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PRICING AND TECHNICAL EFFICIENCIES OF SMALLHOLDER GREEN TEA PRODUCTION : EVIDENCE FROM KOTMALE AREA IN THE NUWARA ELIYA DISTRICT*

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Abstract

Nearly 35 percent of the total export earnings in Sri Lanka is contributed by Tea. Presently the tea cultivation could be categorised into well organized plantation sector and less organized smallholders' sector. Despite being supported by government incentive schemes the tea smallholder sector performs poorly due to low yields, poor input use, variable pricing for green tea and inefficient management of tea lands. The objective of this study is to determine the pricing efficiencies of land, labour, fertilizer use and soil conservation practices of pure and mixed tea stands in the Nuwara Eliya district of Sri Lanka. In addition, farm specific technical efficiencies for smallholder tea was computed for the sample.

The results suggest that all the factors under consideration were inefficiently used by the tea smallholder sector. The technical efficiencies of the mixed and the pure stands of tea are nearly the same.

Introduction

The major plantation crops of Tea, Rubber and Coconut contribute 52 percent of the total export earnings in Sri Lanka. Nearly 35 percent of this foreign exchange is contributed by tea (Central Bank of Ceylon, 1983). In addition, this sector provides employment for nearly 20 percent of the working population. The tea cultivation covers a total land area of 246,812 ha. or 15 percent of the total cultivated land extent in the country. Presently, the tea cultivation is categorised into a large scale plantation sector and a smallholders' sector. Twenty one percent of the tea extent come under the smallholders' sector. It employs nearly 50,000 persons and has 35–45 percent share of the total black tea production in the country.

The tea smallholders sector is generally less organized than plantation sector and is saddled with multifarious problems such as low yields, poor input use, inefficient management despite being supported by government incentive schemes, eg,

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new planting, infllling subsidies, price-supporting mechanism, etc. (Silva and Crovend, 1972). In addition, the institutional facilities such as green tea market outlets, ineffective subsidy schemes and extension, partly attribute to the poor performance of the smallholder tea production.

The objective of this study is to determine the pricing efficiencies for land, labour, fertilizer use and soil conservation practices in the pure and mixed tea[1] extents of the small holders in the Nuwara Eliya district. In addition, farm specific technical efficiencies for smallholder tea would be established for the sample.

Data Collection

Nuwara Eliya district has a land area of 1,227.7 sq. km. which is 1.9 percent of the total land area in the island. The 42,090 ha of tea extents in the district comprises 17.5 percent of the total tea cultivated in the country. Nearly 8 percent of the extents are categorised under small tea holding sector consisting of pure and mixed tea. Fifty five percent of the smallholdings in the district exist as mixed stands of green tea (Dept, of Agric, Economics, 1982). Among the four Assistant Government Agents divisions in the district, Kotmale was selected for the study since it has the highest number of registered tea smallholdings. In Kotmale, the average tea holding size of 0.4 ha is slightly higher than the national average (Table 1). The total population in Kotmale were stratified on the basis of holding sizes and a subsample of 70 farms representing each stratum was randomly selected for the survey. In the cross sectional study all farm data pertaining to green tea in 1983 were collected by means of a questionnaire.

Table 1.—Distribution of Tea Smallholding in Kotmale, Nuwara Eliya District

	Size Categories (ha)					
	0.1—04.	0.4—0.8	0.8—1.2	1.2—1.6	1.6—2.0	2—4
Extent (ha)	1120.7	750.4	117.5	87.3	13	160.
Number of Holdings	4460	1572	180	64	7	42.
Percent of Holdings	70.5	24.9	2.9	1	0.1	0.6

1. The mixed tea stands consists of crops of tea, tobacco, coffee, cloves, pepper, cardomom, grown on the same land extents.

Methodology

The economic efficiency can be used as an index to evaluate the performance of production units operating under different conditions. The differences in the efficiencies among production units may be caused by the differences in the pricing and technical efficiencies.

