博士論文

PRICE AND TRADE POLICY DISTORTIONS IN FOOD CROP SECTOR IN SRI LANKA: IMPLICATIONS ON INCOME AND POVERTY

（スリランカの食用作物部門における価格および貿易政策の歪み：所得と貧困への意味）

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EXECUTIVE SUMMARY

Food crop sector is the principal driving force of the rural economy in Sri Lanka and is a multifunctional sector for the development. Like many other governments in the world, the government of Sri Lanka also influences the economy through many channels such as expenditures, taxes, price and monetary policies. All successive governments in the country since independence have taken major efforts to strengthen the agriculture sector specially the paddy and other food crops to achieve food security through massive transfer of public funds. However, government interventions in food crop sector price setting mechanism lead to distort the sector incentives. Also, direct and indirect interventions on food crop sector have strong consequences on welfare of both the producers and consumers in the country. If the farmers' welfare is accomplished through a high cost to the consumer, it may cause many problems and deteriorate resource allocations of the country.

This study therefore, focuses on incentive framework for Sri Lanka's food crop sector with emphasis on the price and trade policies in rice. The study further examines the effects of fertilizer subsidy policy changes, the level of protection in food crop sector, and the implications of removal of price and trade policy distortion on household income and poverty with special focus on rice.

Following the introduction, the second chapter of this study reviews the food crop sector policies with special attention to rice since after the independence in 1948. In addition, political economy of the food crop sector incentives is also examined. The food crop sector in the country has been protected for decades through provision of various input and output subsidies, marketing policies, trade policies, investment in infrastructure and other development projects. Among them fertilizer subsidy and import trade policy have been playing important role on rice. Examining the political economy of the food crop sector suggests that, country's food crop sector is more protected under the left-wing SLFP coalition than the right-wing UNP government. However, highlights of the policies indicate that the absence of a long term policy agenda and weaknesses in implementation are the major hindrance to the development of the food crop sector. In addition, low predictability and lack of transparency in public fund usage, weaknesses in monitoring, corruptions, misallocations and several other problems in the

government sector would further deteriorate the sector performances. Despite huge incentives given to the food crop sector, its productivity decreases continuously.

The third chapter of the study examines long term trends in paddy production sector in order to evaluate the cost structure and profitability of paddy farming. The study shows that greater efforts on increasing the paddy production by successive governments have resulted in significant increase in rice yield from 1.6 mt/ha in 1960 to 4.4 mt/ha in 2015. The increase in rice production and yield contributes to reduce the import dependency of rice in great extent although it has been fluctuated over the years. Fertilizer consumption tripled from 1961 to 2015 which contributed mainly to increase the paddy yield. Meanwhile, input costs in rice cultivation particularly the labour, machinery and agro chemical cost have markedly increased in the past few decades. In contrast, farmers' cost share on fertilizer has declined significantly as a result of huge fertilizer subsidy granted. However, continuous increase in cost of production (mainly due to other input costs such as machinery and labour) and the low productivity in the paddy sector resulted in profitability decline over the years. Therefore, the majority of farmers consider rice farming is unprofitable in the sense that income derived from rice cultivation alone is insufficient to fulfill the basic needs of the farming households. Therefore, this chapter highlights the importance of reducing cost of production and increasing net income through new technology and income diversification to enhance their living conditions.

The fourth chapter studies the impacts of fertilizer subsidy reforms in the rice sector on paddy production, input supply and demand, farm profit and the government budget. In addition, cost effectiveness of the subsidy is also evaluated in terms of transfer inefficiency. Meanwhile, this chapter also examines the impacts of direct cash transfer policy which has been proposed by the newly elected government with the aim of reducing chemical fertilizer while encouraging farmers to use more organic fertilizer. The analysis is based on demand supply equilibrium model with input markets, using two stage CES technology and base year 2010 is used. The results indicate, complete fertilizer subsidy reduction would reduce rice production by around 4%, while 36% decline in the fertilizer demand for paddy cultivation. Moreover, fertilizer subsidy would cause the government to spend SLRs. 1.38-1.91 to increase farmers' profit by one rupee which means that economic efficiency of the subsidy is low compared to the annual budget spend on fertilizer. In addition, complete cut of subsidy would reduce the labour and machinery

demand by 2.8% and 3.2% respectively. If the fertilizer subsidy is withdrawn completely, farm profit will be decreased by 40%. Further, it is estimated that the proposed direct cash transfer would contribute to reduce public expenditure by 85% with 3% production drop. Moreover, this would increase the rice price by 14.5%. However, proposed direct transfer system is hardly cost effective since there is no obligation for the rice farmers to obtain direct cash payment.

