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TEA PRODUCTION IN SRI LANKA: FUTURE OUTLOOK AND MECHANISMS FOR ENHANCING SECTORAL PERFORMANCE

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The views expressed in this paper are those of the author and should not be interpreted as necessarily those of the Central Bank of Ceylon

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1. INTRODUCTION

In 1982, Sri Lanka's total earnings from exports was Rs. 21,454 million.[1] Of this amount, Rs. 6,342 million or 30 per cent was from the export of tea. During the same year 17 per cent of total Government tax revenue was from taxes directly applied to the tea industry. Furthermore, the latest available employment data show that approximately 600,000 persons or 11 per cent of total employment in the country was directly attributable to the tea industry. These data clearly indicate the importance of the tea industry in the Sri Lankan economy and the extent to which prosperity in the tea industry impacts upon national prosperity.

Tea producers in Sri Lanka can be divided into two principal groups. The first group consists of the two publicly owned corporations, the Janatha Estates Development Board (JEDB) and the Sri Lanka State Plantations Corporation (SLSPC), which are responsible for managing the major share of estates owned by the Sri Lanka government. The second group consists of all other tea producers lumped together under the single heading "smallholders."[2,3] The economics of production within these two groups are quite different and they must therefore be treated independently from the policy perspective. This paper evaluates the performance of each of these groups over the past several years. Based on this evaluation it indentifies various 'problem' areas. The current efforts to address these problem areas are discussed and additional policy actions that can enhance these efforts are suggested.

The paper is organized as follows: Section 2 presents a brief historical background of the tea producing institutions in Sri Lanka. Section 3 reviews existing analyses of the tea sector and identifies the principal problems faced by the sector. Based on this review, discussions with senior officials in the tea sector, and current data pertaining to the tea sector, Section 4 identifies and analyses the major sectoral issues. Finally, Section 5 suggests possible mechanisms for enhancing the performance of the tea sector.

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1 This number, and others in this paragraph are taken from various publications of the Central Bank of Ceylon.

2 Excluding a few other state agencies which manage a small quantity of tea lands (less than 5 per cent of total cultivated area) owned by the government.

3 Strictly speaking, smallholders have been previously defined as only those with holdings less than 10 acres. However, in this analysis we define them more broadly as all private owners of tea land.

2. HISTORICAL BACKGROUND OF TEA PRODUCING INSTITUTIONS[1]

Prior to 1972 the private sector owned almost all tea area in Sri Lanka. The bulk of this area was concentrated in large estates. Tea Commissioner's data show that in 1972 approximately 71 per cent of tea area was in 834 estates, each over 100 acres. In August 1972, the first Land Reform Law was passed. The actual transfer of land began in mid 1974 and resulted in approximately 55,000 hectares of tea (22.7 per cent of total registered tea land) being nationalised. In October, 1975 the Land Reform (Amendment) Law was passed. As a result, a further 96,000 hectares of tea were vested in the Land Reform Commission. Since March 1976, the management of most state-owned tea estates was transferred to the JEDB and the SLSPC.[2] In 1981 Lanka Estates Development, Ltd. (LEDL), a joint stock company, was formed to take over management of selected government owned estates. The JEDB transferred 42 marginal estates to this new company in 1982. These estates were transferred back to the JEDB during December 1983.[3]

3. REVIEW OF EXISTING ANALYSES

The tea sector in Sri Lanka, especially the JEDB and the SLSPC, has been the subject of considerable analysis and debate during the past few years. This debate has stemmed primarily as a result of the declining production trend exhibited by the sector since 1968.[4] The analyses that have been completed, or are currently in progress, provide the natural starting point for any investigation of the sector. In this section we review the more important studies highlighting their relevance to the current policy oriented analysis. In particular, we review the following four studies:

- The Tea Master Plan Final Report (March 1980) ;
- A Central Bank Research Department (Internal) Report on the tea industry (February 1982) ;

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1 This section draws upon H.M. Associates, *Tea Master Plan : Final Report Volume II*, prepared under contract to CIDA/Government of Sri Lanka March 1980, Part I, Chapter II ; and Ernst & Whinney (Sri Lanka) et, al. *Janatha Estates Development Board and Sri Lanka State Plantations Corporation, Consulting Services : Report on the Survey Stage* December 1982, Section 2.

2 These corporations also manage substantial acreage of state-owned rubber estates and a few coconut estates. (see Table 4.9).

3 Section 4.5 of this paper discusses the implications of these actions.

4 Section 4 presents data which demonstrate this trend.

- A study by Ernst & Whinney (Sri Lanka) and others on the management aspects of the JEDB and SLSPC (study still in progress, initial report released in December 1982); and

- A study co-ordinated by the Ministry of Finance and Planning, assisted by the JEDB and SLSPC, which develops a medium term investment programme for JEDB and SLSPC managed plantations (study still in progress, preliminary report released in June 1983).

3.1 Tea Master Plan (TMP)

The TMP Final Report was released in March 1980.[1] This report was the result of two years of intensive research and analysis by a group of consultants headed by Hedlin Menzies and Associates of Canada. Various Sri Lankan organisations, the JEDB and SLSPC among them, also assisted in the study. The primary objective of the Tea Master Plan Study was to "prepare a comprehensive development plan for the tea industry in Sri Lanka, including the development of an appropriate institutional and management structure."[2]

During the early stages of the study the study team held seminars and discussions with the tea trade industry, government corporations and government departments. Later, basic estate sector questionnaires were circulated to all tea estates over 100 acres. These questionnaires were supplemented by case studies of individual estates. These efforts and subsequent analyses resulted in a series of study recommendations relating to the two corporations involved in tea production and the tea smallholders sector.

Three basic strategies were discussed and analysed in the TMP. These were: an aggresive strategy—expand production: a strategy of maintaining the status-quo—keep existing production levels; and a passive strategy—allow continued decline in production. The analysis showed that aggresive expansion of production yielded by far the best return to the economy. Within this framework of aggresive expansion the general investment priorities (in order) were judged to be fertilizer application, infilling, new planting, factory modernisation, replanting and housing improvements for estate labour.

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1 H. M. Associates, *Tea Master Plan Final Report,* Volumes I-VI, prepared under contract to Canadian International Development Agency/Government of Sri Lanka ; March, 1980.

2 Tea Master Plan, Final Report, Volume II, p. 2.

The TMP also assessed various other aspects of the tea industry including future demand for Sri Lankan tea, the organizational structure of the tea industry, the tea smallholder sector, and the nature of taxes faced by the industry and its impact on economic efficiency. Specific recommendations for improvements were made in each of these areas.

Although it was based to some extent on already existing data and analyses, the TMP was the first comprehensive analysis of the tea industry as a whole. From the point of view of the present analysis, however, the time that has lapsed since the study was completed, more than four years, makes it somewhat dated. In particular, the organizational structure of the industry has changed substantially since the completion of the TMP. The most interesting aspect of the entire exercise relating to the TMP is that, to date, not one of the many recommendations made in the plan has been followed.

3.2 Central Bank Research Department Report

In February 1982 the Research Department of the Central Bank completed a report on the tea industry.[1] This report presented a more updated summary of the tea industry in Sri Lanka, compared with the TMP. Similar to the TMP, it identified problem areas in the industry that needed to be addressed. Detailed procedures for addressing these problems were not presented. Two areas where the Central Bank report differed from the TMP was in the discussion of the smallholder sector and in the discussion of the export duty on tea. The major problems identified in the smallholder sector were "the lack of institutional credit, lack of sufficient factory capacity and the low quality of green leaf produced."[2] With regard to export duty, the study claimed that there was an optimal level of export duty which could be determined. It also argued that reducing export duties to alleviate producer problems could result in a loss of foreign exchange earnings to the country. However, the analysis and arguments presented were insufficient to support such claims.[3] The most useful analyses in the study pertain to the smallholder sector.

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1 Dr. W. N. A. Fernando et. al., *A Study of the Tea Industry in Sri Lanka*. Report prepared by the Economic Research Department, Central Bank, February 1982.

2 *A Study of the Tea Industry in Sri Lanka*, p. 2.

3 Section 4.3 of the present report presents arguments and analyses relating to export duties and their impacts.

Though the study did not emphasize the importance of the small-holder sector and its potential for reviving the tea sector, it did identify the key problem areas and make useful suggestions for addressing these problems.

3.3 Ernst & Whinney Study

Ernst & Whinney (Sri Lanka) in collaboration with Booker Agriculture International Ltd. and Ernst & Whinney (London) are currently undertaking a study of the management of the JEDB and the SLSPC. The study is being funded as part of the Tea Rehabilitation and Diversification (TRAD) Project.

The complete study will consist of several reports at different stages of the study. To date four reports have been submitted, the latest on 30th June 1983.[1] The terms of reference of the consultancy service requires the consultants to recommend improvement in management and financial practices in the two corporations and to propose suitable incentive schemes to improve productivity at the JEDB and the SLSPC . Analysing and suggesting changes in the ownership structure and/or organization at the highest (ministerial) levels of the JEDB and SLSPC was specifically excluded from the terms of reference of the Ernst & Whinney Study. Within its terms of reference, the study makes detailed proposals for improving the operation, both in day-to-day procedures and in long-term planning, of the JEDB and the SLSPC.

Besides changes in the internal organizational structure and in the functions of different persons within this structure, the study also assesses other key areas where changes are required. The more important among these are improvements in the marketing procedures for tea and a change in the incentive structure faced by corporation employees. The study team recommend that substantial increases in financial incentives be provided for improving productivity at the estate level. The study also proposes a complete overhauling of existing salary structures—substantial salary increases are proposed—to ameliorate the current exodus of the most capable of the corporations' employees.[2] However, no hard

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1 Ernst & Whinney (Sri Lanka) et. al., *Janatha Estate Development Board and Sri Lanka State Plantations Corporation, Consultancy Services,* (Four separate reports), December 1982 through June 1983.

2 The proposed new salary structure consists of a variable and a fixed component of salary. The variable component can at most be 25 per cent of the fixed component and it is tied directly to monthly production.

evidence or analysis is presented to show that increases in salaries would necessarily result in higher productivity, although there are reasonable grounds to believe that if such increases are not made, there will be even further deterioration in productivity with the departure of experienced and capable managers.

In general, the study has made several concrete suggestions for improving the management structure and operation of the two corporations.

3.4 Medium Term Investment Programme (MTIP)

The MTIP is a detailed investment programme for all plantations managed by the JEDB and the SLSPC. This programme was developed by these two corporations with overall co-ordination by the National Planning Division of the Ministry of Finance and Planning. An interim report was released by the Ministry in June 1983.[1] At the present time the JEDB and the SLSPC have each submitted their detailed final corporate plans to the Ministry which is now in the process of integrating these two plans into a single integrated MTIP.[2]

Although the final version of the MTIP will be concerned with investment to improve all JEDB and SLSPC plantation crops, including rubber and coconut, by far the largest share (of the order of 70 per cent) will be devoted to tea investments. Tea sector investments will cover all estate improvement areas such as replanting, infilling, soil conservation, factory development, housing and medical services for estate labour, and estate transport. The total cost of the programme will run into billions of rupees and the major share of this cost is expected to come from foreign borrowing.

A detailed estate-by-estate assessment of investment needs was undertaken to develop the MTIP. Investment guidelines were provided to individual estate managers and the programmes developed by these managers were reviewed, modified where necessary, costed, and aggregated to regional level, at each corporation's

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1 Ministry of Finance and Planning, Medium Term Investment Programme for the State-owned plantations, Project Identification Report, June 1983.

2 JEDB, Corporate Plan (1984-1988), Report submitted to the Ministry of Finance and Planning, October 1983; and SLSPC, Corporate Plan (1984-1988), Report submitted to the Ministry of Finance and Planning, October 1983.

Regional Boards. These aggregates were then consolidated up to corporation level at the head offices and the total cost of the programme, including cash flows, was estimated.

Benefits resulting from these investments, through increased production and avoidance of further productivity declines which would occur in the absence of the investments, were also estimated on an estate-by-estate basis. The procedures used to make these estimates have not been described in the different documents released up to now. However, the officials preparing the final report have indicated that these benefits were projected by estimating additional productivity (with the investment) and decline in productivity (without the investment) on an estate-by-estate basis. These individual estate productivity estimates were based primarily on judgement and not on any detailed theoretical basis. The production increases, because of the investments, were translated into revenues in future years using projected prices for tea. Finally, the net incremental surplus/deficit on an annual basis was calculated and the internal (financial) rate of return was estimated. An economic rate of return was also calculated using border prices for the various elements in the cost/benefit stream.

