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ECONOMICS OF REHABILITATING TEA LAND BEFORE REPLANTING: SOME EXPLORATION

A. Ananthacumaraswamy and A. R. Amarasekera
(Tea Research Institute of Sri Lanka, Talawakele, Sri Lanka)
and
H. M. G. Herath
(Faculty of Agriculture, University of Peradeniya, Sri Lanka)

The economics of rehabilitating tea lands using grass before replanting was investigated in this study. Both financial and economic incremental benefit-cost ratios were computed for different discount rates. It was noted that for 10% and 15% discount rates, the incremental benefit-cost ratios are very high both for financial and economic analysis. The sensitivity analysis indicated the benefit-cost ratios to be highly sensitive to price and yield changes but in general was not very sensitive to life span. It appears that rehabilitation could be recommended on economic grounds.

INTRODUCTION

Tea, is one of the most important plantation crops in Sri Lanka. Roughly 170 million kg of Sri Lankan tea are exported annually, amounting to around 25% of world demand. Revenue from tea accounts for nearly 45% of the country's export earnings. In 1984 alone, tea exports totalled a whopping $ 620 million, compared to only $ 130 million for rubber and $ 60 million for coconut products.

Tea occupies approximately 245,000 ha or 3.5% of Sri Lanka's land area. The total area under tea is distributed in three elevation zones referred to as high (1,200 m), mid (600-1200 m) and low (600 m). The proportions of tea land in these three zones are 32%, 39% and 29% respectively. Fifty seven per cent of the tea area are managed by Estates, while the remainder comprises the smallholder sector. The tea sector sustains the nation's economy and the fate of over 15 million people hinges on the success of the tea industry.

IMPORTANCE OF REPLANTING

Over 85.0% of the total area of tea are presently under seedling tea and only about 15.0% are under clonal tea with relatively high yields and other desirable attributes. Much of the seedling tea is around 60-80 years old, and many estates in Sri Lanka have reached the peak of its potential, and in others, the seedling tea is beyond its peak and appears to be declining. Decline implies reduced profitability and such tea may continue to decline until it drops below the level of economic viability.

REHABILITATION USING GRASS IN REPLANTING TEA

The growing of a crop of grass after uprooting the old tea and prior to planting the new tea is a long-established practice. The object of this practice which is referred to as soil reconditioning or soil rehabilitation is to improve the soil structure

and fertility by the addition of organic matter, and to reduce or eliminate the presence of pathogenic organisms. In tea soil reconditioning the two grasses commonly usedare Gautemala grass and Mana grass grown for a minimum period of 1½-2 years.

A question often posed in this connection, particularly by planters is whether the use of prime tea land for a two year rehabilitation process is worthwhile. They indicate that it may be more desirable to replant tea straight away without soil reconditioning. This would enable the planters to advance the receipts from the tea crop by two years. Although it is agronomically desirable to rehabilitate tea land prior to replanting, it is not known whether this is economically acceptable. The aim of this paper is to examine the economics of rehabilitation of tea land using grass before replanting.

METHODOLOGY AND DATA

Conventional benefit-cost analysis can be used to determine the benefit—cost ratios of rehabilitation of tea land using grass prior to planting tea (Herath, 1985). The data for this analysis were obtained from an experiment conducted over a period of seven years by the Tea Research Institute in Talawakele, Sri Lanka. The experiment involved a scenario where old tea land was uprooted and grass grown for two years prior to replanting. In another control experiment old tea continued to be plucked for two years and replanted immediately after uprooting. Thus replanting in both cases was done in the same year. Yield data were collected for both cases over a period of seven years (Table 1). The costs of replanting are the same in both cases. However, in the third year in the control where no rehabilitation of land using grass was done, the death rate of plants is high and additional costs are incurred in infilling. This amounts to about Rs. 4,000/ ha. Revenues from two additional years are obtained from the control. The tea yields in rehabilitated lands are higher than that from the control (Table 1). The incremental costs (annual costs from experiment—annual costs of control) and incremental benefits (annual benefits with rehabilitation—annual benefits without rehabilitation) were computed using the yield data from the experiments. These yields were then valued using a price of Rs. 25/ kg which is a reasonable average market price. The incremental costs and benefits up to the seventh year are given in Table 2. The incremental benefit from the 8th year is expected to continue for a period of 30-40 years.

TABLE 1—*Yield of tea in the Control and Experimental (kg ha^{-1}) areas*

Year	*Control (no rehabilitation)*	*Experiment (with rehabilitation)*
1 ..	800	—
2 ..	800	—
3 ..	—	—
4 ..	—	—
5 ..	655	1,382
6 ..	1,266	2,212
7 ..	1,873	2,242
8 ..	2,450	2,749

TABLE 2—*Incremental Costs and Benefits Stream (per hectare) of rehabilitating tea lands using grass*

Year	*Incremental costs (Rs.)*	*Incremental benefits (market price Rs. 25/kg)*	*Incremental benefits (shadow price Rs. 50/kg.)*
1 ..	+2,250	-20,000	-40,000
2 ..	+1,810	-20,000	-40,000
3 ..	-4,000	—	—
4 ..	—	—	—
5 ..	—	18,175	36,350
6 ..	—	23,650	47,300
7 ..	—	9,225	18,450
8 ..	—	7,475	14,950

The market price used reflects private profitability to a planter. However, it is worthwhile investigating the profitability to the nation of a rehabilitation programme. For this reason the incremental output is valued using shadow price of tea (average F.O.B. price in 1983 and 1984) which was Rs. 50/kg. The incremental benefits in shadow prices are also given in Table 2.