The analysis of output supply and input demand elasticities of rice production using the restricted normalized translog profit function approach in Chapter 5, suggests that the changes in market prices of inputs and output significantly affect the farmers' profits, rice supply and the use of resources in paddy cultivation. The supply elasticity of rice with respect to its own price is 0.5 and the supply elasticity of output with respect to fertilizer price is -0.05 on an average. Therefore, paddy production in the country is greatly response on the paddy price; hence assurance of attractive output price is important when subsidy remove. In addition, results suggest that fertilizer demand in the country is inelastic but significant to its own price. Therefore, fertilizer subsidy is one of the main factors to increase fertilizer demand. In addition, the low elasticity of substitution between labour and fertilizer and other inputs indicates that there is a complementary relationship among these inputs hence their combined application increases paddy production synergistically.

The Chapter 6 of the study examines the import trade structure and evaluates trade protection in food sector in the recent years in terms of TPR, NRP and ERP. Results show that the average total protection (TPR) of agriculture tariff lines exceed the TPR for industrial tariff lines which means agriculture sector is highly protected over the years in the country. The investigation further shows that structure of import tariffs in the food sector is highly complex and continually changing. This would result in uncertainty in the market and cause adverse impacts on both consumers and producers. Further, results reveal that the ad-hoc tariff changes are more prominent in major food crops of rice, potato, chilli and big onion. The effective protection rate (ERP) for major import competing products of rice, potato, chilli and onions are positive and considerably high, means that producers of such commodities receive artificially high income due to contemporary policies. Moreover, fertilizer subsidy is the major driver of the effective rates of protection in rice and is a significant fiscal cost in the food sector budget. It is also believed that, the high positive protection on producers results in negative impact on consumers especially who belong to the lower income categories of the society.

Chapter 7 analyzes the income and poverty implications of price and trade policy distortions in rice using policy simulations. The results suggest that the welfare of paddy farmers is declined if both fertilizer subsidy and border protection is removed. However, the negative impacts get soften in the long run when supply and demand elasticities are incorporated. Especially the current fertilizer subsidy has greater impact on paddy farmers' welfare. In contrast, the larger populations of consumers are favorably affected when interventions are removed, hence removal of such intervention in terms of tariffs and other taxes as well as fertilizer subsidy would be benefited on larger portion of consumers. Among the paddy producers, poor households with smaller farm size (both rice and non rice farmers) gain the larger proportion of benefits when both interventions are removed. Therefore, current protectionist policies in rice give fewer benefits to the small farmers. In the meantime, removal of border protection only, would increase the welfare of the majority of rice producers in the long run except the households who cultivate more than 10 acres of lands. In addition, simulations with transfer payments given to all households below the poverty line or paddy households only will reduce the negative implications on income and poverty of the households. The largest poverty reduction is for the estate sector consumers with poverty reduction from 23% to 20% when both interventions are removed accompanying transfer given to all households below the poverty line. In addition, the overall poverty gap reduces from 5.38 to 4.12 with transfer payments give only to all paddy households when both interventions are removed.

Finally, this study suggests to promote the private public partnership, develop long term agriculture policy agenda for the country, crop diversification and use new technology to reduce cost and improve the quality of rice, produce new rice varieties which has high demand, make adjustments to the fertilizer subsidy policy, implement attractive output price policy, targeted transfer payments to the households, regular mechanism to absorb the additional labour in rice farming to other industries, simplify the current tariff schedule to reduce the complexity in the process and move toward uniform and low tariffs to improve the incentive framework of the food crop sector in the country. It would be more important to consider toward invest in agriculture research and other infrastructure in order to gain from the agricultural sector in the country. Since, the government faces difficulties in satisfying the interests of both producers and the consumers, making adjustments to the current price and a trade policy are highly politically sensitive in the country.

