Progressive farmer, Kanakapura Taluk.

1. Pisciculture: Less effort, more income
2. Mushroom cultivation: Lecture cum Demonstration
3. Agriculture: Suggestions for better practices in Thokasandra and Ajje Gowdana valase
4. Check Dams: An Appropriate Proposition

Pisciculture

The facilitators, who are educated farmers have taken up fish rearing on a large scale are currently helping the Fisheries Department to extend fishery cultivation in the region.

A detailed account of fish rearing and the benefits accruing was given:

It is an agriculture related occupation which fetches high income to the farmer with minimum investment needs. Pisciculture is more profitable when compared with sericulture. With scientific farming methods and the use of fast growing hybrid varieties, manure and artifical food, one can grow 1500 to 2000kg of fish in one acre of land per year Scientific cultivation of fish in rural areas resolves the problems of malnutrition and unemployment effectively. The socio-economic status of

rural farmers would also be improved.

I. **Selecting a Suitable Site for the Construction of Fish Ponds:**

Factors to be taken into account are the following:

a. Minimum expenses for the construction.

b. Clay soil is suitable as it would prevent water from percolation.

c. Perennial water source for the pond.

d. Places prone to floods should be avoided.
Paddy fields are suitable areas for pisciculture.

II. **Size and Construction of Ponds**

For fish farming, ponds of 0.25 to 5 acres size with 6 to 8 ft depth is ideal. The pond may be round, square, rectangular or elliptical in shape. Digging should be undertaken after the rainy season and the dug out soil may be used for the bunds around the pond. The pond should be on an incline and the outlet for the pond should be placed at the deepest point. It helps to flush out the water whenever necessary and allows penetration of sunrays to other areas of the pond. To retain water in the pond and prevent percolation,the bottom and inner portions of the sides should be filled with clay.The sides of the pond should also be inclined. After the bunds around the pond become firm, grass can be grown which add to the strength and beauty of the ponds.

III. **Physical and Chemical characteristics of the soil and water.**

The physcial and chemical characteristics of the soil and water of the pond influence the growth, sustenance and production of the fish.

A. Following should be the physical and Chemical characteristics of the soil

1. Acidity (PH) : 6.5 to 8.0
2. Available Nitrogen : 30.0 to 50.0 meq/100gm
3. Available Phosphate : 6.0 to 16. meq/100gm
4. Organic carbon : 1.0 to 2.0%

B. Following should be the physical and chemical composition of water.

1. Oxygen dissolved in water : 6.0 to 8.0 ppm
2. Acidity (PH) : 6.5 to 8.5
3. Salinity : 75.0 to 150.0 ppm
4. Murate of Potash : 0.2 to 0.5 ppm
5. Phosphate : 0.2 to 0.5 ppm
6. Turbidity : 20 ppm

III. **Suitable fish varieties for cultivation**

a. Local varieties

a. Catla : Grows faster, grows from 1.0 to 1.5kg per year in the pond. It grows eating micro organisms in the upper layer of the water.

b. Rohu: It grows from 0.75 to 1.25kg in a year eating food in the middle and bottom portion of the pond. It also eats rotten leaves and the algae.

c. Mrigal: It grows from 0.75 to 1.0kg per year

Foreign Varieties

1. Silver Carp: Fastest growing among carp varieties and grows from 1.0 to 1.5kg per year.

2. Grass Carp: It grows by eating algae, hydrilla azzolla etc., grows from 1.0 to 1.5kg in an year.

3. Common Carp: It adapts itself to any type of weather conditions and eats all types of food. It grows upto 1.0kg in a year.

These are the improved varieties of fish which bring good returns to the farmer.

IV. **Preparing Ponds for Fish Farming**

a. Remove plants grown inside the pond

b. Remove those fishes which gain sustenance by eating hybrid varieties proposed to be cultivated in the pond and such other varieties of fishes which compete for food and place with those varieties grown.

V. Making Pond Water Fertile

To increase the amount of food available to the fishes, organic manure and fertiliser in definite proportion should be added into the pond. If the acidity of the pond water is low, 60 to 80kg lime should be added to an acre of water before 10 to 15 days of actual cultivation. Further cowdung, urea, single super phosphate and a few other types of organic manure should be added.

VI. Sowing Season and Number of Fishes

About 4.0 to 6.0cm long growing carp variety, fishes like catla, roya, mrigal, silver carp, common carp and grass carp seeds can be left in the pond during the month of June and September. About 2000 young fishes per acre should be sown. If artifically prepared food like oilcake is given , about 4000 fishes may be grown in an acre of pond.

