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REPLANTING REASSESSED

B. Sivaram and G. Ganewatte

(Consultant and Research Assistant respectively, Agricultural Economics Unit,
Tea Research Institute of Sri Lanka, Talawakelle, Sri Lanka)

Since the last TRI study on the economics of replanting was presented in March 1995, a number of developments have taken place in the tea industry which call for an updating of the findings. Essentially, the changes that have relevance to this subject are as follows:

Influenced by a combination of higher wages and material costs, the current cost of replanting and maintenance in the estate sector is now placed at about Rs 395780 per hectare (Annexe 1) - up by 24 per cent over the 1994 estimate. As with the earlier estimate, the revised figure is in keeping with the concept of Partial Analysis which incorporates only the actual replanting cost but excludes any element towards general charges. Following the last study, a TRI subgroup is working on measures to cut down the cost and period of soil rehabilitation without detriment to replanting efficiency. Meanwhile, reports of bulldozers being used for uprooting and related activities have been received which, given the favourable terrain, could bring about a cost subsidy of about Rs 35,000.00. Although the present exercise does not provide for such welcome savings on this account, individual estates might look at this possibility as well in their replanting programme.

The yield from the replanted field is now taken at a slightly higher level of 2500 kg/ha (instead of 2250 kg/ha, as earlier)

after the period of immaturity and initial lowcrop. The suggestion is that, given the availability of plants, replanting should in future be done with 3000 and 4000 series clones. A policy decision to this effect has been taken with respect to TRI estates and the point was also stressed at the 193rd E & E Meeting that genetic diversity should be the cornerstone of future planting. All the same, the economic life span of the replanted field has been retained at 25 years.

In keeping with current wages and material rates, the cost of mature tea upkeep has now been worked out at about Rs 22000 per hectare (Annexe 2). This is also higher by 15 per cent over the 1994 level.

Following the upturn in tea prices, the NSA from the replanted area is taken at Rs 119.40 per kg - the national average for the year 1997. In contrast, the corresponding figure for the last study was Rs 70 per kg. Admittedly, the 1997 market conditions need not be representative of the emerging situation and, in an effort to impart an element of flexibility in the analysis, the calculation also incorporates the break-even NSA to determine the level at which replanting becomes viable.

With the privatisation of the estate sector, ADB funding at concessionary interest rates will be forthcoming for undertaking replanting as a prime development activity. Taking this into account, a Discount Rate of 15 per cent (i.e. interest rate of 18 percent less 3 per cent rebate) has been provided for in the calculations.

As in the earlier analysis, the Net Present Value (NPV) has been used to determine the return on the investment from replanting. This is in keeping with the well-established principle that the present cash inflows should be more than the outflows for the investment to generate a surplus or for the NPV to be positive. On this basis, the

revised returns from replanting in the estate sector are presented in Table 1.

Table 1- ***Returns from Replanting in Estate Sector (Rs/ha)***

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 25
Capital Cost	101942	13965	139272	52050	43270	45282				
Mature Tea Upkeep							22015	22015	22015	22015
Yield (kg M T.)							1400	1700	2500	2500
Plucking & Manufacturing Cost							59562	69925	102270	102270
Total Cost	101942	13965	139272	52050	43270	45282	81577	91940	124285	124285
Total Revenue	0	0	0	0	0	0	167160	202980	298500	298500
Net Returns	-101942	-13965	-139272	-52050	-43270	-45282	85583	111040	174215	174215
NPV(15%)	151240									

Assumptions

Labour Wage Rs/day	95.45
Variable Manufacturing Cost Rs/kg MT	18
NSA Rs/kg	119.40

Plucking cost calculated based on TRI Monograph"Labour Economics in Tea"
Cost and returns assumed to move in parity over time

As will be seen, the NPV is positive at Rs 151,240, indicating that, in the current cost and benefit scenario, replanting at the macro-level is a viable proposition. A further inference to be drawn from the calculation is that the pay-back period to recover the capital is 10 years. It must, however, be stressed that while this represents the island-wide position, regional and elevational differences may change the NPV with variying price realised at the auction. These variations are captured in Table 2 and, as will be observed, the replanting operation is remained viable all over the country now. As could be expected, the position in the low-country is extremely favourable.