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CHAPTER 1

INTRODUCTION

1.1 Study Background

Sri Lanka is an island country situated in the Indian Ocean South East to the India which occupies total land area of 65,610 sq km with an estimated population of 21 million people (Central Bank of Sri Lanka, 2015). Although, the country's economy has been diversified considerably over the past decades, mainly it is an agricultural country with diverse agro-climatic and land resources. Therefore, agriculture plays a pivotal role of the economy which constitutes two main sub-sectors namely; import competing domestic food crop sector and export oriented plantation crop sector. In addition, it includes fisheries and livestock sectors. Currently, agriculture sector contributes 8% to the Gross Domestic Product (GDP) of the country (Central Bank of Sri Lanka, 2015) and has been in a declining trend like in many other countries. Notwithstanding of its declining trends, agriculture employs disproportionately high share of employers (28% in 2015) in the sector and it declined unhurriedly than agriculture share in the GDP (Table 1.1). This has created a relatively large gap between share of agriculture income and other sectors of the economy and generates difficulties to the economy. Meanwhile, domestic food sector in the country is dominated by import competing food crops such as paddy and other cereals (maize, cowpea, black gram etc.), condiments (chilli, big onion, red onion), root and tuber crops (potato, manioc etc.), vegetables and fruits in terms of production and area cultivated while plantation sector dominated by traditional export oriented crops (tea, rubber, coconut and other minor export crops). Besides, food crop sector accounts 43% of the agricultural GDP and 75% of the annual agricultural budget during 1998-2009 in Sri Lanka (Wijetunga and Abeysekera, 2010) and it consider as the main driver of the rural economy. Currently, it contributes around 32% to the agricultural GDP (Central Bank of Sri Lanka, 2015).

Even though, the food self sufficiency has been a unique development theme in the food crop sector in Sri Lanka it has proved to be an elusive goal. Meantime, the overall food production has almost stagnated and rural poverty alleviation has been slow (Bandara J. and Jayasuriya S, 2009). Therefore, the country is continuing to be a net food importer. Public expenditure on food imports have dramatically increased over the years and currently it accounts 10% (Central Bank of Sri Lanka, 2015) of the total imports to the country. Despite the continuous rise in

the food prices, the rural consumers' purchasing power has not been increased correspondingly. Conversely, successive governments have taken several measures to increase the welfare of farmers over the years through various government interventions. This creates a contradiction between the satisfaction of consumer and producer preferences.

Table 1.1: Sectoral Shares of GDP and Employments in Sri Lanka, 1950-2014

	1950-51	1960-61	1970-71	1980-81	1990-91	2000-02	2010-11	2014
Sectoral shares of GDP								
Agriculture	44.5	34.6	35.1	33.7	26.3	21.9	13.6	10.7
Plantation agriculture	26.3	17.8	15.8	13.9	8.1	5.2	4.5	3.1
Tea	7.7	6.5	3.2	2.6	2.4	1.4	1.3	0.9
Rubber	5.5	2.3	1.8	1.4	0.6	0.4	0.8	0.2
Coconut	7.1	4.8	4.0	3.8	2.4	1.4	1.1	0.8
Processing of tea, rubber & coconut/other plantation*	6.5	4.2	6.8	6.1	2.7	2.0	1.3	1.2
Non plantation agriculture	14.6	14.5	16.7	15.0	14.8	12.1	6.8	5.2
Paddy	1.5	5.7	7.2	6.1	4.9	3.1	2.0	1.1
Other	13.1	8.8	9.4	8.9	9.9	9.0	4.8	4.1
Forestry	1.9	1.4	1.4	2.0	1.6	1.9	0.6	0.6
Fishing	1.2	0.9	1.2	2.7	1.8	2.7	1.7	1.8
Industries	8.0	9.0	14.0	18.0	23.0	26.0	28.6	33.0
Services	47.5	56.4	50.9	48.3	50.7	52.1	57.8	56.3
Sectoral shares of employment	**1953**	**1963**	**1971**	**1981**	**1991**	**2001**	**2011**	**2014**
Agriculture	53.0	53.0	50.0	45.0	42.0	33.0	32.9	28.5
Industry	12.0	12.0	12.0	15.0	20.0	22.0	24.3	26.5
Services	35.0	35.0	38.0	40.0	38.0	45.0	42.8	45.0

Source: Central Bank of Sri Lanka (various issues)

Note: Processing of tea, rubber and coconut products is usually included under manufacturing, here it is included under plantation agriculture in GDP, but not in employment shares. In 2011 and 2014 this also included minor export crops and plantation development.