Assume a profit function

$$\text{Max } S = P, f(X_1, X_2 \ldots\ldots\ldots X_n \ldots\ldots Z, ; ; ; : Z_m, e) - Wixi \quad (1)$$

Where P = prices of the product;
W_i = prices of ith input ; i=1, 2.....n
$X_1 \ldots X_n$ = variable inputs;
$Z_1 \ldots Z_m$ = fixed inputs;
S = profit ;
E = error term

The first order,

$$\frac{aS}{aX_i} = Pf_i - W_i = 0 \qquad (2)$$

Hence the producer would be price efficient if his $MVP_{xi} = W_i$ where MVP_{xi} is the marginal value product of X_i. The technicl efficiency is measured against the most efficient production frontier that can be achieved under the existing technological conditions of the production procedures. Each production unit of the study sample is compared with the point of the efficient production frontier. Aigner and Chu (1968), Farrell (1975) and Timmer (1980) have developed several methods to determine the most efficient production frontier. A simplified version of the Timmers method as developed by Russell and Young (1983) was used in this study. In this method the poduction frontier is derived by using the Cobb-Douglas production function. The intercept term of the estimated function is corrected by the addition of the highest positive residual which are generated in the estimated procedure. The efficient production frontier,

$$Y_j = \text{all } X_j^{bi} \qquad (3)$$

Where Y_j = potential output of firms if it were on the frontier (given by the level of inputs) ;
a = shifted or corrected intercept

The equation (3) with the actual input and output levels of each farm, provides the information base for the constructon of the technical efficiency measures,

$$T.E. = \frac{Y_j}{Y_j^x} \leq 1 \qquad (4)$$

Where Y_j = actual output of firm J ;

Y_j^* = maximum output obtainable of firm J were on the frontier;

The following Cobb-Douglas function was fitted and estimated by the method of Ordinary Least Squares,

$$\ln Y = \ln a + b_1 \ln F + b_2 \ln P + b_3 \ln L + b_4 \ln T + b_5 D1 + b_6 D2 + E$$

Where,

Y = amount of green tea produced (Kgs) smallholdings/annum:

F = amount of fertilizer (Kg) per holding/annum ;

P = amount of plucking labour (man days) per holding/annum ;

L = extent of tea (ha) per holding ;

T = length of terraces per holding (metres);

D1 = dummy variable for the tea smallholding where
D1 = 1 for mixed stands
= 0 for pure stands ;

D2 = dummy variable for fertilizer application in 1982 ;
0 for those smallholdings not using fertilizers in 1982.

E = random error

The amount of green tea produced (Y shows a seasonal variation. For example), a moderate yield of tea occurs from June to December. In the dry months of January, February and March it is almost 50 percent of the moderate yield. In the flush season of April and May the yield is almost twice that of moderate yield. The immature green tea is generally plucked once in 2 weeks. Therefore, the amount of fertilizer (F) used is important for the growth of the tea bushes. Tea Research Institute (1973) showed that the amount of labour used in tea plucking of green tea (L) determines the green tea output per ha. The plucking is generally a specialized job done by the female labour. In Nuwara Eliya district of Sri Lanka the tea is grown on sloping lands and hence the soil conservation measures have an indirect effect on yield. The predominant soil conservation practices include the construction of terraces and drains. The length of the terraces and drains are determined mainly by the slope of the land (T). The dummy for the mixed/pure tea (D1) is included in the function as the productivity of green tea varies by the type of the stand. The fertilizer applied in the previous year (D2) have a carry over effect on the tea yields of the current year. Some of the tea smallholders fertilize their tea extent every alternate years.

Results and Discussion

The first part of this section is concerned with the management practices and yield levels of the tea smallholders of Kotmale in Nuwara Eliya district. The regression results are presented later.

Several management practices such as weeding, pruning, terracing and drain maintenance, vacancy filling, fertilizer application and shade control were adopted by the tea smallholders in the study area.

The weeding practices were adopted by all the tea smallholders in the sample, although the frequency and the method of weeding differed among the growers. For instance, the frequency of weeding varied from two to six month intervals. Seventy four percent of tea smallholders in the sample weeded their tea blocks once in every two to three month period. Nearly 26 percent did it once in every four to six month period. Ninety eight percent of the tea smallholders adopted manual method and the others practised chemical weeding.

Pruning of tea was done by all the tea smallholders in the sample. The length of the pruning cycle among tea smallholders varied between 2—6 years. For example, 66 percent of the farmers pruned their tea once in 2—3 years and nearly 30 percent once in 3—6 years. Nearly 4 percent did not have a regular pruning cycle. Eighty six percent of the tea smallholders adopted light pruning[1] and others practised either rim lung[2] or collar pruning[3] of their tea stands. Nearly 54 percent of the tea smallholders pruned all tea bushes in their blocks at the same time. Others divided the tea lands into 2—3 blocks and pruned each block separately at different intervals. Thirty three percent of the tea smallholders delayed their pruning owing to lack of sufficient funds, According to the cultivators the labour cost for pruning was nearly three times that of other management practices.

