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Livelihood Analysis of Small Tea Growers by Analysing their Farming Systems and Resource Utilization in Jorhat District

Shyamal Kishore Bordoloi [a*], M. Deka [a], R. P. Bhuyan [a], A. S. Gogoi [a], S. K. Phukon [a], S. Sonowal [b], N. Tanti [a] and T. Hussain [c]

[a] Department of Tea Husbandry and Technology, Assam Agricultural University, Jorhat, Assam, India.
[b] Krishi Vigyan Kendra, Dibrugarh, Assam, India.
[c] Department of Agri-business Management & Food Technology, Tura Campus, NEHU, Meghalaya, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The study was undertaken with the objective to examine the existing farming systems and utilization of resources in Titabar Sub division of Jorhat district, which include two development blocks *viz.* Titabar development block and Jorhat East development block. Primary data revealed that in the study area, five types farming systems existed *viz.* Tea, Field & Horticulture crops, Plantation crops excluding tea (FS-I), Tea, Field & Horticulture crops, Plantation crops excluding tea, Fishery (FS-II), Tea, Field & Horticulture crops, Fishery (FS-III), Tea, Field & Horticulture crops (FS-IV) and Tea, Plantation crops excluding tea (FS-V). The variable cost involved in various farming systems was found to be highest in FS-II (Rs. 163946.96 $farm^{-1}yr^{-1}$) and was lowest in FS-IV (Rs. 52420.20 $farm^{-1}yr^{-1}$) whereas after undergoing ANOVA single factor analysis of the Benefit Cost ratios, it was found that FS-II has the highest mean value (2.92) and FS-IV has the lowest mean (0.89) which was due to variation in inclusion of different components in the farming systems. Small tea growers of the study area had a wide scope of augmenting the income from their limited farm resources by following proper cultivation practices, moving towards organic tea cultivation, forming farmer

**Corresponding author: E-mail: shyamalbordoloi14@gmail.com;*

producer company through which they can collectively bargain for inputs and sell the tea in a common platform. Involving high yielding varieties of other components, crop rotation, diversification of enterprise, proper utilization of fallow land and market consciousness can help in increasing the income from the other components other than tea.

Keywords: Tea; small tea growers; farming system; benefit cost ratio.

1. INTRODUCTION

Tea [*Camellia sinensis* (L) O. Kuntze], the most ancient beverage mankind has been enjoying, is still the most popular drink in the world. India has maintained its reputation of being as one of the leading countries in the world in global tea production, consumption and exports. It accounts for 22.60 per cent of global tea production [1]. The tea industry of India is one of the oldest and perhaps the most organized agricultural enterprises in India [2]. In Assam and other North Eastern States, the concept of growing tea in small holdings was unheard of until 1975, when a small beginning was made in Assam. Small farmers in these states started taking up tea cultivation on a large scale during the mid 90's due to good prices which prevailed during that period. Tea growers with a holding size up to 10.12 ha are categorized as small tea growers by the Tea Board of India and the Small Tea Growers' Advisory Programme, while the Government of Assam considers farmers with a holding size of less than 4 ha as small tea growers [3].

Farming system is an integrated set of activities that farmers perform in their farms under their resources and circumstances to maximize the productivity and net farm income on a sustainable basis. Farming system approach relates to the whole farm rather than individual elements. Farming systems are closely linked to livelihoods because agriculture remains the single most important component of most rural people's living and also plays an important role in the lives of many people in semi-urban areas. Only 30 per cent of small tea growers of Assam has cultivated tea on land inherited from the predecessor or have purchased land [4]. The growers who do not obtain Tea Board Registration have no access to the subsidy provided by the Board and hence depend on their own hard earned fund or privately borrowed fund.

2. MATERIALS AND METHODS

A proper understanding about the research methodology used in the study helps us to systematically solve the research problem. The methodologies used in the present investigation are discussed under the following subheads:

2.1 Period of Study

The study was conducted during February - April, 2019 and the primary data were collected from the study area.