Government intervention in food crop sector is more widespread in both developed and developing countries to achieve a wide range of economic and social objectives while it justified based on various reasons. Some of them are: self sufficiency, employment creation, support to small scale producers for adopting modern

technologies and inputs, reduction of price instability, and improvement of the farm households' income (Sharma, and Thaker, 2010). The government interventions can take a form of import-export policies or domestic policies such as price support programs, direct payments, and input subsidies of credit, fertilizer, seeds, irrigation water etc. However, the policy incentive in Sri Lanka for the import-competing crops resulted mainly from trade interventions in the output market and subsidization of irrigation water (Shilpi, 1995). Besides, fertilizer subsidy too has attracted much interest among the general public and incur massive public expenditures for more than six decades. These direct and indirect policy interventions on food crop sector have created strong consequences on producer prices, consumer prices as well as on both producer and consumer welfare. In addition, other stakeholders such as traders, millers and processers have also been mostly affected by these involvements.

1.2 Problem Statement

Interventions to the market creates distortions which can be defined as something that government impose to create a gap between the marginal social return to seller and the marginal social cost to a buyer in a transaction (Bhagwathi, 1971 and Corden, 1997). Even though interventions are justified on economic, social or environmental grounds, Corden (1997) understand such interventions is welfare reducing. On the other hand, changes in price and trade policies affect the reallocation of labor, land, water and other resources in the country.

The government policy in Sri Lanka aims at improving Sri Lanka's competitiveness and promoting exports while ensuring food security on the country. Moreover, the government interventions on food crop sector have an effect on consumer choice, producer resource allocation and net farm incomes. However, high protection to the farmers through various government intervention policies would imply high cost to the consumers. The government of Sri Lanka has made several changes in their agricultural policy in the recent decades hence creates many distortions in the society. However, any attempts to remove such interventions could have been impact on changes in households' welfare and resource allocation. Therefore, it would be useful and relevant to examine the recent changes in incentive framework of food crop sector in Sri Lanka and to understand the implications of removal of the government interventions on households' economy.

The results of the study help to address some policy questions such as: what are the long term trends in rice farming? what are the impacts of fertilizer subsidy changes on national rice production, farmers' profit and inputs

used in rice cultivation? is the fertilizer subsidy in Sri Lanka cost effective? what are values of output supply and input demand elasticities in rice farming? how the level of protections have been changed recently for major food commodity imports, who benefits from trade liberalization and to what extent?

Therefore, by examining recent price and trade policies in food crop sector, this study will shed some light for better understanding of their implications to the society and necessary measures for the development.

1.3 Study Objectives

The overall objective of this study is to undertake a finer analysis of the distortions occurred due to public sector interventions (with special attention to the fertilizer subsidy and trade policy) in the Sri Lanka's food crop sector with a view to understand its implications on household income and poverty and suggest corrective measures for food crop sector development and households welfare.

More specifically, the study is designed to:

(i) evaluate the recent trends in the paddy production, input use, cost structure and profitability of paddy farming

(ii) analyze the effects of fertilizer subsidy adjustments in paddy sector with a view to understand the cost effectiveness of the programme

(iii) estimate the input demand and output supply elasticities of the rice sector

(iv) study the structure and recent trends of import trade policy in agriculture sector

(v) estimate the level of protection in food crop sector in the recent period

(vi) examine the implications of removal of interventions on household income and poverty to shed light on necessary measures for improvements.

1.4 Chapter Organization

In order to meet the above objectives, this study is organized as follows. Followed by the introduction, Chapter 2 reviews the evolution of food crop sector policies with emphasis to rice since independence to obtain an overall image of the incentive framework of the food sector and then discusses the political economy to understand how the country's political environment has influenced on the food policy changes over the years. Chapter 3 is devoted to

examine the long term trends in paddy production sector concerning: extent cultivated, domestic production and imports, inputs use, cost of production and profitability compared to commercial food crops cultivate in Sri Lanka. Chapter 4 of the study analyses adjustments to the fertilizer subsidy policy in paddy with a view to understand its consequences on national rice production, demand/supply of inputs, farm profit and government budget. In addition, cost effectiveness of the fertilizer subsidy programme is calculated in terms of transfer inefficiency. Next chapter attempts to estimate the output supply and input demand elasticities of rice production in Sri Lanka. Meantime, Chapter 6 reviews the structure of import trade policy in agriculture in the recent years and estimates the level of protection of major food commodity imports to Sri Lanka in terms of total protection rate (TPR), nominal rates of protection (NRP) and effective rates of protection (ERP) during the period of 2007-2015. Chapter 7 of the study focuses on estimating the implications of price and trade policy distortions on income and poverty of different household categories (including rice farmers and non-rice farmers) based on 2012/13 Household Income and Expenditure Survey (HIES) data. Since all the districts have been covered by HIES 2012/13, this study is able to estimate the post war implications of price and trade policy interventions on the whole country. Finally, the Chapter 8 concludes with the policy implications.

