

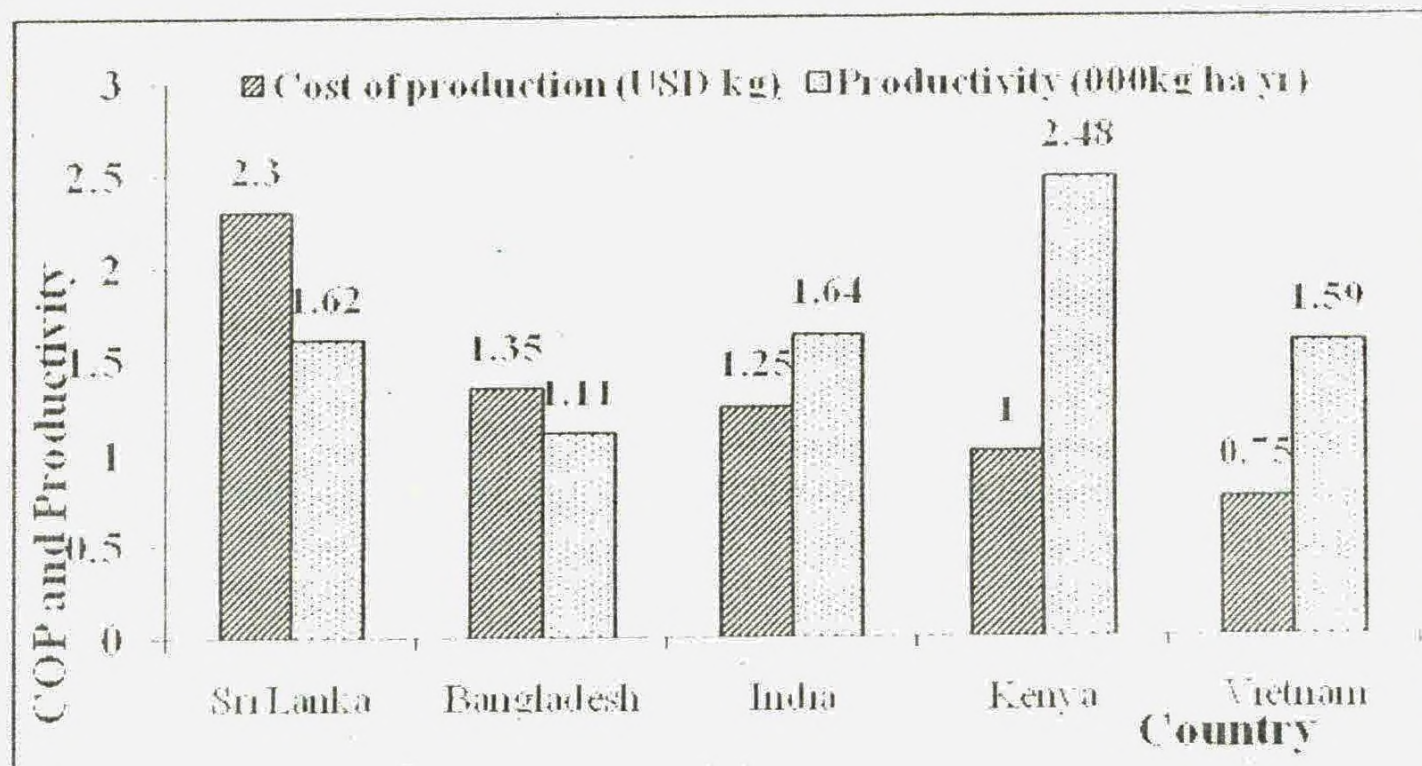
## STRATEGIC COST MANAGEMENT FOR PROFITABILITY OF TEA PLANTATIONS

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Tea industry is very important to the Sri Lankan economy as tea occupies 5% of cultivated land area, absorbs 13 % of labour force & accounts for over 1% of GDP. Tea industry remains a vital contributor to country's exports (16%) earnings too. However,



success of an industry producing an internationally traded commodity lies in its competitiveness in terms of quality and cost. Average productivity and the cost of production (COP) are the main determinants of the competitiveness of a tea producing country compared to another. Figure 01 shows the position of Sri Lankan tea industry in terms of cost of production and productivity. The highest cost of production is reported in Sri Lanka and its productivity is also relatively low in comparison to other tea producing countries.