Seventy six percent of the tea smallholders constructed drains and 90 percent maintained them properly by cleaning and desilting them once a year. Thirty one percent has terrraces in their tea blocks, although none of them maintained such terraces. The construction of terraces required materials such as rocks and boulders and the cost of labour for terracing was almost twice as high as the preparation of drains in the study area.

Most of the tea extents owned by the smallholders were 10—20 years old and hence infilling of tea was relatively important. Thirty six percent of the tea smallholders filled their vacancies 2—3 times over last 10—20 years. Nearly 72 percent of them obtained the planting materials for infilling from their own nurseries.

Twenty four percent of the tea smallholders in the study area applied fertilizers annually. This figure represented 7 percent of growers with mixed stands and 17 percent with pure stands of tea. This suggests that only few smallholders with mixed

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1. In the light pruning method the tea bush is cut at a height of 2 feet above the ground level leaving 6—10 branches with leaves.

2. In rim lung pruning 1—2 side branches are left unpruned and all other branches are cut at a height of 1½ feet above ground level.

3. In collar pruning the entire bush is cut at a height of 1 foot above ground level.

stands of tea fertilize their tea regularly. Sixty two percent of the fertilizer users apply the recommended mixture, but none the recommended dosage of 200 Kg/ha. Majority of these tea cultivators purchased their fertilizer from the green tea collectors in the study area. This is an unreliable system because these collectors would transport fertilizer only if there is sufficient demand for fertilizers in the area. The yield of green tea of fertilizer users was significantly higher than the non fertilizer users.

Eighty three percent of the tea smallholders plucked their tea once in 15 days. Thirty nine of them used unskilled labour at a lower cost for this operation. This practice leads to substandard plucking and improper maintenance of plucking table. The average green tea yield was 2095 Kg/ha/annum in the study area. The variation of green tea harvested ranged from 726—8355 Kg/ha in the studies sample. The highest average yield of 2438 Kg/ha was found in 0.1—0.3 ha size extent of tea. The average green tea yields of 2080, 2100 Kg/ha were reported for mixed and pure stands of tea respectively. The highest yield per ha was obtained during the flush period-ie. from March to May. During May—December the overall yields obtained was nearly 50 percent of the yield between the flush period. In the dry season-ie. from December-February the yield was nearly 25 percent of the yield in the flush period.

The marketing of green tea is also an important aspect of production of the tea smallholding sector. In the study area only the private tea leaf collectors dominate the green tea market, The establishment of a properly organized market system in the study area would reduce the oligopolistic structure of the green tea market and would help to develop a fair price mechanism for the green tea producers, The prompt and punctual payment for green tea collected, financial advances, collection of green tea at farm gate should be taken into consideration for an improved marketing system in the study area.

Regression Results

The green tea yields (Y) was fitted as a function of the amounts of fertilizer (F), plucking labour (P), land extent (L), terraces (T), dummies for the type of tea stand (D1) and fertilizer application in 1982 (D2). Three Cobb-Douglas production functions were fitted for pure, mixed and pooled (Pure and Mixed) stands and estimated by the ordinary least squares, Achows test was performed to determine whether there is a significant difference among the parameters of the production functions for mixed and pure stands. The calculated F ratio was 1.141 and not significant at 5 percent level of significance. This implies that the parameters of the 'mixed' production function are not significantly different from the 'pure' production function, Therefore the mixed and the pure stand data could be pooled together for estimation and this function will explain the variability of output of both types of stands (Table 2).

The high R^2 value of the pooled production function suggests that 92 percent of the variation of green tea output could be explained by the explanatory variables. The other variations can be attributed to variables such as soil type , management. climate, etc. which were not included in the function. The coefficient of all the variables except the dummy for fertilizer use in 1982 were significant. All the parameters were of the correct sign. The returns to scale of 1.307 suggests that if the inputs of the production function are simultaneously increased by 1 percent, there would be an increase of 1.3 percent in the output of green tea. This result is acceptable as most of the tea smallholders use low levels of input and there is a great potential to improve the output of green tea by increasing the input levels.