2.2 Selection of Study Area

The Titabor Sub-division was selected purposively by the researcher for the study. The two blocks of Titabor sub division namely Titabor Development Block and Jorhat East Development Block were included in the study.

2.3 Sampling Design

Stratified random sampling technique was adopted for the present study. A total of 247 respondents were selected out of 2736 small tea growers using proportionate Stratified random sampling method with 90 per cent level of confidence from the list of small tea growers of – Jorhat East Development Block and Titabor Development Block.

2.4 Collection of Data

Primary data have been collected from the sample small tea growers by interviewing them personally at their door step with the help of the pre tested questionnaire and information regarding the various demographic characteristics like age, family members, occupational status, educational level, land holding, land use pattern, information on cost and return of tea and other cultivated crops, utilization of resources in different areas like land, labour, manures and fertilizers, plant protection chemicals, seed etc, problems related to their production and marketing etc. were collected.

2.5 Interpretation of Data

The collected data was compiled and tabulated for the purpose of analysis. Percentage and

average were calculated whenever necessary and presented in tables.

2.6 Statistical Analysis

The experimental data were statistically analyzed by the method of analysis of variance developed by R.A. Fisher. The significance or non-significance of the given variance was determined by comparing the calculated 'F' value with its respective table F value at 5 percent level of significance. The standard error of the mean difference (S.Ed.) was calculated as follows:

$$S.Ed. \quad (\pm) \quad = \sqrt{\frac{2 \times \text{Error Mean Square}}{\text{Total No. of Replications}}}$$

The CD values at 5 per cent level of significance were determined by using the following expression-

C.D. at 5 per cent = S.E. of difference x $t_{0\cdot05}$ for error degree of freedom.

3. RESULTS AND DISCUSSION

3.1 Identification of Existing Farming Systems

During the period of research work five farming systems were identified among the small tea growers. Each farming system has different components. They were nomenclatured as FS-I which comprised of (Tea, Field & Horticultural crops and other plantation crops), FS-II (Tea, Field & Horticultural crops, other plantation crops and Fishery), FS-III (Tea, Field & Horticultural crops and Fishery), FS-IV (Tea and Field & Horticultural crops), FS-V (Tea and other plantation crops).

The table 1 reveals that majority of the respondents were observed in FS-I (Tea, Field & Horticultural crops and other plantation crops) with 73.68 per cent, followed by FS-II (Tea, Field & Horticultural crops, other plantation crops and Fishery) with 16.60 per cent, FS-V (Tea and other plantation crops) with 3.65 per cent, FS-III (Tea, Field & Horticultural crops and Fishery) with 3.24 per cent and FS-IV (Tea and Field & Horticultural crops) with 2.83 per cent.

Majority of the respondents advocated FS-I comprising of Tea, Field & Horticultural crops (rice and vegetables) and other plantation crops (agarwood, arecanut and bamboo) which were commercially cultivated. Out of other plantation crops agarwood was more popular among the growers and extensively cultivated as monocrop and also as intercrop along with tea. The respondents were adopting tea with other plantation crops mainly to earn additional income, since the input use was minimum in the other plantation crops. Similar findings were reported by *Buragohain* (2015), who reorted that majority of the small tea growers were adopting arecanut, coconut and sasi (agarwood) as intercrop mainly for the additional income [5].

Table 1. Identification of Farming systems

Farming System	Components under farming system	Number of respondents	Percentage
FS-I	Tea, Field & Horticultural crops, Other plantation crops (T+F&H+P)	182	73.68
FS-II	Tea, Field & Horticultural crops, Other plantation crops, Fishery (T+F&H+P+F)	41	16.60
FS-III	Tea, Field & Horticultural crops, Fishery (T+F&H+F)	8	3.24
FS-IV	Tea, Field & Horticultural crops (T+F&H)	7	2.83
FS-V	Tea, Other plantation crops (T+P)	9	3.65
Total		**247**	**100.00**

3.2 Land Utilization Pattern in Different Farming Systems

Table 2 revealed the area under different components in all the farming systems under study. Area under tea (64.04 per cent) and area under field and horticultural crops (22.46 per cent) were found to be the two most dominant forms of land use in all the farming systems. The total area under other plantation crops, fishery, fallow land and homestead were 5.92 per cent, 0.42 per cent, 0.35 per cent and 6.82 per cent respectively. The area under different components was observed to be highest in FS-I (207.94 ha) and lowest in FS-IV (5.04 ha).

