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Privatization of the Plantation Sector in Sri Lanka: financial, economic and some environmental aspects

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Abstract

This study has analyzed an important development in the recently privatized large estates of the plantation sector in Sri Lanka, the substitution of rubber with oil palm. Cost benefit analysis and domestic resource cost criterion were employed to assess the financial, economic, and environmental aspects of this development. Extended cost benefit analyses were conducted to capture the carbon sequestration benefits of the two crops.

The study indicates that the current trend was caused by the continuous drop in world rubber prices from 1996-2000 due to the South East Asian (SEA) financial crisis. Because of the low price levels, the financial returns from rubber were considerably lower than oil palm during the crisis period. This situation seems to have caused private entrepreneurs to move away from rubber to oil palm.

However, this analysis indicates higher economic and environmental benefits from rubber than oil palm even at low price levels. This study thus emphasizes the importance of proper policy research to ensure the sustainable development of this vital sector in Sri Lanka.

Key words: oil palm, plantation sector, rubber, Sri Lanka

Introduction

The plantation sector in Sri Lanka covered around 760,000 hectares in 2002. Of this total area, around 24% was used for cultivation of tea, 21% for rubber, and 55% for coconut. The plantation sector contributed about 6% of the national GDP (Central Bank of Sri Lanka, 2002). Estates of 20 hectares or greater are considered to be large holdings. Foreign and a few local entrepreneurs had owned the large estates from the colonial period until these estates were nationalized in 1972. After nationalization, management of the estates was given to the state owned enterprises (SOEs). Because of the ill performances of the SOEs, management was given to 22 private companies on a five-year-management contract in 1992. In 1995, this contract was extended to a 50-year leasing agreement. The main purpose of this agreement is to ensure that the plantations are managed efficiently and effectively by transferring the full risks and benefits of such management to the private sector. By nature, private entrepreneurs are assumed to endorse any financially profitable projects, and in fact, there is a

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current trend of shifting from rubber to oil palm in the sector.

Pitigala (2000), and Kelagame (1997) have reported a qualititative overview of the privatization of the plantation sector in Sri Lanka. Accordingly, privatization presents a mixed picture in this sector. However, there are no analytical studies on post-privatization developments in the literature. Therefore, this study attempts to quantify the economic, financial, and environmental aspects of an important post-privatization development in the sector, the movement away from rubber to oil palm interaction.

Methodology

The benefit cost analysis and Domestic Resource Cost (DRC) criteria are widely used in assessing the financial and economic viability of investments. Many studies have shown that both criteria yield similar results in most cases. A study on the comparative and competitive advantage of the Sri Lankan rubber sector also confirmed this fact (Herath and Takeya, 2002). Thus the benefit cost analysis and the DRC criterions were employed in this study.

Three types of benefit cost analysis were used in this study: financial, economic, and extended analysis. Two types of DRC analysis were conducted on the financial and economic aspects. While financial analysis represents the financial worthiness of projects for individuals, economic analysis represents the worthiness of projects for the overall economy. Extended benefit cost analysis includes environmental aspects and indicates the worthiness of projects in terms of their non-market benefits.

Benefit cost analysis criteria

The benefit cost ratio (BCR), internal rate of return (IRR), and net present value (NPV) are frequently used in project analysis and each has its advantages and disadvantages (Curry and Weiss, 1994). The application of the IRR criterion becomes problematic if the internal rate of return does not exist or if there are too many of them. In addition, the rate of return is not always well defined. However, there always exists a unique NPV corresponding to any finite stream of net benefits and a given discount rate. Since the NPV is always well defined, the NPV criterion does not share the noted limitations of the IRR criterion (Joaquin, 2000). The NPV is the best criterion to use in choosing project alternatives (Curry and Weiss, 1994). Therefore, the NPV was employed as the measurement of benefit cost analysis in this study.