VII Investment & Income (Per Year Per acre)

A. **Non Recurring Expenditure**

1. Construction of pond	Rs.1,60,000.00

B. **Recurring Expenditure**

1. 4000 fish fingerlings	Rs. 1,200.00
2. Manure	Rs. 1,200.00
3. More fodder	Rs. 4,000.00
4. Labour	Rs. 1,500.00
6. Transport	Rs. 1,500.00
7. Others	Rs. 1,200.00
	10,600.00

C **Income**

3000kg fish x Rs.20	=	60,000.00
Non recurring expenditure	=	20,000.00
Recurring expenditure	=	10,000.00
Net profit	=	29,400.00

The expenditure on the construction of the pond may be recovered in eight years. Only 6000/- Net profit/acre/year from fisheries

I. Fish Farming in Irrigation Wells

In villages every farm garden would usually have a well in it. Fish may be grown in these well also. As the natural fodder required for the fish and the amount of oxygen dissolved in the water is low, common carp is

the best variety to grow under such conditions. Organic manure and chemical fertilisers should not be put into such wells. The growth of fish in the well depends on the artifical fodder made available. Farmers can throw into the well leftovers of their meals like rice, ragiballs, rotti etc., cooked food should be pressed into balls and kept on a step (stairs/flight of steps) one to two feet deep down in the water.

Number of fish fingerlings left for rearing in the well should be in the following order:

Diameter of the well	No.of fish
20	60
25	100
30	120
35	150
40	175
45	200
50	250

It is possible to grow 50 to 100kg of fish depending on the pond area in 10 to 11 months.

Prawns

Cultivating prawns especially the Micro Brochiam Rosen Burge variety called Scampy and sweet water prawn is more profitable. There is a great demand for prawns in foreign countries.

If only prawn is sown in the pond, 20,000 young prawns may be reared in an acre of pond. If it is grown along with other fish, about 10,000 young prawns should be sown in the same size of pond.

Out of the 20,000 young prawns sown, only one half would survive to grow. In five months duration on an average, they grow upto 60gms. Thus, the total weight of 10,000 prawns in 600kg and a kg of prawn is usually sold in the market for Rs.200/-. The total income accruing to the farmers would be Rs.1,20,000/-. Deducting the total expenditure of about Rs.40,000/-, a net profit of Rs.80,000/- can be gained under normal crop conditions.

The facilitators informed the participants that rearing fish in artifical ponds constructed out of cement, stones and other such things are costlier and bring only marginal profit. They advised them to consult a government appointed official placed in the taluk head quarters before deciding to go in for fish farming.

Mushroom Cultivation:

The second session of the day was a lecture-cum-demonstration on Mushroom cultivation. Participants were informed that mushroom cultivation may be taken up a preperable commercial venture.

Method of Cultivation:

Paddy straw should be cut into 5-10cm length. This should be allowed to stay in clean sweet water for 10 to 13 hours. The soaked straw should again be put in boiled water for half an hour. Taking out the straw from boiling water, it has to be spread on a clean floor in the shade.

Such straw should be filled in a clean polythene bag of about 20cm to 60cm size. The spawn seeds should be spread along the sides of the bag which is tied after perforating the cover. The bag is kept in a clean dark room for 21 days. After this period the cover is removed and water sprinkled 2 to 3 times a day for two to three days. Mushrooms may be harvested thrice with each harvest weighing about 500gms.

A single bottle of spawn material can be used for 3 polythene bags, from which about 1500gms of mushroom can be obtained.

Depending on the market situation and the quality. A kg of mushroom fetches Rs.15/- to Rs.50/-. This can either be sold to Horticulture department in (Bangalore) Lalbagh or directly to large hotels. The spawn can be obtained from Horticulture Department, Lalbagh, Bangalore at the rate of Rs.3/- per bottle.

Agriculture: Suggestions for better practices in Thokasandra and Ajje Gowdana Valase.

A question and answer session with the participants helped to outline better farm practices which are both environment friendly and sustainable for the future.

The following major points emerged from the discussion.

- The duration of the rainy session and the rate of depletion of soil moisture should be the criteria for choosing the crop.

- When normal rainfall is received in June - July

  a. sow groundnut before the second fortnight of July. Red gram as intercrop may be run after every fourth row of groundnuts.

  b. complete maize sowing by July

  c. apply recommended doses of fertilisers, use 50% of the recommended N as top dressing after one month of sowing ragi and maize.

  d. sow the crop across the slope.

