

# **Terms of Trade in Paddy Production Sector in Sri Lanka**

**Chatura Sewwandi Wijetunga**



Research Report No: 137

March 2011

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Colombo 7  
Sri Lanka**

**First Published: 2011**

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**Typesetting and Lay-out : Dilanthi Hewavitharana**

**ISBN: 978-955-612-121-6**

## **FOREWORD**

The basic purpose of agricultural Terms of Trade analysis is to understand the movements of prices of various commodities sold and purchased by the agricultural sector and to assess the changes in purchasing power of a unit of agricultural commodities over a period of time. Although Terms of Trade in agriculture have been extensively studied by both academics and policy makers in other countries like India, Sri Lanka has not paid much attention to this aspect. In order to fill this information gap the HARTI has conducted a study on Terms of Trade in Paddy Production Sector as an initial step. This research report analyses the changing pattern of Terms of Trade in paddy sector during the last decade.

The study has revealed that, Terms of Trade in paddy sub sector had declined from 1990 to 2007 resulting in decline of living standards of paddy farmers. However, Terms of Trade had increased in 2008 as farmers had received higher prices for paddy during that year. This had resulted in improvement of farmers living standards. Moreover, price of paddy in relation to price of fertilizer has increased almost five times during the study period of 1990-2008 as a result of the subsidy programme. The information available in this report will be useful to policy makers, researchers and others who are interested in the development of agriculture sector. This study as a whole will undoubtedly be a launching pad for future researchers to conduct further research on the broader theme of Terms of Trade.

I congratulate the author, Miss M.W.A.C.S. Wijetunga for undertaking this valuable piece of research which provides much insight on a hitherto unexplored aspect of agriculture sector in Sri Lanka.

**Lalith Kantha Jayasekara**  
**Director**

## **ACKNOWLEDGEMENTS**

This is my first research report after assuming duties as a staff officer at the HARTI in 2009. Dr. L.P. Rupasena, Deputy Director (Research), encouraged me to conduct this study by providing guidance for the original proposal. He also made valuable comments on the first draft of this study. Mr. J.K.M.D. Chandrasiri, Head, Agricultural Policy and Project Evaluation Division (APPED) gave generous help and encouragement throughout this study. I wish to express my sincere thanks to them for their continuous support which contributed immensely for the successful completion of this report.

Professor Ranjith Premalal De Silva, former Director HARTI, helped me to get the report edited. Mr. Lalith Kantha Jayasekara, the present Director, encouraged me to publish the report as early as possible. Dr. Terrence Abeysekera, Senior Agricultural Economist advised, encouraged and made valuable comments at the initiation of this study. Above all he was an admirable mentor and motivator who helped me to proceed so far in my career. The external reviewer Dr. Jeevika Weerahewa (senior lecturer, Faculty of Agriculture, University of Peradeniya) provided excellent feedback which helped me to improve the contents of the report. Mrs. D.A.B.N. Amarasekera, Head, Data and Information Management Division, HARTI supported in data analysis. Prof. W. I Siriweera, former Chairman of the University Grant Commission edited the final draft of the report. Mr. E.N.R. Fernando (Data Analyst) and Mr. S.S.J. Rosa provided support in collecting secondary data. Mr. A.N.K. Shantha Anurasiri (Statistical Assistant) also helped me in numerous ways. Mrs. Udeni Karunarathne designed the cover page. I wish to express my profound gratitude to all of them.

Finally my appreciation goes to printing staff of the HARTI for printing and publishing this report.

**Chatura Sewwandi Wijetunga**

## EXECUTIVE SUMMARY

This study has been undertaken with a view to gain insights on prices received for final product and prices paid for inputs (or terms of trade) to ascertain the extent of changes in the paddy farming sector in Sri Lanka during the period 1990-2008. The producer price index of paddy is divided by composite input index to find the Parity Indices/terms of trade of paddy. The investigation is based on the hypothesis that terms of trade in paddy sub sector had deteriorated over the past decades.

Farmers received considerably low paddy prices during the peak *Maha* harvesting period specially in Anuradhapura and Polonnaruwa districts compared to *Yala* harvesting season. Producer price index had reached a value of 400 in 2008 and it was a four-fold increase over the base year, 1990. Labour index had increased by seven folds over that in the base year, 1990. Fertilizer price at the farm level had significantly declined (Rs.7/kg) to that of the base year index value. This is due to heavy subsidization of fertilizer. Agro chemical cost had increased by six-folds while machinery cost index had increased by six-folds compared to the base year value.

Parity ratios of paddy with inputs (except fertilizer) had declined until 2007 and in 2008 all the parity ratios had increased due to significant increase of producer price. Parity ratio of paddy with respect to fertilizer had drastically increased during the study period with heavy subsidy given to farmers. This ratio had increased to 4.94 in 2008. Terms of trade calculated using composite index of inputs had deteriorated during the period of investigation irrespective of some positive signals in 2008. Although both producer prices and the input prices have increased during the period, producer prices are not commensurate with the rate of input prices increases. Therefore, it has resulted in a decline of the terms of trade in the paddy sector. In 2008, this had positively increased because farmers had received higher prices for paddy. It was found that terms of trade in the *Maha* harvesting season is slightly lower than in the *Yala* harvesting season. Terms of trade in 2008 reached 0.79 in the *Maha* season (69% increase) and 0.72 in the *Yala* season (37% increase) which were the highest recorded terms of trade values after 1992 and 1993 respectively. But unfortunately the terms of trade value never exceed the base year value or at least did not reach that value so far. Hence terms of trade is unfavourable and farmers have been adversely affected in terms of profitability. Parity ratios of paddy with consumer goods namely, bread, milk powder and kerosene oil also had deteriorated during the study period which shows a decline of purchasing power and living standards of the paddy farmers. Price index of bread has risen by 5 folds while the milk powder and kerosene oil has risen by 7 and 10 folds respectively when compared to the base year, 1990. The upsurge in crude oil prices in international markets was the major cause of the overall price increases during the recent past.

Some important implications have come to light in this study. Continuous rise of production cost, low paddy prices and a significant increase in the prices of consumer goods have made terms of trade unfavourable to the paddy farmers. This in turn has led them to move away from paddy cultivation. Commercial paddy cultivated areas were moving towards mechanization due to labour shortages. Labour shortages have resulted in higher wages in the sector.

The study findings suggest that labour saving mechanisms should be introduced in paddy cultivation as a solution to the problem of labour shortage and accompanying high wage rates. Government should encourage the private sector investment in the commercial cultivation of paddy in the country. In addition, local paddy farmers should be encouraged by helping them to explore new markets to sell their products at reasonable prices at the peak periods of production. In order to improve the terms of trade in paddy sector sale of paddy by farmers direct to millers, improvement of the quality of paddy and holding stocks without selling at the peak harvesting period in order to sell at a later period are necessary.

## TABLE OF CONTENTS

Foreword	i
Acknowledgements	ii
Executive Summary	iii
List of Tables	vii
List of Figures	viii
List of Appendices	ix
Chapter One	1
<b>Introduction</b>	<b>1</b>
1.1 Study Background	1
1.2 Study Objectives	2
1.3 Report Organization	3
Chapter TWO	4
<b>Review of Literature</b>	<b>4</b>
2.1 Evolution and Concepts of Terms of Trade	4
2.2 Empirical Review	6
Chapter THREE	9
<b>Methodology and Data</b>	<b>9</b>
Chapter FOUR	13
<b>Trends and Patterns of Producer Price Behaviour in Paddy Sector</b>	<b>13</b>
4.1 Introduction	13
4.2 Patterns of Producer Price Movements in Paddy	13
4.3 Producer Price Volatility in Paddy	16
4.4 Changes of Producer Price Index in Paddy Sector	17
Chapter FIVE	19
<b>Pattern of Price Movements of Inputs and Consumer Goods in Paddy Sector</b>	<b>19</b>
5.1 Introduction	19
5.2 Wage Rates	19
5.3 Seed Paddy Prices	21
5.4 Retail Prices of Fertilizer at the Farm Level	22
5.5 Machinery and Agro Chemical Cost	23
5.6 Changes in Prices of Selected Consumer Goods	24
Chapter SIX	27
<b>Terms of Trade in the Paddy Sector</b>	<b>27</b>
6.1 Introduction	27
6.2 Parity Ratios of Paddy	27
6.3 Inter-relationship of Producer Prices and Input Prices in Paddy	28

6.4 Changes of Price Parity Ratio in Comparison with the Selected Food Items	33
6.4.1 Price Parity Ratios in <i>Maha</i> Season	33
6.4.2 Price Parity Ratios in <i>Yala</i> Season	34
<b>Chapter SEVAN</b>	<b>37</b>
<b>Findings, Conclusions and Recommendations</b>	<b>37</b>
7.1 Findings	37
7.2 Conclusion	40
7.3 Recommendations	41
7.4 Future Research	42
<b>References</b>	<b>43</b>
<b>Appendices</b>	<b>45</b>



## LIST OF TABLES

3.1: Weight given to Different Inputs used in Paddy Cultivation	10
4.1: Correlation Coefficients of Real Paddy Price in Selected Districts during 1990-2008	16
4.2: Annual Variation of Paddy Prices in Selected Districts: 1990-2008	16
4.3: Total Tax Incidence in Importation of Rice from January 1995- August 2008	17
5.1: Changes of Man Days in Paddy Cultivation (Man-days per Acre of Land)	20
5.2: Wage Rate Index; 1990-2008	21
5.3: Seed Paddy Price Index; 1990-2008	22
5.4: Machinery Cost index: 1990-2008	24
5.5: Movements of Nominal Prices of Selected Consumer Goods; 1990-2000	25
5.6: Price Indices of Selected Food Commodities; 1990-2008	26
6.1: Parity Ratios of Paddy in <i>Maha</i> Season; 1990-2008	27
6.2: Terms of Trade in Sri Lanka under Different Scenarios	29
6.3: Change of Terms of Trade in Different Districts in <i>Maha</i> and <i>Yala</i> 1990-2008	31
6.4: Annual Percentage Change of Producer Price, Composite Index of Inputs and Terms of Trade in Selected Years ( <i>Maha</i> season)	32

## LIST OF FIGURES

4.1: Monthly Producer Price Movements of Paddy in Anuradhapura District; January 1990-December 2008 (Nominal and Real Price)	13
4.2: Monthly Changes of Producer Prices of Paddy in Anuradhapura District; 2004-2008 (Real Price)	14
4.3: Changes of Producer Price Index of Paddy: 1990-2008	17
5.1: Movements of Nominal Wages in Paddy Cultivation; 1990-2008	20
5.2: Movements of Seed Paddy Prices (Nominal price); 1990-2008	21
5.3: Changes in Retail Prices of Fertilizer in Paddy (Farm Level); 1990-2008	22
5.4: Movements of Machinery and Agro-chemical Cost Changes in Paddy Cultivation (Nominal Price) in the Anuradhapura District; 1990-2008	23
6.1: Changes in Producer Price Index ( <i>Maha</i> Season) and Composite Index of Inputs	28
6.2: Terms of Trade in Paddy; 1990-2008	30
6.3: Price Parity Ratios of Selected Consumer Goods ( <i>Maha</i> Season)	34
6.4: Price Parity Ratios of Selected Consumer Goods ( <i>Yala</i> Season)	35

## LIST OF APPENDICES

Appendix 1A: Producer Price of Paddy in Anuradhapura District (Rs./kg);1990-2008	45
Appendix 1 B: Producer Price of Paddy in Polonnaruwa District (Rs./kg);1990-2008	46
Appendix 1C: Producer Price of Paddy in Kurunegala District (Rs./kg);1990-2008	47
Appendix 1D: Producer Price of Paddy in Hambantota District (Rs./kg);1990-2008	48
Appendix 2: Lowest Farm-gate Price Received for Paddy in Selected Districts (Rs./kg);1990-2008	49
Appendix 3 A: Producer Price Index of Paddy ( <i>Maha</i> )	49
Appendix 3 B: Producer Price Index of Paddy ( <i>Yala</i> )	50
Appendix 3 C: Producer Price Index of Paddy (Average)	50
Appendix 4: Wage Rate Changes in Paddy Cultivation (Rs./man day)	51
Appendix 5: Wage Rate Index	51
Appendix 6: Changes in Seed Paddy Price (Rs.kg); 1990-2008	52
Appendix 7: Changes in Retail Prices of Fertilizer at Farm Level;1990-2008	52
Appendix 8: Machinery Cost Index; 1990-2008	53
Appendix 9: Agro Chemical Cost index; 1990-2008	53
Appendix 10 A: Weighted Index Values of Inputs-Polonnaruwa District	54
Appendix 10 B: Weighted Index Values of Inputs-Anuradhapura District	54
Appendix 10 C: Weighted Index Values of Inputs-Kurunegala District	55
Appendix 10 D: Weighted Index Values of Inputs-Hambantota District	55
Appendix 11: Composite Index of Inputs in each Selected Districts; 1990-2008	56
Appendix 12 A: Terms of Trade in Paddy in Selected Districts ( <i>Maha</i> Season)	56
Appendix 12 B: Terms of Trade in Paddy in Selected Districts ( <i>Yala</i> Season)	57
Appendix 13: GDP Deflator Index Values	57

# CHAPTER ONE

## Introduction

### 1.1 Study Background

Paddy farming sector in Sri Lanka has been experiencing highly volatile price regimes both in terms of output and inputs. The prices of inputs have been increasing at a fast rate throughout the past 15-20 years. It is also generally observed that, profitability has not been commensurate with the farm gate price increases of paddy in most recent years.

The prices of both inputs and outputs have their impact on the profitability of the crop. The changing ratio of input output prices over time has made the farmers more price conscious in taking decisions in the allocation of productive resources among various crop components. Therefore, it is of vital importance to study the input output price ratio for different inputs used in paddy farming. More inputs have been used after the green revolution and input prices have been on the increase with the higher demand.

Terms of trade is a common measure that is used to understand the performance of international trade. It is also used as a proxy for comparing relative prices of various goods. Thus if the price of consumer goods or industrial products has gone up against the agricultural products, it implies that the terms of trade of agricultural products have declined against the consumer goods or industrial goods. Thus reduction of terms of trade of farmers is a typical issue in the rural agricultural sector that leads to increase poverty and indebtedness. The real impact of variations of relative prices of agricultural goods and subsequent income against the prices of farm inputs would essentially affect the livelihood of the farming community. Terms of trade is important in formulating price policies and the development programmes. Monitoring the changes in terms of trade and effective policy measures are important for more efficient use of agricultural resources and raising the overall production and productivity.

Anyhow, it may not always necessarily be true that favourable terms of trade by implication ensure high profitability and unfavourable terms of trade imply loss of profitability to farmers. A reduction or relatively low increase in prices of agricultural products, as a consequence of reduction in the cost of production due to better and more productive technology does not result in the decrease of profitability of the farmers (Documentation, Indian Journal of Agricultural Economics, Vol. 53 No.1, 1998).

Decline of farm income of paddy dominated small farming sector is very significant and is associated with high cost of production, size of small land holdings and unfavorable terms of trade for agricultural products. Even though per capita monthly income of the country has increased from Rs. 881 in 1980/81 to Rs. 26,286 (in nominal terms) in 2006/07 (Central Bank, 2008) average annual farm income of small paddy holdings in major irrigated areas including imputed cost remained around Rs. 62,410 per hectare in 2008 (DOA, 2008).

One of the other notable features prevalent in the smallholdings farming sector in Sri Lanka is the heavy dependency on imported farm inputs such as machinery, chemicals and fertilizer. It is argued that, although the government has spent large amounts on fertilizer subsidy, paddy production cost has been ever increasing over the period with the increasing input costs. On the other hand paddy farmers did not receive a reasonable price at the farm level to cover the cost of production. Both these factors have caused low profitability in paddy sector. In this context this study is focused on examining the terms of trade in the paddy farming sector.

## **1.2 Objectives**

In this study, the performance of input prices, retail prices of selected food commodities (bread and milk powder) and intermediate goods (Kerosene oil) as well as prices of paddy are examined in detail with a view to ascertaining the extent of the terms of trade/price parity ratio of the paddy farmers.

More specifically this study seeks to:

- i. examine the trends that underline the movements of price of paddy, the price of inputs and the retail prices of selected consumer goods in Sri Lanka during the period 1990-2008;
- ii. ascertain the behavioural pattern of prices of paddy in comparison with the prices of inputs and other consumer goods in terms of trade/ parity price ratios; and
- iii. study the implications of changes of price movements on the paddy farmer's economy.

