Bench Mark Area Description: Socio-Economic Dimensions of Koothy village, Coorg District, Karnataka

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1. INTRODUCTION:

Below ground biodiversity (BGBD) comprises a wide range of soil fauna and flora such as soil microorganisms, earth worms, termites and others which perform many essential ecosystem functions in addition to providing a plethora of services to the society. BGBD and its functions are significantly influenced by human interventions. As a preamble to study ecosystem services from BGBD, a benchmark study was carried out in the study area along with other components of the project. The overall objective of the benchmark survey is to document farmers' present status of agricultural activities, their land holdings, livestock, economics of major crops/activities, resource inventory, their present farming practices related to BGBD and their awareness about BGBD.

2. METHODOLOGY

2.1 Study area:

The study village Koothy (Somwarpet taluk of Kodagu district) has about 160 farm families. It is located close to the northern boundary of Karnataka part of the Nilgiri Biosphere Reserve. The annual rain fall of the area ranges from 2000 mm to 350 mm. The temperature varies from 9^0C during winer season to 35^0C in summer months. A random sample of 60 farmers was chosen for the socio-economic characterization. Sample respondent farmers were post classified into small, medium and large farmer categories based on their landholding. A farmer with a landholding of less than 2 ha was considered as small farmer, farmers with farm size of between 2 ha and 4 ha were treated as medium farmers and those farmers who had land holdings more than 4 ha were reckoned as large farmers. This classification provides distribution of farmers according

to their land holdings which indirectly indicate the status of the farm economy of the region.

A structured schedule was developed for the socioeconomic survey. It was pretested before undertaking the benchmark survey by administering the schedule to a set of selected farmers in the study village. The schedule covered various aspects pertaining to general information about the family, land holdings, crops cultivated, livestock and other asset particulars, economics of important crops of the region, farmers' awareness about BGBD practices, adoption of BGBD practices and other relevant information pertaining to the farms. Data pertained to the crop year 2003-04. Personal data of individual farmers were collected through personal interviews with selected farmers and general information about the village and general agricultural practices of the village were collected from group interviews. Group interviews comprised mostly elders and knowledgeable persons in the village. Secondary data on the study region including study site (KoothY village), Somwarpet taluk and Coorg district were collected for the recent year from relevant government offices of the Somwarpet taluk and village panchayat.

2.2 Analysis of Data

The data were analyzed using several statistical measures such as measures of central tendency (mean etc), chi-square test etc. Chi-square test was used to ascertain whether the awareness and knowledge about bio-diversity conservation are associated with the type of farmer.

3. RESULTS

3.1. General features of the study Area (Benchmark Area)

3.1.1 Land use pattern in the study area

The area of the Koothy village is about 962 ha. As indicated in Table 1, agriculture accounts for about 68% of the total village area compared to 19% area under forests.

In Koothy village more than 90 per cent of the population is directly dependent on agriculture for its livelihood.

Table 1: Land Use Pattern (ha)

	Koothy	
	Area	Percent
Agril.	650	67.56
Forest	180	18.74
Fallow land[a]	na	na
Current fallows[aa]	48	4.97
Uncultivable land	84	8.73
Geo- Area	962	100.00

Source: Village Panchayat office

[a] Lands which are fallow for more than five years

[aa] Lands which are fallow at present

[na] Not avalable

3.1.2 Distribution of land holdings (number and area)

The study region comprises mostly marginal and small farmers who constitute more than 40 per cent. However, with respect to lands owned by these groups, although they form the bulk in terms of number, the total area owned by these groups was lowest. On the contrary, large farmers who formed only about 12 per cent in the study area owned disproportionately more area which signifies inequity in the distribution of land holdings in the study region (Table 2).

Table 2: Distribution of land holdings

Type of household	**No.**	**Percent**	**Percent area owned**
Small farmer	87	43.50	10.28
Medium farmers	74	37.00	69.54
Large farmers	25	12.50	20.17
Agril Labourers	14	7.00	0.00
Total	200	100.00	100.00

Source: Village Panchayat Office, Koothy

3.1.3 Livestock status

Livestock in the study village largely comprises cows (23.23%), buffaloes (10.97%) and poultry (51.77%) (Table 3). In the study area, animal husbandry was not a major economic activity. Though there is no paucity of fodder, only about six per cent of respondents in the village own cattle. Farmers of the village buy milk and milk products from nearby town. The high level of humidity and low milk yield are the important reasons for lower preference for livestock activities in the study region.