It was found that majority of the respondents derive their earning from tea. Field and horticultural crops were being used as a supplementary source of income by the respondents followed by other plantation crops.

3.3 Average Size of Tea Holding in Different Farming Systems

Table 3 revealed the average area under tea in different farming system. From the table it was observed that FS-I has majority of respondents (182) and the area under tea in this farming system was highest at 132.42 hectare (71.23 per cent). The average land holding in tea was observed to be highest in FS-III (1.17 ha) and lowest in FS-IV (0.35 ha).

Table 2. Land utilization pattern in different farming systems (ha)

Farming System	Area under Tea (ha)	Area under Field & Horticultural Crops (ha)	Area under other Plantation Crops (ha)	Area under Fishery (ha)	Area under Fallow Land (ha)	Area under Homestead (ha)	Total Area (ha)
FS-I	132.24	47.45	13.29	0	0.59	14.37	**207.94**
	(63.60)	(22.82)	(6.39)	(0.00)	(0.28)	(6.91)	(100.00)
FS-II	34.13	13.24	2.63	1.04	0.29	3.33	**54.67**
	(62.44)	(24.22)	(4.81)	(1.90)	(0.54)	(6.10)	(100.00)
FS-III	9.39	2.43	0	0.17	0	0.60	**12.59**
	(74.56)	(19.30)	(0.00)	(1.38)	(0.00)	(4.77)	(100.00)
FS-IV	2.48	2	0	0	0.04	0.52	**5.04**
	(49.21)	(39.68)	(0.00)	(0.00)	(0.79)	(10.32)	(100.00)
FS-V	7.41	0	1.23	0	0.09	0.95	**9.68**
	(76.57)	(0.00)	(12.70)	(0.00)	(0.96)	(9.77)	(100.00)
Total	**185.65**	**65.12**	**17.15**	**1.21**	**1.01**	**19.77**	**289.92**
	(64.04)	(22.46)	(5.92)	(0.42)	(0.35)	(6.82)	(100.00)

(Figures in parenthesis indicates per cent to the total)

Table 3. Average size of tea holding in different farming systems (ha)

Farming System	No of Respondents	Area under Tea (ha)	
		Total	Average
FS-I	182	132.24	0.73
	(73.68)	(71.23)	
FS-II	41	34.13	0.83
	(16.60)	(18.39)	
FS-III	8	9.39	1.17
	(3.24)	(5.06)	
FS-IV	7	2.48	0.35
	(2.83)	(1.34)	
FS-V	9	7.41	0.82
	(3.65)	(3.99)	
Total	**247**	**185.65**	0.75
	(100.00)	**(100.00)**	

(Figures in parenthesis indicates per cent to the total)

3.4 Distribution of Area under Different Field and Horticultural Crops in Different Farming Systems

Table 4 revealed the area under field and horticultural crops. From the table it was observed that an area of 65.12 ha was utilized by the respondents for field and horticultural crops in all the farming systems under review. The area utilized for paddy cultivation was 51.07 ha (78.42 per cent) and for vegetable cultivation it was 14.05 ha (21.58 per cent). Land utilized for paddy cultivation was far higher in all the farming systems studied. The ratio of land utilized for paddy farming to land utilized for vegetable farming was 77.72 per cent to 22.28 per cent, 83.79 per cent to 16.21 per cent, 65.88 per cent to 34.12 per cent and 74.67 per cent to 25.33 per cent under FS-I, FS-II, FS-III, FS-IV and FS-V respectively.