Source: Plantation Sector Statistical Pocket Book, Ministry of Plantation Industries

**Figure 01. Cost of Production & Productivity in Major Tea Producing Countries**

An attempt was made in this paper to review the past performance of tea estates and identify strategies required for improving profitability of estates.

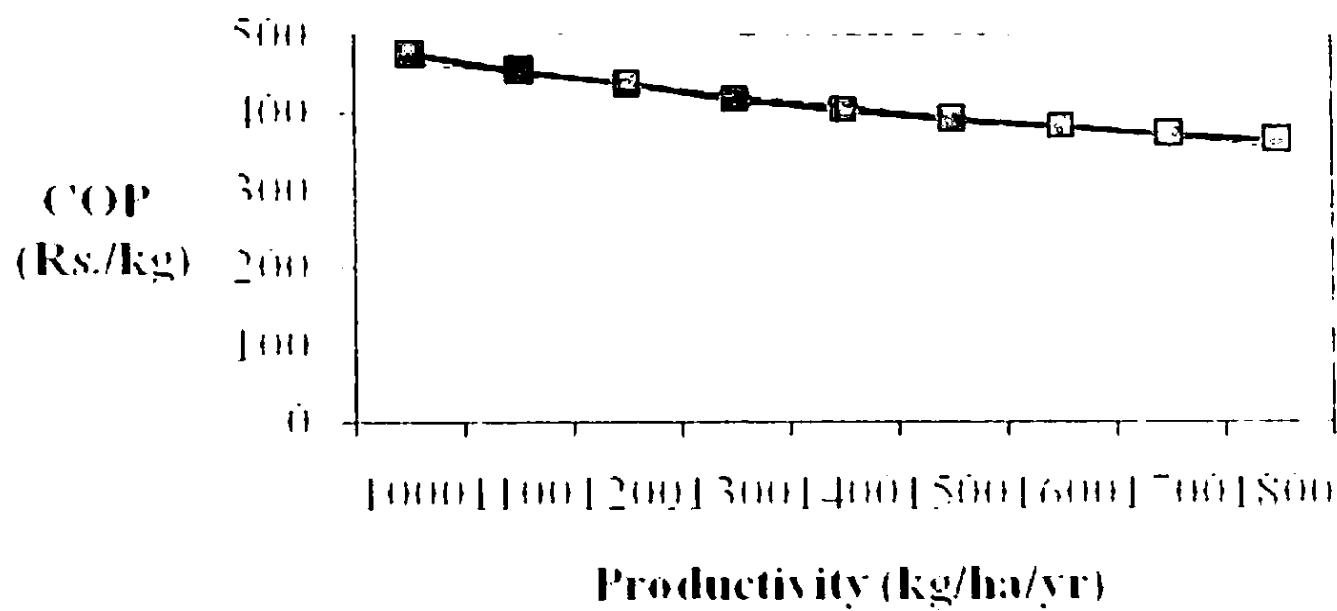
### Past Performance of Tea Estates

Reviewing the past performance is important to identify current position, resource allocation and to improve the performance towards the sustainability. There is a strong negative correlation between productivity and cost of production in tea sector (Figure 02). In the recent past, market prices of tea have not increased keeping in pace with the rising cost of production in Sri Lanka, putting downward