The MTIP puts much more effort into estimating investment costs than into estimating the benefits of such investments. To this extent the effort is unbalanced and the estimated rates of return are suspect because of the judgemental manner in which benefits are estimated. This shortcoming could have been rectified by performing sensitivity analyses of the results, in particular by estimating the sensitivity of rates of return to changes in various components contributing to the benefit estimates. Up to now, in the individual JEDB and SLSPC plans, this has not been done. Furthermore, Ministry of Finance and Planning personnel preparing the final integrated report do not expect to perform such analyses.

3.5 Overall Observations

The foregoing reviews of four recent tea sector studies result in the following overall observations :

- Several of the problems faced by the tea sector, especially by the JEDB and the SLSPC, have been identified in these studies. Courses of action for addressing these problems have also been suggested. Table 3.1 summarizes the more important problems observed and the suggested solutions.

TABLE 3.1

TEA SECTOR PROBLEMS AND SUGGESTED SOLUTIONS IN THE FOUR STUDIES REVIEWED

Problem	*Suggested Solution*
Insufficient annual expenditure on fertilizing, infilling, and replanting.	Additional investment
Old Factory machinery.	Investment in newer machinery
Low labour productivity and outturn.	Social infrastructure improvements – – in housing, health care, and so on – – for estate labour. Also provide monetary incentives for increasing productivity.
Lack of incentives for increasing production and improving quality at individual estate level	Provide monetary incentives in the form of substantial bonuses tied directly to additional production and quality improvements.
Negative producer margins (especially at JEDB and SLSPC).	Varying recommendations. Some claim that negative margins are not relevant because they are caused primarily by government duties and taxes and that the country is still gaining from tea produced at negative margins. Others argue for duty and tax reductions to improve margins. One study argues (uncovincingly) that reducing duties would reduce foreign exchange earnings.
Low smallholder productivity	Improve credit facilities to smallholders. Improve service structure by using bought leaf factories as extension service centres. Expand TSHDA services and funding.

- One of these studies, the TMP, which was primarily a policy oriented study, was completed several years ago. However, none of the recommendations made by the study were followed. This observation points to the need for looking more closely at the process by which policy recommendations are translated into action.

- Investment oriented analyses such as the MTIP are more likely to result in actual investments taking place, compared with policy oriented analyses. Such additional investments will lead to increases in production. However, it is insufficient to observe that additional investment will result in additional output. Instead, the rate of return on the investment must be estimated and compared with the potential rates of return from other available investments, both within and outside the tea sector. In this respect the MTIP does not have a balanced effort in estimating costs and benefits of various investments; most of their effort is concentrated in estimating investment costs.

- The studies reviewed, except for the Central Bank Research Department Study, do not pay much attention to the tea smallholding sub-sector (defined in this study as all privately held tea land).[1] Since the sub-sector owns approximately 40 per cent of tea land (see Table 4.5) productivity increases in the subsector will significantly increase national tea production.

- None of the studies reviewed looks at the basic organizational structure of the entire tea sector. The Ernst & Whinney Study's terms of reference specifically excluded such an analysis. Given the large number of ministries involved in the running of the tea sector (Section 4 presents an organizational summary of the sector), it is important to assess the degree of co-operation, of lack of it, among these different entities. Further, it is critical to look at the entire industry structure to see if the present division of duties is a hindrance or a help to the functioning of the sector.

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1 This observation is not intended as a criticism of the reviewed studies. In particular, analysis of smallholders was outside the scope of the Ernst & Whinney Study and the MTIP. However, the observation does show that insufficient emphasis is being placed on improving the productivity of privately owned tea lands.

4. ANALYSIS OF ISSUES

This section analyses the issues that arise as a result of our review of tea sector studies. In addition, other issues raised in the course of discussions with senior officials in the tea sector and on close examination of the latest available data, are also analyzed. The differential efforts expended in the following analyses of the various issues should not be considered as a measure of the relative importance of these issues. Where there have been extensive and thorough previous analyses, as in the area of field and factory improvement programmes, duplicate effort has been avoided by summarizing the existing analyses. In other areas—for example in the impacts of government levies on tea—where there has been some disagreement among extisting studies the issues are considered in detail.

4.1 Aggregate Production Trends

Table 4.1 shows total yearly tea production in millions of kilograms from 1968 through 1982. Figure 4.1 presents the same data in graphical form. The graphical representation shows a clear downward trend in production. A least squares line fitted to the production data has a slope of -1.87 million kgs. per year implying that total tea production from 1968 through 1982, after excluding non-systematic effects, decreased at 1.87 million kgs. per year.[1] This observed decline is, in fact, the principal reason that the tea sector has

TABLE 4.1

TEA PRODUCTION IN SRI LANKA : 1968-1982

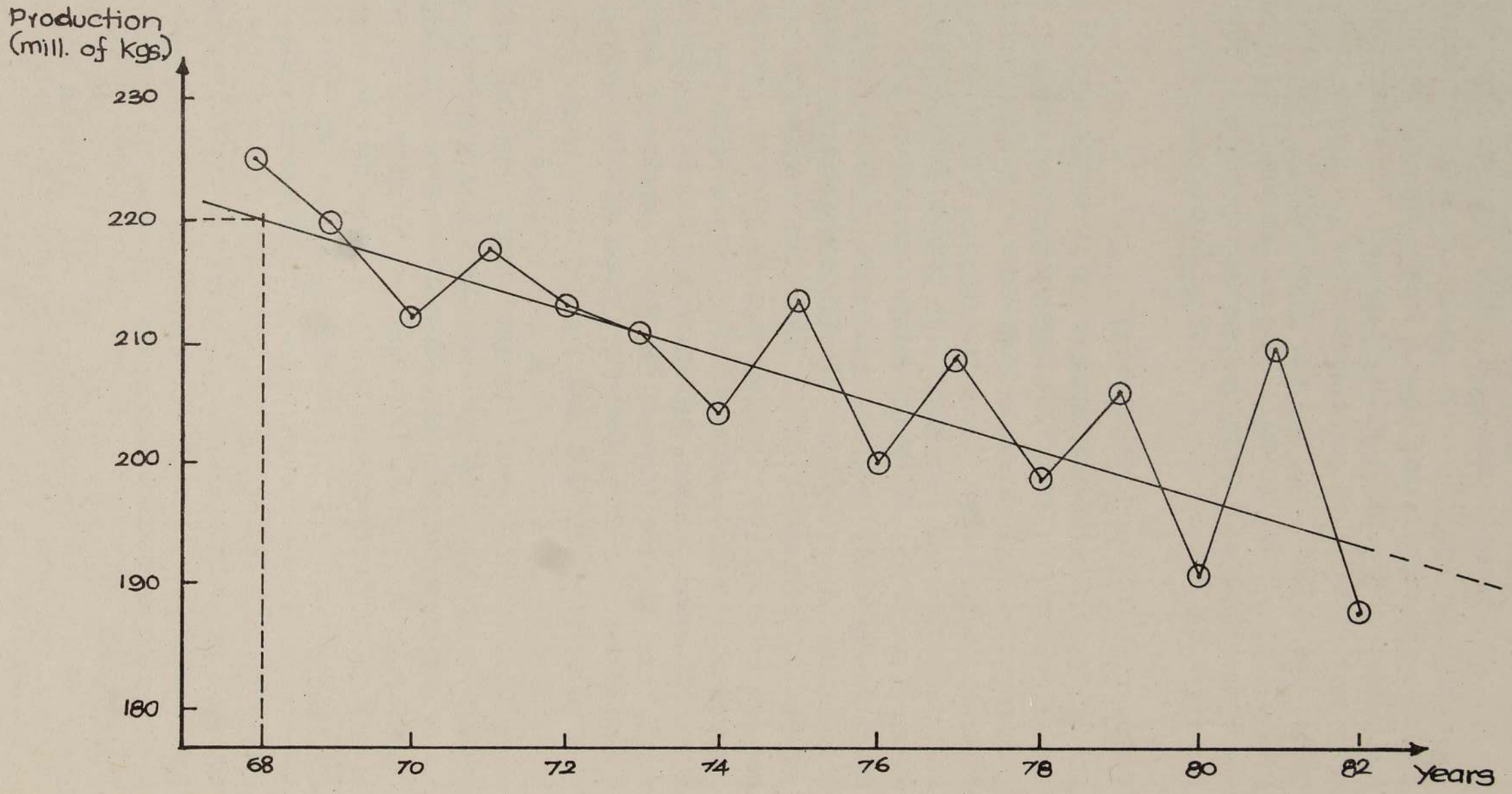
Year	*Total Production (Millions of kgs.)*
1968	224.8
1969	219.6
1970	212.2
1971	217.8
1972	213.5
1973	211.3
1974	204.0
1975	213.7
1976	196.6
1977	208.6
1978	198.9
1979	206.4
1980	191.4
1981	210.1
1982	187.8

Source : Sri Lanka Tea Board

1 The correlation coefficient is – 0.84

FIGURE 4.1

GRAPHICAL REPRESENTATION OF TEA PRODUCTION IN SRI LANKA



received so much attention in recent years. The standard deviation for the same regression line is 7.0 million kgs. showing that there is a significant non-systematic variation in annual tea production around the steady declining trend. Finally, the estimated regression line is drawn in Figure 4.1 and it shows that 'expected' production, or production excluding non-systematic annual variations, is 220.8 million kgs. in 1968, and that this value drops by 1.87 million kgs. per year from 1968 to 1982. This sub-section of the paper now examines the reasons for both the systematic decline in tea production and the non-systematic annual variations in this production.

Systematic Decline in Production

The observed systematic decline in tea production of 1.87 million kgs. per year from 1968 to 1982 could be due to a variety of factors. Whatever the factors, they must have had a systematically worsening effect on tea production as time progressed. The tea sector studies reviewed earlier, and discussions with persons knowledgeable with the sector, results in the following list of possible factors—declining tea area, worsening weather, inadequate replanting and infilling of tea areas, reduced fertilizer application, and worsening management practices in state sector estates. Note that this list only identifies *possible* factors. Closer examination of actual data, which follows, reveals that the required systematically worsening effect on production is not exhibited by some of the factors and they cannot therefore be used to explain the observed systematic decline in production. Each of the factors that is potentially responsible for the production decline, is now analyzed in turn.

Tea Area: The most obvious factor that will explain a systematic decline in total tea production is a systematic decline in the area under tea cultivation. Data on tea area are available from several sources. The Tea Commissioner's Division (TCD) maintain records of all registered tea area and these data are suposed to be updated regularly.[1] Unfortunately, all persons familiar with these data, including those in the TCD, acknowledge that they are very outdated and probably bear very little relationship to actual acreage. In particular, large amounts of land that have gone out of tea production still remain registered while significant amounts of tea lands which have come into production during the last few years are unregistered.

1 These data show that registered tea area has remained virtually unchanged over the last 15 years.

A second source of information is an aerial survey of all agricultural areas, being conducted by the Tea Research Institute (TRI) with foreign assistance. This survey uses aerial photography to develop district-by-district agricultural maps showing what crops are being grown, and where. Experts in the field assert that the results are very accurate and provide a true picture of actual tea area. Unfortunately, there are two shortcomings in these data from the viewpoint of the present paper. First, the survey is not yet complete. Second, even when it is completed it will only provide accurate tea area during one point in time and it cannot therefore be used to look at historical trends in tea area.[1,2]

A third source of information on tea area is the census of agriculture conducted by the Census and Statistics Department (CSD). Such census' were carried out in 1973 and 1982 and data on tea area at these two points in time can be used as a basis for estimating the trends in tea area over time. Table 4.2 shows land utilization in tea, by district, as estimated by the 1973 and 1982 agricultural census'. From the table, during the 9-year period 1973 to 1982 area under tea cultivation declined from 233,987 ha to 211,865 ha, a reduction of 9.45 per cent. From the earlier estimated regression line, the expected production in 1973 was 211.4 million kgs. Therefore, if all other things except tea area were the same in 1982 as they were in 1973, tea production would have declined by $211.4 \times 0.0945 = 19.99$ million kgs. because of declining tea area, where we assume that if all other things remain unchanged, tea production is directly proportional to tea area. On an annual basis this would be an average decline of 2.22 million kgs. per year. Since the available data do not allow us to estimate trends in tea area between 1968 and 1973, it is not possible to estimate how much, if any, of the observed systematic decline in total tea production during these years was attributable to changes in tea

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1 If we assume that registered tea area in 1968 accurately reflected actual tea area, it would be possible to estimate the decline in tea area from 1968 to the present. However, there is no reason to believe that registered area in 1968 more accurately reflected true area than similar data today.