CHAPTER 2

FOOD CROP SECTOR POLICIES AND THE POLITICAL ECONOMY: WITH EMPHASIZE ON RICE

2.1 Introduction

In line with macroeconomic policy reforms pursued since independence in 1948, the successive governments employed numerous domestic agricultural policies to achieve food self-sufficiency mainly focused on rice self sufficiency in the country. Such measures could be categorized broadly in to the: input subsidies, output subsidies, price and marketing policy, infrastructure development etc.

It is also noted that food crop sector policy interventions and political situation in the country are highly interconnected over the years in Sri Lanka. Meantime, country's image is maintained for decades as a welfare state by providing various subsidies to the food crop sector. Among them, universal food ration, fertilizer subsidy, food stamp progarmme, irrigation and other input subsidies are more popular and time to time it has been revised under the different government settings. Among the many crops, subsidies given to rice sector is the most well-known as well as the most politically sensitive intervention. In addition, import and export taxes, duty waivers, purchasing and distribution of food crops also depend heavily upon the political environment of the country. Hence, it is importance to understand how the changes in incentive structure of the food crop sector is influenced by the political economy under different regimes. Therefore, this chapter first discusses the major public sector interventions in Sri Lanka's rice sector in the recent decades. Then the next section, examines the link between food crop sector policy interventions and the political economy of the country.

2.2 Public Sector Interventions in Rice Farming

2.2.1 Land Settlement Schemes

Land settlement in the dry zone was the key agricultural development policy followed to develop irrigation and agricultural infrastructure in Sri Lanka that was aimed at ensuring self sufficiency in the peasant agricultural sector (Senaka arachchi, 1996). There were various land settlement programmes implemented included, Village Expansion Schemes, Highland Settlements and Youth Settlements. Among them, major irrigation settlements and

Mahaweli development settlement schemes were the major schemes involved in rice production of the country. Between 1931 and 1947 only 13 colonies involving 3,145 settlers had been established in the dry zone and this was gradually advanced between 1948 and 1953, which settled 16 schemes involving 10,426 families (Farmer, 1957). In the beginning, farmers were granted total eight acres of land consists both five acres of wet land for cultivation of paddy and other crops and 3 acres of high land. However, with the limitations of land, in 1953, the government reduced the area of land per family to five acres consisted of three acres of wet land for cultivation (Sanderatne, 1974). This was further reduced to two acres of wet paddy land plus one acre of highland in 1956. Since, "advanced alienation policy" in 1956, the settlers were brought in to the settlement scheme two or three years prior to the availability of irrigation facilities where prior to 1956, colonists were brought in to the scheme only after the irrigation facilities were provided. Major irrigation projects cover 10% of total settlers and 28% of total land extent and Mahaweli settlements cover 4% of settlers and 8% of total land extent by 1991 (Henegedara, 2002).The land settlements under the Accelerated Mahaweli Development Programme (AMDP) in1978 was the centerpiece of the agricultural development of the country which brought under cultivation about 2,65,000 ha of new lands. This programme had some specific features including provisions to prevent fragmentation of paddy lands and provide measures for the consolidation of small sized holdings (Sandaratne, 1974).

2.2.2 Food Subsidies

Sri Lanka imported large portion of its rice demand before the independence and as Edirisinghe and Polman (1977) argued around 90% of rice supply met through imports before World War II. However, since the onset of war the government experienced disturbances to the regular import system and the resultant food shortage cause to food distribution and storage in the country. Consequently, in 1942 universal rice rationing was initiated to ensure the adequate provision of rice to consumers. The quantity of rice issued per person per week was two measures until 1996 and the price charged per measure was Rs. 0.60 per measures till 1954, and price was reduced to Rs. 0.25 till 1966. Then the system was revised in 1966 and issued only one measure of free rice. In 1970s under new coalition government, people were granted two rice measures again. One measure of rice was granted free and the additional one measure was priced at one rupee per measure. After the UNP government came in to power in 1978, large scale producers received 4 lb of rice per week per person at a high subsidized price, the expenditure on food subsidies was approximately 20% of the total government expenditure (Weerahewa, 2004). Consequently, the