Table 3: Livestock population in the study area (Census 2003)

Particulars	Koothy village	
	Numbers	Percent
Buffaloes	136	10.97
Cow	297	23.95
Goat	9	0.73
Pig	38	3.06
Poultry	642	51.77
Total	1122	100.00

Source: Village panchayat office

3.1.4 Cropping pattern in the study area

Major crops of the district are paddy and horticultural crops including plantation crops like coffee, cardamom, pepper and ginger. Paddy, the staple food crop, occupies about 24% of net cropped area of the village (table 4). Horticultural crops like chillies, and ginger occupy significant area especially during summer season. The study region is home for major plantation crops like coffee, cardamom, pepper and others.

Table 4: Area under major field crops (ha) (net cropped area)

Crop		Per cent
Paddy	173.15	19.81
Vegetables, pusles etc (under paddy lands in summer)	35.00	
Coffee	542. 34	62.16
Cardamom	147.46	16.84
Coffee + Cardamom	10.42	1.19
Total area	873.37	100.00

Source: Village panchayat office, Koothy

3.1.5 Fertilizer consumption in the study area

Fertilizer usage in the study region is very high because of dominance of plantation crops, which require higher doses of nutrients. Hence, the fertilizer consumption in the study region is very high at 90 tons for the year 2003-04 as reported by the local village panchayat (government) office. Average fertilizer consumption in the Somwarpet taluk that includes Koothy village worked out to 156 kg of N, 122 kg of P and 143 kg of K per ha.

3.2 Socio-Economic Features of Sample respondents

3.2.1: Education level of the sample farmers

The education level of the respondents influences the magnitude of the adoption of recommended agricultural management practices and ability to venture into self-initiatives towards innovations. About 90 per cent of respondents were literates. The mean education level of both respondents who had awareness about BGBD (FBGBD) and respondents who did not had any awareness about BGBD (FNBGBD) was more or less the same. Farmers were classified in to two groups-those having awareness about BGBD and those who did not. If a farmer was able to recognize at least some common soil organisms including soil microbes, he was grouped under awareness category otherwise in the other category.

3.2.2: Age of the respondents

Of the total sample respondents of 60, 31 respondents were aged below 30 years, 13 were aged between 31 to 40 years and 16 were above 40 years of age constituting 51.66, 21.67 and 26.67 per cent, respectively.

Occupation pattern

About one third of families were engaged in the agricultural wage labour, in addition to their involvement in cultivation of their own fields. Coffee and cardamom plantations provide work to a very large number of men and women especially during coffee picking season.

It was found that the average annual income of the FBGBD was higher than those of FNBGBD. The annual income of FBGBD respondents was Rs./- 61589 (aware of BGBD) and Rs./-54304 (not aware of BGBD) from both farm and non-farm sources.

Table 6: Average household income of respondents

Average income of the respondents (Rs per household)	
Farmers who are aware of BGBD	61,589.00 (25703.19)*
Farmers who do not have awareness of BGBD	54,304.00 (32528.00)*

* Std dev.

Family Size

The details on the family size of the sample respondents are presented in Table 7. In general, family size increased with an increase in the size of land holding.

Table 7: Average family size of sample farmers

Sl. No.	**Particulars**	**Category of farmers**		
		Small[1]	**Medium[2]**	**Large[3]**
1	Adult male	2.1	3.1	4.2
2	Adult female	2.0	2	4
3	Children	1.7	2.2	2.8

1 Farmers having lands upto 2ha
2 Farmers having lands between 2 and 4 ha
3 Farmers having lands more than 4 ha

3.2.7: Land holding:

The details of land holding and average farm size of different categories of farmers in the study area are presented in the Table 8. A perusal of Table 8 reveals that 25 farmers were small farmers, 17 farmers fall under medium category and remaining 18 farmers were large farmers. The average size of land holding of small farmers was 0.9 ha while that of medium and large farmers it was 1.5 and 4.35 ha, respectively. The average holdings in the study area is 2.11 ha.