2 Mid- and up-country tea districts surveyed up to now show that registered tea area exceeds area estimated in the aerial survey by more than 20 per cent. However, tea sector officials interviewed observed that there are significant amounts of new tea area that have opened up in the low country, especially in the Galle and Matara districts, and that most of these areas are still unregistered. Therefore, aerial surveys of these districts, when completed, are likely to show actual tea area exceeding registered tea area. In summary, total actual tea area could be more or less than registered tea area.

area. In summary, there has been a systematic decline in tea production of 2.22 million kgs. per year because of declines in tea area.[1,2]

TABLE 4.2

DISTRICTWISE LAND UTILIZATION IN TEA
(ALL PRODUCERS)

District	*Land Utilization in Tea (ha)** 1973	1982
Colombo ..	2,028	274
Kalutara ..	3,123	3,667
Kandy ..	71,496	35,179
Matale ..	8,406	8,395
Nuwara Eliya ..	37,909	62,767
Galle ..	14,427	14,269
Matara ..	18,262	17,020
Hambantota ..	267	170
Kurunegala ..	408	748
Badulla ..	39,013	35,112
Moneragala ..	1,270	795
Ratnapura ..	27,559	24,085
Kegalle ..	9,819	9,383
Country Total ..	233,987	211,865

Source : Agriculture Division, CSD

* The 1973 and 1982 areas are not directly comparable in the case of some districts because of changes in the defining boundaries of these districts.

The presence of a declining trend in tea area can be corroborated using evidence from another source. The JEDB and the SLSPC together account for about 60 per cent of total tea area and these two corporations maintain accurate records of their extents planted in tea. Table 4.3 shows such data from 1979 to 1982. From the table, total tea area at the two corporations declined from 129,632 ha in 1979 to 123,269 ha in 1982, a decline of 4.92 per cent in three years. This rate can be compared to the earlier observed decline of 9.45 per cent in nine years for total tea area. The two figures show trends in the same direction and the different rates of decline can be explained on the basis of faster declines in tea area at state corporations compared with private producers and/or because of accelerating rates of loss in area in recent years.

1 This is only an approximate estimate because it is based on data on tea area at just two points in time.

2 The observation that this systematic decline is larger than the total observed decline is not an inconsistency in the analysis. Other factors could have caused a systematic increases in tea production, thereby partially offsetting the effects of decline due to loss in area.

TABLE 4.3

STATE SECTOR TEA AREA

Year	Extent Planted in Tea (ha)		
	JEDB	SLSPC	TOTAL
1979	67,608	62,024	129,632
1980	66,705	62,835	129,540
1981	65,336	61,005	126,361
1982	63,410	59,859	123,269

Source: Central Bank of Ceylon, Review of the Economy; 1980, 1982.

Weather : Some tea industry officials interviewed claimed that part of the observed decreases in tea production have occurred as a result of bad weather. There is no doubt that weather conditions significantly affect tea production, but, it is not easy to define precisely what is 'bad' weather and what is 'good' weather for tea production. It is not just the quantity of rain, or sunshine, or humidity, or other individual weather parameter that impacts upon production. Rather, it is a combination of all these factors and different mixes of them are appropriate at different times. From a practical point of view, it is not possible to easily model weather interactions and their effect on tea production. However, such an attempt was made by the author as part of a broader effort to estimate a production function for tea.[1] The analysis showed that rainfall per year was the single most important weather parameter affecting annual tea production. Using historical data on rainfall in the tea growing districts, and an estimated production function for tea, it was shown that rainfall had exhibited a statistically significant decline during the past 30 years and that this decline had resulted in a reduction in expected tea production by 0.25 million kgs. per year.[2] Therefore, of the observed systematic decline in tea production of 1.87 million kgs. per year from 1968 to 1982, 0.25 million kgs. per year can be explained on the basis of steadily worsening weather for tea production.

Fertilizer : The production function for tea, developed in the analysis referred to earlier, assessed the impact of fertilizer application on tea production. That analysis estimated that increases in fertilizer application (per ha) results in increased tea production (per ha),

1 See, R. Dias Bandaranaike, "A Quantitative Analysis of Selected Tea Sector Issues Based on an Empirically Estimated Production Function for Tea," Policy and Planning Division, Central Bank of Ceylon, March 1984. A summarized description of this paper is included as an appendix to the present paper.

2 Op. cit., pp.9–12.

all other things being equal, although the relationship is non-linear.[1] Table 4.4 shows data from which the fertilizer application per ha is calculated each year from 1973 to 1982. These are the only years considered because reliable data on tea area are unavailable for years before 1973.[2]

TABLE 4.4

FERTILIZER APPLICATION IN THE TEA SECTOR

Year	*Total Fertilizer issued (1000s tonnes)*	*Tea area* (ha)*	*Fertilizer Applied per ha (kg./ha)*
1973	93.4	233,987	399
1974	102.1	231,419	441
1975	106.7	228,879	466
1976	95.3	226,368	421
1977	80.1	223,883	358
1978	115.6	221,426	522
1979	105.4	218,996	487
1980	109.9	216,593	503
1981	103.3	214,216	482
1982	102.7	211,865	485

Sources: Table 4.2
Central Bank of Ceylon, Bulletin, January 1984.

* The 1973 and 1982 agricultural census estimates are used for tea area in these two years. For years between, area is calculated under the assumption of a constant declining percentage each year. Although this assumption may not reflect the actual situation precisely, it is significantly better than using registered tea area as a measure of actual tea area.

To test for the presence of any systematic effect of fertilizer application rate changes on tea production, and to quantify this effect if it is present, we use an approach similar to the one used to test the effects of weather changes. We first estimate the hypothetical set of productions that would have occurred with the conditions existing in 1982, but with fertilizer application per ha being what it was each year from 1973 to 1982. This is done using the relationship total production = constant x (fertilizer per ha)$^{.234}$ which applies in any one year. This equation and the known values of total production and fertilizer applied per ha (see Tables 4.1 and 4.4)

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1 The estimated relationship was (production/ha) $\propto$ (fertilizer/ha)$^{.234}$

2 More accurately, although data on registered tea area are available for years before 1973, from the TCD, these data are incompatible with more reliable census of agriculture data, available for 1973 and 1982 and which can be interpolated to estimate tea area for years between 1973 and 1982.

were used to calculate the values of the constant consistent with the conditions present in 1982. Next, the different amounts of tea that would have been produced under the various fertilizer application rates per ha from 1973 to 1982 were calculated using the estimated constant and the same equation. The presence of any systematic time trends in fertilizer application rates and thereby on tea production was detected by fitting a time trend line to the set of calculated hypothetical production values, each of which corresponded to fertilizer application rates in a particular year. This line had a slope of 0.92 million kgs. per year and this slope was statistically significant ($P<0.05$). In addition, the standard deviation from the regression line, which is a measure of production variations due to fluctuations in fertilizer application rates, was 3.85 million kgs.

In summary, there has been a systematic *increase* in tea production of 0.92 million kgs. per year because of a systematic increasing trend in fertilizer application per ha from 1973 to 1982.

Other Factors : The other potential factors for the observed systematic decline in tea production were inadequate replanting and infilling of tea areas and worsening management practices on state sector estates. It is difficult to make quantitative estimates of the impacts of these factors, either because of the absence of reliable data—as in the case of replanting and infilling—or because the effect itself is not easily quantifiable as in the case of management practices.[1] Therefore, we use an indirect approach to estimate the combined impacts of all other factors together on systematic declines in tea produotion.

The total observed systematic decline in production is 1.87 million kgs. per year. Considering individual effects, 2.22 million kgs. per year decline in production is attributable to declines in tea area and a further 0.25 million kgs. per year is attributable to worsening weather. In addition, increasing fertilizer application rates have caused a systematic increase in production of 0.92 million kgs. per year. Therefore, just 0.32(=1.87–2.22–0.25 + 0.92) million kgs. per year of decline remains to be explained. Consequently we

1 The earlier referred to study, which estimated a production function for tea, does define management in a broad sense and then use management differences among estates to make an estimate of the effects of varying management on tea production per ha. However, this estimate does not tell us what declines in management practices over time, if any, have occurred on individual estates.

argue that all other factors together are only responsible for 0.32 million kgs. of systematic decline per year. Therefore, contrary to many previous studies, and the opinions of tea sector experts, based on quantitative rather than qualitative evidence, worsening management practices and inadequate replanting and infilling have only been responsible for a relatively small 17 per cent of the observed systematic decline in production.

Non-systematic Variations in Production

The second observation based on the historical tea production data, besides a systematically declining trend, is the presence of a significant non-systematic variation in annual tea production. The earlier regression of tea production versus time resulted in a line whose standard deviation was 7.0 million kgs., which is a measure of the combined effects of annual changes in factors that affect tea production, after excluding their systematic effects. In this sub-section we analyze the reasons for this variation; in particular, the factors that are responsible for the variation and the relative magnitudes of their contribution to the variation.

The factors most likely to have given rise to the observed annual variations in production are fluctuations in weather, fertilizer application rates, tea prices, management practices on estates, infilling rates, and replanting rates. Some of these factors are more likely than others to cause annual variations in production. For example, management practices are unlikely to fluctuate much from year to year on any estate although there could be systematic declines in management over time. Even when the superintendent of an estate is replaced, the inertia of the management system he leaves behind is likely to ensure that management practices change only gradually. Therefore, the contribution of changing management practices to annual fluctuations in production is unlikely to be large. Similarly, replanting and infilling rate changes are also unlikely to contribute much to annual variations in production because these factors only affect tea production in the longer run. Next, consider fluctuations in the price of tea. The price for world and Sri Lankan tea shows considerable fluctuation from year-to-year and even from month-to-month. There is little, however, that a tea producer can do in the short-run (an year or less) to change

production in the face of changing prices.[1,2] One exception to this is to change the rate of application of fertilizer—such changes are considered separately in this section. The two remaining factors, fluctuations in weather and fertilizer application rates are therefore, likely to be responsible for the major share of the observed annual fluctuations in production. Quantitative estimates of their impacts are now made.

Weather: The paper referred to earlier which estimated a production function for tea, used this function and districtwise tea production and rainfall data to analyze both the systematic and non-systematic impacts of weather on tea production.[3] The analysis showed that there has been a systematic downward trend in tea production of 0.25 million kgs. per year because of worsening weather. In addition, as a measure of potential variations in production because of variations in weather, we estimated how much production in 1982 would have varied if the weather patterns in 1982 was not as it really was; in particular, if the weather in 1982 was that observed in each of the proceeding thirty years.[4] This variation in production is expressed in the statement, "potential weather variations in 1982, could have given rise to a 3.9 million kgs. standard deviation in tea production." [5]

Fertilizer : The earlier sub-section which assessed the systematic impacts of changes in fertilizer application rates on tea production between 1973 and 1982 also calculated the non-systematic effects of variations in fertilizer application rates beyond the systematic trend. Specifically, it was estimated that fluctuations in fertilizer application rates were responsible for a standard deviation of 3.85 million kgs. in tea production.

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1 It is possible that if prices are sufficiently low some tea producers, especially marginal smallholders, may simply abandon fields even in the short-run. This, however, is unlikely to arise in practice because prices would have to drop below the variable cost of production, which is only the cost of plucking the green leaf and processing it, before production is abandoned.

2 As argued in the later section on government levies on tea, state producers are likely to be relatively insensitive to price variations.

3 R. Dias Bandaranaike, "A Quantitative Analysis of Selected Tea Sector Issues Based on an Empirically Estimated Production Function for Tea " pp. 9—12.

4 The analysis also accounted explicitly for the presence of the systematically declining trend in rainfall that was observed during this period by excluding effects due to this trend.

5 For comparison, the actual production in 1982 was 187.8 million kgs.

Unlike in the case of systematic declines in production, it is not possible to add up the different standard deviations in production that arise because of variations in fertilizer application rates and weather. In particular, because fertilizer application rate variations and weather variations do not increase and decrease together, the combined impact of the two effects is bound to be less than the value obtained by simply adding up the two standard deviations. However, it can be seen that these effects have the required orders of magnitude to explain the observed standard deviation in production of 7.0 million kgs.