If the rainfall is received in the month of May

- sow cowpea
- if rains are delayed, cowpea may be sown for fodder during the last week of May.
- Take up direct sowing of PR 202 or Indaf-5 Ragi when cowpea is harvested by first fortnight of August.
- take up transplanting of ragi, if cowpea is harvested in second fortnight of August.
- when havesting is further delayed, relay ragi by transplanting in the standing crop of cowpea.
- mixed cropping is more beneficial compared to single cropping. In mixed cropping ragi, mango, sapota, mulberry etc., can be grown separately in parts of the landholding depending upon its size and nature. Such a type of farming helps farmers get a steady income.
- Fruit crops such as mango, sapota, guava and coconut improves fertility of the soil.

- As mentioned in an earlier session, conditions in the two village are suitable for growing roses commercially.
- Fishery, Piggery, poultry, and dairy can be taken up as subsidiary occupations depending upon the financial status of the farmers.
- Farming without the use of chemical fertilisers is possible - Organic farming can be practised.
- "Deenabandhu" biogas plants are successful devices and can be constructed with the subsidy money given by the government. The dung used for the biogas plant is more fertile and suitable for direct application.

Check dams - An appropriate Proposition

A separate discussion was held on the uses and construction of checkdams for solving the problem of water scarcity especially in Thokasandra village. The discussion was prompted by the felt need of the people and at their insistence. Detailed information on the whole scheme of checkdams promoted by the government in districts like Belgaum and Dharwad was given.

Participants were informed that checkdams constructed across small rivulets/streams have many advantages. They can be constructed in a short time and at a cost of not more than Rs.50,000/- They help to raise the underground water level. Village Water Management Co-operative Committees would facilitate the process.

Farmers who suffer loss of crops for want of water in summer particularly should understand that checkdams provide answer to their problem. They have to halt wasteful flow of water in small nallas and streams by creating small pond like reservoirs. Such dams not only help in keeping the water level high in wells, but have also prevented streams from carrying silt to the rivers. Small ponds also provide water to grazing cattle and for washing clothes.

While selecting sites for checkdams it should be seen that the nalla is straight, without abrupt fall for about 100 meters upstream. There should be an abrupt curve within 30 meters on the downstream. There should be well defined banks on both sides. The depth and width of the nalla should be 8-20 meters and 2-3 meters respectively.

Cost effective check dams can be constructed in one or two months. The benefits can be realised within a year or two. Normally each checkdam help to rejuvenate eight wells. Even a small check dam helps to wet an additional area of about five acres.

In addition to the above advantages, there are benefits of double cropping, switchover for commercial crops and accumulation of fertilized silt which helps increase the fertility of the land.

CAMP - VI

Towards Formulating a Participatory Plan of Action for Village Development.

The deliberations of the awareness generation camps had generated considerable interest among the participants, especially the members of the Grama Panchayat and young educated farmers. Villagers from both places were enthusiastic about planning the future course of action.

The participants came out with the following observations while discussing the plan of action.

a. it is easy to prepare a blueprint of action for the development of the village. That in itself is not a progress towards sustainable development.

b. What is required is the practical application of the plan of action. It requires concerted collective effort on the part of the villagers.

c. Such an effort is only possible if there is unity and harmony among all sections of the people in the village.

d. The two villages under study are politically highly sensitive and people are divided sharply on political lines. Sharp divisions are also found in each caste within the village.

e. Initiating the development of the village in such a situation requires strongly motivated leadership of persons of high integrity who can cut across all barriers. They should be able to mobilise and prepare people for the integrated development of the village.

The Action Plan

I. Development of Leadership

1. The present leadership, in the two villages, Thokasandra and Ajje Gowdana Valase, is highly politicised and discredited. It cannot inspire people to come together and take up the task of development. The so called leaders have a skewed perception of the process of development and its implications for future generations.

Therefore, participants decided to give primary importance to the identification, education and organisation of the new class of leaders who should be young and receptive to new ideas. They should be interested in learning, with concern for and dedication to the poor and downtrodden.

They decided to initiate measures for the identification and development of local leadership. For this, the villagers felt that they should organise intensive, well-thought out, meticulously planned "Personality and Leadership Development" programmes.

2. The group also decided to take-up village based, time-bound organisational work for motivating and mobilising villagers for their active participation in the process of sustainable development. Such an effort, participants believed, would supplement the process of identification and development of a new generation of leaders.