Table 8: Land holdings of the sample respondents

Category	No. of farmers	Per cent	Average Acreage (ha)
Small	25	41.66	0.9
Medium	17	28.33	1.5
Large	18	30.00	4.35
Average			2.11

3.2.8: Cropping pattern:

Paddy is the staple food crop of the population of the region, hence, in kharif, paddy is the major crop grown. After the harvest of paddy, farmers take up chilies, pulses and vegetables in the months of February and March from residual moisture available in the soil. Ginger is also becoming popular in the study area. Coffee and Cardamom are the major plantation crops, both in terms of area and income of farmers. Pepper is also of considerable importance though grown by only about five per cent of the farmers. Exclusive orange or pineapple gardens are not seen in the village, for it is a common practice for the coffee planters to grow oranges or pineapple inter-mixed with coffee in their estates. More than half (68.33%) of the farmers owned coffee plantations. About 48 per cent of the farmers owned cardamom plantations. About 13 per cent of farmers owned both coffee and cardamom plantations in the study area (Table 9).

Table 9: Cropping pattern of respondent farmers

Crop	No. of farmers	Per cent of total farmers in the village
Paddy	54	90.00
Vegetables & spices	51	85.00
Coffee	41	68.33
Cardamom	29	48.33
Pepper	3	5.00
Coffee + Cardamom	8	13.33

3.2.10 Economics of coffee, cardamom and paddy production

Coffee and cardamom are the major plantation and commercial crops grown in the study region. Paddy, chilies and ginger are important annual crops grown in khariff and summer months. As a prelude to study the economics of coffee and cardamom, their

establishment and investment were analyzed across different types of farmers. Initial capital investment needed for the establishment along with input requirement for coffee is provided in table 11.

Table 10: Establishment Cost of Coffee Per ha (Rs.)

	1st year	2nd year	Total	Per cent
Planting material	8477.93		8477.93	26.27
FYM	2580.00		2580.00	7.99
Fertilizer	4600.68	6723.89	11324.57	35.08
Pesticide		1548.56	1548.56	4.80
Labour	4963.94	3382.74	8346.68	25.86
Total	**20622.55**	**11655.19**	**32277.74**	**100.00**

The initial capital investment on coffee worked out to Rs. 32277.74 per ha. The major cost was fertilizer, which formed 35.08 per cent for the first two years of establishment. Planting material and labour accounted for 26.27 and 25.86 per cent respectively. Coffee starts yielding berries from 4th year and economic yields from coffee are obtained from sixth year onwards.

A summary of economics of coffee production (arabica variety) is given in table 12. It is evident from the table that total fixed costs in the production of coffee works out to Rs. 15285.77 per ha. However, the cost per ha was highest among small farmers (Rs.17186.27) followed by medium (Rs.15726.21) and large farms (13371.97). Interestingly small farmers incurred highest proportion of variable costs in the total costs at 57.70 and it was lowest in the case of large farmers at 45.65 of total costs. It could be mainly because of economies of scale among large farms. The gross income realized per ha was highest among small farms (Rs.30823.62) followed by medium farms (28251.23) and large farms (Rs.27993.08). However, large farmers realized highest amount of net income of Rs. 14621.11. Perhaps this might be due to higher scale economies, which translated into higher net income although small farmers realized higher gross income.

Table 11. Economics of coffee production (per ha)

INPUTS	**SMALL**		**MEDIUM**		**LARGE**		**Overall**	
Variable costs	Rs.	**%**	Rs.	**%**	Rs.	**%**	Rs.	**%**
Fertilizer	3513.53	20.44	3826.51	24.33	2573.93	19.25	3236.14	21.17
Pesticide	722.96	4.21	721.50	4.59	722.40	5.40	723.37	4.73
Labour	4625.55	26.91	3410.20	21.68	2142.41	16.20	3399.02	22.24
Transportation	71.69	0.42	61.20	0.39	60.20	0.45	64.92	0.42
Total cash costs	8933.73	51.98	8019.41	50.99	5498.94	41.12	7423.45	48.56
Interest on cash costs	981.92	5.71	882.12	5.61	604.88	4.52	816.57	5.34
Total variable costs	9916.46	57.70	8901.56	56.60	6103.81	45.65	8240.03	53.91
Fixed costs								
Amortized cost of establishment	3526.45	20.52	3526.45	22.42	3526.45	26.37	3526.45	23.07
Rental value of land	3082.36	17.94	2825.12	17.96	2799.31	20.93	2902.74	19.00
Land revenue	60.00	0.35	60.00	0.38	60.00	0.45	60.00	0.39
Depreciation	601.00	3.50	413.08	2.63	882.40	6.60	556.55	3.64
Total fixed costs	7269.81	42.30	6824.65	43.40	7268.16	54.35	7045.74	46.09
Total costs	17186.27	100.00	15726.21	100.00	13371.97	100.00	15285.77	100.00
Yield (qtls/ha) per year	6.16		5.65		5.60		5.81	
Gross returns	30823.62		28251.23		27993.08		29027.43	
Net returns	13637.35		12525.02		14621.11		13741.66	
Net returns per farm	8727.90		17159.28		48103.44		15665.49	