4.2 Disaggregated Productivity

Section 4.1 considered the tea producing sector as one entity. Such an approach, while useful and leading to many important observations, misses several relevant production related issues. To understand the nature of these issues it is necessary to look at more disaggregated production data. Specifically, at data disaggregated by tea producing institutions and by tea growing areas. Table 4.5 shows 1982 tea statistics disaggregated by the two principal tea producing groups, state sector producers and private producers.[1] Though the data are for just one year, the relative shares of the two groups have changed little over the past few years.

TABLE 4.5

DISAGGREGATED TEA STATISTICS FOR 1982

	Area Cultivated (ha)	*Total Production (Million kgs.)*	*Yield per hectare (kg./ha)*
State Producers ..	126,529	127.6	1,008
Private Producers ..	85,336	60.2	705
All Producers ..	211,865	187.8	886

Sources: Tea Commissioner's Division
Agriculture Division, CSD

1 Data on tea area were derived from the agricultural census of 1982. As a check, state tea area in Table 4.5 agrees closely with the total JEDB and SLSPC tea area, for 1982, in Table 4.3 The difference in the two values is attributable to small amounts of state tea area not owned by the JEDB and SLSPC.

From Table 4.5, the average yield per ha on privately held tea lands is 30 per cent lower than the average yield on state owned tea lands. To find an explanation for low yields in the private sector it is necessary to look more closely at the private sector data. Table 4.6 disaggregates 1982 private tea producer data by district.

Before analyzing the data in Table 4.6, we point to a shortcoming in these data. In Table 4.6 the yields per ha for the Kandy and Nuwara Eliya districts are calculated as for a single combined district because the production and area data in these two districts are not directly comparable. Specifically, the defining boundaries of these districts were changed in 1979, a substantial area of the Kandy district was allocated to the Nuwara Eliya district at that time, and the data on area (from the CSD) uses the new definition while the data on production (from the TCD) uses the old definition.

TABLE 4.6

DISAGGREGATED PRIVATE PRODUCER TEA STATISTICS FOR 1982

District	*Area Cultivated (ha)*	*Total Production (1000s of kg.)*	*Yield per hectare (kg./ha)*
Colombo ..	113	3	27
Kalutara ..	1,306	1,491	1,141
Kandy ..	17,157	10,565	446
Nuwara Eliya ..	13,517	3,119	
Matale ..	3,970	686	172
Galle ..	11,520	15,239	1,322
Matara ..	13,599	16,217	1,184
Hambantota ..	170	178	1,047
Kurunegala ..	511	18	35
Badulla* ..	8,727	3,795	435
Ratnapura ..	9,220	6,948	754
Kegalle ..	5,426	1,905	351
Country Total ..	85,336	60,164	

Sources: Tea Commissioner's Division
Agriculture Division, CSD

* The small amount of tea land in the Moneragala district is included under Badulla.

From Table 4.6, over 96 per cent of privately produced tea is from 7 districts—Galle, Matara, Ratnapura, Kandy, Kegalle, Badulla, and Nuwara Eliya—which also contain 93 per cent of private tea area. We therefore focus on these districts when making observations about private tea producers. From Table 4.6, there is a wide variation in yields per ha in these districts. In the Galle and Matara

districts, which produce what is traditionally called low-grown tea, the yields exceed the countrywide average yield on state sector estates (see Table 4.5). In contrast, yields per ha in the Kurunegala, Kandy, Badulla, Ratnapura, and Nuwara Eliya districts, producing mid- and high - country tea, are to varying degrees, lower than the average yield in state sector estates. The average yield in these five districts together is 487 kg. per ha, which is less than half the yield on state tea lands.

The foregoing observation lead to two questions. First, why is productivity (yield per ha) so low on privately owned mid- and high-grown tea lands? Second, why is there a marked difference in productivity between low-grown private tea area and mid- and high-grown private tea area? Discussions with persons familiar with the privately owned tea sub-sector revealed the answers to these two questions. The relatively low prices received in recent years for mid-and high-grown tea (especially mid-grown teas) has prompted private producers in these areas to neglect their tea lands. Mid-country private tea growers have diversified their crops away from tea in response to low prices, and, as a result, have become less dependent on tea as a primary source of income. This, in turn, has resulted in the neglect of their tea lands. The lack of adequate credit facilities and the scarcity of support services has further contributed to the decline in private productivity in the mid-and high-country. In contrast with the mid-and high-country, productivity in low-country tea areas has been very high. One contributing factor has been the high prices received for low-grown tea during the past several years. Another reason is that support facilities such as fertilizer on credit, provided by the Tea Small Holdings Development Authority (TSHDA) factories and privately owned factories, are more freely available in the low country.[1] In the mid-and high-country the smallholder typically delivers his green leaf to a JEDB or SLSPC run factory which does not provide such extension services.[2] Finally, although there is a general lack of credit facilities for private producers in all tea areas, the relatively high price and profitability of low grown teas in recent years has somewhat reduced the low-country private tea producers necessity for credit.

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1 The TSHDA presently operates 10 factories, all in the low country.

2 Replanting, new planting, and infilling subsidies are, however, available to all smallholders.

In summary, there exists a great potential for improving the yield per ha of tea smallholders in the mid-and high-country. The current productivity is so low that relatively small investments and incentives could result in substantial increases in productivity. Such improvements would, in turn, significantly increase Sri Lanka's total tea production.[1] The Central Bank Research Department report reviewed in Section 3 identifies the major problem areas in the smallholder sector and suggests possible courses of action for addressing these problems.

4.3 Government Levies on Tea

Table 4.7 lists annual costs and prices per kg. of tea for the whole of Sri Lanka for the years 1972 through 1982. The NSA-COP column shows that, except for four years, during the entire 1972 to 1982 period producers as a whole spent more per kg. on tea production than they received from the sale of tea after taxes. However, the FOB-COP column demonstrates that from the country's perspective, the total price received per kg. of exported tea was substantially in excess of the cost of producing this tea. Clearly, the difference between benefits to the country and tea producer margins occur because of government levies on tea.

As mentioned in Section 3 (see Table 3.1), the negative margins of tea producers, especially at the JEDB and the SLSPC, has caused concern. As a result, the issue was discussed in the studies reviewed in Section 3. Since these studies expressed varying opinions on the subject, in particular on the question of government levies on tea, it is useful to analyse the issue in some detail. As demonstrated in the previous paragraph, it is clearly true that the country as a whole gains from the production of tea even at a negative producer margin. However, the issue is more complicated than that and can be phrased in the question-What level (if any) of duty and other taxes on tea is in the long-term interest of the country? To answer this we must consider the overall objectives of policy making in the sector, which in the case of the tea industry is most likely one of trying to maximize both export earnings and domestic government

1 From Table 4.6, the total privately owned tea area in Kurunegala, Kandy, Nuwara Eliya, Badulla and Ratnapura is 54,047 ha and the averags, yield in these five districts together is 487 kg./ha. If this yield per ha is improved only up to the average yield of private producers, 705 kg./ha, tea production in the country would increase by 11.78 million kgs.

revenues from tea, both in the short-run and the long-run.[1,2] In practice, these objectives may not be simultaneously achievable and a trade-off may have to be made between them.

TABLE 4.7

ANNUAL PRODUCTION COSTS AND PRICES FOR TEA

(*Rs. per kg.*)

Year	*Cost of Production (COP)*	*FOB Price**	*Net Sale Average (NSA)***	*FOB-COP*	*NSA-COP*
1972	4.21	6.11	4.17	1.90	—0.04
1973	4.48	6.13	4.16	1.65	—0.32
1974	5.56	7.75	5.85	2.19	0.29
1975	6.72	9.08	6.12	2.36	—0.60
1976	7.05	10.50	7.79	3.45	0.74
1977	7.80	18.86	13.15	11.06	5.35
1978	10.50	32.22	11.55	22.72	1.05
1979	13.43	30.51	11.14	17.08	—2.29
1980	18.71	33.41	17.73	14.70	—0.98
1981	18.79	35.14	17.71	16.35	—1.08
1982	22.68	35.03	22.52	12.35	—0.16

Sources : Sri Lanka Tea Board
Central Bank of Ceylon Bulletin, June 83.

* FOB Price = Gross Auction Price + Duty

** NSA = Gross Auction Price — Sales Tax

Consider the first objective, maximizing export earnings. In achieving this objective, it is first necessary to consider the elasticity of world demand for Sri Lankan tea. It has been argued by some that the world demand for tea is somewhat inelastic, especially in the short-run, because there are relatively few substitutes for tea available in the short-run.[3] Even if this were so, the world demand for *Sri Lankan* tea is likely to be quite elastic because there are substitutes available, namely, tea from other countries. This is even more so in recent years where Sri Lanka's share of the world tea

1 Other objectives, such as employment enhancement, though relevant are probably secondary to the two main objectives.

2 It is true that historical changes in export duties on tea have sometimes taken place concurrent with exchange rate changes (devaluations), and that these duty changes were intended to offset 'windfall' gains to tea producers because of such devaluations. The prime example of this is original imposition of export duties in November 1977 when the FEEC system was abolished and a single unified exchange rate replaced the existing two level rate. However, this does not detract from the observation that levies on tea constitute a substantial share of government tax revenues, 17 per cent in 1982, and that any decision to change tea levies for the purpose of enhancing tea sector performance must explicitly consider the impact of such changes on government revenues.

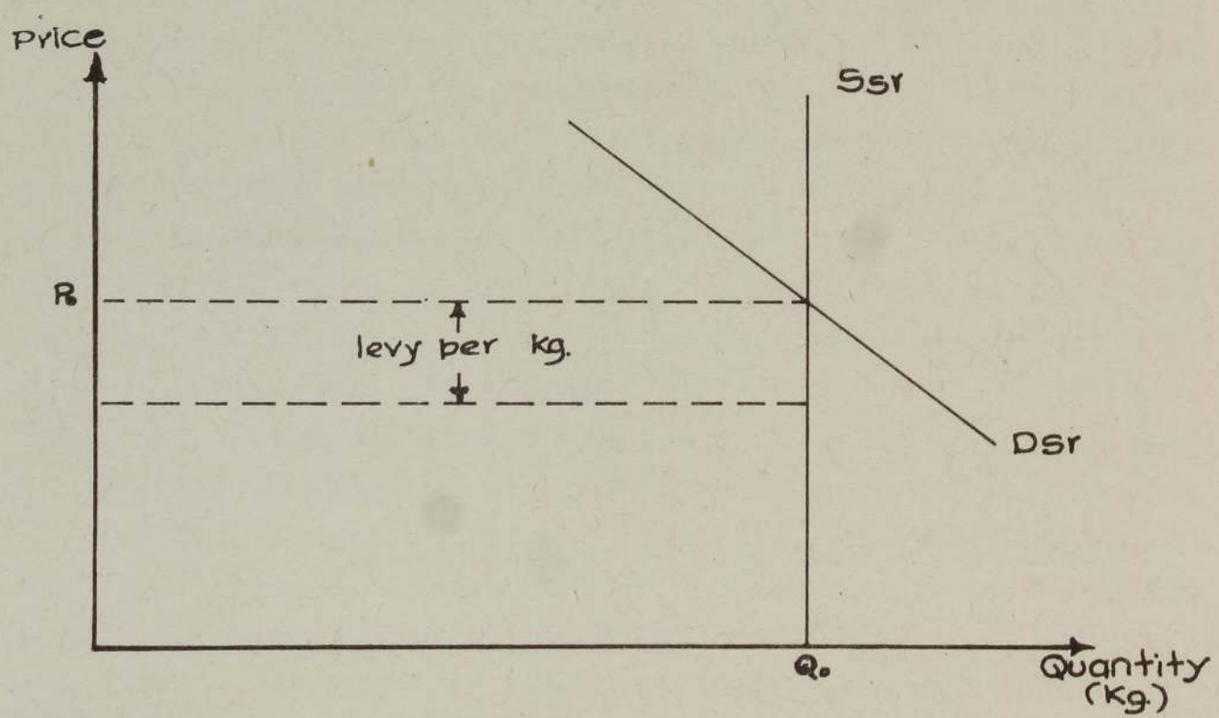
3 The' demand ' for tea referred to here, and later in this report, is the primary or wholesale demand for tea as reflected at the various tea auctions not the ' final ' demand for tea by ultimate consumers.

market has been shrinking. On the other hand, if the world demand for tea is elastic, it is still true that the world demand for Sri Lankan tea would also be elastic. With an elastic demand curve for its tea, the objective of maximising export earnings would be achieved by maximising output and sales.[1] The foregoing argument has been applied to the short-run. However, it also applies to the long-run because world demand in the long-run (for world tea and Sri Lankan tea) will be even more elastic than that in the short-run.