II. Institutional Approach to Development

1. Participants decided to conduct a participatory rural appraisal to identify the basic developmental needs of the two villages. Based on the result of the PRA, they intend to establish specific need based organisations in the villages.

2. A decision to strengthen the existing "Milk Producers Co-operative Society" in Thokasandra was taken. They understood the fact that rearing Milch-cows not only augments the income of the family but also meets the nutritional needs of the family members especially children. Therefore, they decided to promote this co-operative effort towards the commercialisation of milk production.

3. Participants planned to organise women and children of the village and form separate sanghas for their development. They believed that it is possible to fight the problem of rampant alcoholism in the village only by organising children and women against it.

   Expressing concern over the dangerous situation arising out of alcoholism, they decided to initiate a campaign against alcholism in the fashion of the anti-arrack movements in other parts of the country.

4. Group members belonging to both the villages took a decision to build strong and vibrant youth associations in their villages. Such association can initiate innovative programmes for village development. It could undertake programmes on an experimental basis on rain water harvesting, vermiculture, FYM utilisation, strip cultivation and double cropping developing a micro-environment around the village tanks.

5. It was the considered opinion of all those who participated in the camp that more importance should be given to the preservation and better utilisation of the water resources in the village.

   Participants from Thokasandra village decided to establish a co-operative society for water management in the village. They want to construct checkdams across the stream surrounding the village from three sides. It was decided that this should be done in collaboration with the Grama Panchayat and the State Government.

6. The Panchayat members from both villages put forward their decision to undertake the "Joint Forestry Planning and Management Programme" They also expressed their desire to take interest in growing more trees and protecting the existing trees from destruction.

III Education for Awareness Generation

1. The participants decided to organise short duration evening programmes regularly in the village on the following themes:

   a. Ecology and environmental degradation
   b. Preservation and better utilisation of water
   c. Evil effects of deforestation and the need for afforestation
   d. Income generating activities like Piggery, Fishery, Sericulture and Horticulture.
   e. Better land use pattern
   f. Health and sanitation and other programmes conducive to sustainable development.

   It was also decided that educated youth in the village should be sent for training in related fields so that their knowledge base increases.

2. The group took a decision to strengthen the mass literacy campaign in every way possible and vowed to make their communities fully literate.

3. It was the decision of the participants to establish a library in the village so that books, magazines and periodicals essential for village development are made available in the village.

Other Plans Include:

1. It was planned that an intensive programme of saving for the future needs would be undertaken to develop the habit of saving among all the villagers. It was decided that the programme would be jointly conducted by the village Youth Club and other organisations.

2. The Co-operative Credit Society at Banavasi had been serving the farmers of Thokasandra and Ajje Gowdana Valase also. However, it had stopped operation due to the apathy of its office bearers and lack of interest in its on the part of its beneficiaries. The group took a decision to increase the participation of the people of Thokasandra and AGV by subscribing to it and contesting for the position of office bearers. By resorting to such measures they wanted to make the society cater to the credit needs of farmers in the area effectively.

3. Participants felt that understanding such a large programme of integrated development of the village, with emphasis on its sustainablity, is a gigantic task. Its realisation is impossible if villagers are asked to do it on their own. Therefore, they decided to actively involve NGO's and the Government machinery as the co-intervenors in the process of sustainable development.

2: POSSIBILITIES FOR FUTURE RESEARCH

Since the present study is a microlevel study over the short span of one year, focus has been given only to two villages of Kanakapura taluk, Bangalore (Rural) District. Several ideas for further investigation have emerged from this study and the subsequent awareness generation camps.

* By the criteria used for selection in the present study, both areas came under dry land agriculture. It would be meaningful to compare the results of this study with similar issues of villages under wet land agriculture like the nearby Maddur taluk in Mandya district of Karnataka.

* In-depth and long-term studies could be undertaken to quantify the kind of information related to natural resources that has been collected in this study. The collection and analysis of time series data could give valuable insights into the availability, utilisation and optimal levels of conservation of natural resources.

* Studies can also be undertaken to quantify environmental factors like forest cover, biomass degradation, soil erosion, recharging of water services etc.

* In the light of the 73rd Constitutional Amendment and the likely changes in local decision-making processes, it would be interesting to study the extent of people's participation in the management and conservation of village resources.

* It would be worthwhile to explore the linkages between traditional conservation practices related to the environment and focus on women as a special interest group following such practices.