Table 2 - ***Elevational Differences in Returns from Replanting in Estate Sector (Rs/ha)***

Elevation	NSA (Rs/kg)	NPV *	Pay Back Period (yrs)
High	109.43	91179	10
Medium	107.94	.82203	10
Low	129.47	211902	9
Country Average	119.40	151240	10
Break even NSA for Estate Sector Rs/kg			96.00

It will be noticed that in the absence of any major breakthrough in replanting technology or clonal propagation, the major factor influencing the viability of replanting is the price realisation. We have, therefore, undertaken a sensitivity analysis with regard to the NSA component and find that a realisation of Rs 96.00 per kg will be the point at which the investment will break even; that is, where the NPV is zero. This is what may also be termed as the break-even NSA and if estates or groups of estates were to perceive a price realisation at or around this level, there is a good case, other things remaining more or less the same, for them to embark on a sustained replanting programme.

In translating the above model to the smallholder sector, the following adjustments have been made:

As per TSHDA feedback, the current replanting cost in low-country smallholdings is about Rs 265,000 per hectare and in the up- and mid-country about Rs 290,000. (Annexures 3A and 3B)

Taking into account the comparative advantages prevailing in the low-country with respect to yield and green leaf price potential, the cost and returns have also been arrived at separately on an elevational basis; the average yield for the replanted field has been taken at 12,600 and 11,250 kg of green leaf (equivalent to 2,800 and 2,500 kg of made tea) in the low-country and up/mid-country respectively.

At present replanting subsidy, is also available to smallholders in the low-country and up- and mid-country at Rs 57,000 and Rs 67,000 per hectare respectively.

Accordingly, the position for smallholders in low-country is summarised in Table 3. As will be seen, the NPV is positive at Rs 298,834 at this year's green leaf price realisation of Rs 19.50 or so per

kg. In fact, for the investment to break even, it could be lower at about Rs 11.00 per kg, the pay-back period being 7 years.

Table 3 - *Returns from Replanting (Smallholdings/Low-country) Rs/ha*

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 25
Capital Cost	50710	15086	110939	45750	42657				
Yield (Green Leaf kg)						6750	8100	12600	12600
Recuring Cost						61063	64516	85785	85785
Total Revenue						131625	157950	245700	245700
Subsidy	12000	6000	39000						
Net Return	-38710	-9086	-71939	-45750	-42657	70562	93434	159915	159915
NPV(15%)	298834								

Assumptions

1. Common daily wage rate of Rs 95.45 applicable to smallholder and estates
2. Plucking cost as per TRI monograph "Labour Economics in Tea"
3. Green Leaf price estimated at Rs 19.50 per kg
4. Cost and returns assumed to move in parity over time

The situation that emerges with respect to the up- and mid-country is also presented in Tables 4 and 5 respectively. Based on the 1997 estimated up-country green leaf price of Rs 16.53 per kg, the NPV is seen to be positive at Rs 147,049. The slightly lower price realisation for mid-country, estimated at Rs 16.30 per kg, also results in a positive NPV but at a lower level of Rs 139,800. Two aspects may be noted. The first is that for replanting to be viable, the green leaf price should be at least Rs 11.90 per kg - 8 per cent more than in the low-country -, the pay-back period too being higher at 8 years. The other feature is that the subsidy element is not essential to ensures a positive NPV for smallholders in the up and mid-country, unlike the situation prevailed few years back. Had there been no subsidy, the NPV for smallholders in the mid-country and up-country would have been remained at Rs 91,466 and Rs 98,715 respectively.