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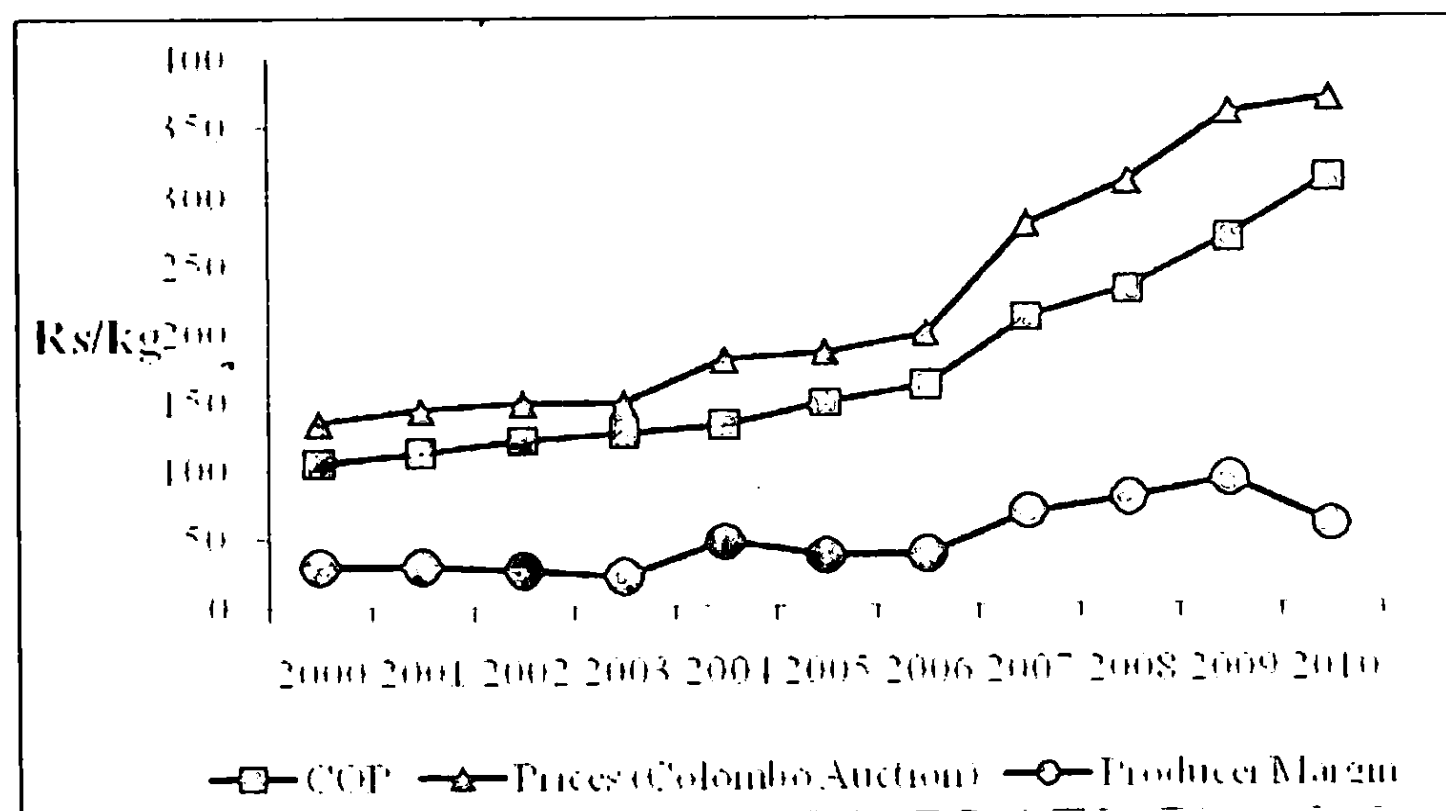
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pressure on profitability and income (Figure 03) of tea plantations. One factor which is closely related to the cost of production is, land productivity in terms of volume per hectare which is affected by change in climate, soil fertility, age of the tea bush, poor agricultural practices etc. The other factors contributing to the high cost of production are; high labour demand, high cost of farm inputs, high cost of energy/fuel at the factories, high cost of transport due to high fuel prices & poor road conditions. Tea is a high labour demanding crop as most of the cultural practices are manually undertaken. Labour cost accounts for around 65% -70% of the unit cost of production and approximately 55 percent of that labour cost is on plucking. The productivity of field and factory workers is also considered to be low in Sri Lanka.