Cardamom is another important perennial crop in the study region. The average establishment cost per ha was about Rs. 28684/- (Table 11). Costs of planting material accounted for highest proportion of 80.95 percent followed by expenses on labour, which was 9.69 per cent. Costs and returns from cardamom production are summarized in table 11. Variable costs were highest among small farmers accounting for 50.30 per cent. But in the case of medium and large farmers it formed less than 50 per cent. On an average, per ha cost of production of cardamom was highest among small farmers (Rs.10956.27) followed by medium and large

farmers. However, the gross income obtained by all farmers was by and large less than potential income. This is attributed to low yields realized by all farmers. The average yield obtained by farmers was 51.30 kg per ha as against the normal yield of about 150. In the case of large farmers the average yield was just 48 kg, which could be due to erratic rainfall and inadequate care bestowed by farmers as opined by them.

Table 12: Establishment costs of cardamom (Rs./ha)

Inputs	**Quantity**	**Costs (Rs)**	**Per cent**
Planting material (no)	11610	23220.00	80.95
Fertilizer (kg)	229.34	2201.60	7.68
Pesticide (liters)	2.58	481.60	1.68
Labour (man days)	55.62	2780.66	9.69
Total		**28683.86**	**100.00**

Table 13. Economics of cardamom production (per ha)

Inputs	**Small**		**Medium**		**Large**		**Overall**	
Variable costs	Rs.	**%**	Rs.	**%**	Rs.	**%**	Rs.	**%**
Fertilizer	960.00	8.76	1100.00	11.37	1650.00	17.85	1236.00	13.16
Pesticide	702.24	6.41	725.62	7.43	446.16	4.83	582.40	6.20
Labour	3303.05	30.15	2334.43	23.90	1261.57	13.65	1876.72	19.98
Total cash costs	4965.29	45.32	3170.65	42.70	3357.73	36.33	3695.12	39.35
Interest variable costs	546.19	4.99	348.70	4.70	369.35	4.00	406.46	4.33
Total variable costs	5511.47	50.30	3518.76	47.40	3727.08	40.32	4101.58	43.68
Fixed costs								
Amortized cost	3133.80	28.60	3133.80	32.09	3133.80	33.90	3133.80	33.37
Rental value of land	1650.00	15.06	1530.00	15.67	1440.00	15.58	1539.00	16.39
Land revenue	60.00	0.55	60.00	0.61	60.00	0.65	60.00	0.64
Depreciation	601.00	5.49	413.08	4.23	882.40	9.55	556.55	5.92
Total fixed costs	5444.80	49.70	5136.88	52.60	5516.20	59.68	5289.20	56.32
Total costs	10956.27	100.00	9765.64	100.00	9243.28	100.00	9390.78	100.00
Returns								
Yield (kgs/ha)	55.00		51.00		48.00		51.30	
Gross returns	16500.00		15300.00		14400.00		15390.00	
Net returns	5543.73		5534.36		5156.72		5999.22	
Net returns per farm	3381.67		8744.29		24185.12		10738.60	