Now consider the second objective, maximising domestic government revenues from tea. Domestic revenues from tea are collected through export duties and other taxes (ad valorem and cess). Therefore, in the short-run domestic revenues could be maximized by increasing these levies on tea, provided the increases do not affect production and sales. Tea production in the short-run is almost totally inelastic because little can be done to increase production within an year. With an elastic supply curve, as Figure 4.2 demonstrates, no matter what the short-run demand curve, D_{sr} the amount sold (and the selling price) will not change and the producer will bear the full cost of any increased levy on tea.

FIGURE 4.2

SHORT-RUN SRI LANKAN TEA DEMAND AND SUPPLY CURVES AND INCIDENCE OF TEA LEVIES



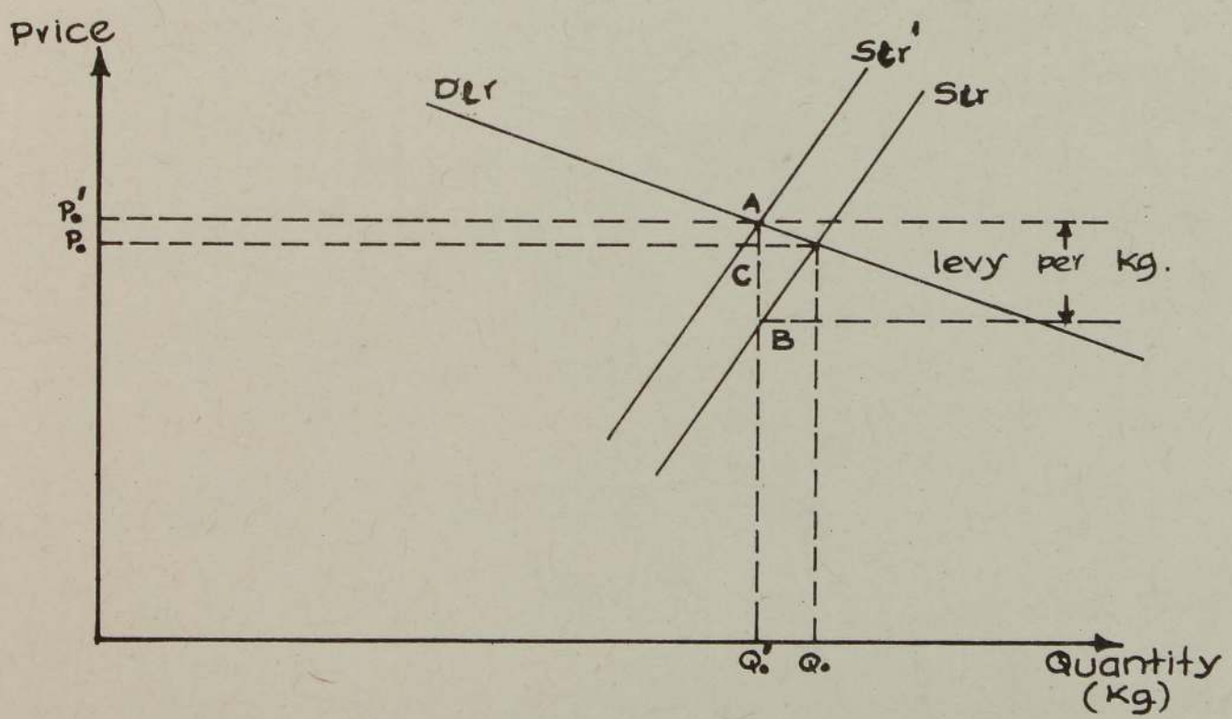
1 Note that if the world demand for Sri Lankan tea were inelastic, maximizing export earnings would require cutting back on production and sales because the additional price received per kg. would more than offset reduced sales.

From Figure 4.2, the short-run supply is fixed at Q_o (the short-run supply curve is S_{sr}) and the equilibrium price will be P_o. Because of the inelastic supply curve the producer will bear the full cost of the levy. The next paragraph which analyses the long-run case will clarify this further. Increasing the levy will not change either P_o or Q_o, implying that the total export earnings will remain unaltered in the short-run.

Figure 4.3 shows the long-run demand and supply curves for Sri Lankan tea. Now, unlike in the short-run case, the supply curve is more elastic because producers have time to change the previously fixed factors of production. The demand curve is also drawn as being more elastic. From Figure 4.3, S_{lr} is the long-run supply curve in the absence of any levy. S'_{lr} is the supply curve with a levy, where S'_{lr} is vertically displaced from S_{lr} by the size of the levy.[1] From the figure it can be seen that the levy causes equilibrium price

FIGURE 4.3

LONG-RUN SRI LANKAN TEA DEMAND AND SUPPLY CURVES AND INCIDENCE OF TEA LEVIES



1 This figure (and Figure 4·2) assumes that the actual physical payment of the levy is made by the producer. If the buyer were paying the levy instead, this would be shown as a downward vertical shift in the demand curve equal to the size of the levy. However, the observations that follow would be the same in either of these situations or a combination of them.

and quantity to move from (P_o, Q_o) to (P_o', Q_o'). Since the demand curve D_{lr} is elastic, total export earnings, with the levy, P_oQ_o', will be lower than the total export earnings without the levy, P_oQ_o. Therefore, unlike in the short-run, in the long-run the levies on tea result in a reduction in export earnings. Furthermore, in the long-run the cost of the levy is no longer borne totally by the producer as in the short-run. Although the actual physical payment of the full levy AB is made by the producer, the portion AC is **borne** by the buyer and the portion CB is **borne** by the producer. The more elastic the demand curve the smaller the fraction of the levy that is borne by the buyer. Further, the more inelastic the supply curve the larger the fraction of the levy borne by the producer. (In the short-run case the totally inelastic supply curve resulted in the entire levy being borne by the producer.)

The foregoing arguments have demonstrated that in the long-run there exists a trade-off between the conflicting goals of maximizing both export earnings and domestic revenues from tea. To decide upon the appropriate trade-off in a rational manner, it is essential to have information about the nature of the curves S_{lr} and D_{lr}. In the absence of detailed data, it is reasonable to argue, as was done earlier, that D_{lr} is quite elastic. Therefore, as argued earlier any government levy will be borne primarily by producers. The nature of the long-run supply curve, S_{lr}, is however more complicated. To examine this nature it is necessary to consider the two different types of tea producers that constitute the sector—state tea producers (primarily the JEDB and the SLSPC) and private producers. These two groups affect the shape of the S_{lr} curve differently. The private producers' long-run supply curve will be the 'normal' long-run marginal cost curve for tea production where tea market price changes will induce these producers to change the (fixed) factors of production—land and capital—in the long-run. State tea producers, on the other hand, are likely to be (as they have been in the past) very sluggish in adapting to tea market price changes. Their past attitude had been one of almost totally ignoring long-run market conditions in what little long-run planning was done. Therefore it is probably accurate to say that the long-run supply curve for state tea producers is inelastic with respect to price. Table 4.2 showed that approximately 68 per cent of total tea production in the country was from state-owned tea lands. As a result, the combined long-run supply curve of private and public (state) tea producers will lean more towards the state supply curve. Therefore, the total public and private long-run supply curve of Sri Lankan tea will be relatively inelastic.

A relatively inelastic long-run supply curve for tea would imply that the same arguments that applied to the short-run case, where tea levies could be increased without affecting export earnings, may also apply to some extent in the long-run. In other words, it appears possible to increase domestic government revenues from tea by increasing tea levies while suffering only small decreases in export earnings. This observation must, however, be tempered by two related considerations which have a significant impact on the analysis. The first is that increasing tea levies will result in worsening the current negative producer margins at the JEDB and the SLSPC. As a result, the Treasury will have to provide subsidies to these organisations if they (the JEDB and the SLSPC) are to continue functioning. In fact, increased government revenues from additional levies on JEDB and SLSPC tea could be exactly offset by additional Treasury payments to these organisations. The second consideration relates to privately owned tea lands. While it is true that private tea land owners currently account for only about 32 per cent of tea production, they have the potential to significantly increase this amount, especially if reduced tea levies substantially increase the profits to be made by producing tea. If this were to happen, the private sector contribution to the industry long-run supply curve would have a larger weight and the curve as a whole would become more elastic. Under such circumstances increasing domestic revenues by increasing the levies on tea could significantly reduce long-run export earnings.

To complete the analysis of the impacts of tea levies on policy objectives, it is necessary to briefly consider the possible presence of imperfections in the market for Sri Lankan tea, both on the demand and the supply side, which could negate any of the previous arguments. On the demand side, it has sometimes been argued that tea buyers as a group are organized and have market power which allows them to collectively depress the price they pay for Sri Lankan tea below the 'competitive' price. While this may have been true to some degree 15-20 years ago when the United Kingdom accounted for about a third of all purchases of Sri Lankan tea, the data in Table 4.8, which shows the percentage shares of Sri Lankan tea by the 7 largest buying countries in 1980, clearly shows that it is very unlikely that there is even an unofficial understanding among them to artificially hold down tea prices. Firstly, the largest single purchasing country, Iraq, accounted for only 11.8 per cent of the total. Secondly, the seven largest

countries together accounted for just 49.9 per cent of total sales. Finally, the diverse political and economic systems in these countries makes it improbable that they have even an unofficial understanding among them. On the supply side, the principal market imperfection is the long-term response to price variations, or more precisely the lack of a response, by the state plantations sector. The presence of this imperfection was recognized explicitly in the earlier analysis. Smallholders, on the other hand, are likely to have 'normal' responses to such variations. In summary, therefore, there are no market imperfections, that have not been considered explicitly in the earlier analyses, which are likely to change the nature of these analyses or their conclusions.

TABLE 4.8

SRI LANKAN TEA EXPORTS IN 1980 BY COUNTRIES OF DESTINATION (AS A PERCENTAGE OF TOTAL EXPORTS DURING THE YEAR)

Country		*Export percentage*
Iraq	..	11.8
United Kingdom	..	11.2
United States	..	7.2
Pakistan	..	6.9
Iran	..	5.3
Australia/New Zealand	..	4.3
Syria	..	3.2

Source : International Tea Committee Bulletin, 1981.

Considering all of the factors together, it is apparent that there is a clear trade-off between the twin objectives of increasing long-run export earnings and increasing domestic government revenues, in the short and the long-run. The appropriate levy on tea (if any) will depend upon how these two objectives are balanced.[1]

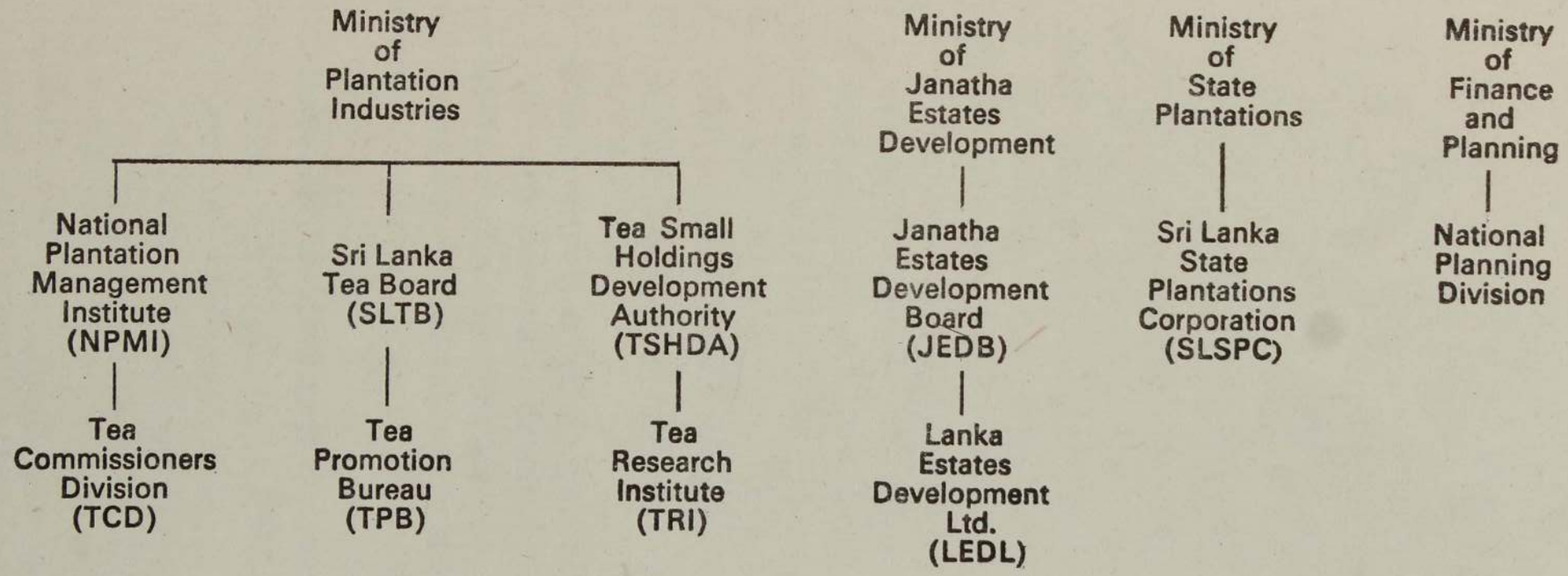
4.4 Overall Organizational Structure of the Tea Industry

Figure 4.4 summarizes the overall organizational structure of the various government institutions directly involved in the planning and/or management of the tea industry. Most of the organizations in the figure have already been referred to earlier in this study. Of

1 Exchange rate changes also affect the performance of the tea sector through changes in the price of tea in rupees. However, such changes have not been considered here because exchange rate change is not a policy instrument practically available for improving tea sector performance. Furthermore, such changes do not affect the conclusions reached in this section.