## **1.3 Report Organization**

This report is organized under seven chapters. The first chapter gives the background to the study, and objectives. The second chapter is devoted to concepts and empirical review of terms of trade. The third chapter is focused on methodology used to examine the parity ratios/terms of trade. The fourth chapter deals with patterns of price movements in paddy, price volatility in paddy and changes of producer price index in paddy sector. The fifth chapter focuses on trends and patterns of input prices of paddy and changes in retail price movements of selected consumer goods. The next chapter which is the most important part of this study deals with the interrelationship of both producer prices and input prices in paddy in relation to terms of trade indices, and price parity ratios of paddy compared to selected consumer goods. The final chapter contains the summary of key findings, conclusions and recommendations for improvement of the paddy sector in Sri Lanka.

## CHAPTER TWO

### Review of Literature

#### 2.1 Evolution and Concepts of Terms of Trade

The concept of terms of trade was historically developed in the context of the theory of international trade. The index of net terms of trade in the international trade employs unit value index of exports expressed as percent of unit value index of imports.

$$1. \text{ Index of Net Terms of Trade} = \frac{\text{Unit Value Index of Exports}}{\text{Unit Value Index of Imports}} \times 100$$

The concept of terms of trade was later extended to monitor the unit value of prices of commodity exchanged between agricultural and non agricultural sectors in the domestic trade. Most of the work in this regard initially considered terms of trade and expressed as a ratio of the index of wholesale prices of agricultural commodities to those of non agricultural products expressed in percentage terms.

$$2. \text{ Index of Terms of Trade} = \frac{\text{Index of Wholesale Prices of Agricultural Commodities}}{\text{Index of Wholesale Prices of Manufactured Products}} \times 100$$

The terms of trade is based on ratio of prices received for farm products and prices paid for farm inputs. However, to observe the changes in the terms of trade between agricultural and non agricultural sectors, all items of prices paid for final consumption, production, inputs and capital investments become relevant and should be considered.

The concept of income terms of trade as being used by some researchers in India is basically the product of the ratio of indices of prices received to indices of prices paid and the quantity of marketed surplus exported to the other sector. The index of income terms of trade for the agricultural sector is calculated by multiplying the ratio of indices of prices received by the agriculture sector for its products to indices of prices paid by the index of quantity of marketed surplus.

The other approach being used in the compilation of index of income terms of trade is multiplication of the ratio of indices of prices received by the agricultural sector to indices of prices paid by it, by the index of productivity per hectare in agriculture. But this shows only the growth of income per hectare in agriculture. The relative position of the increase in the income of the agriculture to the non agriculture sectors are not indicated.

An appropriate approach being used in the compilation of index of income terms of trade would be the consideration of the net barter terms of trade or change in relative prices of agricultural and non agricultural sectors, the quantity exported/ imported from both the sectors and changes in population engaged in two sectors.

The terms of trade index (or the parity index) requires consideration of a year (or a period) during which the relative price position was considered satisfactory from the farmers' and others' point of view. The effort is then to maintain this parity or terms of trade, in order to protect the farmer's real income position, and also to give incentives for production.

According to the Commission for Agricultural Costs and Prices (CACP), a barter terms of trade index is a weighted price ratio of a basket of 21 agricultural commodities sold to a basket of 32 commodities purchased by agricultural households (17 for consumption purposes, 7 for farm inputs, and 8 for farm investment) (Kahlon and Tyagi, 1980). The index is only available at the national level. An alternative terms of trade index that can be computed for individual states is the ratio between agricultural and non-agricultural GDP deflators. This index is often called the 'gross' terms of trade. In principle, the gross terms of trade is better because it measures the relative returns to investment resources in the two sectors, and increases in productivity in both sectors.

Index Terms of trade is expressed in percentage terms as the ratio of index of prices received for farm products and indices of prices paid for final domestic consumption, farm inputs and capital investment in agriculture. The index of prices paid includes seeds, fertilizers, pesticides, insecticides, and agricultural wages for hired labours. The index of prices paid for intermediate consumption would be useful for examining the of cost of cultivation/production of crops. It would help in examining its impact on the increase in overall cost of cultivation in paddy sector.

The FAO has noted that the terms of trade based on ratio of prices received for farm products and prices paid for farm inputs serve the limited objective of indicating the relative production profitability of the times. These are also called Parity Index of prices received for output and paid for farm inputs.

## **2.2 Empirical Review**

Dar (1968) has studied the causes of changes in domestic terms of trade in Indian economy. The objectives of the study were to determine the movements in prices of various commodities and thereby measure the extent of change in the terms of trade between the agricultural and industrial sectors in India and to evaluate the effects of various real and monetary factors on the prices of different commodities. The income elasticity of demand estimates are taken from cross-section data and they are used as prior estimates for determining price relationship from time series data. To determine the movement of terms of trade, both regression and non parametric methods have been applied. He has concluded that terms of trade have moved towards the agricultural sector in the period under consideration and the main reason for this movement, however was that the industrial raw material crops, which carry a heavy weight in the index as well as fruit and vegetables and milk and ghee, moved up in the price much more rapidly than food grain prices. The agricultural commodities for

which price trend were upward most sharply were those with relatively high income elasticities of demand.

Another study carried out by Hayes (1975), regarding the terms of trade has mentioned that there is a continuous and inexorable declining trend of terms of trade of primary commodities. The main objective of his study was to find measures to raise the standard of living of the poorest people of the world most whom are producers of primary commodities or at least live in economies which are highly dependent on the export of primary commodities. Other objectives were to study the need of developing countries progressively to increase the external purchasing power of their foreign exchange receipts and the need to overcome the adverse effects of large short term fluctuations in the prices of primary commodities. He has further explained that large fluctuations in prices of earnings from primary commodities create an additional obstacle to development.

Hazel *et al.* (1995) has analyzed the relative contributions of terms of trade and non price variables in explaining agricultural growth in recent decades in India using time series data. Agricultural growth is largely explained by expansion of irrigation, (which in the model is also a proxy for High Yielding Varieties and other capital investments), and, until the 1970s, by increases in the net cultivated area. Agricultural output is inelastic, and is becoming increasingly more so over time. The terms of trade was not an important factor in explaining past growth. Even during the late 1960s and early 1970s when the terms of trade improved by 18 percent for agriculture they only accounted for 15 percent of the growth in output. Increases in agricultural output are also found to worsen the terms of trade for agriculture, despite government attempts to control prices. The results highlight the importance of further investments in agricultural research, extension, irrigation and other supply-enhancing inputs if the ongoing policy reforms in India are to translate into more rapid and sustained agricultural growth.

Some studies have been concerned about the influence of changing terms of trade noticed during the post reforms period in India on private agricultural investment. Shetty (1990), Patnaik (1987) and Mallick (1993) have indicated adverse agricultural terms of trade to be one of the reasons for the declining private investments in agriculture. Rao (1993, 1994) and Rao and Storm (1998) have indicated that hikes in terms of trade could lead to a shrinkage of public investments in large irrigation projects, rural electrification, transport, storage, agricultural research and extension programmes through fiscal squeezes in the government budget. The direction of causality may imply that rising agricultural terms of trade reduce the government's share of agricultural investment by eroding its fiscal base and enhancing the expenditures. Roy and Pal (2002) have estimated a simultaneous equation model on the basis of pooled cross-section state level and time series data during 1970-71 and 1998-99. They have found a positive relationship between terms of trade and private investments in agriculture. It may be noted that Desai and Namboodiri (1997) have observed that improvements in terms of trade have a net impact that reduces the government expenditure in agriculture.

Rath (1985) has stated that the barter terms of trade are not a safe guide to changing real income position of the farmers, because it does not encompass the technological changes in agriculture affecting per acre yields, the changing crop mix in farms and

the changing size of holdings. The income terms of trade can be expected to catch the first two of these three factors.

Rupasena *et al* (2007) have studied the behaviours of price of rice in comparison with the prices of inputs and other commodity prices to understand the terms of trade in rice sector in Sri Lanka. In computing parity price between output and input prices, fertilizer and labour were selected as inputs. In computing parity price between output and consumer products prices of milk powder, soap and kerosene oil were selected. They concluded that, during the pre-liberalization period the parity ratios had increased, but had continuously declined during the post liberalization period.

According to Dev (2007) terms of trade for agriculture had improved in the post-liberalization period due to reduction in protective measures to industry and increase in procumbent prices. During 1998 to 2004, however, there were four points decline in the agricultural terms of trade although it was still favourable to agriculture as compared to non-agriculture. However in spite of favourable terms of trade, growth rate in agriculture was not higher in the 1990s and beyond.



## **CHAPTER THREE**

### **Methodology and Data**

The investigation is based on the hypothesis that terms of trade in paddy had declined over the past years.

The analysis is based on the basic data available in the Department of Agriculture, Department of Census and Statistics and Hector Kobbekaduwa Agrarian Research and Training Institute. The study is focused on the period of 1990-2008 and four paddy producing districts namely, Polonnaruwa, Anuradhapura, Hambantota and Kurunegala which are selected on the basis of the availability of data during the period. These four districts contribute to nearly 40% of the total annual paddy production in Sri Lanka. In these selected districts, paddy cultivation is mostly practiced under irrigation.

Total cost incurred in paddy cultivation is divided into 3 main components namely, labour, material and power. Power cost includes cost of draught power for land preparation, irrigation etc, while material cost includes seed, fertilizer, pesticides and other materials. In the recent past labour, machinery and agro chemical costs have risen up sharply due to increased demand. Input indices are calculated by using 1990 as the base year. Then these indices are converted to weighted indices by using their share to the total cost of production. Weights are assigned because the importance of these inputs vary from item to item, and differ in measurements. Weighted Index values of these farm inputs are taken to calculate composite index of inputs. Instead of taking the prices of machinery and agro chemicals, their costs are taken to calculate composite index of inputs as these two inputs cannot be separated and taken as unit prices (Rs./Ac). Anyhow it is evident that labour weights have shrunk in late 2000 when compared to those of the early 1990s. This is because gradual expansion of the use of machinery in large paddy producing areas such as Hambantota. But fertilizer costs in paddy farms have dropped in recent years due to the fertilizer subsidy programme launched by the government.

Different Weights assigned to the different inputs are given below.

**Table 3.1: Average Weights given to Different Inputs used in Paddy Cultivation**

District	Inputs	Weight Assign in <i>Maha</i> Season
Polonnaruwa	Labour	48
	Seeds	5
	Fertilizer	14
	Agro chemical	8
	Machinery	26
Anuradhapura	Labour	50
	Seeds	6
	Fertilizer	13
	Agro chemical	6
	Machinery	24
Kurunegala	Labour	51
	Seeds	6
	Fertilizer	14
	Agro chemical	7
	Machinery	22
Hambantota	Labour	46
	Seeds	8
	Fertilizer	12
	Agro chemical	9
	Machinery	24

Source: Cost of Cultivation, Department of Agriculture (1990-2008)

Note: Weights are based on Total Cost of Production in Paddy

In the study, price environment of paddy has been critically examined under three main areas namely, producer prices of paddy, input prices of paddy and interrelationship between these two. Price indices are compiled in order to understand the behaviour of producer price of rice in relation to its input prices. In compiling price parity indices, the producer price indices are worked out by taking the paddy prices at the harvesting time for each selected district during the year.

Producer Price Index =  $(100 / \text{Base Year Producer Price}) * \text{Producer Price at the Year consideration}$

Then the input price indices are worked out by taking the seasonal average prices.

Input Price Index =  $100 / \text{Input price (base year)} * \text{Input price (selected year)}$

Accordingly;

Wage Rate Index =  $100 / \text{Wage Rate of Base Year} * \text{Wage Rate of the Selected Year}$

Seed Paddy Price Index =  $100 / \text{Seeds Price of Base Year} * \text{Seeds Price of Selected Year}$

Fertilizer Price Index =  $100 / \text{Fertilizer Price of Base Year} * \text{Fertilizer Price of selected Year}$

Machinery cost Index =  $100 / \text{Machinery Cost of Base year} * \text{Machinery Cost of Selected Year}$

Agro chemical Cost Index =  $100 / \text{Agro chemical Cost of Base Year} * \text{Agro chemical cost of Selected Year}$

The year 1990 is selected as the base year and all the indices are calculated based on this year's price. These indices are converted to the weighted indices by using their share to the total cost of production of paddy. The percentage of the cost of each input with respect to total value of all the inputs was used as weight for each input for compiling the index of prices paid by the farmers. Due to non availability of input cost relevant to each *Yala* and *Maha* season in each selected district in the initial period of the study, input prices are not calculated for the two seasons separately. Hence, annual general prices are taken into the calculations. Then these weighted indices are used to calculate composite index of inputs.

Composite Index of Inputs= (Wage Rate Index\*Weight assigned to the Wage rate) + (Seed Paddy Price Index\* Weight assigned to the Seed Paddy) + (Fertilizer Price Index\* Weight assigned to the Fertilizer Price) + (Agro chemical Cost Index\* Weight assigned to the Agro chemical Cost)+(Machinery cost Index \* Weight assigned to the machinery cost)

The producer price index of paddy is divided by composite input index to get the parity indices/Terms of Trade of paddy. This can be expressed mathematically as follows.

Terms of Trade/Parity Index for Inputs=Paddy Price Index/Composite Index of Inputs

Also the Parity ratios of paddy with each input were calculated separately. In computing parity price ratios between prices of output and consumer goods such as milk powder, bread and kerosene oil were selected as consumer products, because these are essential items used daily in farming community.

Bread Price Index= 100/Price of Bread in Base year\*Price of Bread in selected year

Milk powder Price Index=100/Price of Milk powder in Base year\*Price of in Milk powder selected year

Kerosene Price Index=100/ Price of kerosene oil in Base year\*Price of kerosene oil in selected year

Then Price Parity Indices are calculated for each commodity by dividing paddy price index from selected commodity price index.

Price Parity Index (Bread) = Paddy Price Index/ Bread Price Index

Price Parity Index (Milk powder) = Paddy Price Index/ Milk powder Price Index

Price Parity Index (Kerosene oil) = Paddy Price Index/ Kerosene oil Price Index

T test results have been used to check whether there is significant difference between *Maha* season and *Yala* season producer prices as expressed by farmers.

H<sub>0</sub>: There is no producer price difference in *Maha* and *Yala* seasons. Hence; P<sub>1</sub>=P<sub>2</sub>

H<sub>1</sub>: There is significant price difference between *Maha* and *Yala* seasons. P<sub>1</sub> ≠ P<sub>2</sub>

Nominal values were converted to the real values using GDP deflator index (Details are given in Appendix 13).

$$\text{Real Price} = (\text{Nominal Price}/\text{GDP deflator index}) * 100$$

## CHAPTER FOUR

### Trends and Patterns of Producer Price Behaviour in Paddy Sector

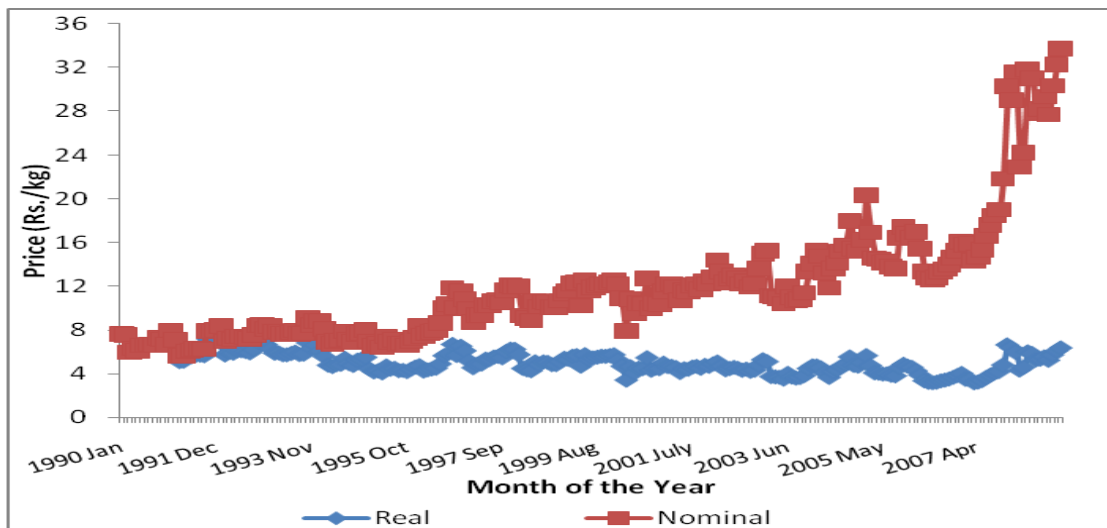
#### 4.1 Introduction

The first part of this chapter deals with producer price of paddy and it reveals the price levels, trends in paddy price changes in different markets, pattern of price variation and price volatility. Next part is focused on developing the producer price indices and their trends.