Paddy is the staple food crop of the region occupying low lying areas where during khariff season adequate water is available for the crop. The economics of paddy crop production is summarized in table 14. It was observed that large farmers were more efficient in the production of paddy crop as they could produce paddy at much lower costs than small and medium farmers. The mean cost per ha among large farmers was Rs.14822.51, where as among small and medium farmers it was Rs.16893.35 and Rs.16216.20, respectively. Among several components of variable costs, labour cost was the major cost accounting for 28.79, 28.15 and 22.59 respectively among small, medium and large farmers. Bullock labour is another major cost in paddy production accounting for 15.32, 15.05 and 15.77, respectively among the three farm categories. The mean yield obtained per ha was 33.71, 30.65 and 28.90 respectively for small, medium and large farms, which translated into a gross income of Rs.23597.00, Rs.21455.00 and Rs. 20230.00. The net income was Rs. 6703.75, 5238.80 and 5407.49, respectively among, small, medium and large farmers. However, per farm income was highest among large farmers as their average paddy area was higher than those of small and medium.

Table 14. Economics of Paddy production (per ha)

Inputs	**Small**		**Medium**		**Large**		**Overall**	
Variable costs	Rs.	**%**	Rs.	**%**	Rs.	**%**	Rs.	**%**
Seeds	543.53	3.22	538.70	3.32	495.38	3.34	525.88	3.30
FYM	2588.18	15.32	2580.18	15.91	2529.53	17.07	2565.96	16.12
Fertilizer	2484.64	14.71	2472.87	15.25	2476.80	16.71	2478.11	15.57
Bullock pair days	2588.20	15.32	2441.01	15.05	2337.48	15.77	2455.56	15.43
Labour	4863.79	28.79	4565.15	28.15	3347.86	22.59	4258.93	26.76
Total costs	13068.32	77.36	12597.93	77.69	11187.60	75.48	12294.94	77.26
Interest on variable costs	1437.52	8.51	1385.77	8.55	1230.64	8.30	1352.44	8.50
Total variable costs	14505.83	85.87	13983.71	86.23	12418.24	83.78	13647.38	85.76
Fixed costs								
Rental value of land	1726.42	10.22	1759.41	10.85	1461.87	9.86	1649.28	10.36
Land revenue	60.00	0.36	60.00	0.37	60.00	0.40	60.00	0.38
Depreciation	601.00	3.56	413.08	2.55	882.40	5.95	556.55	3.50
Total fixed costs	2387.42	14.13	2232.49	13.77	2404.27	16.22	2265.83	14.24
Total costs	16893.35	100.00	16216.20	100.00	14822.51	100.00	15913.21	100.00
Returns								
Yield (qtls/ha)	33.71		30.65		28.90		31.08	
Gross returns	23597.00		21455.00		20230.00		21756.00	
Net returns	6703.75		5238.80		5407.49		5842.79	
Net returns per farm	2681.50		2462.23		4974.89		8939.46	

3.3. Awareness about BGBD practices among respondent farmers

It is surprising to note that only 45 per cent (Table 15) of the respondents had some knowledge and awareness about BGBD and their uses. Remaining 55 per cent of respondents were totally unaware of below ground flora and fauna. The low awareness about BGBD among farmers could largely be attributed to lack of sensitizing/extension programs on the part of the developmental departments on BGBD programs. Farmers had awareness about different types of soil organisms including microbes, earthworms, insects, etc. But they do not have much knowledge about nitrogen fixing bacteria and other nutrient-supplying organisms in the soil. However, a training program on compost making conducted by the district agricultural training school has given some opportunity to a few farmers to learn some new ideas and information about BGBD. The program was conducted in the agricultural school of the district for about three weeks. In the training program farmers were exposed to new technologies and were given practical hands on training on some of the practices including vermi-compost making. Farmers who received this training responded positively on BGBD especially about vermi-compost and earthworms. The data presented in Table 16 reveal farmers awareness about benefits, functions and services from BGBD. It is clear that awareness level is not that high although some farmers had awareness about some of the commonly known benefits from BGBD. Table 17 reveals awareness of farmers about specific BGBD components. Large farmers possess a higher degree of awareness about the BGBD as compared to the other two groups of farmers. Perhaps this could be due to higher education level and exposure to mass media and other knowledge sources thereby higher awareness about BGBD.

Table 15: Awareness about BGBD –

	No. farmers	Per cent
Aware of BGBD	27	45
Not aware of BGBD	33	55

Table 16: Awareness about benefits, functions/services of BGBD

Benefits/ Function/Harm	Percent
Higher nutrient availability	31.66
Faster decomposition of OM	10.00
Improves soil health	21.66
Degradation	1.66
Higher moisture levels	41.66
Helps in Biomass production	11.66

Farmers defined soil health in terms of fertility status, yield potential, soil aggregation and other properties. Degradation has been indicated in terms of soil erosion, loss of nutrients, Stalinization of soil and biomass production in terms of accumulation of organic matter in the soil.