Table 4 - *Returns from Replanting (Smallholdings Up-country) Rs/ha*

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 25
Capital Cost	64281	15320	111241	45173	40910				
Yield (Green Leaf kg)						6300	7650	11250	11250
Recuring Cost						58105	63068	81013	81013
Total Revenue						104139	126455	185963	185963
Subsidy	16000	9000	42000						
Net-Return	-48281	-6320	-69241	-45173	-40910	46034	63387	104950	104950
NPV(15%)	147049								

Assumptions

Same as in Table 3 except for plucking calculation relevant to green leaf yield of 11600 kg/ha and green leaf price of Rs 16.53 per kg.

Table 5 - *Returns from Replanting (Smallholdings Mid-country) Rs/ha*

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 25
Capital Cost	64281	15320	111241	45173	40910				
Yield (Green Leaf kg)						6300	7650	11250	11250
Recuring Cost						58105	63068	81013	81013
Total Revenue						102690	124695	183375	183375
Subsidy	16000	9000	42000						
Net Return	-48281	-6320	-69241	-45173	-40910	44585	61627	102362	102362
NPV(15%)	139800								

Assumptions

Same as in Table 3, except for plucking calculation relevant to green leaf yield of 11600 kg/ha and green leaf price of Rs 16.30 per kg

Financial returns apart, the actual position that emerges among smallholders is their inability to suffer a crop loss on the already tiny extent, averaging barely 0.4 hectares or about 1 acre in the country, which renders conventional replanting impracticable in this sector. It is, therefore, reiterated that rather than advocating replanting *per se*, smallholders should be encouraged to undertake "block" infilling as an on-going activity and that, coinciding with the vacant patches coming into bearing, the old bushes could be culled out and planted with grass and subsequently with proven material as the next and subsequent phases in infilling so that the plant population eventually reaches about 12,500 per hectare. Such a phased-out programme would appear to be an appropriate "replanting strategy" for smallholders.

Annexure 1 Replanting Cost for Estates

(Rupees per hectare at 1996)