#### 4.2 Pattern of Producer Price Movements

Producer price of paddy has changed over the months of the year. November-February belong to *Maha* season off peak and May, June, September and October months belong to *Yala* off season. Paddy farmers get their harvests during February-April months at the *Maha* season and July-August in *Yala* seasons. It is known that generally farmers receive lower prices at harvesting periods and prices were high during off harvesting seasons. This was statistically tested by using paired T test. According to the test, there were significant price difference between peak *Maha* harvesting and off *Maha* harvesting seasons in all the four districts namely Anuradhapura, Polonnaruwa, Kurunegala and Hambantota ( $P$  value < 0.05). Figure 4.1 explains the monthly producer price changes of paddy in Anuradhapura during the period of 1990-2008 (Details are given in the Appendix 1A, 1B, 1C, 1D).

**Figure 4.1: Monthly Producer Price Movements of Paddy in Anuradhapura District, January 1990 - December 2008 (Nominal and Real Price)**



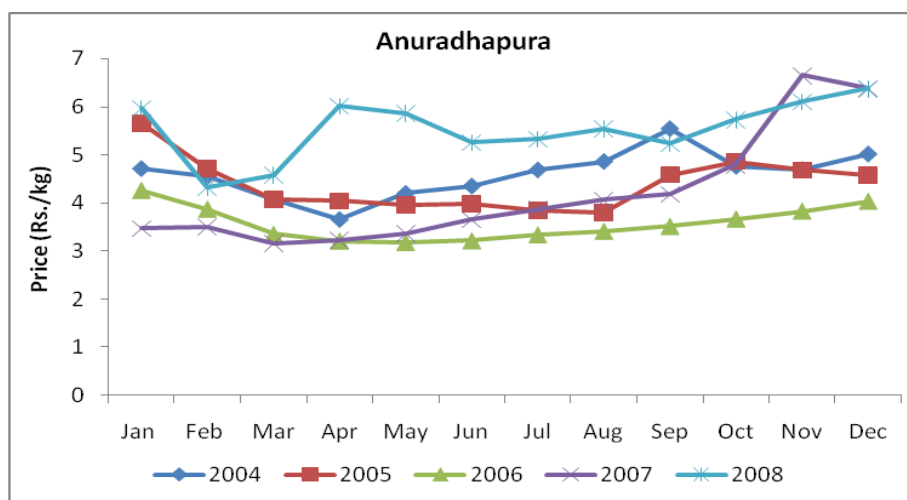
Source: Statistical Abstract, Department of Census and Statistics (1990-2008)

Figure 4.1 indicate that, nominal producer price of paddy has moved in the upward direction over the study period but there are ad-hoc changes. During the phase (1990-1995) paddy prices were stagnant. During 1996-2001 period, creeping rise of prices could be seen. During the period of 2002-2005, prices had moved both upwards as well as downwards. In the period 2006-2008, paddy prices had sharply increased

creating a favourable price environment to paddy farmers. However, as in real price, producer prices of paddy has been sluggish and shown an irregular pattern. Prices had declined specially in March and April in most of the years. That was due to large stocks of paddy from the *Maha* season had come to the market during this period.

Figure 4.2 shows the monthly behavioural pattern of producer prices in the Anuradhapura district during the past five years. As could be seen, until 2007, there was no huge price variation during all the months of the year. Anyhow, at the end of 2007 and in 2008 farmers had received reasonably higher prices for their output. In 2008 paddy prices had risen by more than 50% compared to 2007. 2007 *Maha* season paddy supply was low in the domestic market and there was speedy intervention by the government to control prices at reasonable level. In order to do so, the government lifted customs duty on rice imports (Central Bank Annual Report, 2008) in the context of an international food crisis. Producer prices had normally increased at the end of the year and these high prices prevailed till the beginning of the next year.

**Figure 4.2: Monthly Changes of Producer Prices of Paddy in Anuradhapura; 2004-2008 (Real Price)**



Source: Statistical Abstracts, Department of Census and Statistics (1990-2008)

Generally, *Maha* season prices were below the *Yala* season prices. Farmers experience lower prices during the *Maha* harvesting season specially during the March-April period in Anuradhapura. This has been tested by using paired T test and real producer prices. Results indicate that there is significant difference in the producer prices of *Maha* season with producer prices of *Yala* season in Anuradhapura, and Polonnaruwa) ( $P$  value < 0.05). However in Hambantota and Kurunegala districts there are no significant producer price difference between *Maha* and *Yala* season ( $P$  value > 0.05).

In Polonnaruwa district, producer price reduction during February-April within the *Maha* harvesting season is more than 80%. During these 19 years, only in two *Yala* harvesting seasons, farmer had received lower prices than during the other months of the year (Details are given in Appendix 2). In the Hambantota district, price decline during the *Maha* harvesting season was about 70% and it was 20-30% during *Yala* harvesting season.

## Market Integration

The degree of inter-relationships between price movements in two markets is called market integration. In other words, in an integrated market, price of homogeneous commodity at spatially separated locations should tend to move together indicating efficient spread of price information and inter linkages of markets. Therefore, market integration signifies the extent to which price movements in one market are related to those in other markets. In a competitive market structure prices in spatially separated markets are expected to move in unison in response to stimuli from changing demand, supply and other economic forces (Alam *et.al*, 2001). Correlation coefficients were used to explain the market integration by Alam *et.al* (2001) and Dev (2007).

Correlation coefficients are shown in Table 4.1. High correlation coefficients values indicate that the markets were significantly correlated in respect of their producer price changes. Correlation values are almost similar in every two sets of districts. There is no great isolation between markets. That indicates that the price movements between markets were strongly associated.

**Table 4.1: Correlation Coefficients of Real Paddy Price in Selected Districts during 1990-2008**

District	Anuradhapura	Polonnaruwa	Kurunegala	Hambantota
Anuradhapura	0	0.93	0.92	0.87
Polonnaruwa	0.93	0	0.92	0.84
Kurunegala	0.92	0.92	0	0.88
Hambantota	0.87	0.84	0.88	0

### 4.3 Producer Price Volatility in Paddy

Price volatility in paddy sector is measured using Coefficient of Variation (CV). This indicates the relative magnitude of variation. According to the Table 4.2, the highest price variability had occurred during the 2005-2008 period in all the districts. This is because high producer prices prevailed in 2007. Also price variation had marginally changed within the *Maha* harvesting season as well as during *Yala* harvesting season of the year.

**Table 4.2: Annual Variation of Paddy Prices in Selected Districts: 1990-2008**

Period	Co-efficient of Variation (CV)			
	Anuradhapura	Polonnaruwa	Kurunegala	Hambantota
1990-94	12.93	15.37	13.26	11.63
1995-99	12.96	14.72	15.86	13.27
2000-04	10.85	11.21	13.05	12.31
2005-08	22.90	24.98	23.95	24.38

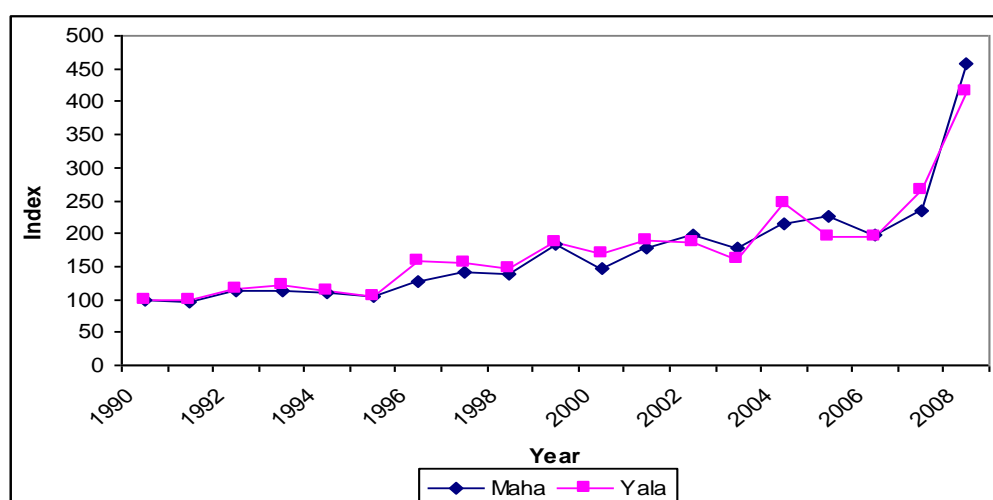
Source: Statistical Abstracts, Department of Census and Statistics (1990-2008)

Note: CV=SD/Mean\*100

#### 4.4 Changes of Producer Price Index in Paddy Sector

As shown in Figure 4.3, the highest producer price indices were recorded in 1996, 1999, 2001, 2004 and 2008 *Maha* season and 1996, 1999, 2004, 2007 and 2008 *Yala* season. Price increase in 1996 was owing to supply shortage as a result of low production. Hence farmers had received attractive prices. The farm-gate price of paddy remained attractive throughout the year 2004 due to shortfall in supply as a result of the low production and low imports of rice. Paddy prices had increased sharply due to global food crisis at the end of the 2007. In 2008 farmers received highest paddy price in history and this was the highest boost of growth in recent times. There was nearly 60% growth in 2008 when compared to growth in year 2007. Producer price index had increased up to the level of 456 (in *Maha* season) and this is over four fold intensification compared to the base year, 1990 (Details are given in Appendix 3).

**Figure 4.3: Changes of Producer Price Index of Paddy: 1990-2008**



Source: Statistical Abstracts, Department of Census and Statistics (1990-2008)

In 2000 producer price index had decreased significantly in all the districts due to low prices resulting from ad-hoc duty reductions and reluctance of the paddy millers and stockists to purchase and stock paddy on a large scale after 1999/2000 *Maha* season (Annual Report of the Central Bank, 2000). Information on exaggerated output than actual production in 2003 had led to adverse expectations of the prices. In 2006, there was a significant drop of the producer prices of paddy due to higher paddy production recorded in the *Maha* season of the same year.



**Table 4.3: Total Tax Incidence in Importation of Rice; 1995-2008**

<b>Period</b>	<b>Total tax %</b>	<b>Period</b>	<b>Total tax %</b>
Jan 1, <b>95</b> -Feb 7, <b>95</b>	65.70	Jan 01, <b>01</b> -Jan 20, <b>02</b>	61.99
Feb 8, <b>95</b> -Apr 14, <b>96</b>	44.61	Jan 21, <b>02</b> -April 30, <b>02</b>	53.34
Apr 15, <b>96</b> -Jan 30, <b>97</b>	7.60	May 01, <b>02</b> -Nov 05, <b>02</b>	44.79
Jan 31, <b>97</b> -Nov 20, <b>97</b>	44.58	Nov 06, <b>02</b> -Mar 04, <b>03</b>	24.00
Nov 21, <b>97</b> -Jan 31, <b>98</b>	7.62	Mar 05, <b>03</b> -Aug 20, <b>03</b>	22.00
Feb 1, <b>98</b> -Nov 5, <b>98</b>	44.55	Aug. 21, <b>03</b> -Oct 04, <b>04</b>	25.00
Nov 6, <b>98</b> -Oct 23, <b>99</b>	46.28	Oct 05, <b>04</b> -Nov 18, <b>04</b>	1.00
Oct 24, <b>99</b> -Dec 31, <b>99</b>	19.55	Nov 19, <b>04</b> -Dec 29, <b>04</b>	1.50
Jan 1, <b>00</b> -May10, <b>00</b>	46.26	Dec 30, <b>04</b> -Jan 15, <b>05</b>	1.50
May 11, <b>00</b> -Jul 16, <b>00</b>	48.00	Jan 16, <b>05</b> -Dec 31, <b>05</b>	25.56
Jul 17, <b>00</b> - Feb 20, <b>01</b>	47.93	Jan 01, <b>06</b> -Jan 30, <b>06</b>	20.74
Feb21, <b>01</b> - Mar 31, <b>01</b>	62.00	Jan 31, <b>06</b> -Sep 16, <b>06</b>	48.79
Apr1, <b>01</b> - Oct 11, <b>01</b>	63.68	Sep 17, <b>06</b> -Oct 14, <b>07</b>	39.42
Oct 12 , <b>01</b> - Nov21, <b>01</b>	61.96	Oct 15, <b>07</b> -Dec 31, <b>07</b>	3.00
Nov 22, <b>01</b> -Dec 8, <b>01</b>	11.12	Jan 01, <b>08</b> -Aug 25, <b>08</b>	6.39
Dec 9, <b>01</b> -Dec 31, <b>01</b>	36.07		

Source: Sri Lanka Customs and Annual Reports, Central bank of Sri Lanka

Note: Total Tax Calculations based on Author's Bsc Thesis, Taxation of Sri Lanka's Food Commodity Imports and Their Impacts on Domestic Markets

Pearson correlation value of total tax incidence and producer price is -0.434. Therefore there is negative weak correlation between tax incidence and producer price. This is a significant difference ( $P$  value <0.05).

## CHAPTER FIVE

### Pattern of Price Movements of Inputs in Paddy Sector and Selected Consumer Goods

#### 5.1 Introduction

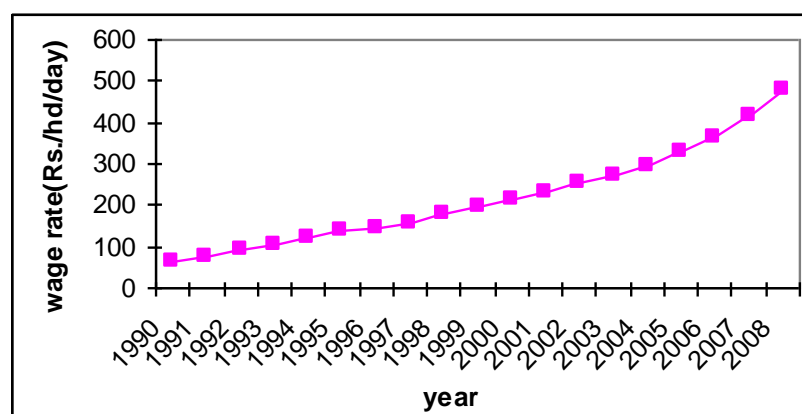
The input costs can be viewed at two main levels: farm level and the level of the society. The farm level cost will determine the level of income of those involved in paddy cultivation. On the other hand, a study of production cost at society level, will give a macro picture on resource allocation in paddy vis-à-vis other sectors of the economy.

In this chapter input prices of paddy and prices of consumer goods are analyzed by developing the price indices for major inputs: labour, seed paddy, fertilizer, machinery and agro chemicals and consumer goods such as bread, milk powder and kerosene oil (intermediate goods). Due to difficulties of analyzing prices of various consumer goods, the above were selected as most essential consumer items.

#### 5.2 Wage Rates

Wage rate for paddy in all selected districts has shown less than Rs. 100 per person a day (in nominal wage) during the 1990-1992, except in the Hambantota district in 1992. Thereafter, in 1994 and 1995 wage rate had increased at a sharper rate by more than 15%. This change was around 6-9% in 2003-2004, but afterwards it had increased by more than 10%. Nominal price of average wage rate had increased up to Rs. 481 in 2007 from Rs. 65 in 1990 (Figure 5.1). From the selected districts of paddy cultivation, highest wage rate was recorded in Hambantota district in 2008 and it was Rs. 550. Labour shortage is due to young persons moving away from agriculture causing a sharp reduction in the labour supply in paddy sub sector in recent years.

**Figure 5.1: Movements of Nominal Wages in Paddy Cultivation  
(Average wages of Anuradhapura, Polonnaruwa,  
Kurunegala and Hambantota Districts) ; 1990-2008**



Source: Cost of Cultivation for *Maha* and *Yala* seasons, Department of Agriculture, 1990-2008

Changes in number of man days per acre of paddy cultivation is given in the Table 5.1. As explained in this table, man days per acre had declined significantly from 42 to 31 within the 12 year period. This is 24% decline compared with 1996. As a result of mechanized harvesting lower man days for an acre was reported in Hambantota in 2008 compared to the other selected districts. This was 19 man days per acre of land. This had reduced labour cost share significantly in Hambantota compared to the other districts. However, reduction in labour cost in Hambantota, had been put back by power cost keeping the overall cost at comparable level with all other selected districts.

**Table 5.1: Changes of Number of Man days in Paddy Cultivation In Selected Districts (Man-days per Acre of Land)**

District	1996	2000	2008
Anuradhapura	40	32	32
Polonnaruwa	42	33	31
Hambantota	NA	36	19
Kurunegala	43	40	32

Source: Cost of Cultivation for *Maha* and *Yala* seasons, Department of Agriculture, 1990-2008

Labour index has been calculated for the study period using 1990 as the base year value. As shown by the Table 5.2, labour index had increased from 100 (1990) to range of 600 (Hambantota)-900 (Kurunegala) in 2008. This is an average eight-folds rise (More details are given in the Appendix 5). Although Hambantota district had recorded as highest price charger for labour in 2008 its index value becomes lowest among all the districts. This is due to highest wage rate in Hambantota in the base year compared to other districts. Kurunegala district shows the highest wage rate index because the base year value is lowest compared with the other districts.