ration scheme was replaced with food stamp scheme after 1978 in order to reduce the cost of subsidy and extent of state intervention (Samaratunga, 1984). Under this system rationed rice was limited to the household whose monthly income is less than or equal to Rs. 300. According to this food stamp scheme, for each child less than 8 years old received stamp worth Rs. 25 per month, and child between 8-12 years received stamp worth Rs. 20 per month and any member of household with more than 12 years received a stamp worth Rs. 15 per month to purchase a basket of commodities consists of rice, wheat flour, bread, sugar, dried fish, milk, food and pulses. The total subsidy was reduced to Rs. 305 million in 1980 and by the end of 1982 the subsidy was almost totally eliminated (Edirisinghe, 1987).

2.2.3 Paddy Marketing (Purchasing, Storing and Milling)

Farmers produce of paddy is used to household consumption, seed for the next season and the surplus is sell either to the private sector or the government. Before the trade liberalization policy in 1977, the government plays a major role in purchasing, milling, storing processing and distribution of rice as well as imports. With the policy changes, government intervention in paddy marketing has gradually declined and currently it is mainly handled through the private sector while some farmers are able to sell their produce to the government sector through PMB outlets and few amount purchases through the Co-operative Wholesale Establishment (CWE) under the Guaranteed Price Scheme (GPS) announced by the government.

Just after the independence of the Sri Lanka, more attention was focused to increase rice production in the country; a proper mechanism to sell the paddy was also emerged. After realizing its importance government introduced assured price system to provide more reasonable price for paddy and subsequently Agrarian Service Department initiated the purchasing paddy from the farmers. As there were several shortcomings and weaknesses in this process, in 1971 the Paddy Marketing Board (PMB) was established to purchase paddy from farmers under the assured price system (Annual report of PMB, 2010) and paddy purchasing was started in 1972. The PMB had the monopoly of purchasing paddy from 1971 to 1977 and the board had been able to purchase 25% of the paddy production during this period (PMB, Annual Report, 2010). As PMB acquired paddy purchasing activities from Agrarian Service Department, all the ware houses were also acquired by the PMB. Rice mills owned by PMB as well as private mills were used to mill the stored paddy into rice. Under the coupon system, the required rice stocks

were released to the Department of Food to be issued to the consumers. Following the end of coupon system PMB issued rice to the open market for sale.

In the mid 1980s the government introduced a bonded ware housing system for rice which enabled the registered private rice importers to import rice at the world market price and pay the tariff rate of 35% on cif price. In order to ease the upward pressure on prices, importers were allowed to release the stocks to the market during the lean seasons of domestic production (Gunawardana and Somaratna, 2000). Accordingly, purchase of paddy from farmers under the minimum purchase price scheme declined sharply from 36% of domestic output in 1978 to below 5% by 1989 due to deregulation of and increased private sector participation in the marketing of rice. The role of PMB has been reduced to the "buyer of last resort" supporting the floor prices when the market prices fall below the floor price particularly during the harvesting time (Gunawardana and Quilkey, 1993). In the beginning of 1990s the PMB was closed down and purchasing of paddy and marketing was handed over to CWE by 1996 while PMB existed as inactive institute. Farmer organizations and MPCS through the co-operative shops also helped to purchased paddy from farmers in the beginning. However, paddy purchases through these organizations were insignificant compared to the total production (Weerahewa, 2004) and leads to greater involvement of the private sector in paddy marketing.

In mid 1999, a Cabinet Sub Committee on agricultural marketing was established to review the situation of food supply and international and domestic prices. In addition, in line with the recommendation of the National Development Council, the government reintroduces the minimum purchase price scheme for 10 of the non plantation crops including rice in August 1999 (Gunawardana and Somarathna, 2000) and the implementing agency was the CWE. The minimum prices were fixed on par with the world market prices to safeguard the farmers' interests. However, all operations of the PMB, including purchasing of paddy at the farm gate price, paddy milling and distribution of rice through its retail outlets and cooperative outlets have been eliminated since September 1999. Since then, private sector is allowed to purchase paddy from farmers, paddy milling and distribution of rice on a competitive basis.