Operation	Labour									Materials										Grand Total	
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total Man days	Total Project Cost	Percent of Cost	Unit	Unit Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total Units	Total Cost	Percent of Cost	Overall Cost	Percent of Cost
	(Mandays)											(Units)										
Survey							0	0.00	0		1500.00	1						1	1500.00	1	1500.00	0.4
Uprooting - Tea	280						280	26726.00	10									0	0.00	0	26726.00	6.8
Lining & Pegging(Tea)			100				100	9545.00	4									0	0.00	0	9545.00	2.4
Teracing	50	4	4	4	4	4	70	6681.50	3									0	0.00	0	6681.50	1.7
Lining & Pegging(Drains)	5						5	477.25	0									0	0.00	0	477.25	0.1
Forking & Leveling	350						350	33407.50	13									0	0.00	0	33407.50	8.4
Holing			150				150	14317.50	6									0	0.00	0	14317.50	3.6
Filling Holes			34				34	3245.30	1									0	0.00	0	3245.30	0.8
Planting High Shade	12						12	1145.40	0	plants	2.00	67						67	134.00	0	1279.40	0.3
Planting Low Shades	35						35	3340.75	1	plants	3.00	268						268	804.00	1	4144.75	1.0
Planting Grass	100						100	9545.00	4									0	0.00	0	9545.00	2.4
Planting Tea			125				125	11931.25	5	plants	3.50			12500				12500	43750.00	32	55681.25	14.1
Roads & Paths	50	5	5	5	5	5	75	7158.75	3									0	0.00	0	7158.75	1.8
Drains & Silt Pits	30	20	20	20	20	20	130	12408.50	5									0	0.00	0	12408.50	3.1
Ravines & Boundries	5	5	5	5	5	5	30	2863.50	1									0	0.00	0	2863.50	0.7
Weeding	30	30	30	60	60	60	270	25771.50	10									0	0.00	0	25771.50	6.5
Dolamite Application	8						8	763.60	0	kg	2.10	1255						1255	2635.50	2	3399.10	0.9
Grass Fertilizer (U 625)	10	10					20	1909.00	1	kg	8.10	160	310					470	3807.00	3	5716.00	1.4
Tea Fertilizer (T200)			21	30			51	4867.95	2	kg	12.00			1200	1500			2700	32400.00	24	37267.95	9.4
Tea Fertilizer (T750)					24	24	48	4581.60	2	kg	12.30					1750	1750	3500	43050.00	32	47631.60	12.0
Shade & Organic Manure	5	5					10	954.50	0									0	0.00	0	954.50	0.2
Shade Infilling	5	5	5				15	1431.75	1									0	0.00	0	1431.75	0.4
Bush Cover (Crotalaria)			20				20	1909.00	1	kg	30.00	20						20	600.00	0	2509.00	0.6
Field Edges (Eragostis)			10	10	10	10	40	3818.00	1									0	0.00	0	3818.00	1.0
Lopping Grasses	20	20	72				112	10690.40	4									0	0.00	0	10690.40	2.7
Lopping Shades			6	6	6	6	24	2290.80	1									0	0.00	0	2290.80	0.6
Supplying Vacancies				18	18		36	3436.20	1	plants	3.50				1250	625		1875	6562.50	5	9998.70	2.5
Pest & Diseases			16	16	16	16	64	6108.80	2									0	0.00	0	6108.80	1.5
Blister Blight Control			10	10	10	10	40	3818.00	1	kg	213.00			0.4	0.4	0.4	0.4	1.6	340.80	0	4158.80	1.1
Couch Grass Grass Eradication		16	16	16	16	16	80	7636.00	3									0	0.00	0	7636.00	1.9
Centring				10	10	12	32	3054.40	1									0	0.00	0	3054.40	0.8
Thatching			100	100			200	19090.00	7									0	0.00	0	19090.00	4.8
Refuse Tea			100				100	9545.00	4									0	0.00	0	9545.00	2.4
Cut-Across						60	60	5727.00	2									0	0.00	0	5727.00	1.4
Mandays Total	995	120	849	310	204	248	2726	260196.70	100										135583.80	100	395780.50	100
Annual Costs	94972.75	11454.00	81037.05	29589.50	19471.80	23671.60	260196.70	260196.70				6969.50	2511.00	58235.20	22460.20	23797.70	21610.20		135583.80	100	395780.50	100
										Yearly Labour and Material Cost (Rs)		101942.25	13965.00	139272.25	52849.70	43269.50	45281.80				
										Yearly Labour and Material Cost Percentage		26	4	35	13	11	11				

Assumptions

1. Labour wages including EPF & ETF 95.45
2. Excludes General Charges which, as per estate records, constitute about 35%
3. Calculation based on 12500 plants per hectre
4. Re-applying at 10% casulties in 1st year after planting and 5% in following year
5. Thatching materials to be collect from estate
6. Blister Blight control by Perenox application as recommended

Annexure 2 Annual Average Cost of Mature Tea Upkeep (Rs/ha)

Operation	Labour Cost		Material Cost			Total Cost	Total Cost %
	Man days	Cost	Unit	Unit Cost	Quantity	Cost		
Tools		0.00	Set	1250.00	1	1250.00	1250.00	5.7
Roads & Bridge	3	286.35				0.00	286.35	1.3
Desilting & Trace Drains	11	1049.95				0.00	1049.95	4.8
Terracing	4	381.80				0.00	381.80	1.7
Weeding - Hand	22	2099.90				0.00	2099.90	9.5
- Chemical		0.00				0.00	0.00	0.0
- Labour	8	763.60				0.00	763.60	3.5
- Gramoxone		0.00	litre	240.00	4	960.00	960.00	4.4
Couch Grass Eradication		0.00						
Labour	2	190.90				0.00	190.90	0.9
Round up		0.00	litre	500.00	0.5	250.00	250.00	1.1
Ravines & boundries	2	190.90				0.00	190.90	0.9
Pruning	12	1145.40				0.00	1145.40	5.2
Shade Management	10	954.50				0.00	954.50	4.3
Bush Sanitation	5	477.25				0.00	477.25	2.2
Artificial Manure		0.00				0.00	0.00	0.00
Dolomite	6	572.70	Kg	2.10	200	420.00	992.70	4.5
U 709 (Mature Tea)	16	1527.20	Kg	8.80	922	8113.60	9640.80	43.8
Blister Blight Control	10	954.50	Kg	213.00	2	426.00	1380.50	6.3
Total	111	10594.95				11419.60	22014.55	100.0
Labour wages rate Rs. /Day		95.45						