**Table 5.2: Wage Rate Index; 1990-2008**

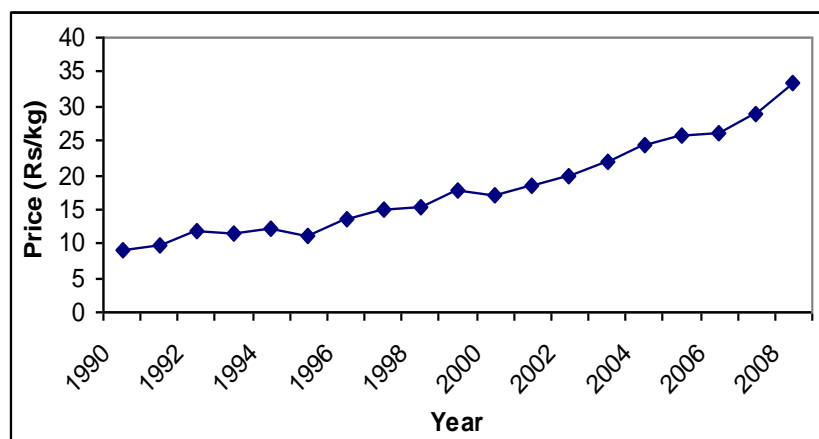
Year	Polonnaruwa	Anuradhapura	Kurunegala	Hambantota	Average
1990	100	100	100	100	100
2008	710	790	949	632	770

Source: Cost of Cultivation, Department of Agriculture

### 5.3 Seed Paddy Prices

Seed paddy prices had continuously increased during the past two decades. It had increased at a higher rate in 1991 and 1992. In 1996, seed paddy price had increased by 11%. But there was below 5% intensification after 2005. Seed paddy price had increased from Rs. 9/kg in 1990 to Rs. 35/kg in 2008 which is 16% (per year) increase.

**Figure 5.2: Movements of Seed Paddy Price  
(Nominal Price); 1990-2008**



Source: Cost of Cultivation for *Maha* and *Yala* seasons, Department of Agriculture, 1990-2008

As shown by Table 5.3 seed paddy price index had increased more than 3 folds in 2008 compared to the base period (Details are given in Appendix 6). Index value of seed paddy did not exhibit sharper increase in comparison to the index value of labour during the past few years. It was a 10% rise when compared to the previous year.

**Table 5.3: Seed Paddy Price Index; 1990-2008**

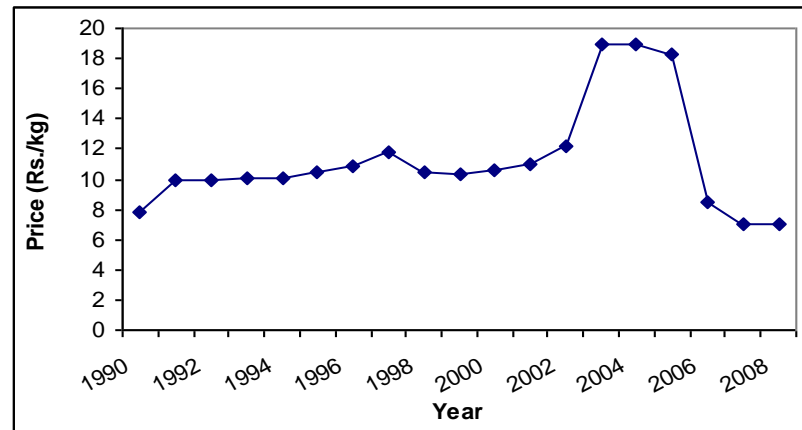
Year	Polonnaruwa	Anuradhapura	Kurunegala	Hambantota	Average
1990	100	100	100	100	100
2008	341	438	365	368	378

Source: Cost of Cultivation for *Maha* and *Yala* seasons, Department of Agriculture, 1990-2008

#### 5.4 Retail Prices of Fertilizer

Against labour, seeds and other inputs of paddy cultivation, chemical fertilizer became most important after its introduction to the country in 1950. The government of Sri Lanka has been subsidizing fertilizer for more than four decades. Because of the importance of fertilizers in increasing paddy production, government intervention through introduction of fertilizer subsidy programme was started in 1962. This intervention made fertilizer available at an affordable price to the farmer. In 1990 the government completely removed the fertilizer subsidy, as it was a heavy burden on its budget. But fertilizer subsidy scheme was reintroduced in 1994. As shown in Annexure 7, up to 2001 average price of 1kg of fertilizer was around Rs. 10-12 and in 2003 this price was rapidly increased to Rs.19/kg. But again in 2006, due to the government decision to reintroduce the subsidy scheme for all types of fertilizer by fixing their selling price, average price went down to Rs. 9/kg and under the Mahinda Chinthana Programme and this was further reduced to Rs. 7/kg in 2007.

**Figure 5.3: Changes in Retail Prices of Fertilizer in Paddy (Farm Level); 1990-2008**



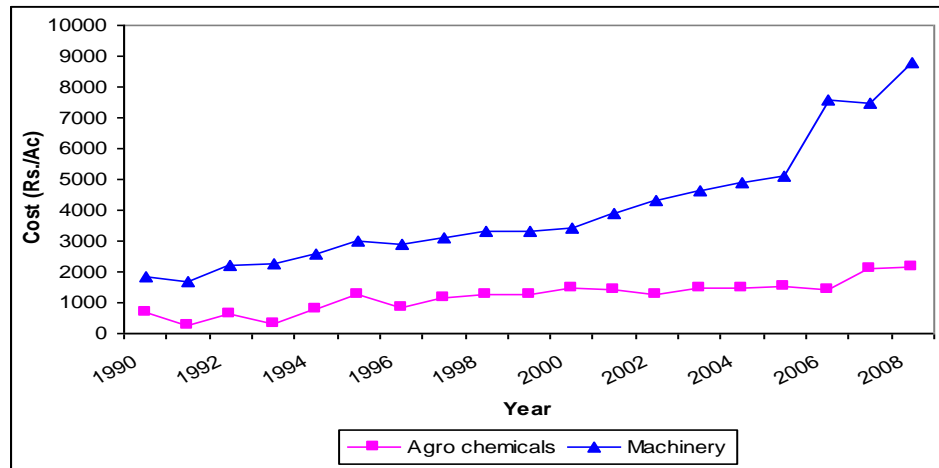
Source: Cost of Cultivation for *Maha* and *Yala* Seasons, Department of Agriculture, 1990-2008

With regard to the other input indices, it is to be noted that fertilizer price index fell below 100 in 2007. The fertilizer price index distinctly showed a lowered value though it has fluctuated from year to year. The highest percentage increase was recorded in the year 2003. It reached the maximum index value in 2004. Since then, there was a considerable decline of the index value by more than 50% notably in 2006 compared to the 2005 value. This continuous decline of fertilizer index value was due to the government policy of issuing fertilizer at a subsidized price. In 2007 and 2008, the index value of fertilizer had reached that of the base year value of 100. This had created favorable conditions to farmers because they had to pay lesser amounts of money than the market value to purchase fertilizer. Anyhow, this subsidy has become a burden on the government budget.

### 5.5 Machinery and Agro Chemical Cost

Machinery and agro chemicals are other major inputs in paddy cultivation. Cost of these two inputs had also remarkably increased during the past 20 years. Land preparation (ploughing and leveling), harvesting, threshing and winnowing are the main operations which can be mechanized. Share of machinery cost to the total cost increased from 20% in 1990 to 30% in 2008 and average cost during the past two decades was nearly 25% of the total cost of production of paddy. In Hambantota 58% used combine harvesters while in Kurunegala it was only 2% (Cost of Cultivation, 2008 *Maha*). Agro chemical cost accounted for nearly 10% of the total cultivation cost of paddy.

**Figure 5.4: Movements of Machinery and Agro-chemical Cost in Paddy Cultivation (Nominal price) in the Anuradhapura District;1990-2008**



Source: Cost of Cultivation for *Maha* and *Yala* Seasons, Department of Agriculture, 1990-2008

The index value of machinery also increased over the past few years and it has continuously. The highest percentage increase was recorded in 2006 which was 46% above the price in 2005. In that year index value increased to the value of 546. As given in the Table 5.4, machinery cost has reached the maximum value in 2008 and it has risen seven folds compare to the base year (Details given in the Appendix 8).

**Table 5.4: Machinery Cost Index; 1990-2008**

Year	Polonnaruwa	Anuradhapura	Kurunegala	Hambantota	Average
1990	100	100	100	100	100
2008	483	553	795	819	662

Source: Cost of Cultivation for *Maha* and *Yala* seasons, Department of Agriculture, 1990-2008

There is extensive use of agro chemicals in the agriculture sector. Paddy farmers also adopted a wider use of agrochemicals. Hence, the prices of agro chemicals have increased over the past few years followed by increase of index value of agro chemicals. Highest percentage increase was recorded in 1997 compared to the 1996 value and significant reduction of 16 % could be seen in year 1998. Again, annual percentage change of index value has risen except in 2003. In 2008 there was seven folds increase compared to the base year (Appendix 9). This was a 26 % enhancement over the 2007 index value.

After bringing the different measurable input items to the same index value those are added to calculate the composite index of inputs (Details given in Appendix 11).

## 5.6 Changes in Prices of Selected Consumer Goods

Price movements of consumer goods have been studied in this section. Due to difficulties in studying all consumer goods bread, milk powder and kerosene oil were selected, as these are the essential consumer items for which the farmers entirely depend on the market.

**Table 5.5: Movements of Nominal Prices of Selected Consumer Goods;  
1990-2008**

Year	Bread Rs./450g)	Annual % Change	Milk Powder (Rs.400 g)	Annual % Change	Kerosene oil (Rs. Ltr)	Annual % Change
1990	5.03	0	40.94	0	7.65	0
1991	4.51	-10.34	40.80	-0.34	9.42	23.14
1992	4.50	-0.22	48.38	18.58	9.73	3.29
1993	4.86	8.00	57.18	18.19	11.08	13.87
1994	4.77	-1.85	57.56	0.66	12.01	8.39
1995	3.79	-20.55	60.64	5.35	11.47	-4.50
1996	5.99	58.05	79.14	30.51	10.93	-4.71
1997	7.87	31.39	80.00	1.09	11.58	5.95
1998	8.50	8.01	80.00	0.00	11.36	-1.90
1999	8.50	0.00	82.49	3.11	11.49	1.14
2000	8.34	-1.88	90.56	9.78	25.33	120.45
2001	9.42	12.95	113.76	25.62	19.63	-22.50
2002	11.67	23.89	117.89	3.63	21.02	7.08
2003	13.97	19.71	121.73	3.26	25.04	19.12
2004	14.55	4.15	134.26	10.29	26.36	5.27
2005	16.43	12.92	146.88	9.40	29.90	13.43
2006	18.87	14.85	154.00	4.85	40.58	35.72
2007	27.20	44.14	181.00	17.53	48.00	18.28
2008	NA	NA	275.00	51.93	78.00	62.50

Source: Statistical Abstract, Department of Census and Statistics

Prices of all the three commodities have increased during the past two decades. Price of bread had decreased by 10% in 1991 due to reduction of prices of wheat flour in that year. Again in 1995, the price of bread had declined by 21% while a marked increase of 58% was recorded in 1996 owing to supply shortage of domestic consumer items and corrective upward adjustments of prices of wheat flour. In 1997 price increase of 31% could be seen. Then there were incessant price increases during the 2001-2008 period while there was 44% rise of bread prices in 2007 due to high international price of wheat flour.

Price of milk powder has increased continuously during the studied period. In 1996 price increased by 30% due to increased import costs. In 2001 price had increased by 26%. The highest price increase could be seen in 2008 and it was 52% increase compared to the previous year due to rapid fluctuations in the international commodity prices.

Price of kerosene oil had increased by 23% in 1991 compared to the previous year. There was continuous increase of prices until 1995. The incredible increase of 120% was recoded in year 1999 and this was due to the rupee depreciation against the US dollar. Again in 2000 price of kerosene had decreased by 22% but gradually it had increased again. There was a 36% price increase in 2006 due to high international prices passed on to the domestic market. In 2008, 62% price increase of kerosene oil was observed corresponding to the world market price increases. The domestic fuel prices were adjusted upward and were raised by 57% respectively by May 2008 compared to the prices that prevailed in May 2007.

Index values of the above consumer goods are shown in Table 5.6. Accordingly, index value of bread had risen five folds compared to the base year of 1990. At the same time index values of milk powder and kerosene oil had increased 7 folds and 10 folds respectively.

**Table 5.6: Price Indices of Selected Food Commodities; 1990-2008**

<b>Year</b>	<b>Bread</b>	<b>Annual % Change</b>	<b>Milk powder</b>	<b>Annual % Change</b>	<b>Kerosene oil</b>	<b>Annual % Change</b>
1990	100.00	0.00	100.00	0.00	100.00	0.00
1991	89.66	-10.34	99.66	-0.34	123.14	23.14
1992	89.46	-0.22	118.17	18.58	127.19	3.29
1993	96.62	8.00	139.67	18.19	144.84	13.87
1994	94.83	-1.85	140.60	0.66	156.99	8.39
1995	75.35	-20.55	148.12	5.35	149.93	-4.50
1996	119.09	58.05	193.31	30.51	142.88	-4.71
1997	156.46	31.39	195.41	1.09	151.37	5.95
1998	168.99	8.01	195.41	0.00	148.50	-1.90
1999	168.99	0.00	201.49	3.11	150.20	1.14
2000	165.81	-1.88	221.20	9.78	331.11	120.45
2001	187.28	12.95	277.87	25.62	256.60	-22.50
2002	232.01	23.89	287.96	3.63	274.77	7.08
2003	277.73	19.71	297.34	3.26	327.32	19.12
2004	289.26	4.15	327.94	10.29	344.58	5.27
2005	326.64	12.92	358.77	9.40	390.85	13.43
2006	375.15	14.85	376.16	4.85	530.46	35.72
2007	540.76	44.14	442.11	17.53	627.45	18.28
2008	NA	NA	671.71	51.93	1019.61	62.50

Source: Statistical Abstract, Department of Census and Statistics



## CHAPTER SIX

### Terms of Trade in the Paddy Sector

#### 6.1 Introduction

The terms of trade of paddy were studied by using the concept, output-input parity. Therefore, this chapter is focused on relationship of input prices over output prices in the paddy sector. The basic purpose of paddy sector analysis is to understand the movements of prices of various commodities sold and purchased by the agricultural sector and to assess the changes in purchasing power of a unit of agricultural commodities over a period of time and thereby to understand terms of trade in the paddy sector.

#### 6.2 Parity Ratios of Paddy

**Table 6.1: Parity Ratios of Paddy in *Maha* Seasons; 1990-2008**

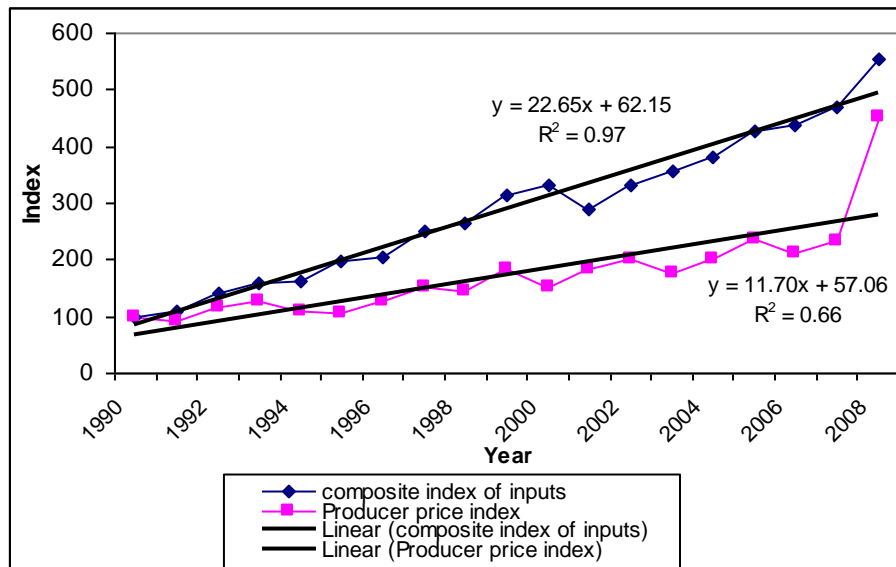
Price Ratio	1990	1995	2000	2005	2008
<b>a)With inputs</b>					
<b>Fertilizer</b>	1.00	0.77	1.05	1.80	4.94
<b>Labour</b>	1.00	0.47	0.43	0.43	0.59
<b>Seeds</b>	1.00	0.73	0.73	0.78	1.20
<b>Machinery</b>	1.00	0.61	0.63	0.60	0.69
<b>Agro chemical</b>	1.00	0.52	0.43	0.60	0.72
<b>b)With consumer goods</b>					
<b>Bread</b>	1.00	1.38	0.88	0.69	
<b>Milk powder</b>	1.00	0.70	0.66	0.63	0.68
<b>Kerosene oil</b>	1.00	0.69	0.44	0.58	0.45

As indicated in Table 6.1 the highest price ratio of paddy was in fertilizer. The significant rise in price ratios of paddy with fertilizer was due to the fertilizer subsidy received by farmers. The fall in price ratios with other inputs was due to the rise in input prices at much higher rates than the producer price of paddy. However in 2008 parity ratios of paddy with all inputs had increased with the rise of producer price. Parity ratios of paddy with the consumer goods have continuously declined due to their prices increases.