The regression coefficients of the variables of the Cobb-Douglas production function directly gives the input elasticities. Table 3 shows the geometric means, marginal value product (MVP), marginal factor cost (MFC), and the pricing efficiency (= MVP/MFC) of each input. The MVP of an input was obtained at the geometric mean level of output, when each input is held constant at its geometric mean level. The ratio of MVP/MFC was statistically tested with the null hypothesis that the ratio equals one.

Table 2. — Regression Coefficients of the Cobb-douglas Production Function for Green Tea in Kotmale

Variables	*Coefficents*
Fertilizer (F)	0.0884**
	(3,6747)
Plucking labour (P) ..	0.5703**
	(9.1373)
Land (L)	0.3139**
	(4,0450)
Length of Terraces (T) ..	0.0349*
	(1.9766)
Type of Tea Stand (D1) ..	0.1665*
	(2.2585)
Fertilizer Application in 1982 (D2) ..	0.1337
	(1.2814)
Constant	71.1210
R^2	0.9265
F	63.62

** Significant at 1% level

* Significant at 5% level

Figures in parentheses are the calculated t values.

The results suggest that if the amount of fertilizer could be increased by 10 percent, the yields of green tea would show a 0.9 percent increase. Accordingly, increasing the fertilizer would be beneficial in terms of yield only to a limited extent. This may be due to several reasons. For example, majority of the tea smallholdings in the study area were planted with seedling tea with low response to fertilizer and were exposed to severe soil erosion. Consequently the erosion of the top soil retards the fertilizer absorption of the tea plant. The results of the dummy for the fertilizer applied in 1982 suggests that there are no carry over effect of fertilizer on yields. The MVP for fertilizer shows that the total value product would increase by Rs. 320 by the addition of 100 Kgs. of fertilizer per smallholdings. The pricing efficiency of fertilizer equals 1.15 and is significant at 1 percent level. This result may be due to—

Table 3. — Geometric Mean, Marginal Value Product (MVP) Marginal Factor Cost (MFC) and MVP/MFC Ratio by Inputs

Inputs	*Geometric mean*	*MVP (Rs.)*	*MFC (Rs.)*	*MVP/MFC*
Fertilizer	103.4 .. kgs.	3.20 ..	2.79 .. (Rs./kg.)	1.147 ** (5.769)
Plucking labour ..	54.37 .. Mandays	39.27 ..	19.20 .. (Rs/manday)	2.044* (2.083)
Land	0.34 .. hac.	3486.55 ..	3125 .. (Rs./ha)	1.1157 0.005)
Terraces	58.83 .. metres	2.42 ..	3.13 .. Rs./yet	0.77* (2.751)

** Significant at 1 % level

* Significant at 5% level

Figures in parentheses are the calculated t values

(i) the poor financial ability of the tea smallholders which does not allow them to use adequate dosage of fertilizers on tea. because of the high costs involved ;

(ii) difficulties in procurement and transport of fertilizers.

A 10 percent increase in the amount of plucking labour results in a 6 percent increase of the green tea yields. The number and the skill of the plucking labour directly determine the quantity and the quality of the green tea. In addition, the maturity of the plucked bushes too determines the extent of yields. The MVP for plucking labour implies that an addition of 100 man days of plucking labour would increase the total value product by Rs. 393. The pricing efficiency is greater than one and is significant. Abeysekera (1971) reported that the high rate of the unemployment prevalent in the tea smallholdings makes MVP for labour to be near zero leading to over utilization of labour in green tea. However, there is under utilization of labour in plucking. in the study area which may be explained in terms of high cost of plucking and the skill required. The tea holdings in the study area also demands a substantial amount of plucking labour during peak plushing periods. Nearly 39 percent of the tea smallholders use unskilled labour for plucking due to the high wages and inadequacy of the experienced labour.

The input elasticity of land indicates that doubling the existing land area would increase the yield of green tea by 30 percent. Nearly 50 percent of the tea smallholdings are mixed stands and hence doubling of such land would not double the extent under tea. The ratio of MVP to MFC was not significantly different at 5 percent level. This result indicates inefficient utilization of land under smallholdings. Nearly 35 percent of the tea smallholdings in Kotmale were initiated under aid schemes and another 45 percent due to fragmentation of the large tea estates. Although these lands were properly utilized in the 1960' s due to the higher costs of labour and inputs as fertilizers and poor prices of green tea resulted in mismanagement in the 1970's.