Annexure 3A Replanting Cost for Small holdings in Low -country

(Rupees per hectare at 1997 prices)

Operation	Labour								Materials										Grand Total	
	Year 1	Year 2	Year 3	Year 4	Year 5	Total Mandays	Total Project Cost	Percent of Cost	Unit	Unit Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Total Units	Total Cost	Percent of Cost	Overall Cost	Percent of Cost
	(Mandays)										(Units)									
Uprooting - Tea	104					104	9926.80	7								0	0.00	0	9926.80	3.7
Lining & Pegging(Tea)			180			180	17181.00	12								0	0.00	0	17181.00	6.5
Teracing	100	40	10	5	5	160	15272.00	11								0	0.00	0	15272.00	5.8
Forking & Leveling	125					125	11931.25	8								0	0.00	0	11931.25	4.5
Planting High Shade	6	1				7	668.15	0	plants	3.00	100	10				110	330.00	0	998.15	0.4
Planting Low Shades	8	1				9	859.05	1	plants	2.00	420	42				462	924.00	1	1783.05	0.7
Planting Grass	54					54	5154.30	4								0	0.00	0	5154.30	1.9
Planting Tea			60			60	5727.00	4	plants	3.50			12500			12500	43750.00	35	49477.00	18.7
Weeding	30	20	100	120	120	390	37225.50	26								0	0.00	0	37225.50	14.0
Dolamite Application	2					2	190.90	0	kg	2.10	1976					1976	4149.60	3	4340.50	1.6
Grass Fertilizer (U 625)	4	4				8	763.60	1	kg	8.10	340	340				680	5508.00	4	6271.60	2.4
Tea Fertilizer (T200)			60	60		120	11454.00	8	kg	12.00			1200	1500		2700	32400.00	26	43854.00	16.5
Tea Fertilizer (T750)					32	32	3054.40	2	kg	12.30					1750	1750	21525.00	17	24579.40	9.3
Shade & Organic Manure		6	12	15	15	48	4581.60	3								0	0.00	0	4581.60	1.7
Nematicide in planting hole			4			4	381.80	0	kg	93.46			88			88	8224.48	7	8606.28	3.2
Lopping Grasses	14	56				70	6681.50	5								0	0.00	0	6681.50	2.5
Supplying Vacancies				12	6	18	1718.10	1	plants	3.50				1250	750	2000	7000.00	6	8718.10	3.3
Tools &Pest control						0	0.00	0								0	0.00	0	0.00	0.0
Blister Blight Control						0	0.00	0	kg	213.00			0.4	0.4	0.4	1.2	255.60	0	255.60	0.1
Couch Grass Grass Eradication			20			20	1909.00	1								0	0.00	0	1909.00	0.7
Centring				12	15	27	2577.15	2								0	0.00	0	2577.15	1.0
Thatching			20	20		40	3818.00	3								0	0.00	0	3818.00	1.4
Mandays Total	447	128	466	244	193	1478	141075.10	100									124066.68	100	265141.78	100
Annual Cost	42666.15	12217.60	44479.70	23289.80	18421.85	141075.10	141075.10				8043.60	2868.00	66459.68	22460.20	24235.20		124066.68	100	265141.78	100
									Yearly Labour and Material Cost (Rs)		50709.75	15085.60	110939.38	45750.00	42657.05	265141.78			
									Yearly Labour and Material Cost Percentage		19	6	42	17	16	100.00			