#### 6.3 Inter-relationship of Producer Prices and Input Prices in Paddy

After studying the behavioural pattern of producer prices and input prices of paddy separately, it is important to study the inter-relation of these two factors together. Therefore, this section of the report attempts to reveal that relationship, measured in terms of trade. Figure 6.1 shows the movements of these two indices during the period 1990-2008 on the same graph.

**Figure 6.1: Changes in Producer Price Index (*Maha* Season) and Composite Index of Inputs**



Source: Statistical Abstract, Department of Census and Statistics

The above figure clearly shows that both producer prices and input prices of paddy have increased over the period. Slope of the producer price index is 50 per cent less than the slope of the composite index of inputs. Therefore, it is clear that input prices are drastically increased at a higher rate than the increase of producer prices.

Finally this study attempts to find the terms of trade in paddy sector by using the ratios of composite input price index to the output price index. Table 6.1 shows the changing pattern of terms of trade (compared to input prices) in Sri Lanka under *Maha*, and *Yala* harvesting seasons as well as the changes in terms of trade value when considered the annual average paddy prices during the recent past. Terms of trade values highlight that, there had been irregular movements during the last two decades. Generally lower terms of trade values have been recorded in *Maha* harvesting season because farmers had received lower prices during this period. Terms of trade has shown irregular movements during the last two decades and marginal decline especially in *Maha* harvesting season.

**Table 6.2: Terms of Trade in Sri Lanka under Different Scenarios**

Year	Annual Average	Annual % change	<i>Maha</i>	Annual % change	<i>Yala</i>	Annual % change
1990	1.00	0	1.00	0	1.00	0
1991	0.87	-13	0.83	-17	0.85	-15
1992	0.82	-6	0.80	-3	0.82	-3
1993	0.77	-6	0.75	-6	0.80	-3
1994	0.66	-14	0.67	-11	0.68	-14
1995	0.56	-16	0.56	-16	0.56	-18
1996	0.74	32	0.65	17	0.82	46
1997	0.68	-8	0.64	-2	0.70	-15
1998	0.61	-11	0.58	-9	0.61	-12
1999	0.70	15	0.71	23	0.71	16
2000	0.55	-22	0.52	-27	0.61	-15
2001	0.63	14	0.62	18	0.66	8
2002	0.60	-5	0.62	0	0.58	-12
2003	0.50	-16	0.51	-17	0.47	-19
2004	0.62	23	0.57	11	0.66	40
2005	0.55	-12	0.55	-3	0.47	-28
2006	0.44	-20	0.44	-21	0.43	-9
2007	0.54	25	0.46	6	0.52	21
2008	0.74	35	0.79	69	0.72	37
Mean	0.66		0.65		0.67	
SD	0.14		0.14		0.15	
CV	20.96		21.66		22.25	

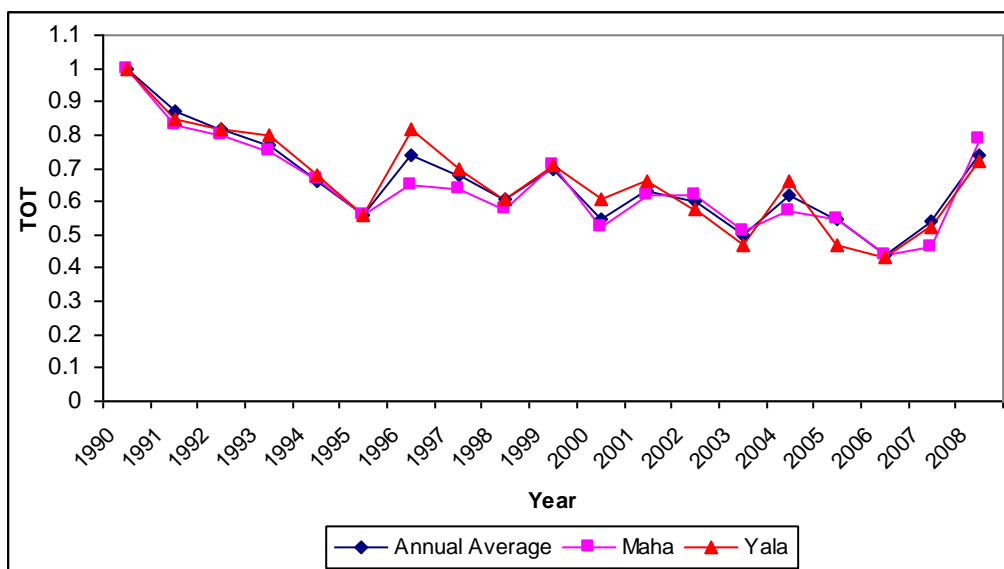
Source: Cost of Cultivation, Department of Agriculture and Statistical Abstract, Department of Census and Statistics (1990-2008)

In *Yala* season terms of trade values had been fairly favourable to the farmers. The annual average value of terms of trade shows an irregular movement which decline from 1 (1990) to 0.74 in 2008. Highest cutback in change of terms of trade had been recorded in *Maha* season. Anyhow, terms of trade had not been favorable to the farmers in any year after 1990. In 1996 terms of trade values had increased by 17% in *Maha* season and 46 % in *Yala* season owing to 21% and 52% increase in paddy prices respectively. In 1999 due to the favourable paddy prices terms of trade values had increased by 23% (*Maha*) and 16% (*Yala*). In 2000 it has decreased significantly due to high cost of production and lower farm gate prices. Then in 2003 terms of trade in both *Maha* and *Yala* seasons declined respectively by 17% and 19%. In the 2004 *Yala* season there was an outstanding growth of terms of trade value due to attractive farm gate prices throughout the year. It had severely declined in the same season of the next year due to decline of paddy prices by 21%. The lowest value of terms of trade can be seen in 2006 due to heavy cost of production and decline of paddy prices by 12% in *Maha* season. Again in 2008 terms of trade values had been favourable and increased to the values of 0.79 (*Maha*) and 0.72 (*Yala*) due to increase of paddy prices by 95% and 57% respectively.

Anyway, terms of trade value has not exceeded or at least not reached the value of 1 after the 1990 (Base year) although in the year 2008 it had indicated some favourable

trend. This means, farmers had still not received favourable output prices commensurate with the ever increasing input prices.

**Figure 6.2: Terms of Trade in Paddy; 1990-2008**



Source: Cost of Cultivation, Department of Agriculture (1990-2008)

As explained in Table 6.3 there is no noteworthy change in the values of terms of trade in four selected districts except in some exceptional circumstances in Kurunegala specially in 2008 *Maha* harvesting season. In 2008 *Maha* harvesting season, highest terms of trade value was recorded in Polonnaruwa (0.92) district while the lowest was recorded in Kurunegala district (0.59). Both Anuradhapura and Hambantota districts show the same value of 0.82 during that season.

**Table 6.3: Change of Terms of Trade in Different Districts in  
*Maha* and *Yala* ; 1990-2008**

Year	Anuradhapura		Polonnaruwa		Kurunegala		Hambantota	
	<i>Maha</i>	<i>Yala</i>	<i>Maha</i>	<i>Yala</i>	<i>Maha</i>	<i>Yala</i>	<i>Maha</i>	<i>Yala</i>
1990	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1991	0.84	0.87	0.84	0.85	0.76	0.78	0.87	0.92
1992	0.82	0.77	0.87	0.82	0.67	0.74	0.84	0.96
1993	0.80	0.74	0.79	0.81	0.59	0.68	0.84	0.95
1994	0.68	0.69	0.70	0.72	0.52	0.56	0.75	0.76
1995	0.54	0.53	0.55	0.53	0.44	0.46	0.69	0.73
1996	0.62	0.75	0.67	0.82	0.50	0.69	0.83	1.01
1997	0.60	0.64	0.71	0.75	0.45	0.58	0.78	0.81
1998	0.55	0.60	0.64	0.67	0.44	0.46	0.69	0.73
1999	0.58	0.57	0.81	0.80	0.53	0.58	0.93	0.89
2000	0.46	0.52	0.55	0.73	0.41	0.55	0.68	0.62
2001	0.63	0.63	0.66	0.65	0.47	0.58	0.73	0.76
2002	0.61	0.56	0.65	0.62	0.43	0.43	0.80	0.70
2003	0.50	0.45	0.55	0.50	0.38	0.35	0.63	0.57
2004	0.53	0.61	0.61	0.66	0.44	0.53	0.71	0.82
2005	0.55	0.48	0.55	0.48	0.42	0.38	0.69	0.54
2006	0.48	0.46	0.50	0.50	0.34	0.36	0.44	0.39
2007	0.50	0.58	0.53	0.58	0.33	0.45	0.49	0.48
2008	0.82	0.78	0.92	0.82	0.59	0.54	0.82	0.72

Source: Cost of Cultivation, Department of Agriculture and Statistical Abstract, Department of Census and Statistics (1990-2008)

Table 6.4 explains some of the important years of changes of terms of trade in *Maha* harvesting season and % contribution made by producer price index and composite input index .

According to Table 6.4, there was 23% increase of terms of trade in *Maha* harvesting season in paddy during 1999 compared to that of the previous year. This was mainly due to the producer price increases. In the year 1999, highest percentage of terms of trade increase could be seen in Hambantota due to 44% increase in the producer price while lowest terms of trade increase was in Kurunegala due to producer price increase only by 27%.

In 2000, Terms of Trade had decreased by 27%. Although annual percentage change of composite input index had increased compared to the previous year, producer price index had decreased at a much higher rate, which had caused a decrease in the terms of trade significantly.

**Table 6.4: Annual Percentage Change of Producer Price, Composite Index of Inputs and Terms of Trade in Selected Years (*Maha* Season)**

<b>1999</b>	% change compared to 1998		
	Producer price index	Composite input index	TOT
Polonnaruwa	34	5	28
Hambantota	44	7	34
Kurunegala	27	5	21
<b>2000</b>	% change compared to 1999		
	Producer price index	Composite input index	TOT
Polonnaruwa	-33	10	-33
Anuradhapura	-21	5	-21
Hambantota	-27	6	-27
Kurunegala	-23	4	-23
<b>2003</b>	% change compared to 2002		
	Producer price index	Composite input index	TOT
Polonnaruwa	-6	11	-15
Anuradhapura	-12	8	-18
Hambantota	-15	8	-21
Kurunegala	-7	5	-11
<b>2004</b>	% change compared to 2003		
	Producer price index	Composite input index	TOT
Polonnaruwa	18	7	10
Anuradhapura	13	6	7
Hambantota	23	10	12
Kurunegala	25	9	15
<b>2008</b>	% change compared to 2007		
	Producer price index	Composite input index	TOT
Polonnaruwa	98	14	73
Anuradhapura	93	18	63
Hambantota	88	14	66
Kurunegala	101	14	77

In the year 2003, farmers were vulnerable to unfavourable terms of trade. Terms of trade had declined in all four districts by more than 10% compared to the previous year. Highest reduction was recorded in Hambantota due to the highest cutback in the producer prices. In 2003, unfavourable terms of trade was not only due to lower farm gate prices received by farmers but also due to price increases of inputs.

In the year 2004, though the input prices had increased, the rate of increase in the farm gate prices had contributed to an increase in the terms of trade. Highest producer price increase was recorded in Kurunegala resulting in the highest increase of the terms of trade in that district.

The year 2008 was the most favourable year for the paddy farmers in the recent past which had caused increase of producer prices over the increase of input prices. Therefore, in 2008 terms of trade had risen by more than 60% over the previous year and thereby the living standards of paddy farmers had increased satisfactorily.

According to the above figures, it is distinctly clear that terms of trade had highly fluctuated over the past two decades. But there was no favourable increase as farmers' input prices had drastically increased during the recent past than increase of producer prices.

In terms of trade analysis, not only the price environment but also some other factors such as price ratios, overall production, imports, technology and cost of production have also taken into account to analyze whether in the recent past farmers had been affected favourably or adversely.

## **6.4 Changes of Price Parity Ratio in Comparison with the Selected Food Items**

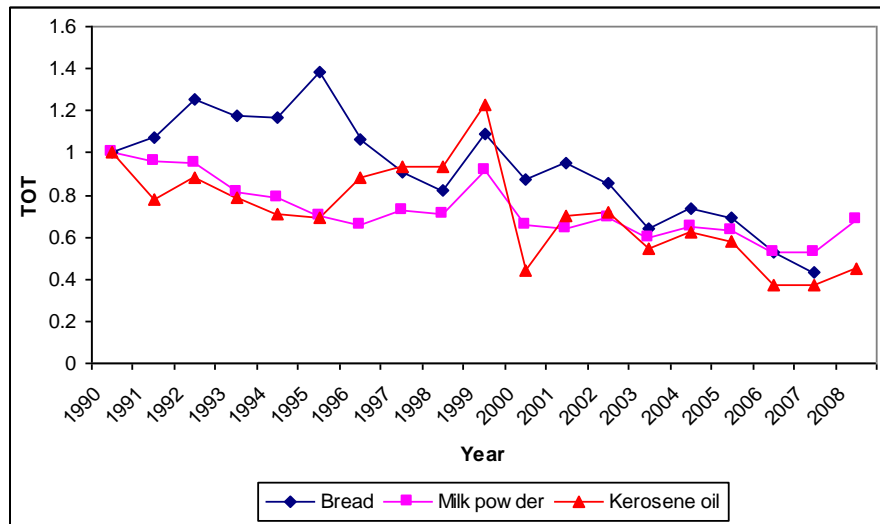
### **6.4.1 Price Parity Ratios in *Maha* Season**

As indicated by the Figure 6.3 price parity ratio compared to bread was significantly favourable during the period 1990-1996 and the parity ratios were higher than one (1) during this period. Highest parity was recorded in 1995 and it reached the value of 1.38. This was due to the price of bread had declined by 21% compared to the 6% decline in paddy prices. After 1996 parity ratios had declined below one except in the year 1999. During 1999, producer price increase of 33% had caused this favourable change. Lowest parity ratio was recorded in 2007 and parity ratio had declined to 0.43 due to 44% increase in the price of bread than the price increase in paddy.

Parity price ratio of milk powder had declined continuously although there had been some favourable signs in 1999. Anyhow, in 1999 parity price had not reached at least the value of 1. This favourable change in 1999 was due to 33% increase in paddy prices. In 2008 parity ratio had increased by 28% against the 52% increase in milk powder prices. Paddy prices increase by 95% had caused this favourable parity ratio in 2008 *Maha* season.

Price parity ratio when compared to kerosene had declined during the period under consideration although there had been some favourable signals in 1999. In 1999 this positive increase was due to 33% increase in paddy prices. In 2000 parity ratio had declined to 0.44 by 64% compared to the same season of the previous year due to 120% price increase in kerosene oil. Lowest parity ratio was recorded in 2006-2007 period due to kerosene price increases. In 2008 parity ratio had increased by 20% against the significant price escalation of kerosene in the international market. Anyhow, paddy price increase by 95% had caused the parity ratio increases in 2008.

**Figure 6.3: Price Parity Ratios of Selected Consumer Goods (Maha Season); 1990-2008**

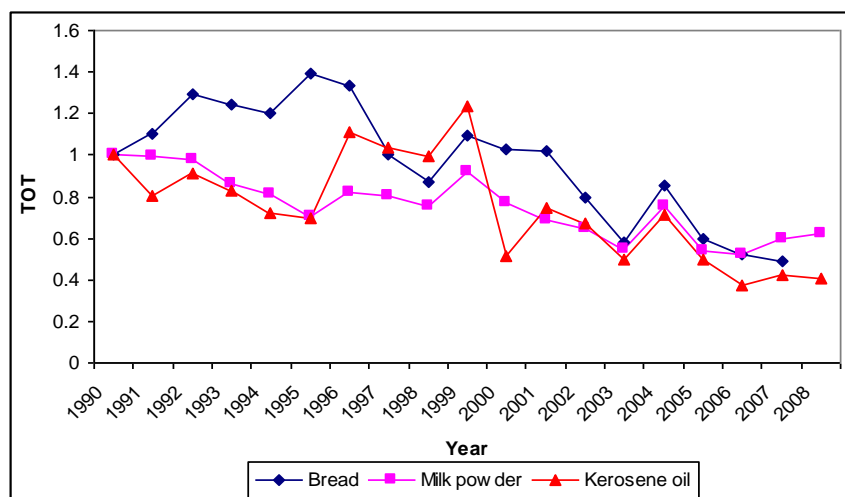


Source: Statistical Abstract, Department of Census and Statistics (1990-2008)

#### 6.4.2 Price Parity Ratios in Yala Season

As could be seen in the Figure 6.4, except in 1998, parity ratio compared to the prices of bread was above 1 during the period of 1990-2001. The highest price parity ratio was recorded in 1995 which was 1.39 followed by the value of 1.34 in 1996. In 1995 the highest parity ratio was recorded due to 21% reduction in the price of bread compared to the previous year. After 2001 price parity ratio had significantly dropped and in 2002 remarkable decline was due to increase price of bread by 24% and reduction of paddy price by 21%. Due to increase of prices of wheat flour in the world market the increase was passed on to the domestic economy. This has caused the parity ratio decline below 1. Hence there had been a noteworthy decline of purchasing power of the paddy farmers.