Source: Agricultural Economics Division

Figure 02. Relationship between COP and Average Productivity



Source: Plantation Sector Statistical Pocket Book, Ministry of Plantation Industries

Figure 03. COP, Prices & Producer Margin

### Efficiency Measures

There are different indicators to measure the performance of any business. These are categorized as physical and financial efficiency measures. Land labour ratio, average productivity, revenue labour output and total productivity index (TPI) are some of the physical measures that can be used to measure performance. Table 01 presents land labor ratio and productivity of well performed and poorly performed tea estates. The data shows that estates are facing a threat of the fast declining labour force and stagnated or declining productivity. Land labour ratio has decreased both in well performed and poorly performed estates, mainly due to less labour force. The revenue labour output (RLO) can be used to evaluate labour productivity. High RLO indicates better performance of the estate. Total Productivity Index measures the overall performance of the estate. TPI of well performed estate is always greater than wage cost for the unit (Table 02). The formula for calculating RLO & TPI are given below.

$$\text{Revenue Labour Output (RLO)} = \frac{\text{Estate production}}{\text{Total Man days}}$$

*Total Productivity Index (TPI)*

$$\text{Equivalent labour units} = \frac{\text{Estate revenue expenditure}}{\text{Daily wage}}$$

$$\text{Total Revenue Output} = \frac{\text{Estate production}}{\text{Equivalent labour units}}$$

$$\text{Total Productivity Index (TPI)} = \text{Total Revenue Output} * \text{NSA}$$

**Table 01. Land Labour Ratio & Productivity**

Year	Well Performed Estate				Poorly Performed Estate			
	Productivity (kg/ha/yr)	Extent (ha)	Labour force	Land Labour Ratio	Productivity (kg/ha/yr)	Extent (ha)	Labour force	Land Labour Ratio
2000	2254	230.7	685	2.97	1269	244.88	785	3.21
2001	2261	234.00	664	2.84	1255	245.17	757	3.09
2002	2010	242.25	607	2.51	1288	228.17	73	3.20
2003	2145	248.50	549	2.21	1181	227.33	763	3.36
2004	1581	248.50	530	2.13	1242	226.83	727	3.21
2005	1868	229.00	522	2.28	1351	225.83	742	3.29
2006	2036	229.00	567	2.48	998	230.36	714	3.10
2007	2117	229.00	560	2.45	1151	235.16	729	3.10
2008	2228	229.00	546	2.38	1107	226.74	659	2.91
2009	2287	229.00	521	2.28	1189	227.33	645	2.84
2010	2386	228.00	516	2.26	1264	227.58	615	2.70
2011	2281	228.00	489	2.14	1311	227.58	615	2.70

**Table 02. Revenue Labor Output (RLO) & Total Productivity Index (TPI)**

Year	Wage rate (Rs./day)	Well Performed Estate		Poorly Performed Estate	
		RLO	TPI	RLO	TPI
2000	136.00	3.41	175.95	2.24	159.91
2001	165.15	3.58	186.90	2.26	180.7
2002	165.15	3.98	201.34	2.23	170.93
2003	200.25	3.41	207.75	2.39	194.64
2004	200.25	2.94	205.82	2.16	215.01
2005	285.50	2.92	295.96	2.13	290.66
2006	285.50	4.03	323.59	2.19	296.46
2007	320.00	3.32	428.60	2.36	338.40
2008	320.00	3.44	504.43	2.14	387.64
2009	447.75	3.49	654.06	2.42	416.38
2010	447.75	3.46	713.68	2.32	571.19
2011	572.00	3.21	622.21	2.41	400.40

**Table 03. Financial Efficiency Measures**

Year	Well Performed Estate		Poorly Performed Estate	
	B/C Ratio	Profit Margin (Rs./kg)	B/C Ratio	Profit Margin (Rs./kg)
2000	1.28	24.65	1.17	20.09
2001	1.29	28.71	1.09	10.50
2002	1.13	15.04	1.04	4.23
2003	1.00	0.20	0.97	-4.25
2004	1.00	0.16	1.07	12.53
2005	1.03	4.44	1.02	2.99
2006	1.04	5.97	0.93	-16.60
2007	1.01	2.07	1.06	14.55
2008	1.34	67.98	0.87	-39.88
2009	1.13	27.61	0.93	-26.37
2010	1.46	107.65	1.00	0.49
2011	1.38	91.39	0.70	-136.12

Benefit/cost ratio and profit margin are used to measure financial efficiency. In well performed estate benefit/cost ratios are often greater than one and profit margins are relatively high (Table 03).