The average area under paddy cultivation is observed to be highest in FS-II (0.27 ha) followed by FS-I (0.21 ha) and lowest in FS-I and FS-III (0.20 ha). For vegetable cultivation maximum average area is observed in FS-III (0.10 ha) followed by FS-IV (0.07 ha) and minimum in FS-II (0.05 ha).

3.5 Distribution of Area under other Plantation Crops in Different Farming Systems

Table 5 depicts the area under other plantation crops in different farming systems. The table reveals that an area of 17.15 ha was under other plantation crops in all the farming systems studied. A total of 11.05 ha (64.45 per cent) was observed to be under agarwood, 3.49 ha (20.38 per cent) under arecanut and 2.60 ha (15.17 per cent) under bamboo in all the farming systems. The total area under agarwood was observed to be maximum in FS-I (8.83 ha) and minimum in FS-V (0.83 ha) while the average area under agarwood was maximum in FS-V (0.09 ha) and minimum in FS-II (0.03 ha). Average area under arecanut was found to be highest in FS-II and FS-V (0.02 ha) and lowest in FS-I (0.01 ha). The total area under arecanut and bamboo was found to be highest in FS-I (2.67 ha and 1.80 ha respectively). The average area under arecanut and bamboo was maximum in FS-II and FS-III (0.02 ha) and FS-III (0.02 ha) respectively.

The table revealed that most dominant plantation crop was agarwood as compared to arecanut and bamboo. The majority of the respondents were adopting agarwood plantation as a source of additional income along with tea plantation since the cost of cultivation and maintenance of agarwood is very low and return from it is quite high.

3.6 Utilization of Resources in Different Components of Farming Systems

Labour is one of the major inputs in all the farming systems. Farm labour resources have several prominent characteristics. First labour typically comes in discrete units. From a production standpoint, an hour of labour if not used during that period, is lost and cannot be recaptured. Unlike fertilizers or seed, it cannot be stored for the future use.

Table 4. Area under field crops and horticultural crops in different farming systems

Farming System	Area under rice (ha)		Area under vegetables (ha)		Total area under field and horticultural crops (ha)	
	Total	**Average**	**Total**	**Average**	**Total**	**Average**
FS-I	36.88 (77.72)	0.20	10.57 (22.28)	0.06	**47.45** (100.00)	0.26
FS-II	11.09 (83.79)	0.27	2.15 (16.21)	0.05	**13.24** (100.00)	0.32
FS-III	1.60 (65.88)	0.20	0.83 (34.12)	0.10	**2.43** (100.00)	0.30
FS-IV	1.49 (74.67)	0.21	0.51 (25.33)	0.07	**2.00** (100.00)	0.29
Total	**51.07** (78.42)	0.22	**14.05** (21.58)	0.06	**65.12** (100.00)	0.28

(Figures in parenthesis indicates per cent to the total)

Table 5. Area under other Plantation Crops in different farming systems (ha)

Farming System	Area under Bamboo (ha)		Area under Agarwood (ha)		Area under Arecanut (ha)		Total area under other Plantation Crops (ha)	
	Total	**Average**	**Total**	**Average**	**Total**	**Average**	**Total**	**Average**
FS-I	1.80	0.01	8.83	0.05	2.67	0.01	**13.29**	0.07
	(13.53)		(66.41)		(20.06)		(100.00)	
FS-II	0.59	0.01	1.40	0.03	0.64	0.02	**2.63**	0.06
	(22.36)		(53.28)		(24.36)		(100.00)	
FS-V	0.21	0.02	0.83	0.09	0.19	0.02	**1.23**	0.13
	(17.44)		(67.31)		(15.25)		(100.00)	
Total	**2.60**	0.01	**11.05**	0.05	**3.49**	0.02	**17.15**	0.08
	(15.17)		(64.45)		(20.38)		(100.00)	