**Figure 6.4: Price Parity Ratios of Selected Consumer Goods (Yala Season); 1990-2008**



Source: Statistical Abstracts, Department of Census and Statistics (1990-2008)



Price parity ratio compared to milk powder had continuously declined until the year 1995 and then had increased by 17% in the year 1996. This was due to producer price increase in 1996 by 52%. Anyhow, during 1996, milk powder prices had increased by 30%. During the period 1997-98 parity price ratios were reduced and in 1999 they had risen up again to the value of 0.92. From the year 2000 this had declined continuously except 38% increase in 2004. This was due to paddy price increase by 52% compared to the previous year *Yala* season. In 2008 due to higher prices in international market domestic price of milk powder had increased by 52%. Price parity ratio had marginally increased by 3% due to the favourable paddy prices in the season.

There were ad-hoc changes in the price parity ratios compared to kerosene oil. In 1991, it had declined by 20% due to 26% reduction of paddy prices. After that it had declined continuously and again had increased to the value of 1.11 in 1996 due to 52% increase of paddy prices. The highest parity ratio was recorded in 1999. Then there was an obvious decline in 2000 due to 120% price increase in kerosene oil. At the same time paddy prices also had declined by 58%. These two unfavorable price movements had caused such a decline in the parity ratio. The lowest parity ratio could be seen in 2006 and the value is 0.37. This was due to 35% price increase in kerosene oil. In 2008, parity ratio of 0.41 was recorded due to high international price.

## CHAPTER SEVEN

### Findings, Conclusions and Recommendations

#### 7.1.1 Findings

The analysis of main implications resulting from changes in prices that had occurred in the paddy sector is the main focus of this section. Accordingly, the issues arising from the previous analysis, their implications on the paddy sector and some thoughts for the future are presented in this chapter.

##### 1. Irregular paddy price movements

During the harvesting season producer prices are drastically reduced when compared to those of the other months of the year. This situation is worst during the *Maha* harvesting season. More than 70% price reduction occurs during the months of February-March peak harvesting season. Producer prices in the *Maha* season fluctuate significantly compared to the producer prices in the *Yala* season in Anuradhapura and Polonnaruwa. Paddy prices had increased very slowly during the period 1990-2005. However, towards the end of 2007, farm gate prices of paddy had risen at a faster rate with the global food crisis. Paddy prices in selected markets namely Anuradhapura, Polonnaruwa, Kurunegala and Hambantota were not considerably different during the period under discussion. Similar correlation values within each two markets, reveal that market integration can be expected.

##### 2. Producer price index had increased four folds

Producer price index had increased only four folds compared to that of the base year (1990). Both producer prices as well as input prices are significantly important in determining the terms of trade in paddy. Anyhow, producer prices of paddy had not increased commensurate with the level of rise in the prices of inputs. This had resulted in a down turn in profitability and terms of trade in the paddy sub sector during the period under consideration. Because of the increase in input costs and as the profit margins are not commensurate with the increase of total production costs, returns from paddy farming had declined over the last several years. This trend will have adverse implications on farmers who continue to concentrate on paddy farming.

##### 3. Input prices of paddy had hugely increased

Input prices had drastically increased in recent times. This increase is twice the producer price increases. Labour prices had considerably increased due to shortage of labour in paddy cultivation. The youth were unwilling to be engaged in agriculture because of low profitability as well as due to their attitudes. During the recent past, machinery cost and agro chemical cost had drastically increased. The use of agro chemicals had become popular with the introduction of new high yielding varieties which were susceptible to various pests and diseases. Manual labour had been replaced by machine power at a higher cost especially in the Hambantota district. Anyhow, reduction in labor cost in Hambantota had been put back by power cost keeping the overall cost at comparable levels with all other selected districts. Share of

machinery cost to the total cost increase from 20% in 1990 to 30% in 2008 and average cost during the past two decades were nearly 25% of the total cost of production of paddy. In Hambantota 58% had used combine harvesters. Fertilizer prices had declined during the recent years which is favourable to the farmers. But a high subsidy is borne by the government leading to extreme budgetary constraints.

#### 4. Uneven changes in Terms of Trade

There are no substantial changes in the terms of trade within the selected districts when inputs were taken into calculation of parity ratios. The indices of terms of trade were adverse to the extent that they became unfavourable to the agricultural sector and results suggest that terms of trade of the paddy sector had declined over the years. Index of paid prices had increased sharply in 2000 relative to the index of prices received and as a result the index of terms of trade moved much to the disadvantage of agriculture sector. During 2007 however, the increase in the index of prices received by agricultural sector was higher than the increase in the index of prices paid by the sector resulting in a marginal increase in the index of terms of trade. According to Rupasena (2008), in the pre-liberalization period, the parity ratios had increased but they had continuously declined during the post-liberalization period. These results are also in line with the findings of this study. However in his study he has calculated the parity ratios of rice with inputs (fertilizer and labour) and with consumer goods (soap, milk powder and kerosene oil). He has not constructed the composite input index to obtain the terms of trade using the ratios of indices of inputs and outputs used in paddy cultivation.

#### 5. Positive signals of Terms of Trade in the economy of paddy farmers economy in 2008

Parity ratios of paddy were calculated individually with the inputs used for cultivation and these ratios (except with fertilizer) had declined until 2008. Parity ratios of paddy with fertilizer had increased during the entire period of investigation due to fertilizer subsidy given to the [paddy farmers. Terms of trade in 2008 had risen to 0.79 in *Maha* season and 0.72 in *Yala* season when compared to the base year, 1990 had and shown some positive signals of terms of trade values with attractive paddy prices in that year. However, the terms of trade with inputs had not increased up to the levels of the base year during the period under consideration. Thus the paddy farmers had unfavorably affected. Producer price is the key factor which contribute to increased terms of trade in recent years. With the ever-increasing cost of production in paddy farming, and low and unfavourable paddy prices, it is not profitable to remain in this sector. This is one factor that had caused young generation to turn away from paddy farming.

#### 6. Reduction of purchasing power of the paddy farmers

Price parity ratio compared to prices of consumer goods were calculated in order to determine the terms of trade in paddy farming. The analysis reveals that prices of consumer goods such as bread, milk powder and kerosene oil had drastically increased during the most recent years. This imply that farmers were vulnerable to the higher consumer prices. They had received a low income from the paddy farming. Although, paddy prices had increased at the end of 2007 at a higher rate they had not compensated the price increase in consumer goods. Therefore, there is always a big

gap between these two price levels and this had caused a reduction in purchasing power of the farmers.

#### 7. Parity price ratios related to consumer goods swing down

Prices index of bread had raised 5 folds while the milk powder and kerosene oil had risen by 7 and 10 folds respectively when compared to the base year-1990. The upsurge in crude oil prices in international markets was the major driving force in increase of the overall price levels during the recent past. When the prices of consumer goods are considered in order to calculate the parity ratios in paddy sector, it is observed that the values had also gradually declined during the recent past with the increasing food prices. Although, the parity price was higher than 1 during 1990-2001 period parity ratio had gradually gone down thereafter indicating a decline of the purchasing power of the farmers. This value had declined to 0.43 (*Maha*) and 0.49 (*Yala*) from 1990. Price parity ratio compared to milk powder had continuously declined until the year 1995 and then had increased by 17% in the 1996. This was due to producer price increases in 1996 by 52%. Subsequently this party ratio also had moved down. There were unfavourable terms of trade when compared to prices of kerosene oil owing to the recent high prices in the world market. The value had declined from 1 to 0.44 (*Maha*) and 0.41 (*Yala*). The highest party ratio in 2008 when compared to the three consumer goods can be seen in the prices of milk powder (0.50).

### 7.2 Conclusion

This study shows that terms of trade in the paddy sub sector had deteriorated during the period under discussion both in terms of inputs and comparable prices in consumer goods. This had resulted in decline of living standards and wellbeing of the farmers. Anyhow, some positive signals could be seen in 2008. The significant drop in the terms of trade of paddy had been due to the rise in input costs at higher rates than the producer price of paddy. The end result is the reduction in paddy farmers' profits and hence their well-being over a period of time.

### 7.3 Recommendations

The indices of the terms of trade and parity indices reveal that improvement in the terms of trade in favour of agriculture is a recent phenomenon which need to be sustained. The terms of trade as measured on the basis of relative movements of the trends in prices of paddy sold and purchased by the sector is an important but not the sole indicator of economic well-being of the sector.

Besides prices, extent of fluctuations of the farmers' production may be equally important for the producers. Upgrading of technology which increases the productivity of land and other resources plays a much more positive role in raising farm production and income than merely increasing the prices of agricultural products. High prices or favourable terms of trade without technology improvements have only a limited impact on agricultural production. Moreover, diversification of agriculture would generate greater farm incomes. It is also essential that rise of prices in items such as chemical fertilizer and machinery be kept under check.

Agriculture should be made a profitable enterprise so that farmers are induced to make further investments. Profitability of agriculture can be increased, if there is enough increase in productivity and the terms of trade remain at a favourable level to the farmers. In order to improve the terms of trade in paddy sector sale of paddy direct to millers, improvement of the quality of paddy and holding stock to sell later, without selling at the peak harvesting period are necessary.

The study findings suggest that labour saving mechanisms should be introduced in paddy cultivation as a solution to the labour shortage problem and accompanying high wage rates. Government should encourage the private sector investment in the commercial cultivation of paddy in the country and local paddy farmers should be encouraged by helping them to explore new markets to sell their products at reasonable prices at the time of heavy production.

It is better to keep buffer stocks which will be enough at least for 2-3 months of the year. These buffer stocks should be maintained in paddy producing areas by the government and these stocks should be used before the end of each season and stocks should be refilled from time to time. If government is able to maintain a buffer stock of paddy, it would help farmers as well as consumers. While encouraging the private millers to compete with the government paddy prices, a strong market should be built up and this would help to protect the consumers. It would also help paddy farmers to receive higher market prices.

With the support of the government, a strong paddy price network should be established. Paddy cultivated areas, producing areas, expected paddy production, paddy stocks, market capacity, market prices of paddy should be included in the price network. These data of paddy demand and supply could be utilized to forecast price environment to both producers consumers.

Creating a favourable price framework for farmers is important and it should be continuously up-grading. There should also be an increased investment in agriculture. Generally stable terms of trade has resulted in a sustained rate of growth in production in the agriculture sector. Results of research by Misra and Hazell (1996), Misra (1998) and Gulati and Bathla (2001) indicate that a favourable terms of trade had helped to raise private investment in agriculture in India.

Although changes in programmes and policies can lead to more efficient use of agricultural resources and the raising of the overall production and productivity, actual behavior would depend upon the extent of improvement in terms of trade in favour of agriculture as also on the response of the farmers to price increase. In this context it would be important to monitor the changes in terms of trade so that effective policy measures, if needed can be taken to ensure that the farmers benefit from new economic policies. Therefore, government should consider terms of trade as one of the factors for formulating its recommendations on a price policy for agriculture commodities when decisions are taken on agriculture.

### **Future Research**

Terms of trade is one of the factors that should be taken in to account while formulating recommendations on the price policy for agriculture commodities.

Therefore, it is worthwhile to study the terms of trade in the whole agriculture sector and impact of changing terms of trade on the private component of agriculture investment.

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Appendix 1 A: Producer Price of Paddy in Anuradhapura (Rs./kg);1990-2008

Year	Janua	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual			Seasonal-Maha			Seasonal-Yala		
													mean	SD	CV	mean	SD	CV	mean	SD	CV
1990	7.67	7.57	6.02	6.38	6.12	6.63	6.64	6.72	6.66	7.30	7.20	6.71	6.80	0.53	7.799	6.2	0.53	8.556	6.68	0.53	7.941
1991	7.98	7.15	5.67	5.70	6.11	6.19	6.33	6.33	6.28	7.95	7.91	8.05	6.80	0.938	13.79	5.685	0.938	16.5	6.33	0.938	14.82
1992	8.39	6.99	7.28	7.19	7.47	7.47	7.38	7.23	7.60	8.44	8.47	8.15	7.67	0.538	7.019	7.235	0.538	7.442	7.305	0.538	7.371
1993	8.39	7.86	7.91	7.67	7.67	7.83	8.01	7.70	7.74	9.15	8.48	8.86	8.11	0.499	6.16	7.79	0.499	6.409	7.855	0.499	6.356
1994	8.86	8.15	6.97	6.80	7.07	7.10	7.91	7.19	6.95	7.67	7.79	8.05	7.54	0.629	8.336	6.885	0.629	9.132	7.55	0.629	8.328
1995	7.00	6.60	6.75	6.46	7.46	6.98	7.12	6.78	6.81	6.63	7.00	7.30	6.91	0.294	4.253	6.605	0.294	4.447	6.95	0.294	4.227
1996	8.42	7.52	7.73	7.87	7.98	8.70	10.05	10.39	11.89	10.08	11.59	10.85	9.42	1.569	16.65	7.8	1.569	20.12	10.22	1.569	15.35
1997	9.98	8.78	9.42	9.41	10.30	10.25	10.67	10.79	10.54	11.66	12.09	12.04	10.49	1.046	9.972	9.415	1.046	11.11	10.73	1.046	9.752
1998	12.02	9.37	9.11	8.92	10.67	10.16	10.64	10.55	10.10	10.10	10.70	11.34	10.31	0.894	8.678	9.015	0.894	9.921	10.6	0.894	8.442
1999	11.60	12.27	12.39	10.25	12.58	11.62	11.91	12.07	12.25	12.23	12.38	12.55	12.01	0.64	5.328	11.32	0.64	5.652	11.99	0.64	5.336
2000	12.25	10.93	7.94	10.83	9.54	10.50	10.43	12.75	10.06	10.48	10.38	11.59	10.64	1.245	11.7	9.385	1.245	13.27	11.59	1.245	10.75
2001	12.19	12.26	11.98	10.75	11.68	11.53	12.09	12.24	11.77	12.49	12.24	12.88	12.01	0.538	4.477	11.37	0.538	4.731	12.17	0.538	4.42
2002	14.44	13.37	12.38	12.71	13.02	12.76	12.25	12.54	11.99	12.25	13.65	15.00	13.03	0.93	7.134	12.55	0.93	7.41	12.4	0.93	7.5
2003	15.26	11.15	11.08	10.95	10.45	12.05	11.01	10.71	10.87	11.42	13.38	14.10	11.87	1.539	12.97	11.02	1.539	13.98	10.86	1.539	14.18
2004	15.32	14.79	13.23	11.88	13.64	14.14	15.23	15.80	18.01	15.47	15.25	16.30	14.92	1.574	10.55	12.56	1.574	12.54	15.52	1.574	10.15
2005	20.33	16.96	14.62	14.52	14.22	14.31	13.82	13.63	16.47	17.47	16.82	16.44	15.80	1.976	12.5	14.57	1.976	13.56	13.73	1.976	14.39
2006	16.99	15.45	13.36	12.79	12.67	12.82	13.32	13.61	14.01	14.63	15.28	16.09	14.25	1.425	9.999	13.08	1.425	10.9	13.47	1.425	10.58
2007	15.82	15.94	14.38	14.69	15.35	16.63	17.63	18.49	19.04	21.83	30.29	29.05	19.10	5.367	28.11	14.54	5.367	36.92	18.06	5.367	29.72
2008	31.63	22.92	24.25	31.84	31.05	27.88	28.21	29.36	27.72	30.37	32.33	33.77	29.28	3.264	11.15	28.05	3.264	11.64	28.79	3.264	11.34