NPV is defined as the present worth of an income stream generated by an investment (Gittinger, 1994). The mathematical formula is given below:

$$NPV = \sum_{t=1}^{n} (B_t - C_t) \Big/ (1+r)^t$$

B_t = benefit in year t
C_t = cost in year t $(t = 1, 2 \ldots n)$
r = discount rate

Domestic Resource Cost (DRC) criteria

The DRC ratio measures the cost of domestic resources used in the production of a good in relation to the amount of domestic value addition that takes in the process. The mathematical formula of the DRC as follows:

$$DRC = \frac{\left[\sum_{j=1}^{n} DQ_j . DP_j\right]}{\left[VO - \sum_{k=1}^{m} TQ_k . TP_k\right]}$$

DQ_J = quantity of the j^{th} domestic input
DP_J = price of the j^{th} domestic input
VO = value of output in border price
TQ_k = quantity of the k^{th} traded input
TP_k = price of the k^{th} traded input

A given project is viable if the NPV > 0, and the DRC < 1. A given project is not viable if the NPV < 0 and, the DRC > 1.

Extended benefit cost analysis

There are many crop related environmental concerns like soil erosion, nutrition loss, water table depletion, ability of carbon sequestration, *etc.* It was not possible to account for all of these concerns due to the lack of data. However, we were able to assess the process of carbon sequestration, which is considered to be a non-market benefit, and the damage cost avoided method (Kualshreshtha *et al.*, 2000; Website of Ecosystem Valuation) was employed to estimate the benefit. The damages avoided method estimates values of ecosystem services based on the costs of avoiding damages due to lost services. It assumes that the cost of avoiding damages provides useful estimates of the value of ecosystems or services. In turn, this is based on the assumption that, if people incur costs to avoid damages caused by lost ecosystem services, then those services must be worth at least what people pay to replace them. The damages avoided method uses the value of the cost of actions taken to avoid damages, as a measure of the benefits provided by an ecosystem.

Accordingly, the carbon sequestration by green plants provides an environmental service as this helps to avoid the expensive carbon cleaning methods. The value of carbon sequestration was estimated as follows:

Value of carbon sequestration = (quantity of carbon sequestration) × (price of carbon)

Quantity of carbon sequestration = (NCA × LAI)

NCA = Net Carbon Absorption (tons/ ha /year)
LAI = Leaf Area Index

Amalgamated value of carbon sequestration and the financial benefits were used to evaluate the extended net present value (EXNPV).

Following Gittinger (1994), the constant price approach was employed to value inputs and outputs. The

standard conversion factor (SCF) approach was used to value all benefits and costs in border prices. In this regard, a foreign exchange premium of 10 percent was assumed to discount the distortions in the domestic economy due to tariff measures.

Discounted cash flow analysis was carried out to account for the time value of money, as the economic life spans of rubber and oil palm crops are around 30 years. An average weighted deposit rate of 11% (Central Bank, 2002) was employed to account for the opportunity cost of capital. A discount rate of 3% was employed in the sensitivity analysis. The switching–value method (Gittinger, 1994) was used to evaluate break- even prices.

Data

Land, labor, fertilizer, chemicals, planting and other materials, and general expenses were counted in the cost accounts. Crepe rubber and crude oil are the main products of rubber and oil palm respectively. Data on farm budgets were collected by a field survey of the large estates in 2003. Also, the plantation sector Statistical Pocket Book (2002) was used as a guideline for optimal estimations. The activity budgeting method (Gittinger, 1994) was employed to develop estate cost and benefit models. Both financial and economic budgets were prepared. Market prices were employed to develop the financial models. The shadow prices were used and all of the transfer payments were removed in the process of transforming financial models into economic models.

The land-leasing price of 2000 Sri Lankan Rupees (Rs.) per hectare per year was used as the land cost. A capitalized land value estimated at the rate of 11% was entered in the first year budgets of both rubber and oil palm. Furthermore, the net benefit forgone by excluding rubber was also taken as the opportunity cost of land in the estimations of the oil palm budget (ADB, 1997; Gittinger, 1994). The economic value of the land was calculated by the SCF approach.