ANALYSIS AND RESULTS

The financial incremental benefit—cost ratios computed for two alternative discount rates are given in Table 3. The benefit cost-ratios are extremely high indicating rehabilitation using grass to be highly advantageous to any producer.

TABLE 3—*Financial Incremental Benefit-Cost Ratios (BCR) for Different Scenarios and Discount Rates.*

Scenario	*BCR at Discount rates*	
	10%	15%
Base Case		
Lifespan 30 years (price Rs. 25/kg.) ..	53·58	11·79
Sensitivity		
33% increase in lifespan ..	58·49	12·61
66% increase in lifespan ..	60·38	12·82
40% increase in price ..	73·07	15·27
33% increase in lifespan and 40% increase in price ..	79·94	16·41
66% increase in lifespan and 40% increase in price ..	82·59	16·70
80% increase in price ..	96·45	21·23
33% increase in lifespan and 80% increase in price ..	105·28	22·70
66% increase in lifespan and 80% increase in price ..	108·69	23·07

Sensitivity analyses were conducted to examine the effects of changes in prices and lifespan on the benefit—cost ratios of rehabilitation investment. The results of this sensitivity analysis are given in Table 3. Table 3 shows that an increase in

the lifespan by 33% increases the benefit—cost ratio to some extent, and when lifespan increases by 66%, there is no significant change in the benefit-cost ratios. Increase in the price showed a more marked effect on the benefit-cost ratios. Simultaneous changes in prices and lifespan shows that the effect of price increase dominates the lifespan effect. The effect of increase in output by 20% gave very high benefit cost ratios at 10.0% and 15.0% discount rate (Table 4). Thus output effect dominates even the price effect.

TABLE 4—*Financial Incremental Benefit-Cost Ratios for Different Scenarios and Discount Rates (20% increase in yield)*

Scenario	*BCR at Discount rates*	
	10%	15%
Base Case		
Lifespan 30 years (price Rs. 25)	64·30	14·15
Sensitivity		
33% increase in lifespan	70·18	15.14
66% increase in lifespan	72·46	16.68
Lifespan 30 years and 40% increase in price	90·02	22.87
33% increase in lifespan and 40% increase in price	98·26	24·25
66% increase in lifespan and 40% increase in price	101.44	24.57
Lifespan 30 years and 80% increase in price	115·74	25.47
33% increase in lifespan and 80% increase in price	126·33	27·24
66% increase in lifespan and 80% increase in price	130·43	27·69

The economic benefit-cost ratios are given in Table 5. Economic benefit-cost ratios indicate the viability of the scheme from the national view point. Economic benefit-cost ratios indicate, that rehabilitation is economically even more justifiable.

TABLE 5—*Economic Incremental Benefit-Cost Ratios for Different Scenarios and Discount Rates*

Scenario	*BCR at Discount rates*	
	10%	15%
Base Case		
Lifespan 30 years (shadow price Rs. 50/kg.)	107·16	23·59
Sensitivity		
33% increase in lifespan	116·97	25·23
66% increase in lifespan	120·77	25·63
20% increase in price	128·60	28·31
33% increase in lifespan and 20% increase in price	140·37	30·27
66% increase in lifespan and 20% increase in price	144·92	30.76
40% increase in price	150·03	33·02
33% increase in lifespan and 40% increase in price	163·76	35·32
66% increase in lifespan and 40% increase in price	169·07	35·89

TABLE 6—*Economic Incremental Benefit-Cost Ratios for Different Scenarios and Different Discount Rates (20% increase in yield)*

Scenario	*BCR at Discount rates*	
	10%	15%
Base Case		
Lifespan 30 years (price Rs. 50)	128·60	28·31
Sensitivity		
33% increase in lifespan 40 years	140·37	30·27
66% increase in lifespan 50 years	144·92	30·76
30 years lifespan and 20% increase in price	154·31	33·97
33% increase in lifespan and 20% increase in price	168·44	36·32
66% increase in lifespan and 20% increase in price	173·90	36·91
30 years lifespan and 40% increase in price	180·03	39·63
33% increase in lifespan and 40%	196·52	42·38
66% increase in lifespan and 40% increase in price	202·87	43·07

Sensitivity analysis for the economic benefit-cost ratios were also conducted. Different scenarios were examined and the results are presented in Tables 5 and 6. In general however, the economic benefit-cost ratios remain much higher than the financial benefit-cost ratios. The results in tables 5 and 6 indicate the economic benefit-cost ratios to be sensitive to yield and price than to life span.

CONCLUSION AND IMPLICATIONS

Agronomists advocate the use of rehabilitation of tea lands as a desirable agronomic practice. The economic analysis done here give unequivocal evidence that it is so. The query of the planters whether it is not worthwhile replanting tea immediately after uprooting has no economic merit. The economic analysis indicates that national profitability to rehabilitation is even higher than financial profitability. The private profitability to rehabilitation is so high however that any governmental assistance to encourage the practice do not appear to be necessary.

REFERENCES

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