Appendix - I

List of villages visited for the selection of study villages

Villages	LC.No.	Area of Village (ha)	Population (no.)	No.of households
Gerahalli	244	452.19	1349	248
Yalachavadi	126	1183.13	827	164
M.Maniamabal	92	616.21	1352	269
Thokasandra	93	376.98	1171	234
Paduvangere	98	966.90	1253	232
Hunsunakodihalli	161	466.80	777	141
Marale Bekuppe	192	1914.27	4165	635
Attihalli	237	184.08	855	165
Thatikuppe	146	370.14	589	119
Ajje Gowdana Valase	97	408.67	454	82

Reference: B.K.Das, Census of India, 1981, Series 9, District Census Hand Book, Bangalore District.

Appendix - II

Functional Specifications:

1. For regression analysis, the following production function formulations have been used.

(i) $Y = a+b_1x_1+b_2x_2+b_3x_3+b_4x_4$

(ii) $Y = a\ X_1^{\ b1}\ X_2^{b2}$

Where

Y = Value of total output in current prices for all farm products produced during the 1991-92 cropping season;

X_1= Value of hired labour

X_2= Value of family labour

X_3= Value of animal labour used

X_4= Value of seeds utilised

X_5= Value of Chemical Fertilizers

X_6= Value of Farm Yard Manure

X_7= Size of land holding

a, b_1, b_2 etc are constants

2. Among the dependent variables, factors of production supplied by the household have been valued at the same price as those bought from outside, since these represent their opportunity cost.

3. The statistical significance of the regression coefficients and the value of coefficient of multiple determination for each function are examined to determine the goodness of fit. Since the Cobb-Douglas formulations, involving logarithmic values proved to be

unsuitable with multiple variables for a small sample, the best fits were obtained by the linear model of the production function. Even in this case, Thokasandra with a larger number of households gave better results - i.e with significance at lower margins of error - than Ajje Gowdana Valase. This may be seen in Table 3.15 in Chapter III. The D.W index for TKS at 2.17 was better than that for AGV at 1.77.

4. Since in these exercises, land proved to be the most important factor, we also attempted an analysis of co-variance in respect of factors other than land, for each "group" of households - i.e households with upto 1 acre, 1 to 2.5 acres and 2.5 acres and above. The formula used was the familiar one of

$$(3) \quad \text{Covariance} = \frac{\text{Standard Deviation}}{\text{Arithmetic Mean}} \times 100$$

In general, covariance was higher in respect of larger holdings in both TKS and AGV, while that in respect of fertilizer use varied in the opposite direction. In the case of labour input, the covariance in Group II (less than 1 acre) was less than for Groups III and IV, in both AGV and TKS. Apart from indicating a variability in the sample, these calculations do not reveal anything significant from an operational view point.

QUESTIONNAIRE

INSTITUE OF SOCIAL STUDIES TRUST, BANGALORE

"SUSTAINABLE DEVELOPMENT THROUGH NATURAL RESOURCE UTILIZATION"

1993

IDENTIFICATION :

NAME OF THE VILLAGE :

NAME OF THE TALUK :

NAME OF THE DISTRICT :

NAME OF THE HEAD OF THE HOUSEHOLD :

NAME OF THE INVESTIGATOR :

SIGNATURE :

DATE :

DURATION OF INTERVIEW :_ _ _ _ _ Hrs._ _ _ _ _min.

BLOCK 1
DEMOGRAPHIC PARTICULARS OF HOUSEHOLD

I. Type of family

1. Nuclear 2. Joint 3. Extended

Sl.No	NAME	Age	Sex (A)	Relation to the Head of the HH (B)	Marital Status (C)	Education (D)	Occupation (E)	Annual Income (in Rs.)

(A) - Code A (B) - Code B (C) - Code C (D) - Code D (E) - Code E

CODE A

1. Male
2. Female

CODE B

01. Head of the Household
02. Father
03. Mother
04. Brother
05. Sister
06. Wife/Husband
07. Son
08. Daughter
09. Daughter-in-law
10. Son-in-law
11. Brother-in-law
12. Sister-in-law
13. Relative
14. Grandson
15. Grand daughter
16. Mother-in-law
17. Father-in-law
18. Nephew
19. Niece
20. Not related

CODE C

1. Unmarried
2. Married
3. Widowed
4. Divorced/Separated

CODE D

1. Illiterate
2. Literate
3. Pre-Primary
4. Primary
5. Secondary
6. PUC
7. Graduate/Professional
8. Others (Specify)

CODE E

1. Own cultivation
2. Agricultural labour
3. Household work
4. Artisan
5. Service Industry
6. Others (specify)

BLOCK II

LAND AND AGRICULTURAL ASSETS

A) LAND HOLDING:

SL. Description	Dry land (In Acres)	Wet land (In Acres)	Garden (In Acres)	Total	Rent P/R per acre
1. Land owned					
2. Land leased out					
3. Land leased in					
4. Operated land					
5. Uncultivated land					
6. Total land (1-2+3)					

B) AREA CULTIVATED DURING 1992-1993 SEASON:

Land Type	Kharif (In Acres)	Rabi (In Acres)	Summer (In Acres)
1. Dry land			
2. Wet Land			
3. Garden			
4. Total			

B.1) IRRIGATION

Source	Area (ac)	Season

C) AGRICULTURAL ASSETS:

Sl No.	Particulars	Area In Acres	Number O	Number B	Year of Purchase	Mode of Finance: Own	Mode of Finance: Borrowed	Value in Rs.
01	Land							
02	Wells/Tubewell							
03	Farm Building							
	a) Kutcha							
	b) Pucca							
	c) Mixed							
04	Implements							
	a) Bullock Cart							
	b) Wooden Plough							
	c) Iron Plough							
	d) Cultivators/ Harrows							
	e) Seed Drills							
	f>Gudali/pick-axe							
	h) Spade							
	i) Others							
05	Machinery							
	a) Tractor							
	b) Irr.P.set							
	c) Hand sprayers							
	d) Others							

BLOCK-III

A) CROPPING PATTERN AND IRRIGATION (92-93)

SEASON	DRY LAND					
	Crop (Code)	Area (Acres)	Qty. Produced		Qty. Consumed (kg)	Qty. Sold (kg)
			M.P(kg)	B.P(cl)		
Kharif						
Rabi						
Summer						
	WET LAND					
Kharif						
Rabi						
Summer						
	GARDEN					

Code :
01. Ragi
02. Paddy
03. Mulberry
04. Groundnut
05. Red gram
06. Coconut
07. Avare
08. Castor
09. Horse gram
10. Tamarind/Banana
11. Chilli
12. Jowar
13. Sesamum
14. Arecanut
15. Tomato/Vegetables
16. Sugarcane

0. No crop

B) SOURCE OF IRRIGATION:

Source of Irrigation	Area (In Acres)		
	Kharif	Rabi	Summer
Well			
Well & Pump			
Tank			
Tank & Pump			
Tube well			
River			
River with pump			
Any other (Specify)			

BLOCK IV

COST OF CULTIVATION OF FOOD CROPS

Crop:
Variety : HYV/Local
Area:

Season K/R/S:
Irrigated/Dry:

INPUTS/ PER PLOT

SL.NO.	INPUTS	QUANTITY (kg/ac)	COST
1	Seed rate/acre		
2	FYM(compost)		
3	Fertz. (kg) Nitrogen -Urea Phosphorus-DAP Potassium-MOP Complex		
4	Plant Protection Chemicals		
5	Irrigation (Own)		
6	Irrigation(hired)		

1. Do you follow the recommended package of practices given by:
   a) Agricultural Department
   b) U.A.S.
   c) Own knowledge
   d) Any Other

2. From where do you buy your inputs?

   a) Kanakapura
   b) Maralvadi
   c) Bangalore
   d) Any Others

3. Do you use any green manure? Yes/No
4. If yes, list them.

STORAGE:

1) Do you store food grains ? Yes/No

2) What type of storage facilities do you have ?
   1) Gunny Bag
   2) Vadae
   3) Kanaja
   4) Bamboo Structure

3) What type of pests attack your storage bins ?
   a) Insects
   b) Rodents
   c) Others

4) Have you taken any control measures to eradicate the pests ? Yes/No
   If yes, what pesticides do you use ?
   a) Name of pesticide
   b) Solution
   c) Dust
   d) Others

   What type of sprayer is used ?

5) Does it cause any health problems ? Yes/No

6) What was the cost of constructing the storage structure ?

7) When was the storage structure constructed ?