FIGURE 4.4

OVERALL ORGANIZATIONAL STRUCTURE OF TEA INDUSTRY INSTITUTIONS
(GOVERNMENT INSTITUTIONS)



the rest, the most important is the National Planning Division of the Ministry of Finance and Planning. This division is responsible for overall planning in the country and any government investment programme costing more than Rs. 5 million must be passed by the Division and approved by the Cabinet. In the case of the plantations industry, including the tea sector, the National Planning Division has been actively involved in planning. In particular, the Medium Term Investment Programme reviewed in Section 3 is being developed directly under the Division's co-ordination with input from the JEDB and the SLSPC.

Figure 4.4 lists various organizations under each of the four ministries. It must, however, be pointed out that these organizations are not the only ones under each of these ministries. Furthermore, the different listed organizations do not necessarily deal with only the tea industry. For example, the JEDB and the SLSPC also manage rubber and coconut estates, besides tea estates.

The first observation on studying the structure in Figure 4.4 is that there are four different government ministries—with three different ministers, the President is the minister of both State Plantations and Janatha Estates Development—involved in management and/or planning of the tea industry. While it is true that the tea industry is the largest single sub-sector within the Sri Lankan economy, it is not so large that it needs four different ministries directly involved in its operation. In fact the involvement of so many different organizations is a definite hindrance to the smooth and efficient functioning of the industry. The interviews with senior industry officials conducted as part of the present study revealed that the level of co-operation among these organizations leaves much to be desired.

The second observation pertaining to the industry organization is more general and relates to the nature of the overall planning process in the country. Although there has been an effort made by professional staff in the government to allocate the scarce investment resources of the country in an economically efficient manner, namely, on the basis of economic and social rates of return, the actual allocations that occur in practice are sometimes quite different. Those ministries and ministers having the most influence and power often direct a disproportionate amount of investment resources to their own sectors. The presence of three different

ministers at the head of different tea industry organizations has meant that power, influence, and commitment has been diluted in the sector. It is true that the President heads two of the tea industry ministries, but, he is also the Minister of Defence, Plan Implementation, Higher Education, and Power and Energy. The combined duties as the head of so many important ministries together with his presidential duties means that the President, quite understandably, does not have the time or energy available to devote the necessary effort to any of these ministries. In particular, though the President has power and influence it has not been brought to bear principally on the tea industry.

In this context, two observations made by one of the tea industry officials interviewed are relevant. He observed that while it was true that the President was the head of several ministries, he (the President) was also a very good manager of time. As a result the official argued that the relatively small fraction of time that the President devotes to any problem or issue was 'quality' time, meaning that the amount accomplished by the President in even a short time was more than that achieved by others in a much longer time. More importantly, the official claimed that having the President as head (even if it is only in name) of a ministry automatically assured that the political interference in that ministry, which primarily occurs at the local level, was greatly reduced, thereby enhancing the operation of that ministry. While these observations, especially the second, must be considered when assessing the present institutional structure, a powerful and influential minister at the head of a unified tea ministry would also be able to withstand political interference, especially at the local level.

In summary, as a result of the fragmentation of the industry, from the viewpoint of authority at the highest level, the quantity of development funds and effort that have been directed towards the tea sector in past years has not been adequate when compared with the importance of this sector to the national economy and the potential returns to be had from such investment. This fragmentation of authority at the highest level has also affected another critical area of the tea industry, that of general operation. Since no single individual has the ultimate responsibility for the overall performance of the tea sector, no one has taken the lead in developing and implementing policies to improve this performance. Even if someone had the desire and drive to do so, the present organization structure puts so many barriers in his path that he is bound to fail.

For any industry such as the tea sector, a major share of whose factors of production are owned and operated by the state to function effectively, especially in Sri Lanka, it is essential to have a strong, committed, and capable personality at its helm. The lack of such an individual in the present institutional structure, which in fact would prevent the emergence of such an individual if one existed in the organization, means that any effort to permanently improve the sector is likely to fail.

Possible Changes in the Organizational Structure—The arguments just presented show that there is a need for changing the present organizational structure of the tea industry. When proposing such changes, however, it is important to consider the presently existing structure. Any changes to this structure must be carried out in a manner which is designed to minimize the disruption in day-to-day operations of the industry.

The first step in any re-organization is to consider the present division into the JEDB and the SLSPC. This division has resulted primarily because of historical accident and not because of any specific underlying objective. The present sub-division of these corporations into Regional Board, each with broad powers, makes it easy to amalgamate these two corporations into a single entity. The Regional Boards could remain much as they currently are, except for a realignment of a few estates within Boards for geographic convenience. It will only be necessary to merge the Central Boards of the two corporations, and their support staffs. Such a step will eliminate the substantial duplication of effort that occurs as a result of the present two-corporation structure. The delegation of authority through the Regional Boards will ensure that the Central Board and support staff of a single unified corporation will be of manageable size. Another advantage of a single corporation structure is in the area of tea marketing. The two corporations currently compete against each other at the tea auctions and they do not co-ordinate their production strategies—for example, in deciding the mix of tea grades that are to be produced during any month. If there were a single corporation if would be possible to increase profits by proper co-ordination in such areas.

Another consideration in re-organizing the tea industry is that the JEDB and SLSPC, besides managing tea estates, also manage rubber and coconut estates. Several estates managed by these two

corporations' also produce more than one of these crops. Table 4.9 provides a percentage breakdown of different crop acreages and production in estates managed by the two corporations' and by all other producers together. From the table, the JEDB and the SLSPC

TABLE 4.9

PERCENTAGE BREAKDOWN OF ACREAGE CULTIVATED AND PRODUCTION BY JEDB, SLSPC AND OTHERS IN 1981*

	Area Cultivated			*Production*	
	Tea	*Rubber*	*Coconut*	*Tea*	*Rubber*
JEDB ..	26	12	2	41	18
SLSPC ..	25	16	—	38	22
Others ..	49	72	98	21	60
Total ..	100	100	100	100	100

Source: Ernst & Whinney et. al., Report on the Survey Stage, p. 12.

* The data in this table are taken from a single source for convenience. As a result the tea data are not consistent with those presented earlier in the paper. However, since the subsequent arguments only use their orders of magnitude no difficulties arise because of the inconsistency.

together managed 51 per cent of total tea acreage —26 and 25 per cent, respectively—and accounted for 79 per cent—41 and 38 per cent, respectively—of total tea produced in 1981. For rubber, the two corporations together managed 28 per cent of the acreage and accounted for 40 per cent of production. The coconut acreage and production by the two corporations were insignificant compared to national figures. These data show that divesting of coconut lands by the JEDB and the SLSPC will lead to little disruption. The same cannot, however, be said of rubber lands where the corporations have a significant presence.

The rubber lands issue can be addressed in two alternate ways. One possibility is for the rubber management functions of the JEDB and the SLSPC to be broken off from the tea management functions and attached to a separate ministry.[1] Alternately, there can be a single ministry in charge of both rubber and tea. The latter arrangement is more suitable for several reasons. First the disruption of present operations, especially at the JEDB and the SLSPC, would

1 At present there is no separate Ministry of Rubber and many of the support functions of the rubber industry, similar to the tea industry, fall under the Ministry of Plantation Industries. However, there has recently been some discussion of setting up a separate ministry to deal with rubber.

be minimized. Second, the Ministry of Plantation Industries already handles support facilities in both tea and rubber industries. Finally, simultaneous planning in the rubber and tea sectors, the two largest export crops will result in better long term allocation of resources.[1]

Referring again to Figure 4.4, the remaining ministry that deals directly with tea sector planning is the Ministry of Finance and Planning. It will be relatively straightforward for the National Planning Division of this Ministry to confine its role to one of reviewing tea (and rubber) sector plans rather than taking an active role in developing the details of such plans.

In summary, it will not be particularly difficult or disruptive to re-organise the present structure of the tea industry so that all functions, now handled by different ministries, fall under a single ministry (and minister) responsible for both tea and rubber.[2] Such a re-organization by itself will not, however, revive the tea industry. A critical ingredient for such a revival is that a strong, committed, and capable personality be put in overall charge of this ministry. If this individual also has power and influence the chances of success will be increased even further.

4.5 Tea Sector Policy Changes : Two Historical Examples

Since this report recommends policy changes appropriate for the tea sector, it is useful to consider past instances where such changes have taken place. In particular, we consider two recent cases, the first relating to the formation of Lanka Estates Development Ltd. (LEDL) and the second relating to the increases in tea levies in January 1984. These two examples are selected because they illustrate a viewpoint which has underlain many, if not all, past policy changes made in the sector.

Lanka Estates Development Ltd.—LEDL, a joint stock company, was formed in 1981 and 51 per cent of its equity issued was owned by the Ministry of Janatha Estates Development. The original rationale for the formation of LEDL was to see if private management of

1 Ideally, planning for all major agricultural crops (and forestry) together would be very useful. However, from a more practical perspective it is unlikely that a single ministry handling all these crops together could be formed, or operate efficiently if formed. Furthermore, there are already separate Ministries dealing with coconut industries and with agriculture.

2 As part of this re-organization the JEDB and the SLSPC should be merged into a single corporation while still maintaining the current Regional Boards so as to minimize disruptions in operation.

unprofitable state sector estates would result in a turn around of the performance of these estates. In addition, it was felt that the financial position of the state plantations corporations would be improved by getting 'rid of' money losing estates. In 1982 the JEDB transferred 43 estates (primarily tea growing estates) to LEDL for development and management.[1] Although it is not expressly acknowledged, the general criterion used by the JEDB in selecting estates to transfer to LEDL was to choose those estates which had been operating at a loss and which had low productivity.

LEDL in turn planned to lease (or in some instances sell) these estates to private sector companies for development and management. The leasee selection and allocation procedures were as follows: Private companies or other organizations first provided detailed long-term development plans for individual estates. If these plans were approved by LEDL a lease contract was to be drawn up. The initial leasing period was to be 30 years with two subsequent 30 year renewals possible if development took place according to the original development plan. LEDL's role was to be one of monitoring the progress of the leased estates. By the middle of 1933, detailed development plans had been submitted by various private organisations; these plans had been approved and individual leases were being drawn up. Around the end of 1983, however, all negotiations were abruptly terminated and 40 of the estates were handed back to the JEDB.[2]

Senior tea sector officials when questioned about the reason for returning the estates to the JEDB said that the principal reason was because of difficulties in reaching agreement about employees of the estates to be leased. The present employees of these estates wanted to remain as government sector employees whereas the potential leasees wanted them to be employees of the leasing companies. Because no agreement could be reached, the tea sector officials claimed, no lease agreements were signed.

At first glance the reasons given for the breakdown in the leasing negotiations appears reasonable. However, it should have been foreseen at the start of the leasing process, rather than at the

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1 The SLSPC also offered certain estate properties to LEDL. However, because these properties were not entire estates but blocks within estates, LEDL refused them.

2 The remaining three estates had already been leased out, one to a Japanese company and two to local entrepreneurs.

end, that potential problems would arise with respect to estate employees. These problems could and should have been addressed at the start, before considerable effort and resources had been expended by both the potential leasees and by LEDL. In fact, it is unlikely that the JEDB and LEDL were so shortsighted as to not expect opposition from their employees to leasing arrangements which made them (the employees) private sector employees. Therefore, the reason given for the leasing negotiation breakdown is not convincing and one needs to look further for the 'true' reasons. In this respect, a closer look at the timing of the negotiation process is particularly revealing.