Source: Statistical Abstract, Department of Census and Statistics

Appendix 1B: Producer Price of Paddy in Polonnaruwa (Rs./kg); 1990-2008

Year	Janua	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual			Seasonal-Maha			Seasonal-Yala		
													mean	SD	CV	mean	SD	CV	mean	SD	CV
1990	7.76	8.82	6.70	6.07	6.76	7.23	7.45	6.20	6.09	6.60	8.31	7.87	7.16	0.90	12.62	6.39	0.90	14.14	6.83	0.90	13.23
1991	8.35	7.19	6.10	5.56	5.97	6.02	6.34	6.27	6.36	7.78	8.21	8.02	6.85	1.00	14.59	5.83	1.00	17.13	6.31	1.00	15.84
1992	7.67	7.08	6.95	7.09	7.68	7.72	7.23	6.95	7.84	7.88	8.49	8.48	7.59	0.54	7.15	7.02	0.54	7.73	7.09	0.54	7.65
1993	8.37	6.90	6.77	6.74	7.28	7.63	7.66	7.16	7.94	8.23	8.74	8.89	7.69	0.75	9.75	6.76	0.75	11.10	7.41	0.75	10.12
1994	8.94	7.86	7.06	6.77	6.84	6.96	7.76	7.29	6.86	7.64	7.95	8.62	7.55	0.72	9.48	6.92	0.72	10.35	7.53	0.72	9.51
1995	7.68	7.08	6.38	6.67	6.76	6.77	6.99	6.39	6.72	6.61	7.39	8.24	6.97	0.55	7.92	6.53	0.55	8.47	6.69	0.55	8.26
1996	7.73	8.21	7.65	8.20	8.34	9.56	10.43	10.14	10.78	10.51	11.59	11.27	9.53	1.44	15.06	7.93	1.44	18.12	10.29	1.44	13.96
1997	10.44	8.75	8.70	9.17	9.53	8.88	9.80	10.44	10.96	12.16	13.18	10.89	10.24	1.40	13.69	8.94	1.40	15.70	10.12	1.40	13.86
1998		8.17	9.11	8.10	9.55	9.31	9.77	9.52	9.00	9.09	10.30	12.14	9.46	1.10	11.58	8.61	1.10	12.73	9.65	1.10	11.36
1999	13.76	11.23	11.73	11.37	12.88	12.33	12.19	12.18	12.46	12.63	12.52	12.41	12.31	0.68	5.49	11.55	0.68	5.85	12.19	0.68	5.55
2000	11.96	8.75	8.32	8.75	9.03	9.41	11.35	13.00	10.91	10.77	11.50	12.42	10.51	1.60	15.24	8.54	1.60	18.78	12.18	1.60	13.16
2001	13.34	12.84	12.00	10.73	11.15	11.86	11.94	12.25	11.87	12.00	13.17	13.80	12.25	0.90	7.31	11.37	0.90	7.88	12.10	0.90	7.40
2002	15.00	15.06	10.96	13.03	13.60	13.28	12.20	12.34	11.43	12.25	12.96	13.49	12.97	1.25	9.64	12.00	1.25	10.42	12.27	1.25	10.18
2003	12.81	12.19	11.28	11.20	11.49	11.64	11.42	10.38	11.78	11.58	12.62	14.04	11.87	0.94	7.94	11.24	0.94	8.38	10.90	0.94	8.64
2004	14.69	14.90	13.04	13.46	13.98	13.89	14.94	16.00	17.32	16.67	19.06	19.06	15.58	2.06	13.21	13.25	2.06	15.54	15.47	2.06	13.31
2005	19.00	18.00	13.35	13.58	13.31	13.29	12.37	12.75	18.09	18.09	18.10	18.62	15.71	2.75	17.51	13.47	2.75	20.43	12.56	2.75	21.90
2006	17.90	13.80	12.89	13.04	12.49	12.88	14.50	13.33	13.76	14.99	14.56	15.08	14.10	1.48	10.48	12.97	1.48	11.40	13.92	1.48	10.62
2007	16.12	16.11	15.70	15.16	15.93	16.68	17.25	18.52	20.78	22.36	32.40	29.52	19.71	5.71	28.98	15.43	5.71	37.02	17.89	5.71	31.94
2008	31.11	25.04	25.57	35.61	32.81	31.67	28.57	29.76	27.70	30.09	32.21	33.83	30.33	3.21	10.58	30.59	3.21	10.49	29.17	3.21	11.00

Source: Statistical Abstract, Department of Census and Statistics

Appendix 1C: Producer Price of Paddy in Kurunegala (Rs./kg); 1990-2008

Year	Janua	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual			Seasonal-Maha			Seasonal-Yala		
													mean	SD	CV	mean	SD	CV	mean	SD	CV
1990	8.80	7.71	6.86	6.68	5.84	6.66	6.63	6.28	6.92	7.31	7.88	7.43	7.08	0.80	11.23	6.77	0.80	11.75	6.46	0.80	12.32
1991	7.94	6.44	6.69	6.66	6.72	6.70	6.50	6.53	6.76	7.67	8.12	8.13	7.07	0.68	9.56	6.68	0.68	10.12	6.52	0.68	10.37
1992	9.24	8.05	7.47	7.24	8.09	7.97	7.87	7.69	7.96	8.51	9.09	9.01	8.18	0.65	7.90	7.36	0.65	8.78	7.78	0.65	8.30
1993	8.82	7.80	7.19	7.43	8.26	8.25	8.29	7.95	8.26	8.42	8.86	9.01	8.21	0.55	6.75	7.31	0.55	7.58	8.12	0.55	6.82
1994	8.54	7.91	7.59	7.16	6.78	7.46	7.61	7.44	7.28	7.35	8.03	8.16	7.61	0.48	6.33	7.38	0.48	6.53	7.53	0.48	6.40
1995	7.65	7.47	6.50	6.89	6.88	7.19	6.66	6.55	6.52	6.60	7.15	7.67	6.98	0.44	6.31	6.70	0.44	6.57	6.61	0.44	6.66
1996	8.04	8.31	8.11	8.15	8.50	9.88	10.56	10.97	11.76	11.88	12.45	12.19	10.07	1.77	17.62	8.13	1.77	21.81	10.77	1.77	16.47
1997	9.78	8.43	8.60	8.98	9.34	9.67	10.19	11.41	10.85	11.93	11.73	12.43	10.28	1.37	13.28	8.79	1.37	15.53	10.80	1.37	12.64
1998	10.59	9.37	9.18	8.90	9.52	9.56	8.95	8.96	9.12	9.17	10.37	10.38	9.51	0.61	6.38	9.04	0.61	6.71	8.96	0.61	6.78
1999	10.50	15.00	11.18	11.80	13.24	12.84	12.24	11.57	11.73	12.27	12.88	12.82	12.34	1.15	9.36	11.49	1.15	10.05	11.91	1.15	9.70
2000	11.98	9.86	9.18	9.31	9.25	8.85	11.50	12.00	9.95	10.04	11.65	11.74	10.44	1.23	11.77	9.25	1.23	13.30	11.75	1.23	10.46
2001	14.00	12.00	11.75	11.50	11.69	12.40	14.18	13.11	13.18	12.69	13.13	13.07	12.73	0.88	6.92	11.63	0.88	7.58	13.65	0.88	6.46
2002	13.79	14.23	12.30	12.96	12.70	13.41	12.13	12.22	14.91	12.98	12.98	13.61	13.19	0.85	6.41	12.63	0.85	6.69	12.18	0.85	6.94
2003	13.08	11.96	11.63	11.82	12.48	12.21	10.61	10.03	10.71	11.35	13.13	14.80	11.98	1.30	10.86	11.73	1.30	11.10	10.32	1.30	12.61
2004	17.35	15.67	14.07	15.37	15.07	15.54	17.01	17.21	17.71	18.13	21.69	19.19	17.00	2.08	12.24	14.72	2.08	14.13	17.11	2.08	12.16
2005	19.74	16.60	15.62	14.90	14.74	15.66	13.18	13.00	15.53	15.53	17.25	17.91	15.81	1.90	12.00	15.26	1.90	12.43	13.09	1.90	14.49
2006	16.70	13.83	13.11	12.90	13.00	12.50	13.41	13.42	13.40	14.25	15.82	16.92	14.11	1.52	10.77	13.01	1.52	11.68	13.42	1.52	11.32
2007	17.53	15.92	14.71	14.25	16.03	16.86	18.01	19.13	19.76	22.51	28.84	30.51	19.51	5.28	27.05	14.48	5.28	36.43	18.57	5.28	28.41
2008	33.75	25.06	25.77	32.56	32.19	33.95	23.09	28.20	28.46	31.47	32.40	34.44	30.11	3.86	12.83	29.17	3.86	13.25	25.65	3.86	15.06

Source: Statistical Abstract, Department of Census and Statistics

Appendix 1D: Producer Price of Paddy in Hambantota (Rs./kg); 1990-2008

Year	Janua	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual			Seasonal-Maha			Seasonal-Yala		
													mean	SD	CV	mean	SD	CV	mean	SD	CV
1990	7.67	6.80	6.74	7.01	6.89	7.30	7.04	7.22	6.76	7.46	7.47	6.76	7.09	0.32	4.56	6.88	0.32	4.71	7.13	0.32	4.54
1991	9.06	9.08	7.18	6.78	6.94	6.98	7.81	7.48	7.50	7.52	7.76	7.91	7.67	0.75	9.74	6.98	0.75	10.70	7.65	0.75	9.77
1992	10.06	7.76	7.13	8.56	9.64	8.39	9.58	9.00	9.42	9.58	9.58	9.58	9.02	0.89	9.83	7.85	0.89	11.30	9.29	0.89	9.54
1993	8.62	8.19	8.13	7.57	9.46	8.17	9.58	8.96	9.34	8.43	9.76	9.78	8.83	0.75	8.45	7.85	0.75	9.51	9.27	0.75	8.05
1994	9.12	8.57	7.91	7.88	8.06	8.96	8.49	7.99	7.71	8.26	8.41	8.74	8.34	0.45	5.40	7.90	0.45	5.71	8.24	0.45	5.47
1995	9.36	9.58	7.48	7.53	7.57	8.50	8.55	7.79	7.53	7.93	9.19	9.40	8.37	0.83	9.93	7.51	0.83	11.08	8.17	0.83	10.17
1996	9.71	9.40	8.66	10.03	9.98	10.00	10.84	12.94	13.14	12.51	13.20	13.27	11.14	1.73	15.57	9.35	1.73	18.56	11.89	1.73	14.59
1997	13.42	10.05	9.76	10.04	10.31	10.47	10.63	10.74	11.67	11.92	13.87	13.30	11.35	1.46	12.89	9.90	1.46	14.78	10.69	1.46	13.69
1998	13.59	10.83	9.97	9.68	10.44	11.61	11.50	10.00	11.06	12.23	13.30	13.84	11.50	1.46	12.65	9.83	1.46	14.81	10.75	1.46	13.54
1999	13.12	13.22	13.32	15.03	13.96	13.17	14.22	14.08	13.43	13.40	12.90	14.00	13.65	0.61	4.48	14.18	0.61	4.31	14.15	2.43	17.16
2000	12.75	11.33	10.71	11.36	11.00	10.35	10.10	10.60	10.87	10.40	11.65	12.90	11.17	0.90	8.03	11.04	0.90	8.13	10.35	0.90	8.66
2001	12.62	12.94	12.61	12.46	12.67	13.12	13.50	13.75	13.81	14.50	16.75	16.00	13.73	1.39	10.10	12.54	1.39	11.06	13.63	1.39	10.18
2002	16.60	15.00	15.73	14.00	13.65	13.50	13.75	13.10	14.71	13.50	14.77		14.39	1.08	7.50	14.87	1.08	7.26	13.43	1.08	8.04
2003	16.33	14.83	13.08	12.13	12.75	12.10	12.20	11.38	12.05	12.15	13.00	15.50	13.13	1.57	11.94	12.61	1.57	12.44	11.79	1.57	13.29
2004	16.00	15.83	15.00	16.10	17.00	17.50	19.67	17.90	17.90	17.75	21.40	21.43	17.79	2.09	11.77	15.55	2.09	13.47	18.79	2.09	11.15
2005	23.00	18.88	16.70	15.55	15.11	14.43	14.08	12.47	13.44	14.41	14.82	15.23	15.68	2.82	17.96	16.13	2.82	17.46	13.28	2.82	21.21
2006	14.47	13.54	13.16	12.93	12.47	12.39	12.50	11.87	12.70	13.29	14.90	16.57	13.40	1.32	9.88	13.05	1.32	10.15	12.19	1.32	10.87
2007	18.13	18.23	18.32	15.70	15.68	20.62	17.28	17.28	19.22	20.59	25.64	24.60	19.27	3.15	16.36	17.01	3.15	18.54	17.28	3.15	18.25
2008	31.33	26.72	30.42	33.60	33.50	36.12	29.55	29.03	27.78	30.00	32.00	33.33	31.12	2.72	8.75	32.01	2.72	8.51	29.29	2.72	9.30

Source: Statistical Abstract, Department of Census and Statistics

**Appendix 2: Lowest Farm-gate Price Received for Paddy in Selected Districts  
(Rs./kg); 1990-2008**

Year	Anuradhapura		Polonnaruwa		Kurunegala		Hambantota	
	price	Month	price	month	Price	month	price	month
1990	6.02	March	6.07	April	5.84	May	6.74	March
1991	5.67	March	5.56	April	6.44	Feb	6.78	April
1992	6.99	Feb	6.95	March	7.24	April	7.13	March
1993	7.67	April	6.74	April	7.19	March	7.57	April
1994	6.80	April	6.77	April	6.78	May	7.71	Sep
1995	6.46	April	6.38	March	6.50	March	7.48	March
1996	7.52	Feb	7.65	March	8.04	June	8.66	March
1997	8.78	Feb	8.70	March	8.43	Feb	9.76	March
1998	8.92	April	8.10	April	8.90	April	9.68	April
1999	10.25	April	11.23	Feb	10.50	June	12.90	Nov
2000	7.94	March	8.32	March	8.85	June	10.10	July
2001	10.75	April	10.73	April	11.50	April	12.46	April
2002	11.99	Sep	10.96	March	12.13	July	13.10	Aug
2003	10.45	May	10.38	Aug	10.03	Aug	11.38	Aug
2004	11.88	April	13.04	Mar	14.07	March	15.00	March
2005	13.63	August	12.37	July	13.00	Aug	12.47	Aug
2006	12.67	May	12.49	May	12.50	June	11.87	Aug
2007	14.38	March	15.16	April	14.25	April	15.68	May
2008	22.92	Feb	25.04	Feb	23.09	July	26.72	Feb

Source: Statistical Abstract, Department of Census and Statistics

**Appendix 3 A: Producer Price Index of Paddy (Maha)-Base Year 1990=100**

Year	Anuradhapura	Polonnaruwa	Kurunegala	Hambantota	Average	Annual Change (%)
1990	100.00	100.00	100.00	100.00	100.00	0.00
1991	91.69	91.31	98.60	101.53	95.78	-4.22
1992	116.69	109.95	108.64	114.11	112.35	17.30
1993	125.65	105.79	107.98	114.18	113.40	0.94
1994	111.05	108.30	108.94	114.84	110.78	-2.31
1995	106.53	102.19	98.89	109.16	104.20	-5.94
1996	125.81	124.12	120.09	135.93	126.49	21.39
1997	151.85	139.94	129.84	144.00	141.41	11.80
1998	145.40	134.77	133.53	142.91	139.15	-1.59
1999	182.58	180.89	169.72	206.18	184.84	32.83
2000	151.37	133.67	136.56	160.51	145.53	-21.27
2001	183.31	178.00	171.71	182.33	178.84	22.89
2002	202.34	187.86	186.56	216.22	198.24	10.85
2003	177.66	176.04	173.19	183.35	177.56	-10.43
2004	202.50	207.52	217.43	226.18	213.41	20.19
2005	235.00	210.88	225.41	234.55	226.46	6.12
2006	210.89	203.05	192.10	189.75	198.95	-12.15
2007	234.44	241.66	213.88	247.42	234.35	17.80
2008	452.34	479.09	430.80	465.60	456.96	94.99

Source: Calculations based on Producer Price Data obtained from Statistical Abstract, Department of Census and Statistics

**Appendix 3 B: Producer Price Index of Paddy (Yala)-Base Year 1990=100**

Year	Anuradhapura	Polonnaruwa	Kurunegala	Hambantota	Average	Annual Change (%)
1990	100.00	100.00	100.00	100.00	100.00	0.00
1991	94.76	92.38	100.93	107.22	98.82	-1.18
1992	109.36	103.88	120.53	130.29	116.02	17.40
1993	117.59	108.57	125.79	130.01	120.49	3.86
1994	113.02	110.26	116.58	115.57	113.86	-5.51
1995	104.04	98.02	102.32	114.59	104.74	-8.00
1996	152.99	150.70	166.77	166.76	159.31	52.09
1997	160.63	148.28	167.31	149.86	156.52	-1.75
1998	158.61	141.32	138.73	150.77	147.36	-5.85
1999	179.49	178.53	184.43	198.46	185.23	25.70
2000	173.50	178.39	182.03	145.16	169.77	-8.35
2001	182.11	177.22	211.39	191.09	190.45	12.18
2002	185.55	179.78	188.61	188.29	185.56	-2.57
2003	162.57	159.71	159.88	165.36	161.88	-12.76
2004	232.26	226.67	265.07	263.46	246.86	52.50
2005	205.46	184.03	202.79	186.19	194.62	-21.16
2006	201.57	203.88	207.82	170.90	196.04	0.73
2007	270.36	262.05	287.68	242.36	265.61	35.49
2008	430.91	427.33	397.29	410.80	416.58	56.84