The labor force in the large estate sector is a unique group. The workers are mostly indentured laborers of Indian origin. The current nominal wage rate is Rs.126/day. As these workers have few opportunities for employment other than as plantation laborers, we can consider the opportunity cost of these laborers to be very low. Indeed, some economists state that this value is zero (Gittinger, 1994). Considering all of these factors, the financial wage rate was discounted by 1% to obtain the economic wage rate of the large estate laborers. The market prices of planting materials, tools, and local fertilizer were assumed to represent the economic values of these items, as they are domestically produced inputs that are supplied by industries operating near full capacity (Gittinger, 1994). The economic values of imported fertilizers and chemicals were estimated according to a study by Herath (1989).

In the carbon sequestration valuation, only the gross carbon dioxide (CO_2) sequestration was counted because of the lack of data on CO_2 emissions during the processes of biomass loss and the burning of fuel wood. The other forms of CO_2 emissions are comparatively low in volume. The information used to evaluate carbon sequestration is given in Table 1.

Table 1. *Average values of Net Carbon Assimilation (NCA), Leaf Area Index (LAI), Carbon Sequestration (CS), Average crop prices, and Break-even prices*

Item	Rubber	Oil palm
1. Information of CS		
NCA	-	2.1
LAI	-	3.4
CS	14.4	7.1
2. Average crop prices (Rs/kg)		
1995-1996	82	31
1997-2000	66	30
2001-2003	85	30
1995-2003	77	30
3. Break-even prices		
At 3% discount	35.50	13.75
At 11% discount	52.75	18.00

Source:
1. Hartley, C W S 1988; Webster, C C and Baulkwill, W J 1989
2. World Bank commodity price data, 2003; Plantation sector statistical pocket book, 2002
3. Break-even prices calculated by the authors

Notes:
1. NCA and CS are given in ton/ha/year
2. Current average price estimated for 2001-2003
3. Long-term average price estimated for 1995-2003

Price of carbon

Many different values for carbon prices are available in the literature. Considering a global perspective, some researches have suggested a value of carbon in the range of US$ 348 to 790 per ton (Kulshrestha *et al.*, 2000). The estimates of carbon cleaning costs are in the range of US $ 100 to 300 using current technology and the goal is to reduce the cost to US$ 10 or less by 2015 (website of the Department of energy in US: www.fe.doe.gov/coalpower/sequestration/index.shtml). The global carbon market behavior shows a price range of US $ 2 to 9.50 and the prices specified in the forward contracts for Kyoto compliance units during 2002 suggest a price range of US $ 3 to 5/ton of CO_2 emissions (Haites, 2002). The lowest carbon cleaning cost, US $ 100, was used as the carbon value in this study and sensitivity analyses were conducted to capture the other possible price ranges.

Results and Discussion

Our analysis indicates that both rubber and oil palm are financially viable at the current cost and price levels. However, NPV and the DRC values indicate that oil palm is more financially feasible than rubber at the current interest rate (11%) and at an

estimated long-term average rubber price level of Rs.77/kg (Table 2). According to the sensitivity analysis, the rate of return from rubber is higher than the rate of return from oil palm only when the price of rubber exceeds Rs. 85/kg and when the price of oil palm is assumed to be Rs.30/kg (Table 3). Under the current cost structure, the break-even price of rubber at the 11% discount rate is around Rs. 53/kg (Table 1). The average yearly price behavior of rubber indicates that the average price level during 1997-2000 almost reached the break-even price level (Table 1). The price decline from 1995 to 1997 was around 20% and this shock seems to have prevailed for nearly four years. In fact, a considerable decline in world rubber prices was recorded during this period because of the South East Asian financial crisis. According to Burger and Smith (2001), the economies of key players in the natural rubber market both on the demand and supply sides were severely affected due to the South East Asian crisis. This has resulted in turbulent developments in the natural rubber market both during this period and in the year 2000. The current development of the sector is probably a consequence of this substantial price drop and the resulting decline in the profit margin of rubber compared to crops like oil palm.

However, the values of the NPV and DRC in the economic analysis indicate that rubber is more economically feasible at the estimated long-term average price level compared to oil palm (Table 2). This shows that although rubber is not financially attractive compared to oil palm, its contribution to the general economy is considerable.