### Strategic Cost Management

Ultimate objective of any entrepreneur is maximizing the profit. Profit is the difference between price of product and COP. Therefore, it is imperative to maintain a minimum cost and obtain a high price to ensure better profit margin. It is necessary to identify factors affecting COP in order to control the cost. The cost of plucking which is the highest cost component depends on many factors. Land and labour productivity are the most important factors affecting the cost of plucking. Land productivity may differ with type of tea, age of tea, weather pattern, field condition and management practices.

If the Sri Lankan tea is to be very competitive in the global market and make our tea industry sustainable, it is very necessary that the COP is controlled by improving land and labour productivity. As the labour related costs contributes to the largest share of the COP, proper deployment of workers and use of labour saving techniques should be adopted by the estates. Monitoring and supervision (Plucker intake, output/worker etc), contractual plucking, block plucking, shear harvesting, reduction of below norm pluckers, adopting good agricultural practices (shorter plucking rounds & correct length of pruning cycle), diversify unsuitable fields, proper labor deployment, replanting & infilling are some of the strategies available for improving land and labour productivity thus controlling cost.

In this paper, some of these strategies were analysed using estate & experimental data and hypothetical values and examined the effectiveness of those strategies towards cost management.

### Offering Contract Work

**Table 04: Cost management with contractual plucking**

Crop (G.l/ha/yr)	10872
Intake (kg/worker day)	27.82
Average norm (kg/day)	18
Over kilos %	9.82
Plucking cost (Rs./ha)	2,88,777
Plucking cost with 10% cash plucking (Rs./ha)	2,83,152
Saving (Rs/ha.)	5,624
Saving (Rs./kg made tea)	2.41

Some estates offer field activities such as plucking, weeding, pruning etc. on contractual basis. Cost of contractual plucking was analyzed using the data collected from the estates and compared with normal plucking practice. Saving from contractual plucking was estimated to be Rs.2.41 per kg of made tea (Table 04).

**Block Plucking**

Block plucking (entrusting a separate block of tea to a worker) has also been considered to be an efficient system of plucking in tea estates. Table 5 shows that block plucking has reduced the cost of plucking by Rs. 17.69 per kg of made tea in comparison with normal plucking.

**Table 05 Cost saving from block plucking**

	<b>Normal plucking</b>	<b>Block plucking</b>
Made Tea (kg)	12231	11565
No. of pluckers	2615	2123
Plucking cost (Rs.)	1,751,211	1,451,249
Plucking cost (Rs./Kg)	143.18	125.49
Average plucker intake (kg/day)	18.99	19.79
Below norm plucker %	15.41	9.68
Saving (Rs/kg of made tea)	17.69	

**Plucking with TRI Selective Tea Harvester**

Improvement of plucker intake, fixing plucking norms depending on growing seasons (rush crop & lean periods) and category of fields (high & low yield) and mechanization of harvesting have been identified as the most effective means of reducing cost of plucking in the field. Use of TRI Selective Tea Harvester helps increasing plucker intake, allowing them to pluck more over kilos and reducing below-norm pluckers with less labour requirement for plucking. The impact of below norm pluckers on cost of plucking and cost benefit of using the TRI Selective Tea Harvester are presented in table 06 & 07 respectively.