Assumptions

1. Labour wages 95.45
2. Calculation based on 12500 plants per hectare
3. Resupplying at 10% casulties in 1st year after planting and 5% in following year

Annuexure 3B Replanting Cost for Small holdings inUp/Mid Country
(Rupees per hectare at 1997 prices)

Operation	Labour								Materials											Grand Total	
	Year 1	Year 2	Year 3	Year 4	Year 5	Total Mandays	Total Project Cost	Percent of Cost	Unit	Unit Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Total	Units	Total Cost	Percent of Cost	Overall Cost	Percent of Cost
	(Mandays)										(Units)										
Uprooting - Tea	132					132	12599.40	8									0	0.00	0	12599.40	4.3
Lining & Pegging(Tea)			180			180	17181.00	11									0	0.00	0	17181.00	5.9
Teracing	100	40	10	5	5	160	15272.00	9									0	0.00	0	15272.00	5.3
Forking & Leveling	200					200	19090.00	12									0	0.00	0	19090.00	6.6
Planting High Shade	4	1				5	477.25	0	plants	3.00	100	10					110	330.00	0	807.25	0.3
Planting Low Shades	6	1				7	668.15	0	plants	2.00	260	13					273	546.00	0	1214.15	0.4
Planting Grass	54					54	5154.30	3									0	0.00	0	5154.30	1.8
Planting Tea			60			60	5727.00	4	plants	3.50			12500				12500	43750.00	34	49477.00	17.1
Weeding	30	20	100	120	120	390	37225.50	23									0	0.00	0	37225.50	12.8
Dolamite Application	2					2	190.90	0	kg	2.10	3952						3952	8299.20	6	8490.10	2.9
Grass Fertilizer (U 625)	4	4				8	763.60	0	kg	8.10	340	340					680	5508.00	4	6271.60	2.2
Tea Fertilizer (T200)			60	60		120	11454.00	7	kg	12.00			1200	1500			2700	32400.00	25	43854.00	15.1
Tea Fertilizer (T750)					32	32	3054.40	2	kg	12.30					1750		1750	21525.00	17	24579.40	8.5
Shade & Organic Manure		6	12	15	15	48	4581.60	3									0	0.00	0	4581.60	1.6
Nematicide in planting hole			4			4	381.80	0	kg	93.46			88				88	8224.48	6	8606.28	3.0
Lopping Grasses	14	56				70	6681.50	4									0	0.00	0	6681.50	2.3
Supplying Vacancies				12	6	18	1718.10	1	plants	3.50				1250	750		2000	7000.00	5	8718.10	3.0
Tools &Pest control						0	0.00	0									0	0.00	0	0.00	0.0
Blister Blight Control			40	40	40	120	11454.00	7	kg	213.00			0.4	0.4	0.4		1.2	255.60	0	11709.60	4.0
Couch Grass Grass Eradication			20			20	1909.00	1									0	0.00	0	1909.00	0.7
Centring				12	15	27	2577.15	2									0	0.00	0	2577.15	0.9
Thatching			20	20		40	3818.00	2									0	0.00	0	3818.00	1.3
Mandays Total	546	128	506	284	233	1697	161978.65	100										127838.28	100	289816.93	100
Annual Cost	52115.70	12217.60	48297.70	27107.80	22239.85	161978.65	161978.65				11873.20	2810.00	66459.68	22460.20	24235.20			127838.28	100	289816.93	100
							Yearly Labour and Material Cost (Rs)				63988.90	15027.60	114757.38	49568.00	46475.05	289816.93				
							Yearly Labour and Material Cost Percentage				22	5	40	17	16	100.00				

Assumptions
1. Labour wages 95.45
3. Calculation based on 12500 plants per hectare
4. Resupplying at 10% casulties in 1st year after planting and 5% in following year