According to the pledge made during Presidential election 2005, the PMB was reestablished in 2005 and purchasing of paddy was started since 2008. Currently, PMB owns more than 140 regional outlets in the districts of Polonnaruwa, Anuradhapura, Eastern, Southern, Northern, North Western and Ampara. Due to unavailability of

enough storage capacity as well limitations of the government budget, PMB procure only 2000-2500kg of paddy from an individual farmer under the GPS announced by the government. Moreover, they used certain standards[1] in purchasing of paddy under GPS and only the paddy harvest prepared up to the standards will purchased. As can be seen in the Appendix 2.1, purchased amount under PMB has dramatically declined and during 2007 *Yala* season to 2007/08 *Maha* season paddy purchase was zero. Currently the PMB purchases only an insignificant amount compare to the total national production.

Paddy mills play a major role in the rice marketing system in Sri Lanka by processing paddy in to rice and currently conversion ratio is 0.67 kg of rice from 1kg of paddy. At the beginning, PMB has their own mills and also they send procures to the private millers and then hand over the milled rice to the Department of Food Commissioner. Subsequently, the Food Commissioner's Department distributes rice island-wide through the co-operative shops and private retailers. As the PMB purchases are minimal, the bulk is procured through the private sector and farmers were paid less than the GPS. After purchase from traders or directly from the farmers, millers also provide drying and storage facilities for rice. Price margin of the mills seems to be large in the value chain process due to their high fixed cost as well as adding cost of drying, storage and transportation to wholesalers and around the country. Paddy purchased by the private sector is channeled to the retail sellers and purchases of the government sector channeled to the public rice distribution scheme. Sometimes, private sellers directly sell their purchased paddy to the private mills or private millers directly purchase from the paddy farmers. Millers then sell milled rice to the whole sellers at wholesale price. Then its purchases by the retail sellers and finally they sell it to the consumers (see Marketing channel for paddy and rice in Appendix 2.2).

Farmers face many difficulties when they sell their paddy to government sector. In addition, it is time consuming and farmers do not receive money as soon as they sell it takes time to pay the money to their purchased paddy. Most of the farmers realize it is cost-effective to sell their output to the private sellers because payment is usually on the spot they do not face any transport difficulties as they face when they sell to PMB and they can save their time. In contrast, payment is usually on the spot when paddy sells to the private sector and farmers do not face transport problems as they face in PMB. Moreover, some cases have been reported that farmers cannot hand over their stocks directly to the PMB warehouses without being subjected to exploitation by a third party.

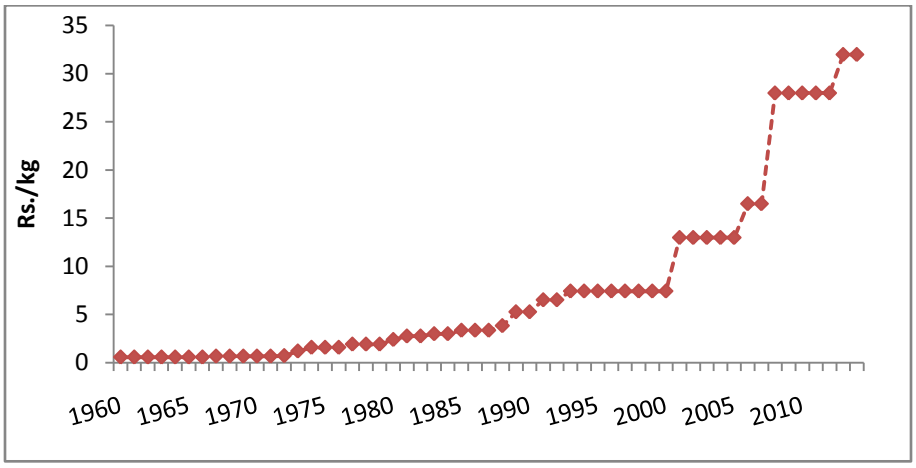
[1] Maximum dampness-14%, dirt 1%, mixture of other varieties 6%, immature seeds:9% and also should be free of discoloured seeds, gravel, sand, free of damages by insects, and fungus.

2.2.4 Guaranteed Price Scheme (GPS)

Government does not usually intervene to sustain producer prices through market operations in the country. However, it announce official paddy prices for indicative purposes and currently PMB intervene to purchase only 2000kg of paddy from each farmer at the announced guaranteed price.