**Table 06 Impact of below-norm pluckers on plucking cost**

<b>Below-norm pluckers</b>	<b>Pluckers No/ha/yr)</b>	<b>Plucking Cost (Rs/kg, MT)</b>	<b>Saving (Rs/kg)</b>
With 30% below-norm pluckers	517	163.81	-
Reduce below-norm pluckers by 10 %	511	162.09	1.72
Reduce below-norm pluckers by 20 %	506	160.66	3.15
Reduce below-norm pluckers by 30 %	502	159.52	4.29
Reduce below-norm pluckers by 40 %	497	158.09	5.72

**Table 07 Benefits of Shear harvesting**

Intake (kg G.I./day)	Worker days	Worker cost (Rs.)	Other cost (Rs.)	Total cost (Rs.)	Rs/kg GL	Rs/kg mt	Saving/loss (Rs/kg)
18	363	207795	16347	224141	34.28	159.39	-6.01
19	344	196858	16347	213205	32.61	151.61	1.77
20	327	187015	16347	203362	31.10	144.61	8.77
21	311	178110	16347	194456	29.74	138.28	15.10
22	297	170014	16347	186361	28.50	132.52	20.86
23	284	162622	21180	183802	28.11	130.70	22.68
24	272	155846	25610	181456	27.75	129.04	24.34
25	262	149612	29686	179298	27.42	127.50	25.88
26	252	143858	33449	177307	27.12	126.09	27.29
27	242	138530	36932	175462	26.83	124.77	28.61
28	234	133582	40150	173733	26.57	123.54	29.84
29	225	128976	43149	172125	26.32	122.40	30.98
30	218	124677	45990	170667	26.10	121.36	32.02

The cost saving with TRI Selective Tea Harvester as compared to manual harvesting (20kg/day) varied from about Rs.2.00 to 32 per kg of made tea depending on the intake per plucker.

### Shorter Plucking Rounds

Advantages of shorter plucking rounds were analyzed using data of the experiments conducted by the Agronomy Division of the Tea Research Institute. Shorter plucking rounds increase tea yield and improve leaf standard with less % of coarse leaves. In this analysis it was found that there are attractive financial benefits of adopting shorter plucking round when compared with extended plucking rounds. The benefit will be much more if quality improvements i.e. high NSA due to improved leaf standard was taken into account (Data pertaining to NSA was not available). The additional income (excluding increment of NSA due to quality improvement) was in the range of Rs.31,624-118,343 per hectare for plucking intakes of 15-20kg per day (Table 08).

**Table 08 Advantages of Shorter Plucking Rounds**

	5 day interval	10 day interval	Difference
Productivity (kg/ha/yr)	3235	2393	842
Tea Price (Rs./kg)	360.51	360.51	
Revenue (Rs.)	1,166,250	862,700	303,549
Plucker requirement (man days)	758	561	197
Plucker requirement/round	8	16	-8
Cost of plucking (Rs.)	480,146	361,105	119,041
Other cost (Rs.)	520,835	454,670	66,165
Additional benefits (Rs.)			
Intake 20 kg/day	165,269	46,926	118,343
Intake 17 kg/day	111,070	46,926	64,144
Intake 15 kg/day	78,550	46,926	31,624

**Correct Length of Pruning Cycle (Up country)**

The results of the analysis presented in table 09 shows that length of pruning cycle affects the cost of production and profitability. When consider four year and five year pruning cycle for 20 years period with a recovery period of three months from each pruning, analysis show that the total crop loss and cost of pruning are comparatively high with the shorter pruning cycle. If growers in the up country follow five year pruning cycle instead of four year cycle, additional income of Rs. 10, 443/ha/yr (Rs. 5.22 per kg of made tea) can be secured from a tea field with an average yield of 2000 kg/ha/yr.

**Table 09 Benefits of Adopting Correct Length of Pruning Cycle**

	<b>Four year pruning cycle</b>	<b>Five year pruning cycle</b>
Crop loss –kg (recovery period -3 months)	2500	2000
Labour requirement (Man days)	250	200
Additional Income (Rs./ha)		
Low crop loss		1,80,255
Saving labour cost		28,600
Total		2,08,855
Annual income saving (Rs./ha/yr)		10,443
Saving Rs./kg of made tea		5.22

**Productivity improvement in marginal tea lands**

Infilling of vacancies and adoption of good agricultural practices, are considered vital for improving land productivity and reducing the COP. Infilling of vacancies aims at consolidation of tea fields, increasing pluckers intake, soil conservation and preventing soil degradation and reducing cost of weeding. Of the good agricultural practices, soil fertility improvements, appropriate plucking and pruning policies, proper shade management and timely management of pest and diseases take high priority in improving field productivity. Therefore, it is required to improve productivity of marginal tea lands as one of the important strategies to reduce COP.