At the time when leasing negotiations were started and were being actively pursued, tea prices were low and the estates to be leased were operating at a loss. However, because of large increases in tea prices during the last quarter of 1983 these estates suddenly became profitable, and would remain so as long as tea prices remained at high levels. This, rather than difficulties with employees, was the main reason for terminating the leasing negotiations. Policy makers at the JEDB and elsewhere obviously felt that leasing out estates making a profit would merely result in profits accruing to the private sector rather than to the state. Since it was not possible to abruptly tell the potential leasees, who had put in considerable resources into the negotiations up to then—for example, in drawing up estate development plans—that the leases would not be awarded because tea prices had improved, the excuse of employee dissatisfaction was given.

The original idea of leasing poorly performing state sector estates through LEDL was an interesting experiment. While it is not certain what the results of the experiment would have been, given the normal levels of waste and mis-mangement in many public institutions, there is a fair chance that the productivity of these poorly performing estates could have been considerably improved by private management. If this were in fact the case, the country as a whole would have gained because of increased tea production.

The decision not to lease these estates is a typical example of the short-run view taken previously by policy makers in the sector. Temporary profits because of inordinately high tea prices will not last. When tea prices drop these estates will once again be operating at a loss, as they have most times in the past. Even if tea prices

are always high enough to let these estates operate at a profit in spite of low productivity, the chances of this are miniscule, the improvement in productivity that may have been brought about by privatization of management will never be realized. More importantly, the sequence of events in the attempted leasing has a more far reaching consequence, namely, if state estates are offered for leasing to private management companies any time in the future there would probably be no takers.

Tea Levy Changes in 1984 —In January 1984 the ad valorem tax on tea was changed. The old tax was 35 per cent of excess of selling price over Rs. 26/- per kg. while the new tax was 50 per cent of excess over Rs. 28/- on the first taxable slab of Rs. 27/- and 40 per cent on the balance beyond Rs. 55/-.[1] This tax increase was instigated primarily as a government revenue enhancing measure, in particular, to reduce the budget deficit. It was argued that the boom in tea prices which began during the last quarter of 1983 resulted in a very large profit to tea producers and that an increase in the ad valoram tax could easily be absorbed by these producers who would continue to earn substantial profits.

Section 4.3 of this paper discussed the impacts of levies on tea production and on incentives to expand this production. It was argued that the principal effect of levies, besides providing government revenues, is to reduce incentives for private tea production.[2] Therefore, the 1984 increase in ad valorem taxes will result in a reduction in incentives to expand production compared with if there had been no increase. The argument that private (and state) tea producers still earn substantial profits even with the tax increases is not sufficient justification for the increase. A private tea producer's decision to expand productive area or to increase the level of inputs such as fertilizer, both of which actions would increase production, is not based on high profits during a short period when tea prices are high. Instead, it is the average return on his investment that he will be concerned with. In particular, if profits are low or negative when tea prices are low, as has been the case during much of the past few years, profits when tea prices are high must be exceptionally large if the average return is to be reasonable. Furthermore, in today's liberalized economy there exists many

1 Central Bank of Ceylon, Bulletin, January 1984, p. 5

2 Section 4.3 also argued that the incentive effects on state producers of changing tea levies is much weaker than that on private producers.

investment opportunities which can yield substantial rates of return. Even virtually riskless fixed deposits at banks can yield returns of up to 20 per cent. The average returns on tea sector investments have to be higher than the returns from such alternative investments before private producers make tea sector investments. For this to be the case, returns during tea price booms should be exceptionally high and the fact that they are quite high in spite of the ad valorem tax increase may not be sufficient to stimulate production.

Another, as important, effect of the ad valorem tax increases is their impact on expectations. If private tea producers come to believe, as a result of past tax policies, that tea levies will be increased whenever there is a tea price boom, thereby reserving most of the benefits of the boom for the state treasury, private producer incentives to invest in tea will be reduced.

In conclusion, the two examples discussed in this section, the LEDL experience and the ad valorem tax increases in January 1984, have a common thread running through them. In both instances long-run objectives have been sacrificed in exchange for short-run benefits. Such decisions are acceptable if they were made with full awareness of the trade-offs involved. However, it is not at all clear that this was in fact the case in the two examples considered.

4.6 Future Outlook in the Tea Sector

The analyses and evaluations presented in the previous sections can be used as the basis for assessing the future outlook for the tea sector in the country. There are two areas where such assessments are particularly useful, future prices and future production. First consider future prices. The future (FOB) price of Sri Lanka tea depends principally on the world price of tea, which in turn depends on future world demand for and world supply of tea. Previous attempts to project future prices on the basis of projected future demand and supply estimates have had very little success because of the many different factors that affect world demand and supply.[1] It is therefore pointless to repeat the past exercises which did not result in any reliable estimates and a meaningless exercise to

1 For example, the International Monetary Fund and the World Bank make such projections on a regular basis.

attempt price projections for tea, especially in the medium- to long-term. In the short term, less than one year, the best assumption may be to expect prices to be the average of what they were in the previous six months.[1]

Next consider future tea production. The projection of future production also has uncertainities associated with it, but, it is possible to make conditional statements about expected future production. Based on the analysis in Section 4.1, if all conditions in 1982 had taken on their expected values, production during this year would have been 194.7 million kgs. If historical rates of deterioration in weather and reduction in tea area occured in 1983 and continue to occur in future years, expected production in years beyond 1982 would drop at the rate of 2.47 (=2.22 + 0.25) million kgs. per year. Under these circumstances, 1983 *expected* production would have been about 192.2 million kgs. and 1984 *expected* production will be 189.7 million kgs. On the other hand, if further deterioration in weather and reduction in tea area has not occured since 1982, and will not occur in the future, expected production would have been 194.7 million kgs. in 1983 and will be the same in 1984 and beyond.[2] These statements are all conditional on other factors such as fertilizer application rates and management staying unchanged from their 1982 levels. Instead of staying unchanged, if fertilizer application rates increased by 10 per cent from its 1982 value, expected production would be increased by 4.4 million kgs.[3] In contrast, a reduction in fertilizer application rates by 10 per cent would cause expected production to drop by 4.8 million kgs.[4]

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1 There are two approaches that can be taken when developing and analyzing policies in the face of uncertain future tea prices. The first is to check the sensitivity of the costs and benefits resulting from any policy to variations in the price of tea and only implement policies where benefits exceed costs over a wide range of possible tea prices. The second approach, applicable in certain cases, is to explicitly build in price into the policy. For example, in the case of a tax on tea, this tax could be made a function of the price of tea.

2 If instead of declining, tea area increases because of appropriate government policies or because of high tea prices, the effect of this increase on production, will not be seen for about 4-5 years because of the time, necessary for newly planted tea bushes to mature.

3 The new expected production would be $194.7\ (1.10)^{.235} = 199.1$ m.kgs.

4 The new expected production would be $194.7\ (0.90)^{.235} = 189.9$ m.kgs

Up to now this paper has not explicitly estimated the effects of management practices on production. The paper which devised a production function for tea (referenced earlier) also showed that relatively small improvements in management could give rise to significant increases in expected production on tea estates, In particular, if tea estates are stratified into deciles according to management practices—the best ten per cent, the next ten per cent, and so on—an improvement in management to that of estates $1\frac{1}{2}$ deciles higher would be sufficient to achieve a 10 per cent increase in estate production. Focussing on production on state sector estates, in 1982 such an improvement would translate to an increase in production of 12.8 million kgs.[1] A similar level of management decline would result in a comparable decline in production.

The analyses in Section 4.1 can also be used as the basis for estimating the uncertainty associated with the earlier projections of expected production. The principal factor giving rise to non-systematic variations in production, that is outside the control of the producer, is variations in weather (rainfall). The earlier analysis showed that the standard deviation in production because of weather variations is 3.9 million kgs. Statistically, it is possible to show that 95 per cent of actual production values will be within 2 standard deviations of expected production. Therefore, we can say that as a result of potential weather variations, actual production will be within a range of 7.8 million kgs. on either side of expected production. In the earlier projected case where there is no systematic deterioration in rainfall or further decline in tea area, productions in future years could range from a low of 186.9 million kgs. to a high of 202.5 million kgs.[2] In practice, actual production could be outside this range for two reasons. First, other controllable factors do not stay at their 1982 levels. For example if fertilizer application rates are different, the expected production would change. Similarly, if management practices improve, or deteriorate, substantially from their 1982 levels, expected production would be significantly different. The second reason that actual production may be outside the estimated range is that uncertainty could be introduced by factors other than weather which affect tea production While the first reason can substantially alter production, the second is unlikely to have a significant impact.

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1 From Table 4.5, state sector production in 1982 was 127.6 million kgs

2 186.9 = 194.7 — 7.8; 202.5 = 194.7 + 7.8

Finally, the earlier analyses assessed how much historical variations in fertilizer use, besides the steadily increasing trend in fertilizer use, impacted on tea production. In spite of this, however, since future rates of fertilizer use are within the control of tea producers, we do not consider changes in use as giving rise to any uncertainty in future production.

Up to now we have made projections of future tea production under a variety of alternate conditions. Although it is not possible to definitively state which conditions will occur in practice, some situations are more likely than others. Specifically, the principal reason for past declines in production has been a decline in tea area and a significant part of this has been reduction in JEDB and SLSPC tea area (see Table 4.3). The reason for the loss in JEDB and SLSPC area has primarily been village expansion. The political and developmental pressures which prompted the government to re-allocate tea area to other non-agricultural uses is likely to continue, and state tea area will continue to decline unless a conscious decision is made and actions are taken at the highest levels to prevent such an occurence. Past experience of government policies and actions suggests that the most likely situation is that nothing will change and JEDB and SLSPC tea areas will continue their decline, resulting in further reductions in expected tea production. One potential offsetting factor is private tea area. If world tea prices remain high for the next few years, private tea area is likely to increase, provided tea levies are not raised so much that the share of world price going to private producers is reduced even below its present low level.

The deterioration in weather observed in past years is also likely to continue in the future as the underlying factors most probably responsible for such declines, such as deforestation, show no evidence of changing. Based on the earlier analysis, however, these declines will result in declines in expected tea production of a relatively small 0.25 million kgs. per year.

The most likely situation with respect to fertilizer use in tea is that the recent increasing trend in use in the sector will continue and probably even be accelerated with the recent increases in tea prices. If we assume a 5 per cent increase per year in average fertilizer use, the resulting increase in production would be sufficient to offset the effects of declining tea area and deteriorating weather.

In summary, the most likely outlook for future tea production in the next 4-5 years is that it will be around 195 million kgs. per year with a variation of about 8 million kgs. above or below, because of variations in weather.[1]

5. MECHANISMS FOR ENHANCING SECTORAL PERFORMANCE

The analyses presented earlier in this paper allow the identification of several different mechanisms for enhancing the performance of the tea sector. This section of the paper discusses these alternate mechanisms and the underlying reasons why they are likely to be effective.

- The single most important reason for the observed past declines in tea production has been a decline in tea area. It is imperative that this trend be reversed, or at the very least not be allowed to continue. There are two types of actions that are necessary to achieve this goal. First, to avoid further reduction in public tea area, and, if possible to increase this area, a commitment must be made at the highest levels that no further reductions will be acceptable. In practice, such a stance will be difficult to maintain because of various interest groups that will be attempting to acquire tea land for their own purposes. If future losses in state tea land are to be avoided it will therefore be necessary to establish a blanket rule which forbids the acquisition of state tea lands under any circumstance. If any exceptions are allowed to such a rule, it will only be a matter of time before loopholes are found in the rule and the losses in tea area, and consequently in tea production, continue.

  The second type of action to reverse the declining trend in tea area should focus on expanding private tea area. One possible approach is to provide tax incentives for opening up new tea lands, especially land which has been previously uncultivated.

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1 It should be noted that this estimated 8 million kgs. per year variation around expected production is only a probabilistic concept. It merely states that the actual production will be within plus or minus 8 million kgs. of expected production *95 per cent of the time*. If there is exceptionally high, or low, rainfall in any given year, actual production could be outside the estimated range.

Another approach, more in keeping with the free market system emphasized by the present government, is to reduce the current extremely high levies on tea. Such reductions will lead to significant increases in the profits from tea cultivation and thereby provide incentives to the private sector to expand tea area and improve cultivation practices.