(Figures in parenthesis indicates per cent to the total)

The composition of labour force on an individual farm varies according to the type, size and location of the farm. Major sources of labour on an individual farm include:

1. Family labour
2. Hired labour
a. Regular
b. Seasonal
c. Casual (occasional or part time)

In the present study two sources of labour have been observed in all the farming system of the small tea growers. They are as follows

1. Family labour (full time and part time)
2. Hired labour (under hired labour both casual and permanent labour included)

The labour force, regular or permanent performed other activities besides working in tea cultivation. Casual labour were highly needed during the peak season, when heavy flush came during the rainy season and in need of some other cultural operations like weeding, fertilizer application etc. demanded more labour units.

Tea cultivation is highly labour intensive enterprise. It needs year round labour supply for various operations in varying quantities, depending upon the nature of operations. Engagement of labour by the small tea growers was also reported [6].

3.7 Resource use Pattern of Tea (Per Farm)

The availability of resources per farm per year and their utilization in different farming system of small tea growers are shown in Table 6. It was clear from the table that total human labour was used maximum (742.87 mandays farm^{-1}yr^{-1}) in FS-III where use of hired labour (670.88 mandays farm^{-1}yr^{-1}) was more than family labour (71.99 mandays farm^{-1}yr^{-1}). The use of family labour per farm per year was higher in FS-II and FS-V due to non-availability of hired labour in the peak seasons. It was observed that FS-IV has minimum requirement of total human labour (221.07 mandays farm^{-1}yr^{-1}) where the hired labour requirement per farm per year was 149.39 mandays and family labour requirement was 71.68 mandays due to low average size of land holding. Use of organic manures per farm per year was found to be highest in the FS-III with 675.54 kg and FS-IV has not used any manure as a resource. The use of fertilizers such as urea, SSP and MOP per farm per year was maximum in FS-III (261.51 kg, 258.10 kg and 144.75 kg respectively) and minimum in FS-IV (79.55 kg, 74.53 kg and 42.85 kg respectively). The per farm resource use for plant protection chemicals such as for looper, helopeltis, red spider mites and herbicides was maximum in FS-III (2.18 kg/l, 4.13 kg/l, 4.06 kg/l and 13.10 l respectively) and minimum in FS-IV (0.61 kg/l, 1.32 kg/l, 1.29 kg/l and 3.87 l respectively). The use of growth promoter was maximum in FS-III (3.31 l) and minimum in FS-IV (1.01 l).

Table 6. Resource utilization pattern per farm for Tea in different farming system

Inputs Type	Unit	Average Price/Unit	Farming System				
			FS-I	FS-II	FS-III	FS-IV	FS-V
Hired Labour	Mandays	131.04	397.88	460.17	670.88	149.39	445.37
Family Labour	Mandays	131.04	65.62	80.24	71.99	71.68	79.48
Total Human Labour	Mandays	131.04	463.50	540.40	742.87	221.07	524.85
Organic Manure	kg	8.72	335.92	425.24	675.54	0.00	331.26
Fertilizer							
Urea	kg	8.85	164.53	190.93	261.51	79.55	189.31
SSP	kg	8.85	158.65	186.42	258.10	74.53	182.72
MOP	kg	18.35	94.92	106.78	144.75	42.85	103.31
Plant Protection Chemicals for							
Looper	kg or l.	1967.20	1.37	1.54	2.18	0.61	1.55
Helopeltis	kg or l.	1585.52	2.74	3.11	4.13	1.32	2.95
Red Spider Mites	kg or l	1523.74	2.79	3.15	4.06	1.29	3.01
Herbicides	l	380.88	8.29	9.42	13.10	3.87	9.16
Growth Promoters	l	854.46	2.25	2.23	3.31	1.01	2.09

From the table it was revealed that use of resources vary from farm to farm. Among all the resources, use of human labour per farm was found to be maximum in all the farming system as compare to the other resources. The difference in use of inputs was mainly due to the variations in farm size holdings in different farming systems.