Source: Calculations based on Producer Price Data obtained from Statistical Abstract, Department of Census and Statistics

**Appendix 3 C: Producer Price Index of Paddy (Average)-Base Year 1990=100**

Year	Anuradhapura	Polonnaruwa	Kurunegala	Hambantota	Average	Annual Change (%)
1990	100.00	100.00	100.00	100.00	100.00	0.00
1991	100.04	95.70	99.84	108.08	100.91	0.91
1992	112.79	106.06	115.52	127.21	115.39	14.35
1993	119.17	107.51	115.93	124.52	116.78	1.20
1994	110.89	105.46	107.42	117.60	110.34	-5.51
1995	101.56	97.46	98.51	117.96	103.87	-5.87
1996	138.53	133.25	142.12	157.05	142.74	37.42
1997	154.29	143.14	145.11	159.99	150.63	5.53
1998	151.53	132.22	134.20	162.18	145.03	-3.72
1999	176.55	172.01	174.20	192.49	178.81	23.29
2000	156.43	146.95	147.42	157.45	152.06	-14.96
2001	176.55	171.15	179.65	193.53	180.22	18.52
2002	191.57	181.23	186.14	202.89	190.46	5.68
2003	174.50	165.89	169.19	185.03	173.65	-8.82
2004	219.38	217.81	240.01	250.80	232.00	33.60
2005	232.31	219.60	223.13	221.01	224.01	-3.44
2006	209.53	197.09	199.13	188.90	198.66	-11.32
2007	280.74	275.48	275.36	271.72	275.83	38.84
2008	430.45	423.91	425.11	438.65	429.53	55.72

Source: Own Calculations based on producer price data obtained from Statistical Abstract, Department of Census and Statistics

**Appendix 4: Wage Rate Changes in Paddy Cultivation  
(Rs./man days):1990-2008**

Year	Polonnaruwa	Anuradhapura	Hambantota	Kurunegala	Average	% change
1990	68	59	87	45	65	0
1991	77	66	100	59	75	17
1992	92	86	120	80	95	25
1993	96	101	122	88	102	7
1994	114	117	145	105	120	18
1995	149	138	147	119	138	15
1996	147	139	153	135	143	4
1997	158	151	169	152	157	10
1998	175	170	205	171	180	14
1999	188	194	230	179	198	10
2000	212	208	242	183	211	7
2001	239	222	256	203	230	9
2002	255	253	263	252	256	11
2003	270	263	284	263	270	6
2004	301	282	313	281	294	9
2005	333	323	344	304	326	11
2006	356	352	399	337	361	11
2007	410	380	491	380	415	15
2008	479	466	550	427	481	16

Source: Cost of Cultivation, Department of Agriculture

**Appendix 5: Wage Rate Index; 1990-2008**

Year	Polonnaruwa	Anuradhapura	Kurunegala	Hambantota	Average
1990	100	100	100	100	100
1991	113	112	130	115	118
1992	135	146	178	138	149
1993	141	170	194	140	162
1994	167	198	232	166	191
1995	219	234	264	169	222
1996	216	236	299	176	232
1997	232	256	338	194	255
1998	257	287	379	236	290
1999	276	329	397	264	316
2000	312	353	406	278	337
2001	351	376	451	294	368
2002	375	429	560	302	417
2003	396	446	584	326	438
2004	442	478	623	360	476
2005	490	547	676	395	527
2006	523	596	748	459	581
2007	603	643	843	564	663
2008	710	790	949	632	770

Source: Calculations based on data obtained from Cost of Cultivation, Department of Agriculture

**Appendix 6: Changes in Seed Paddy Price (Rs./kg) : 1990-2008**

Year	Polonnaruwa	Anuradhapura	Hambantota	Kurunegala	Average	% change
1990	10	8	8	10	9	0
1991	9	9	9	12	10	12
1992	12	13	11	11	12	12
1993	12	11	11	12	11	8
1994	12	13	12	12	12	9
1995	12	12	13	7	11	8
1996	14	14	14	13	14	11
1997	15	14	16	15	15	8
1998	16	15	16	14	15	7
1999	19	18	18	16	18	8
2000	17	17	17	16	17	5
2001	19	19	17	19	18	6
2002	20	19	19	21	20	6
2003	22	22	21	23	22	6
2004	25	25	23	25	24	5
2005	27	25	25	27	26	4
2006	27	27	23	27	26	4
2007	33	30	25	28	29	4
2008	33	35	31	35	34	4

Source: Cost of Cultivation for Maha and Yala seasons, Department of Agriculture, 1990-2008

**Appendix 7: Changes in Retail Prices of Fertilizer at Farm Level: 1990-2008**

Year	Polonnaruwa	Anuradhapura	Hambantota	Kurunegala	Average	% change
1990	7	7	10	7	8	0
1991	10	10	11	11	10	29
1992	10	10	10	10	10	0
1993	11	10	10	10	10	1
1994	10	10	11	10	10	0
1995	10	10	11	11	11	4
1996	11	11	11	11	11	4
1997	12	12	12	12	12	8
1998	11	11	10	11	11	-11
1999	11	10	10	11	10	-1
2000	11	10	11	11	11	2
2001	11	11	11	12	11	4
2002	12	11	12	14	12	11
2003	18	18	19	21	19	54
2004	18	19	19	20	19	0
2005	17	18	18	20	18	-3
2006	10	7	7	11	9	-53
2007	7	7	7	7	7	-18
2008	7	7	7	7	7	0

Source: Cost of Cultivation for Maha and Yala seasons, Department of Agriculture, 1990-2008



### Appendix 8: Machinery Cost Index: 1990-2008

Year	Polonnaruwa	Anurahapura	Hambantota	Kurunegala	Average	% change
1990	100	100	100	100	100	0
1991	109	87	110	114	105	5
1992	111	127	116	163	129	23
1993	132	156	117	208	153	18
1994	155	108	114	206	146	-5
1995	167	152	142	213	169	16
1996	162	154	152	213	170	1
1997	173	212	177	280	211	24
1998	182	208	185	294	217	3
1999	183	232	189	296	225	4
2000	193	231	196	304	231	3
2001	224	242	230	339	258	12
2002	235	304	269	405	303	17
2003	260	327	271	408	317	4
2004	270	318	318	438	336	6
2005	331	355	319	489	373	11
2006	423	492	669	600	546	46
2007	443	503	753	682	595	9
2008	483	553	819	795	662	11

Source: Cost of Cultivation for Maha and Yala seasons, Department of Agriculture, 1990-2008

### Appendix 9: Agro chemical Cost Index: 1990-2008

Year	Polonnaruwa	Anurahapura	Hambantota	Kurunegala	Average	% change
1990	100	100	100	100	100	0
1991	49	97	158	164	117	17
1992	93	139	218	139	147	26
1993	84	119	207	179	147	0
1994	116	126	246	250	185	25
1995	159	232	192	214	199	8
1996	143	265	201	186	199	0
1997	170	604	229	284	322	62
1998	178	241	269	230	230	-29
1999	182	384	259	311	284	24
2000	210	422	308	385	331	17
2001	197	408	323	393	330	0
2002	215	409	329	411	341	3
2003	220	394	319	281	304	-11
2004	184	507	338	456	371	22
2005	248	457	381	421	377	1
2006	244	604	337	417	401	6
2007	306	887	306	509	502	25
2008	324	1148	482	573	631	26

Source: Cost of Cultivation for Maha and Yala seasons, Department of Agriculture, 1990-2008

**Annexure 10 A: Weighted Index Values of inputs-Polonnaruwa District:1990-2008**

Year	Labour	Seeds	Fertiliser	Machinery	Agro chemical	Total	% change
1990	48	5	14	26	8	100	0
1991	54	5	19	28	4	109	9
1992	64	6	20	28	7	126	15
1993	67	6	21	34	6	134	7
1994	79	6	20	40	9	154	15
1995	104	6	20	43	12	186	20
1996	103	7	22	41	11	184	-1
1997	110	8	23	44	13	198	7
1998	122	8	21	46	14	212	7
1999	131	10	21	47	14	223	5
2000	148	9	22	49	16	245	10
2001	167	10	22	57	15	272	11
2002	179	11	24	60	17	289	7
2003	189	12	36	66	17	320	10
2004	210	13	36	69	14	342	7
2005	233	14	34	84	19	385	12
2006	249	14	19	108	19	409	6
2007	287	17	14	113	24	455	11
2008	338	18	14	123	25	518	14
<b>Mean</b>	152	10	22	58	14	256	
<b>SD</b>	83	4	6	29	6	122	
<b>CV</b>	<b>54</b>	<b>41</b>	<b>29</b>	<b>50</b>	<b>40</b>	<b>48</b>	

Source: Calculation based on data obtained from Department of Census and Statistics

**Annexure 10 B: Weighted Index Values of inputs- Anuradhapura District : 1990-2008**

Year	Labour	Seeds	Fertiliser	Machinery	Agro chemical	Total	% change
1990	50	6	13	24	6	100	0
1991	56	7	19	21	6	109	9
1992	74	10	19	30	9	142	30
1993	86	9	19	37	8	158	11
1994	100	10	19	25	8	163	3
1995	118	10	19	36	15	197	21
1996	119	11	21	36	17	204	4
1997	129	11	22	50	38	251	23
1998	145	12	20	49	39	265	5
1999	166	14	19	55	62	315	19
2000	178	14	19	55	68	332	5
2001	190	15	21	49	15	290	-13
2002	216	15	21	55	24	332	14
2003	225	18	34	55	27	358	8
2004	241	20	35	57	26	380	6
2005	276	20	34	72	26	428	13
2006	301	22	13	77	25	438	2
2007	325	24	13	75	32	469	7
2008	399	28	13	84	29	553	18
<b>Mean</b>	179	15	20	50	25	289	
<b>SD</b>	97	6	7	19	17	129	
<b>CV</b>	<b>54</b>	<b>41</b>	<b>33</b>	<b>38</b>	<b>69</b>	<b>45</b>	

Source: Calculation based on data obtained from Department of Census and Statistics

**Annexure 10C: Weighted Index Values of inputs -Kurunegala District:1990-2008**

Year	Labour	Seeds	Fertiliser	Machinery	Agro chemical	Total	% change
1990	51	6	14	22	7	100	0
1991	66	7	21	24	11	130	30
1992	91	7	21	35	9	163	25
1993	99	7	21	45	12	184	13
1994	119	7	21	44	17	208	13
1995	135	8	21	46	15	224	8
1996	153	8	23	46	13	242	8
1997	173	9	25	60	19	286	18
1998	194	9	22	63	16	303	6
1999	203	10	21	64	21	318	5
2000	207	12	21	65	26	331	4
2001	231	12	23	73	27	365	10
2002	286	13	23	87	28	437	20
2003	299	14	37	88	19	457	5
2004	319	15	39	94	31	498	9
2005	345	16	37	105	29	533	7
2006	382	16	14	129	28	571	7
2007	431	17	14	147	35	644	13
2008	485	22	14	171	39	732	14
Mean	225	11	23	74	21	354	
SD	126	5	7	41	9	180	
CV	56	40	33	55	43	51	

Source: Calculation based on data obtained from Department of Census and Statistics

**Annexure 10D: Weighted Index Values of inputs -Hambantota District:-1990-2008**

Year	Labour	Seeds	Fertiliser	Machinery	Agro chemical	Total	% change
1990	46	8	12	24	9	100	0
1991	53	9	13	26	15	117	17
1992	64	11	12	28	21	136	16
1993	65	11	12	28	20	136	1
1994	77	12	13	27	23	152	12
1995	78	13	14	34	18	157	3
1996	81	14	14	36	19	164	5
1997	89	16	14	42	22	184	12
1998	109	16	12	44	25	207	12
1999	122	18	12	45	24	222	7
2000	129	17	14	47	29	235	6
2001	136	17	13	55	30	251	7
2002	140	19	15	64	31	269	7
2003	151	21	24	65	30	290	8
2004	166	23	23	76	32	320	10
2005	183	25	22	76	36	342	7
2006	212	23	9	160	32	435	27
2007	260	25	9	180	29	503	16
2008	292	29	9	196	45	571	14
Mean	129	17	14	66	26	252	
SD	69	6	4	53	8	132	
CV	54	34	31	80	32	53	

Source: Calculation based on data obtained from Department of Census and Statistics

### Appendix 11: Composite Index of Inputs in selected Districts; 1990-2008

year	Anuradhapura	Polonnaruwa	Kurunegala	Hambantota	Average
1990	100	100	100	100	100
1991	109	109	130	117	116
1992	142	126	163	136	141
1993	158	134	184	136	153
1994	163	154	208	152	169
1995	197	186	224	157	191
1996	204	184	242	164	199
1997	251	198	286	184	230
1998	265	212	303	207	247
1999	315	223	318	222	269
2000	332	245	331	235	286
2001	290	272	365	251	294
2002	332	289	437	269	332
2003	358	320	457	290	356
2004	380	342	498	320	385
2005	428	385	533	342	422
2006	438	409	571	435	463
2007	469	455	644	503	518
2008	553	518	732	571	594

Source: Calculations based on data obtained from Cost of Cultivation, Department of Agriculture

### Appendix 12A: Terms of Trade in Paddy in Selected Districts (*Maha Season*)

Year	Anuradhapura	Polonnaruwa	Kurunegala	Hambantota	Average
1990	1.00	1.00	1.00	1.00	1.00
1991	0.84	0.84	0.76	0.87	0.83
1992	0.82	0.87	0.67	0.84	0.80
1993	0.80	0.79	0.59	0.84	0.75
1994	0.68	0.70	0.52	0.75	0.67
1995	0.54	0.55	0.44	0.69	0.56
1996	0.62	0.67	0.50	0.83	0.65
1997	0.60	0.71	0.45	0.78	0.64
1998	0.55	0.64	0.44	0.69	0.58
1999	0.58	0.81	0.53	0.93	0.71
2000	0.46	0.55	0.41	0.68	0.52
2001	0.63	0.66	0.47	0.73	0.62
2002	0.61	0.65	0.43	0.80	0.62
2003	0.50	0.55	0.38	0.63	0.51
2004	0.53	0.61	0.44	0.71	0.57
2005	0.55	0.55	0.42	0.69	0.55
2006	0.48	0.50	0.34	0.44	0.44
2007	0.50	0.53	0.33	0.49	0.46
2008	0.82	0.92	0.59	0.82	0.79

Source: Calculations based on Cost of Cultivation, Department of Agriculture

**Appendix 12 B: Terms of Trade in Paddy in Selected Districts (Yala Season)**

Year	Anuradhapura	Polonnaruwa	Kurunegala	Hambantota	Average
1990	1.00	1.00	1.00	1.00	1.00
1991	0.87	0.85	0.78	0.92	0.85
1992	0.77	0.82	0.74	0.96	0.82
1993	0.74	0.81	0.68	0.95	0.80
1994	0.69	0.72	0.56	0.76	0.68
1995	0.53	0.53	0.46	0.73	0.56
1996	0.75	0.82	0.69	1.01	0.82
1997	0.64	0.75	0.58	0.81	0.70
1998	0.60	0.67	0.46	0.73	0.61
1999	0.57	0.80	0.58	0.89	0.71
2000	0.52	0.73	0.55	0.62	0.60
2001	0.63	0.65	0.58	0.76	0.66
2002	0.56	0.62	0.43	0.70	0.58
2003	0.45	0.50	0.35	0.57	0.47
2004	0.61	0.66	0.53	0.82	0.66
2005	0.48	0.48	0.38	0.54	0.47
2006	0.46	0.50	0.36	0.39	0.43
2007	0.58	0.58	0.45	0.48	0.51
2008	0.78	0.82	0.54	0.72	0.70

Source: Calculations based on Cost of Cultivation, Department of Agriculture

**Appendix 13: GDP Deflator Index 1996=100**

Year	Value	Year	Value
1990	56.3	2000	131.3
1991	62.5	2001	147.6
1992	68.8	2002	160
1993	75.3	2003	168.2
1994	82.3	2004	183.0
1995	89.2	2005	201.1
1996	100	2006	224.9
1997	108.6	2007	256.4
1998	117.8	2008	298.3
1999	123.1	2009	315.1

Source: Annual Report (2009), Central Bank of Sri Lanka