- The greatest potential for increasing tea production in Sri Lanka, at the lowest cost, is by increasing the productivity of privately owned (smallholder) tea lands in the mid- and high-country. Potential mechanisms for achieving this are—

  JEDB and SLSPC factories which presently buy leaf from smallholders could act as extension centres for these smallholders. These extension services should, for example, make arrangements for fertilizer deliveries and offer credit for fertilizer purchases against future green leaf supplies.

  If easy credit is made available to smallholders they would improve their cultivation practices, for example, increase fertilizing rates, which would then result in higher tea yields. Such credit should be made available without excessive institutional 'red tape'.

  The role and funding of the Tea Small Holdings Development Authority (TSHDA) could be expanded to enable the TSHDA to reach more smallholders and thereby improve their productivity.

  The existing structure of subsidies offered to smallholders could be changed with a view to providing additional incentives to smallholders in the mid- and high-country. Increasing smallholder subsidies will probably be an 'investment' with a very high rate of return—the benefits being additional export earnings and domestic government revenues—much higher than the returns from other tea sector investments, such as the MTIP currently being considered.

- Another mechanism for improving sectoral performance is to change the present organizational structure at the highest levels of the tea industry so that all functions fall under a

single ministry (and minister) responsible for both tea and rubber. The JEDB and the SLSPC could be merged at the Central Board level as a part of the reorganization while still maintaining the current Regional Board structure. The reorganized ministry should be placed in the hands of a strong, committed, and capable minister. If this minister also has power and influence, the chances of reviving the tea industry will be further increased.

- The incentive scheme/salary structure revisions proposed in the Ernst & Whinney study as a means of increasing production in JEDB and SLSPC estates merits careful consideration. Ernst & Whinney do not prove conclusively that the new salary structure will lead to additional production, but, there is plausibility to their argument that without such revisions there will be an acceleration of the present exodus of qualified estate managers from the two corporations, thereby resulting in further decreases in production. Ernst & Whinney do calculate that a 5 per cent increase in annual production (or the prevention of a 5 per cent decrease in annual production) will more than offset the added cost of the new salary and incentive structure. The total additional cost of the salary revisions, around Rs. 200 million per year for both corporations together, is sufficiently small compared with the size of investments required under the MTIP, and the potential returns sufficiently great, to make a salary structure revision scheme worth pursuing. Another reason for undertaking such an 'investment' is the potentially disastrous consequence of not doing so. Though the actual probabilities are unknown, and may be low, there is the chance that in the absence of salary revisions a massive exodus of experienced and capable estate managers could occur, resulting in substantial (far in excess of 5 per cent) drops in tea production. In summary, steps to implement a salary revision cum incentive scheme similar (or identical) to that proposed by Ernst & Whinney may be critical for maintaining and improving state tea production.

- The Medium Term Investment Programme (MTIP) presently being finalized by the Ministry of Finance and Planning has proposed an extensive investment effort covering all JEDB and SLSPC estates. This programme involves many different

investment components which are likely to increase tea production. However, the procedures used to estimate potential benefits from these investments, which are then used to calculate expected rates of return, do not have a strong theoretical basis. As a result, there is considerable uncertainity associated with these rates of return and caution should be exercised when borrowing large sums of money, which have ultimately to be repaid, for undertaking major investments.

This is not to say that substantial returns may not be available from undertaking investments in the MTIP. Given the scarcity of capital resources, it does however argue that more funds should be directed towards those areas with the greatest potential returns. In this respect there is a related issue which needs consideration. It may be easier to arrange foreign funding for a large, relatively more centralized, investment project like the MTIP than for a more diffused programme such as one attempting to improve smallholder production. However, a significant component of total investment funds are from domestic sources and these funds are fungible. This flexibility can, therefore, be used to re-allocate investment resources from one area to another, even when foreign investment funds are tied to particular investments.

In summary, careful assessments of potential investments, especially in estimating benefits and the uncertainities associated with calculated rates of return, must be made before undertaking large investment projects like the MTIP.

- The trade-off between long-run export earnings and domestic government revenues (in the short- and the long-run) must be explicitly recognised when selecting export duties and other taxes on tea.[1] The decision to lower duties (or other levies) should not be based on the JEDB's and the SLSPC's worsening producer margins, as these corporations' are unlikely to change long-term behaviour because of such margins, especially since financial shortfalls are usually met by Treasury grants. Instead, the principal long-term impacts

1 The reasonable assumption of elastic world demand for Sri Lanka tea, in the long-and the short-run, was made in the analyses that resulted in this conclusion.

of changes in tea levies will result from changing responses of private tea producers, and it is these responses that should be considered when considering changes in tea levies.

- Past experience shows that policy making in the tea sector has often been characterized by the sacrifice of long-run objectives in exchange for short-run benefits. Examples of past policies which demonstrate this attitude are the ad valorem tax increase in January 1984, the LEDL episode, and many past occasions where state tea lands have been acquired for purposes such as building bus depots. In addition, even the short-run benefits, for which long-run objectives in the tea sector have been sacrificed, have not, in many instances, accrued to the tea sector. Consequently, the performance of the tea sector has shown a precipitous decline. If this trend is to be contained, or reversed, a long-term view, as opposed to a short-term view, must be taken when making and implementing policies in the sector. Furthermore, given the importance of the tea sector to the Sri Lankan economy and the neglect of this sector in the past, the meeting of objectives outside the sector, at the cost of worsening sectoral performance, can no longer be justified.

APPENDIX

SUMMARY OF TEA PRODUCTION FUNCTION ANALYSIS

In this appendix we summarize the arguments and estimation procedures used in the paper which developed the tea production function referred to in Section 4.1. We do not, however, present any of the analyses of tea sector issues using the estimated production function, although such analyses were presented in the earlier paper.

Theoretical Formulation—The first step consisted of formulating a theoretical tea production function for tea estates having the log-linear form

$$\begin{aligned}&\ln(\text{production/bearing ha}) \\ &= C + a\ln(\text{fertilizer/bearing ha}) + b\ln(\text{rainfall}) \\ &+ c\ln(\text{raindays}) + \sum_{=M,H} d_i D_i + \sum_{i=L,M,H}\ \sum_{j=2}^{N_i} e_{ji} D_{ji} + u\end{aligned}$$

where a, b, c, and C are constants

d_i represents the difference in ln(production/bearing ha) between low elevation and elevation i

e_{ji} represents the difference in ln(production/bearing ha) between estate 1 (in elevation i) and estate j (in elevation i)

N_i is the number of estates in elevation category i

u is a random error term

$D_L = 1,\ D_M = D_H = 0$ for low elevation

$D_M = 1,\ D_L = D_H = 0$ for medium elevation

$D_H = 1,\ D_L = D_M = 0$ for high elevation

$D_{1i} = 1,\ D_{2i} = D_{3i} = - - - = D_{N_i i} = 0$ for estate 1 in elevation i

$D_{2i} = 1,\ D_{1i} = D_{3i} = - - - = D_{N_i i} = 0$ for estate 2 in elevation i

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The principal arguments used to formulate this function were as follows :

- The log-linear form was chosen because it allows for interaction among the various factors affecting tea production while still being sufficiently restrictive to allow estimation.

- Although a host of different weather related factors could affect tea production in any year, for practical purposes rainfall per year and raindays per year were selected to represent the overall effects of weather on tea production.

- The 'dummy' variables D_L, D_M, and D_H were introduced to test for the presence of any systematic differences in tea production per bearing ha by elevational category.

- The dummy variables D_{ji} are introduced to capture all other systematic variations among tea estates that effect production/bearing ha. These factors can be divided into two categories, those outside the control of the tea grower (estate superintendent) and those within his control. The factors outside his control are terrain and soil type. A range of other factors such as pruning practices, plucking cycles, soil conservation techniques, replanting and infilling rates, and more nebulous practices such as labour management and motivation, are collectively termed 'management practices' because they are all within the control of the tea grower.

- It was argued that for any one estate, during the relatively short 4-5 year period for which data were collected, that management practices would not change by much. Even if a superintendent were changed during this period the inertia of the management system in place would result in little change in overall practices. This unvarying character allowed the specification of a single e_{ji} coefficient for each estate.

- The D_{ji} variables were introduced in 'nested' form with the estates nested within elevation categories to avoid technical difficulties (perfect correlation would result if this were not done) that would arise during estimation.

Empirical Estimation—The theoretically formulated tea production function was estimated using an ordinary least squares (OLS) regression procedure and a sample consisting of pooled cross-section/time series data from 60 JEDB and SLSPC estates, each covering 4-5 years. The results indicated that the coefficients of ln(fertilizer/bearing ha) and ln(rainfall) were significant ($p<0.01$) while the coefficient of ln(raindays) was not ($p>0.10$). However, because rainfall and raindays are closely correlated this does not necessarily mean that raindays do not have a significant impact on tea production per bearing ha. Repeating the regression without the ln(rainfall) variable resulted in the coefficient of ln(raindays) becoming statistically significant. These analyses showed that while raindays do affect production per bearing ha, it is sufficient to use ln(rainfall) alone to represent the impact of weather on ln(production/bearing ha). With this consideration, Table A.1 summarizes the results of the OLS regression used to estimate the coefficients of the theoretical production function after excluding the ln(raindays) variable. F–statistics were calculated to test the significance of the various dummy variable groups and are shown in Table A.2. These statistics show that each of these groups is collectively significant ($p < 0.01$).

TABLE A.2

F - STATISTICS TO TEST SIGNIFICANCE OF DUMMY VARIABLE GROUPS

Dummy Variable Group	*F - Statistic*
Elevation ..	11.34
Low elevation estates ..	16.32
Medium elevation estates ..	11.44
High elevation estates ..	7.19

The set of coefficients e_{ji}, corresponding to the dummy variables D_{ji}, collectively represent the effects of all systematic differences among estates other than those effects explicitly considered in the production function. The paper calculated a χ^2 statistic to test for systematic effects of soil differences among estates and showed that the contributions of such differences to productivity were not statistically significant. The paper also argued that the principal effects of terrain on productivity are within the control of the tea grower and that terrain could therefore be included under 'management practices'. In summary, therefore, differences in the D_{ji} coefficients between estates can be taken as a measure of the impacts of management differences among estates.

TABLE A.1

RESULTS OF TEA PRODUCTION FUNCTION REGRESSION

Variable		*Estimated Coeff.*	*t-stat**	*Variable*	*Estimated Coeff.*	*Variable*	*Estimated Coeff.*	*Variable*	*Estimated Coeff.*
ln (fertilizer/ha)	..	0.234	4.79	D_{2L}	0.277	D_{2M}	− 0.042	D_{2H}	− 0.346
ln(rainfall)	..	0.220	4.74	D_{3L}	0.590	D_{3M}	0.395	D_{3H}	− 0.215
D_M	..	0.135	—	D_{4L}	− 0.278	D_{4M}	− 0.552	D_{4H}	− 0.231
D_H	..	0.431	—	D_{5L}	− 0.158	D_{5M}	− 0.257	D_{5H}	− 0.354
				D_{6L}	0.200	D_{6M}	− 0.267	D_{6H}	− 0.275
				D_{7L}	− 0.085	D_{7M}	0.133	D_{7H}	− 0.081
				D_{8L}	0.139	D_{8M}	0.113	D_{8H}	0.137
				D_{9L}	0.104	D_{9M}	0.161	D_{9H}	0.246
				D_{10L}	− 0.067	D_{10M}	− 0.275	D_{10H}	− 0.111
				D_{11L}	0.611	D_{11M}	0.408	D_{11H}	− 0.278
				D_{12L}	0.616	D_{12M}	− 0.290	D_{12H}	− 0.179
				D_{13L}	− 0.005	D_{13M}	− 0.494	D_{13H}	− 0.417
				D_{14L}	0.648	D_{14M}	0.023	D_{14H}	− 0.102
				D_{15L}	0.037	D_{15M}	− 0.277	D_{15H}	− 0.010
				D_{16L}	− 0.834	D_{16M}	− 0.326	D_{16H}	− 0.113
				D_{17L}	− 0.094	D_{17M}	− 0.210	D_{17H}	− 0.404
				D_{18L}	− 0.433	D_{18M}	− 0.227	D_{18H}	− 0.247
				D_{19L}	− 0.068	D_{19M}	0.501	D_{19H}	0.267
						D_{20M}	− 0.130	D_{20H}	− 0.476
						D_{21M}	− 0.008		

* Individual t-statistics are not shown for the coefficients of dummy variables. Instead, F-statistics to test the significance of particular groups of dummies together are calculated in the text.

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