3.8 Resource use Pattern of Rice (Per Farm)

The resource used per farm per year and their utilization in different farming system was shown in Table 7. From the table it was observed that maximum human labour per farm was used in FS-II (16.17 mandays) compared to the other farming system. Use of hired labour was maximum in FS-II (12.84 mandays) and family labour in FS-I (3.77 mandays). The use of hired labour and family labour was minimum in FS-I (8.61 mandays) and FS-III (3.31 mandays) respectively. The use of machine labour, seed and manures and fertilizers was maximum in FS-II (5.99 mandays, 14.47 kg and 30.90 kg respectively).

From the table it revealed that the labour requirement per farm was dominating in all the farming system as compared to the other resources used. Tea and rice were found to be the two most labour intensive components among all.

3.9 Resource use Pattern of Vegetables (Per Farm)

The availability of resources per farm per year and their utilization in different farming system was shown in Table 8. From the table it can be seen that use of human labour per farm per year was maximum in FS-III (7.85 mandays) out of which 3.58 mandays were hired. But FS-III was found to have maximum number of family labour (4.27 mandays). FS-II was observed with minimum labour force (3.95 mandays) out of all the farming systems. Use of manure and fertilizers and seed was highest in FS-III (23.88 kg and 0.36 kg respectively) and lowest in FS-II (10.82 kg and 0.22 kg respectively).

Table 7. Resource utilization pattern per farm for Rice in different farming system

Inputs Type	Unit	Average Price/Unit	Farming System			
			FS-I	FS-II	FS-III	FS-IV
Hired Labour	Mandays	299.47	8.61	12.84	9.28	9.40
Family Labour	Mandays	299.47	3.77	3.33	3.31	3.59
Total Human Labour	Mandays	299.47	12.37	16.17	12.60	12.98
Machine Labour	Mandays	299.47	4.51	5.99	4.56	4.56
Seed	kg	24.43	9.25	14.47	11.02	11.07
Manure & Fertilizer	kg	11.76	20.33	30.90	21.35	26.20

Table 8. Resource utilization pattern per farm for Vegetables in different farming system

Inputs Type	Unit	Average Price/Unit	Farming System			
			FS-I	FS-II	FS-III	FS-IV
Hired Labour	Mandays	299.12	2.11	1.54	3.58	2.24
Family Labour	Mandays	299.12	2.76	2.41	4.27	3.43
Total Human Labour	Mandays	299.12	4.86	3.95	7.85	5.67
Manure & Fertilizer	kg	11.87	13.24	10.82	23.88	14.03
Seed	kg	2462.50	0.22	0.22	0.36	0.24

Table 9. Total variable cost of different components (Rs./ farm)

Farming systems	Components							
	Tea	Rice	Vegetables	Arecanut	Agarwood	Bamboo	Fishery	Total
FS-I	92675.00	6150.95	2303.44	1096.98	1921.98	157.14	0.00	104305.50
FS-II	108219.56	8106.91	2138.43	1006.10	1475.61	201.22	4701.83	125849.65
FS-III	149298.26	6224.96	4010.00	0.00	0.00	0.00	4413.75	163946.96
FS-IV	43110.34	6518.88	2790.98	0.00	0.00	0.00	0.00	52420.20
FS-V	104357.55	0.00	0.00	1258.89	3788.89	378.89	0.00	109784.22

The resource used in case of vegetables was observed to be very low since very less area was found under vegetable cultivation. The area under vegetables should be increased in order to increase the use of resources.

3.10 Cost of Cultivation of Different Components in all the Farming Systems (Per Farm)

The total variable costs per farm of different components in all the farming systems are shown in Table 9.