COST OF CULTIVATION

	Operation	Family labour (in No.)				Temporary labour (in No.)				Machine labour (In No.)				Total Days
		M	F	C	B	M	F	C	B	M	F	C	B	
1	Preparatory tillage													
2	Ploughing													
3	Manuring													
4	Puddling													
5	Seed treatment & Sowing													
6	Fertz.applcn. & top dressing													
7	Transplanting													
8	Plant Protection													
9	Irrigation													
10	Weeding													
11	Harvesting/ Threshing													
12	Watch & Ward													
13	Drying, Weighing Bagging													
14	Transportation													
15	Total													

BLOCK V

MARKETING

ITEM	CROPS					
	M.P	B.P	M.P	B.P	M.P	B.P
Qty.sold						
Price Rcd a)Cash						
b)Kind						
To whom sold						
Marketing Costs Incurred						

01. Ragi
02. Paddy
03. Mulberry Cocoon
04. Groundnut
05. Red Gram
06. Coconut
07. Avare
08. Castor
09. Horse Gram
10. Tamarind/Banana
11. Chilli
12. Others

01. Shop in the village
02. Shop in Kanakapura
03. Shop in Maralvadi
04. Big farmer in the village
05. Small farmer in the village
06. Middle man
07. Money lender
08. Trader in the village
09. Trader outside the village
10. Channapatna
11. Others (Specify)

BLOCK VI

LIVESTOCK PARTICULARS

A) MAINTENANCE OF LIVESTOCK

Livestock code:									
Item	L	H	C	L	H	C	L	H	C
Number									
Purpose									
Year of purchase									
Value									
Qty of fodder (kg/day) G									
D									
Qty of concentrates/ day									
Value of feed									
Other expenses									

Purpose Code:
1. For ploughing in own land
2. On hire to others
3. For meat/egg
4. For milk
5. For sale
6. For wool
7. Multiple use
8. For dung

01) Cow
02) Bullock
03) Buffalo
04) Sheep
05) Goat
06) Poultry
07) Others

Feed:
G : Green
D : Dry

F\ INCOME FROM LIVESTOCK

LIVESTOCK	MILK/DAY (In litres)				CURDS/DAY (In litres)				GHEE/MONTH (in Kgs)				EGG/MEAT PER MONTH (No./Kg		
	P.	C.	S.	Pr.	P.	C.	S.	Pr.	P.	C.	S.	Pr.	P.	C.	S. Pr.*

* P. = Production
C. = Consumption
S. = Quantity Sold
Pr.= Price Received

BLOCK VII4

PERMANENT IMPROVEMENTS

Slno	Item	During 1992-93 Kharif	Rabi	Summer
1)	Farm Expenditure:			
	Purchase			
	Reclamation			
	Bunding & Others			
	Well Construction			
	Deepening of wells & Repairs			
	Repairs of Agri. impliments			

BLOCK VIII

CONSUMPTION PARTICULERS:

1)What is the staple food of the family ?

1.Rice 2.Ragi
3.Wheat 4.Jowar
5.Others (Specify)

CONSUMPTION EXPENDITURE:

SLNO	ITEM	Qty use/month (In Kgs)		Amount spent/month (In Rs)
		Home grown	Purchased	
1.	Food grains			
2.	Pulses			
3.	Vegetables & Fruits			
4.	Milk & milk products			
5.	Meat/Fish/Egg			
TOTAL				

OTHER CONSUMPTION EXPENDITURE OF THE HOUSEHOLD:

SLNO	PERTICULERS	AMOUNT SPENT/MONTH (In Rs)
1	Schooling/Education	
2.	Travelling	
3.	Clothing	
4.	Medical services	
5.	Personal habits (Cigerater,Alchol etc)	
6.	Fuel (Firewood/diesel Kerosene)	
7	Others (Specify)	

BLOCK IX

NVIRONMENTAL ISSUES

1.Has your yield (main crop)
a) Increased
b) Decreased
in the last 5 years?

2.Give reason for change of yield.

3.Are you using more fertilizers than what you were using 5 yrs. back?YES/NO
Give reasons.

4.Do you feel that the tree population in the village has decreased/increased over a period of years?
What could be the reason?

5.What kind of plants/trees were there previously?

6.Hasthere been a lot of change in your surroundings as you remember?

7.What kind of trees are grown in your field?
On bunds:

In your field:

9.TREE/SHRUB POPULATION AND BIOMASS

Type	PURPOSE						
	Sale (Timber)	Food	Fodder	Fuel	Shade	Construction	Implements

10. Did you extend your land in recent times ? Yes/No

If Yes how did you do it ?
a) Purchased
b) Encroachment

12. What was the condition of the acquired land ?

13. What are you growing in the acquired land ?

WATER

1.Where do you wash your clothes?

1) Pond
2) Tank
3) Well
4) Home
5)Rivers
6)Tap
7)Others

3.Where do you wash your cattle?

1) Pond
2) Tank
3) Well
4) Home
5) Rivers
6) Tap
7) Others

5.Where is the compost pit located?