Table 17: Awareness about Specific BGBD components (in percent)

Group	Small farmers	Medium farmers	Large farmers
Rhizobium	16.00	35.29	44.44
Earth worms	36.00	29.41	38.88
Azatobacter	16.00	35.29	44.44
Termites	32.00	11.76	55.55

Chi-square value = 8.991 NS

The Chi-square test revealed that the awareness about the bio-diversity conservation methods is independent of the size of the land holding.

3.3.2 Common BGBD practices adopted by farmers

Common BGBD practices followed by farmers in the study region were compost making and application of farm yard manure (FYM), green leaf manure and dried leaves collected from the forest to the soil. Compost making refers to storing of farm wastes including dung in the deep pits (about 5-6 feet and allowing it for decomposition mostly in anerobic condition for quite a long time normally 2-3 months. Farm yard manure is also collection of farm wastes including dung but stored in either open spaces or in heaps. Green leaf manure refers to incorporation of fresh green leaf cut from the trees into the soil. This is a common practice in paddy cultivation in south India including Coorg

district. Incorporation of weeds into the soil is another practice commonly followed by the farmers. Ploughing back paddy crop stubbles and residues to the soil is a major BGBD practice followed by all farmers in the study region. Table 19 reveals that majority (91.66%) of farmers in both categories produced FYM on their farms. Only about 8 per cent of farmers purchased FYM to manure their fields. The farmers in the study area purchased FYM from the neighboring/known farmers in their own village or from the neighboring villages at a price of 930 Rs./- per ton.

Table 19: Use of farm yard manure

Category	Own production	Purchased	Total
Aware of BGBD	24 (88.88)	3 (11.11)	27
Not aware of BGBD	31 (93.94)	2 (6.06)	33
Total	55 (91.66)	5 (8.33)	60

Figures in the parentheses indicate percent of farmers reporting the practice

3.3.3: Reasons for non-adoption of BGBD practices

A BGBD practice is defined as any farm activity that improves soil fertility, organic matter, and beneficial soil fauna. These practices directly or indirectly aid in rising soil fauna including microorganisms. Adding FYM, compost manure, green leaf manure, soil amendments, vermicompost, and ploughing back weeds, crop residues are some of the examples of BGBD practices. Farmers' reasons for non-adoption of BGBD practices were elicited and they are presented in table 19. Farmers expressed many reasons for the non-adoption of BGBD practices. The important ones were lack of awareness about BGBD, which was expressed by about 57 per cent of respondents. Unawareness about benefits from BGBD was another important reason for the non-adoption (47 %) followed by lack of technical expertise (20 %), non-availability of inputs locally and difficulty in the adoption of BGBD practices (10 %).

Table 20: Reasons for non-adoption of BGBD practices

Reasons	Aware of BGBD	Unaware of BGBD	Total
Lack of awareness	17	17	34 (56.66)
Unaware of benefits	14	14	28 (46.66)
Lack of technical expertise	5	7	12 (20.00)
Inputs not available locally	5	5	10 (16.66)
Difficulty in adoption	5	1	6 (10.00)

4. CONCLUSION

The study region is agrarian in character and represents a wide range of agroecosystems, which is congenial for studies on BGBD. The benchmark survey revealed that almost entire population of the study area is dependent on agriculture and related activities. The major source of income for the farmers is plantation crops and paddy is the staple food crop of the region. Livestock enterprises are not important enterprises due to climatic factors. Most of the farmers in the study are small farmers with average holding of 2 ha. In general farmers have awareness about the BGBD; they are unable to identify specific species and their roles. Common BGBD practices adopted by the farmers were application of farm yare manure, addition of green leaf manure and crop stubbles to the cropland, incorporation of dried leaves in to the soil etc. Important reasons for non-adoption of BGBD practices by farmers' were lack of awareness about BGBD, unawareness about benefits from BGBD, lack of technical expertise, non-availability of inputs locally and difficulty in the adoption of BGBD practices.

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