Table 9 revealed that the total variable cost per farm for tea was maximum in FS-III (Rs. 149298.26) and minimum in FS-IV (Rs. 43110.34). The per farm cost of cultivation for rice, vegetables, arecanut, agarwood, bamboo and fishery were maximum in FS-II (Rs. 8106.91), FS-III (Rs. 4010.00), FS-V (Rs. 1258.89), FS-V (Rs. 3788.89), FS-V (Rs. 378.89) and FS-II (Rs. 4701.83) respectively and minimum in FS-I (Rs. 6150.95), FS-II (Rs. 2138.43), FS-II (Rs. 1006.10), FS-II (Rs. 1475.61), FS-I (Rs. 157.14) and FS-III (Rs. 4413.75) respectively.

The overall variable cost of all the components in different farming systems was found to be highest in FS-III (Rs. 163946.96) and lowest in FS-IV (Rs. 52420.20). The variation in cost was mainly due to the difference in size of land holding of the respondents. The average size of land holding in FS-III (1.17 ha) for tea which was quite high as compared to FS-IV (0.35 ha). Similarly in all the components, where the average land holding of the respondent were higher the cost of cultivation is also high.

3.11 Total Gross Return from Different Crops under Different Farming Systems (Per Farm)

The total gross return from different crops under different farming system was shown in Table 10. The table shows that maximum gross return per farm for tea was found to be highest in FS-III with Rs. 309016.00 and lowest in FS-IV with Rs. 82782.88. The variation in gross return was due to the difference in size of land holding in different farming systems. The ratio of maximum to minimum gross return for different farming system in rice, vegetables, arecanut, agarwood, bamboo and fishery were FS-II (Rs. 17463.44) to FS-III (Rs. 12529.14), FS-III (Rs. 9532.50) to FS-II (Rs. 5442.59), FS-V (Rs. 4604.44) to FS-II (Rs. 3512.20), FS-V (Rs. 12222.22) to FS-II (Rs. 6097.56), FS-V (Rs. 1100.00) to FS-I (Rs. 424.18) and FS-III (Rs. 14236.12) to (Rs. 11909.38) respectively.

Table 10. Total return from different farming systems (Rs.farm^{-1})

Farming systems	Components							
	Tea	Rice	Vegetables	Arecanut	Agarwood	Bamboo	Fishery	Total
FS-I	164069.18	12571.40	6274.29	3646.15	9010.99	424.18	0.00	195996.19
FS-II	211815.70	17463.44	5442.59	3512.20	6097.56	627.03	14236.12	259194.63
FS-III	309016.00	12529.14	9532.50	0.00	0.00	0.00	11909.38	342987.02
FS-IV	82782.88	13319.31	6405.71	0.00	0.00	0.00	0.00	102507.91
FS-V	201504.00	0.00	0.00	4604.44	12222.22	1100.00	0.00	219430.67

Table 11. Comparison of different farming systems

Farming System	Components							Mean	SE(d)	CD
	Tea	Rice	Vegetable	Arecanut	Agarwood	Bamboo	Fishery			
FS-I	1.77	2.04	2.72	3.32	4.69	2.7	0	2.46	**0.68**	**1.40**
FS-II	1.96	2.15	2.55	3.49	4.13	3.12	3.03	2.92*		
FS-III	2.07	2.01	2.38	0	0	0	2.7	1.31		
FS-IV	1.92	2.04	2.3	0	0	0	0	0.89		
FS-V	1.93	0	0	3.66	3.23	2.9	0	1.67		

** - signifies at 5 % level of significant*

The overall gross return in all the farming systems was observed to be highest in FS-III (Rs. 342987.02) followed by FS-II (Rs. 259194.63) and lowest in FS-IV (Rs. 102507.91). The difference in gross return per farm was also mainly due to the variation in average size of land holding in all the farming systems.

3.12 ANOVA Single Factor for Comparison of Different Farming Systems

Comparison of different farming systems with ANOVA single factor was shown in Table 11.

For comparison among different farming systems, ANOVA single factor analysis was done to find out the best farming system. From the analysis it was observed that FS-II showed the highest mean value which was significantly different from FS-III and FS-IV at 5 per cent level of significance. No significant difference was found between FS-II, FS-I and FS-V; FS-I, FS-V and FS-III; FS-V, FS-III and FS-IV. So they can be considered as statistically at par.