1
2
3

FUEL

1. What type of chullah are you using/
   1 smoky
   2 smokeless

2. What type of fuel are using?

Sl.no:	Item	Qty.of fuel used/day	Total
1.	Firewood		
2.	Kerosene		
3.	Mulberry Twigs		
4.	Coconut Tree b.p.		
5.	Others (Specify)		

4.Are you willing to change to smokeless chullah? YES / NO / DONT KNOW

HEALTH AND SANITATION :

GENERAL HEALTH OF THE FAMILY

Have the members of your family been suffering from any of the following diseases?

Sl.no:of the person <block1>	Diseases <code A>	Period <yrs>	Treatmant source <code B>

Code A

01 Anaemia	07 Dental Problems	
02 Epilepsy	08 Piles	
03 Dysentry	09 Asthma	
04 Diabetes	10 Gynae Problems	
05 Heart Problems	11 Others (Specify)	
06 ENT Problems		

Code B

01 PHC/Govt.Hospital
02 Private Doctor
03 ANM
04 Nursing at home
05 Others<specify>

BLOCK X

INDEBTEDNESS

Sl. No.	Institution	Total Amount borrowed(Rs)	Purpose of borrowing(code)	Year of borro. (specify the year)	Amount outstanding in (Rs.)	Subsidy (if any)	Rate of interest
1	Commercial Bank						
2	Grameena Bank						
3	Co-operative society						
4	Land Mortgage Bk.						
5	Private Borrowg.						

01. Crop loan
02. Sericulture
03. Land development (purchase of pumpsets etc.)
04. Borewell & to dig a well
05. To purchase agricultural inputs (fertilizers, seeds etc.)
06. Construction purpose
07. Purchase of livestock
08. Agro based industries (Gobar gas, poultry etc.)
09. Purchase of bullock cart
10. Others (specify)

BEEDI ROLLING

1.Why did you start beedi rolling?

2.Since when are you doing beedi rolling?

3.Where do you get the raw materials from?

4.How much do you pay for the raw materials?

5.To whom do you sell the beedis?

6.How much bonus do you get per annum ?

R.Code	No of beedies rolled/day	No of hours Spent/day	To whom sold

COST OF BEEDI MAKING

Item	Price paid	Quantity	Source	Frequency
1.Leaf				
2.Tobacco				
3.Thread				

Source codes:
1 Kanakapura 2 Maralvadi 3 Bangalore 4 Others

Frequency codes
1 once in two days 2 twice a week 3 once a week 4 once in two weeks

1. Do you have any financial committment with the supplier of the raw materials?

2. Do you bargain for different prices?

3. Is beedi rolling affecting your health?
   If yes in what way?

QUARRYING

1. For how many years now have you been quarrying?

2. Who is the owner of the quarry?

3. To whom does the quarry land belong?

4. Are you a native of this village Y/N?

If No - From where have you migrated?
What was your occupation there?
Give reasons for your migration

5. Does quarrying have any relation to your caste?
Is quarrying an ancestral activity?

6. No. of family members involved in quarrying?

Men:
Women:
Children:

7. How often do you quarry?

Days: (in a month)	Months: (in a year)	Seasons:

8. What do you do in the other seasons?

9. What are the different activities performed and their respective wages/day?

	Activities	Wages/Day
Men:		
Women:		
Children:		

10. How many makris of jelli you produce in a day?

Men:
Women:
Children:

11. What is the product produced

1. Jelli
2. Rubbles
3. Slabs
4. Pillars
5. Survey stones
6. Building materials

12. Do you take care of loading Y/N

    If yes, how much are you paid for it?

13. What is the cost of a lorry load of:

    1. Jelli
    2. Rubbles
    3. Slabs
    4. Pillars
    5. Survey stones
    6. Building materials

14. Do you borrow from the contractor Y/N

    If Yes,

    1. For what purpose?
    2. At what interest do you pay back?
    3. Are you able to make your own calculations?
    4. Do you feel you are being cheated?

15. Who supplies your raw materials?

16. Are you under any contract? Y/N?

17. Do you know what happens to the jelli after loading? Y/N?

    If yes, Where is it sold? At what price?

18. Do you suffer from any health problems like:

    1. Bronchital illness
    2. Headaches
    3. Eye defects
    4. Dust allergy
    5. Skin ailment/disorders
    6. Handicappedness
    7. Others

19. Is alcoholism more prevalent in your area?

20. Would you prefer any other alternative activity? Y/N?

21. Are you a member of any Union?

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