Table 2. *DRC, NPV, and EXNPV at long-term average price levels*

Indicator	At 3% discount		At 11% discount	
	Rubber	Oil palm	Rubber	Oil palm
Financial				
DRC	0.48	0.49	0.72	0.65
NPV	1014	702	186	199
Economic				
DRC	0.10	0.48	0.17	0.47
NPV	1691	693	493	280
EXNPV	3752	2083	1286	720

Source:
Calculated by the authors
Notes:
1. NPV and EXNPV are in thousands
2. Long-term average price levels of rubber and oil palm were Rs 77 and Rs 30 per kg

When the environmental component is included in the analysis, the extended net present value (EXNPV) indicates higher values for rubber than oil palm. Therefore, rubber is more feasible in terms of environmental benefits than that of oil palm (Table 2). Further, the EXNPV values of rubber are higher than that of oil palm within the carbon price range of US$100 to 2 at both current average price levels of Rs.85/kg and break even price levels at both high and low interest

rates (Table 4). A recent expert poll on the price of allowances in 2008 indicated a median value of US$ 8/t CO_2 emissions with a range of US$ 2 to US$30. According to Haites (2002), there is much uncertainty about the future price of carbon. However, these results indicate that the extended benefit of rubber is higher than that of oil palm even at low carbon price levels. It has been reported that, compared to other temperate climate plants, oil palm is inefficient in the process of photosynthesis (Hartley, 1988). In contrast, rubber plants are considered to have similar properties to rainforest ecosystems (Rahaman, 1994).

Table 3. *Financial and economic values of DRC, NPV, and EXNPV at different price levels and discount rates*

Indicator	Oil palm (Rs./kg)				Rubber (Rs./kg)			
	20	25	30	40	55	66	77	85
DRC								
At 11%	1.01	0.79	0.65	0.48	0.67	0.84	0.72	0.65
	(0.72)	(0.57)	(0.47)	(0.35)	(0.15)	(0.20)	(0.17)	(0.16)
At 3%	0.76	0.60	0.49	0.36	1.02	0.56	0.48	0.43
	(0.75)	(0.59)	(0.48)	(0.36)	(0.24)	(0.12)	(0.10)	(0.09)
NPV								
At 11%	32	115	199	367	17	101	186	247
	(112)	(196)	(280)	(447)	(323)	(408)	(493)	(554)
At 3%	269	485	702	1134	476	745	1014	1209
	(260)	(477)	(693)	(1126)	(1153)	(1422)	(1691)	(1887)
EXNPV								
At 11%	552	636	720	888	1117	1201	1286	1347
At 3%	1640	1862	2083	2525	3214	3483	3752	3948

Source:
Calculated by the authors
Notes:
1. NPV values are in thousands
2. Values in parenthesis are the economic analysis indicators

Table 4. *EXNPV at different carbon prices*

Price	EXNPV at 3%		EXNPV at 11%	
	Rubber	Oil palm	Rubber	Oil palm
No.1*				
US$ 100	3948	2083	1347	720
US$ 10	1483	867	357	252
US$ 8	1429	840	335	241
US$ 2	1264	758	269	210
No.2**				
US$ 100	2738	1364	1099	519
US$ 10	273	147	109	50
US$ 8	219	120	87	40
US$ 2	54	39	22	9

Source:
Calculated by the authors
Notes:
No.1* Situation at current average price levels
No.2** Situation at break-even price levels

Concluding remarks

This study indicates that at the current average price levels, both oil palm and rubber are financially viable. However, the financial return from oil palm was higher than the return from rubber when the price of rubber dropped to very low levels for a few years because of the South East Asian financial crisis. The movement away from rubber to oil palm due to this short term shock would immensely affect the long term sustainability of the plantation sector in terms of an overall decline in economic and environmental benefits. Research on optimal policy measures to address this development would therefore be helpful to ensure the sustainable development of the plantation sector in Sri Lanka.

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