Analysis showed that FS-II was the best farming system among all other farming systems with highest mean value (2.92) and the lowest mean was found in FS-IV (0.89).

3.13 Scope of Augmenting Farm Income in Different Farming Systems

Augmenting of small tea grower's income is of greater concern for the study area which requires minute observation. During the study period it was observed that augmenting the income can be done within a short period which requires identification of source of income growth from all the components and enabling conditions for harnessing their growth potentials. Tea farming is the main source of income for the farmers of the study area and requires its upgradation for increasing the income as a whole in all the farming systems.

From the analysis it was observed that FS-II (Tea, Field and Horticultural crops, other plantation crops and Fishery) was the best farming system under review. Since all the components were present in this farming system so the return was maximum compared to all the farming systems. So it can be said that if all the components *i.e..* tea, field and horticultural crops, other plantation crops and fishery were incorporated in other farming systems the return or income will definitely increase. Diversified farming helps in offsetting the loss of a particular crop and increase stability in income.

From the current study it was found that there was fallow land in all the farming systems except FS-III. So the fallow lands which are productive can be utilized for cultivation of crops like rice (low land) and plantation crops such as agarwood, arecanut, banana etc (high land) and the unproductive land can also be utilized for fishery. Thus, the fallow lands can be used for production of different components which will help the grower in augmenting the farm income.

Moreover there is wide scope for them to develop organic tea production and also

production of speciality tea which has a great demand in the domestic and international market. It will be very easy for them to shift towards organic cultivation as they already have a diversified farming system with more than one component, where losses from one component can be overcome by the components during the initial years of conversion to organic. After which it will be equalized by the profit from selling of high prices and demandable organic tea. By following the above practices they can augment the farming system easily.

Through formation of Farmer Producer Organizations, groups of rural producers can come together on the principles of membership, to pursue specific common interests to harness technical and economic benefit, which will help them ensure better income for the producers through an organized system of their own. Moreover through formation of Farmer Producer Organizations, the registered farmers can get a common platform for buying inputs and sale of outputs which will lead to decrease the cost of production due to collective bargaining and increase income from the farm.

Use of high yielding varieties, irrigation facilities, proper utilization of available resources, diversification of enterprise etc. should be done which will help the growers in augmenting their income.

4. CONCLUSION

During the study, five farming systems were identified among the respondents where, majority of the respondents followed FS-I (Tea, field and horticultural crops, other plantation crops) with 73.68 per cent and minimum number of respondents followed FS-IV (Tea, Field & Horticultural crops) with 2.83 per cent.

The utilization of resources varied from farm to farm. Among all the resources, use of human labour per farm was found to be highest in all the farming system as compared to the other resources. The variation in cost of production in tea was mainly due to the difference in size of land holding of the respondents in different farming systems. Similar variation was observed in case of gross return per farm due to the variation in average size of land holding in all the farming systems. ANOVA single factor analysis revealed that FS-II was the best farming system among all other farming systems with highest mean value (2.92) and the lowest mean was found in FS-IV (0.89).

Augmenting of small tea grower's income is of greater concern for the study area which requires minute observation. Tea farming is the main source of income for the farmers of the study area and requires its upgradation for increasing the income as a whole in all the farming systems. From the analysis it was observed that FS-II (Tea, Field and Horticultural crops, other plantation crops and Fishery) was the best farming system under review. Since all the components were present in this farming system so the return was highest compared to all the farming systems. So it can be said that if all the components i.e. tea, field and horticultural crops, other plantation crops and fishery were incorporated in other farming systems the return or income will definitely increase. At last we can finally conclude that practicing diversified farming system with selective enterprise according to the market demand and growth habit of the enterprise without hampering tea farming will give a new hope to the small tea industries of the small tea growers to augment the income to a new height.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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