The results of the analysis displayed in table 10 showed that by improving tea yield of low yielding C category fields (with a below breakeven productivity) from 1300 kg/ha/yr to 1500 kg/ha/yr, the average cost of production can be markedly reduced (from Rs. 351.63 to Rs. 339.47) with a cost saving of Rs. 12.16/kg of made tea.

**Table 10 Improve Marginal Tea Fields**

Categories of fields	Extent (ha)	Fields with below BEP		After improving below BEP fields	
		Average yield (kg/ha/yr)	COP (Estimated) Rs./kg	Average yield (kg/ha/yr)	COP (Estimated) Rs./kg
A	50	3320	310.11	3320	310.11
B	50	2228	359.48	2330	354.71
C	10	1600	402.47	1550	405.07
	10	1500	407.68		
	10	1100	462.55		
	20	900	526.35		
Average		2249	351.63	2556	339.47

**Break Even Productivity**

Break even productivity levels of different elevations were calculated using data of respective estates and given in table 11. Break even productivity in up country at current tea price and COP is 1717kg per ha per year. With an improved NSA (10% increase), break productivity reduced to 1164 kg/ha/yr. Similar results can be obtained by reducing the COP by 5% & improve NSA by 5% as shown in the table 11. Therefore, it is clear from this analysis that one can make profits from a low yielding field if costs are appropriately minimized.

**Table 11 Sensitivity of Break Even Productivity for changes of COP & NSA**

Elevation	General Charges (Rs./ha)	Variable cost (VC) -Rs./kg	NSA (Rs./kg)	Break Even Productivity (kg/ha/yr)				
				At current NSA & COP	At +10% NSA	At +20% NSA	At -5% COP	At +5% NSA & -5% COP
Up	130,088	284.23	360.00	1717	1164	880	1373	1145
Mid	120,633	303.03	342.00	3096	1649	1124	2118	1609
Uva	129,416	297.01	333.00	3595	1868	1261	2418	1822
Low	130,987	316.18	412.00	1367	956	735	1115	941

**Diversification of unsuitable lands (Fuelwood plantations)**

Lands that are unsuitable for tea cultivation can be diversified into other crops which are of economic value. Diversification of unsuitable lands may lead to improve land productivity by optimum utilization of resources. In this strategy, establishment of fuelwood plantations takes high priority. The results of the economic analysis showed that planting of *Gliricidia* spp and *Eucalyptus* spp in marginal lands is economically viable option for growers (Table 12 & 13). Planting of *Gliricidia* was analysed under two scenarios, considering wood value and wood value plus nutrient value of leaves. In both cases planting of *Gliricidia* is financially feasible.

**Table 12 Planting of *Gliricidia***

Criteria	Fuel wood value	Value of fuel wood + Leaves
Gross margin at maturity (after 4yrs) -Rs/ha/yr	61,777	82,646
Net Present Value at 20% - (Rs.)	56,623	114,288
IRR	27%	34%
Payback Period (yrs)	6	5

**Table 13 Planting of *Eucalyptus***

Criteria	Value of fuel wood + Timber
Net Present Value at 20% -(Rs.)	814,148
IRR	38%
Payback Period -(yrs)	7

Low land and labour productivity and high COP largely affect the profitability of tea estates. There is a strong negative correlation between COP and productivity and therefore, it is necessary to increase productivity in order to manage the cost. Also, estates can comfortably reduce the cost using effective cost controlling strategies such as contract and block plucking, mechanization of harvesting, shorter plucking rounds, adopting correct length of pruning cycle, improving marginal tea lands and diversifying unsuitable tea lands in to energy (fuelwood) plantations.