The input elasticity for the length of terraces has the least contribution to the out put of green tea. A 10 percent increase in the length of terraces results in a 3 percent increase in the output of green tea. The length of terraces does not directly determine the output of green tea. This practice conserves the top soil from erosion and make the land more favourable for crop growth. As the top soil plays an important role in plant nutrient absorption terracing would indirectly improve fertilizer absorption– leading to higher yields of green tea. The substantial low contribution of terraces to the yield would result in a low MVP. In addtion, the high MFC would result due to higher wages and high cost of building materials for terracing.

Technical Efficiency of Tea Smallholdings

The technical efficiency of a tea smallholding indicates the value of additional output of green tea if that holding was operating on the most efficient production frontier. The most efficient production frontier for the tea smallholdings in the sample was obtained from the pooled Cobb-Douglas production function by adding the intercept to the largest of the estimated positive residual. This equation is represented by the form,

$$Y = 128.168\, F^{0.08846}\, P^{0.5703}\, 2^{0.3139}\, T^{0.0349}\, D_1^{0.1665}\, D_2^{0.1337}$$

The technical efficiency measure for each of the tea smallholdings is shown in table 4. It varies from 32-100 percent. Th e increase in the technical efficiency of the sample equals to 57 percent. This implies that the tea smallholders obtain almost half of the maximum possible output of green tea, on the average. Nearly

Table 4. — Technical Efficiency Index for Tea Smallholdings in Kotmale, Nuwara Eliya District N=70

Rank Number	*Technical Efficiency Index*
1	1.0
2	0.97
3	0.93
4	0.87
5	0.83
6	0.80
7	0.75
8	0.75
9	0.74
10	0.73
11	0.72
12	0.72
13	0.70
14	0.78
15	0.67
16	0.67
17	0.66
18	0.66
19	0.66
20	0.65
21	0.65
22	0.64
23	0.63
24	0.62
25	0.61
26	0.61
27	0.60
28	0.59
29	0.57
30	0.57
31	0.56
32	0.56
33	0.56
34	0.56

Rank Number	*Technical Efficiency Index*
35	0.56
36	0.56
37	0.56
38	0.55
39	0.54
40	0.54
41	0.54
42	0.53
43	0.52
44	0.52
45	0.51
46	0.51
47	0.51
48	0.50
49	0.49
50	0.49
51	0.48
52	0.48
53	0.48
54	0.47
55	0.46
56	0.46
57	0.44
58	0.43
59	0.42
60	0.42
61	0.41
62	0.40
63	0.40
64	0.39
65	0.38
66	0.38
67	0.34
68	0.33
69	0.33
70	0.32
Mean	0.57

19 percent of the tea smallholders are at least 70 percent technically efficient and 33 percent are less than 50 percent efficient. The mean efficiency of the mixed and pure tea smallholders are almost the same (Table 5). The distribution of the efficiencies of these two types of stands show a similar pattern. The main technical

efficiency of the first 50 percent of the mixed tea holdings and pure tea holdings are 70 and 67 percent respectively. However this result is not substantial to determine that the mixed tea stands are better than pure tea stands with respect to the technical efficiencies.

In general, majority of the tea smallholders were not successful in producing maximum output of green tea irrespective of the stand differences (Table 6).

Policy Implications

The results of the study showed that all the management practices were adopted inefficiently by the Tea Smallholders in the Kotmale area. Although the application of fertilizer was an essential practice it was adopted by few smallholders. Their applications were less than the recommended dosage. The availability of the supplies of fertilizers, lack of capital, lack of knowledge of application restricted the use of fertilizers among tea smallholders. The TSHDA could take effective measures to meet the smallholders fertilizer requirements. The establishment of fertilizer distribution centre, fertilizer extension services, credit scheme and subsidizing the market price of fertilizers for tea may improve the levels of fertilizer used by the tea smallholders. The soil conservation practices should also be encouraged with fertilizer application among the tea smallholders to ensure the benefit of such a fertilizer package.

The use of unskilled labour in plucking resulted in substandard plucking of the tea bushes. The use of family labour and training of such labour for plucking operations has a beneficial impact. This would tend to decrease the demand for labour in the peak periods and would reduce the cost of plucking.

The elasticity results implied decreasing returns to scale of tea smallholdings in the study area, This may be due to the existence of vacancies in the pure stands and intensive cultivation of other crops in the tea mixed stands. The tea smallholders should be encouraged through provision of good quality planting material at a low cost subsidies to fill their vacancies. The TSHIDA could initiate the supply.

Table 5.—Technical Efficiency Index of Mixed and Pure Stands of Tea Smallholdings in Kotmale, Nuwara Eliya District

Pure Stands (N=39)		*Mixed Stands* (N=31)	
Rank No.	*Technical Efficiency*	*Rank No.*	*Technical Efficiency*
1	0.87	1	1.0
2	0.83	2	0.97
3	0.80	3	0.93
4	0.75	4	0.75
5	0.73	5	0.74
6	0.72	6	0.70
7	0.72	7	0.66
8	0.68	8	0.66
9	0.67	9	0.64
10	0.67	10	0.63
11	0.66	11	0.62
12	0.66	12	0.60
13	0.65	13	0.56
14	0.61	14	0.56
15	0.61	15	0.56
16	0.59	16	0.54
17	0.57	17	0.52
18	0.57	18	0.52
19	0.56	19	0.50
20	0.56	20	0.49
21	0.56	21	0.49
22	0.56	22	0.48
23	0.55	23	0.47
24	0.54	24	0.46
25	0.54	25	0.43
26	0.53	26	0.42
27	0.51	27	0.41
28	0.51	28	0.40
29	0.51	29	0.40
30	0.48	30	0.39
31	0.48	31	0.34
32	0.46		——
33	0.44	Mean	0.575
34	0.42		——
35	0.38		
36	0.38		
37	0.33		
38, 39	0.32		
Mean	0.572		

Table 6.—Actual and Estimated Maximum Output for Smallholder Green Tea in Kotmale, Nuwara Eliya District

Case Number	*Output Actual (Kgs)*	*Estimated maximum (Kgs)*	*Case Number*	*Output Actual (Kgs)*	*Estimated maximum (Kgs)*
1	848	1673	36	494	694
2	594	1226	37	422	760
3	710	2200	38	405	915
4	1764	2352	39	1160	1983
5	432	795	40	1490	2659
6	760	1175	41	714	984
7	296	579	42	2304	4786
8	296	523	43	840	1408
9	468	589	44	564	1088
10	512	761	45	426	910
11	628	922	46	368	926
12	1020	1843	47	2214	4785
13	1671	2335	48	396	631
14	708	1339	49	212	488
15	526	1149	50	1200	2431
16	438	818	51	524	1206
17	326	579	52	2110	3014
18	232	453	53	3150	6431
19	194	581	54	350	891
20	256	671	55	800	1214
21	738	847	56	458	1110
22	2320	3172	57	800	1216
23	684	827	58	1280	1728
24	1080	2256	59	586	1082
25	508	1600	60	860	927
26	406	667	61	3460	3460
27	878	1215	62	528	826
28	300	460	63	402	770
29	522	933	64	181	533
30	440	1153	65	876	2068
31	552	834	66	462	920
32	500	886	67	3630	6535
33	218	523	68	496	795
34	348	614	69	552	570
35	556	937	70	444	1106

of planting materials through the establishment of nurseries and also execute a replantng/infilling programme in the study area. The cultivation of other crops in the tea mixed stands has not reduced the allocative efficiency of land in relation to the green tea leaf production. The analysis of technical efficiency showed that there is substantial variation in the technical efficiency of tea smallholdings. The results showed that nearly half of the smallholders in the sample did not obtain even 50 percent of the potential yield which could have been obtained if they had allocated their inputs optimally, The inefficient smallholders in the tea small holding sector could be identified through such technical measure and the necessary incentives required to inprove their productivity could be provided. There is no significant difference of green tea production between the mixed and pure stands.

Therfore it is advantageous for the smallholders to maintain their tea mixed holdings as it would (a) provide an additional income from other crops grown and (b) reduce the risk of dependence on tea production facing variation of market prices. However, it is useful to estimate the optimum number of other crops to be grown with tea.

The tea smallholders in the study area has not been supported by organized aid scheme since 1960's . The ASHDA hence should improve their technical and extension services to such areas for improved productivity of tea.

Limitations of tbe Study

The basic model that is fitted to determine the efficiencies assumed perfect competition. However, there is a possibility of imperfect competition to exist due to the structure of the green tea market. Presently efficiency studies are done using profit function approach. However, this method requires the use of simultaneous equation techniques. At the time of this study such facilities were not available at the University of Peradeniya. Owing to the financial and time constraints the sample of this study could not be expanded. Hence, the implications obtained from this study may not be successfully applicable to other tea smallholding areas.

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