In the beginning PMB procures paddy at the Guaranteed Price Scheme (GPS), a government fixed price that has existed in Sri Lanka since 1948. The main purpose of the GPS was to increase the market prices of paddy and thereby improve the farm incomes (Sirisena, 1986). The criteria followed for determining GPS were mainly based on local rice production rather than other important factors such as cost of production of rice, volume of paddy purchased under GPS and the import price for purchasing the same amount of rice (Henegedara, 2002). Up to 1973, guaranteed price was higher than the cif price of the imported rice and this price structure was reversed in 1974 (Yoshimura *et al*, 1975). The GPS has remained unchanged at Rs. 12 per bushel until 1966 in spite of rising cost of production. Then the GPS price increased up to Rs. 14 per bushel in 1967 and remained same until 1971. Several changes were made since then. During the 1980s, the government procurement price (floor) for rice and subsidiary food crops were increased in order to increase the output of food crops produced. With the decision made by PMB to purchase paddy at competitive prices above the guaranteed price in 1990s, their purchases increased by six folds over the purchases of 5mt in 1989 (Weerahewa, 2004). Guaranteed price of rice increased in 1993 to Rs. 155 per bushel and remained unchanged till 2000. The assured price of Rs. 13 per kilogram which was maintained at the time of reestablishment in 2005 was increased to Rs. 28 per kilogram in 2008 after realizing the price was not adequate according to high cost of production. The guaranteed paddy purchasing prices of the government were increased to Rs. 32 and Rs. 35 per kilogram for *nadu* and *samba* varieties respectively in 2013. The Figure 2.1 shows the changes in assured price of paddy over the years.

Figure 2.1: Changes in Guaranteed Price of Paddy in Sri Lanka, 1960-2014



Source: Paddy Marketing Board, Agricultural Product Marketing Authority

There are some critical issues in PMB and guaranteed price scheme in Sri Lanka. Although the GPS was the main price mechanism for purchase paddy it is not set like a typical floor price. As it is not legalized by the government it is not much effective. Further it is not announced annually, but intermittently, and the timing of changes in its level bears no relation to the planting decisions of farmers. For example from 1980 to 1996, the GPS was changed 10 times, and the timing of the announcement of new levels occurred in seven different calendar months varying from January to November (Ellis *et al*, 1997). Due to their limited capacity as well as budgetary limitations, PMB purchase only a minimal proportion of farmers' produce. In addition most of the farmers are not able to sell their paddy to the government sector and hence they sell their produce to the private collectors immediately after harvesting at prices below the guaranteed price to meet their cash requirements.

2.2.5. Seed Policy

Seed paddy production and distribution was mainly implemented through the Department of Agriculture up to late 1980s (Weeearhewa *et al*, 2006). After that government monopoly on seed paddy production was abolished and private sector was allowed to enter to the seed paddy production. The government declared the National Seed policy (NSP) in 1996 to facilitate farmers to easily get access to the high quality seed and planting materials with the more private sector involvement in local seed production. Under this policy, private sector is expected to produce and market seeds with the technical assistance of the DOA. As a result of that, the current seed supply system

involves many sectors such as public sector including Provisional Agricultural Departments and Mahaweli Authority of Sri Lanka, contract seed farmers and private companies. With the implementation of NSP, DOA gradually phased out its certified seed production while limited up basic and registered seed production. Currently, DOA is responsible for the quality assurance of the seed production programme.

2.2.6 Fertilizer Subsidy Programme

The new high yielding varieties which respond to massive use of fertilizer were introduced to the paddy sector in 1960s in the history of Asia's green revolution. After that, chemical fertilizer became more popular among paddy farmers because these high yielding varieties are highly responsive to the fertilizers. Therefore, with a view to increase the paddy yield by stimulating the fertilizer application among the paddy farmers, the government of Sri Lanka took measures to introduce fertilizer subsidy to the country. This subsidy is targeted largely toward import competing crops, particularly those cultivated by small holders in the country. Periodically a fertilizer subsidy has been a component of government assistance in agriculture. Therefore, it has become customary to provide subsidy continuously to farmers in spite of tremendous pressure on government budget.

According to the subsidy level and type of subsidized fertilizer provided five distinct phases in the fertilizer subsidy could be recognized over the last six decades (Ekanayake, 2006; Semasinghe, 2012).

Phase 1- Subsidy provided for three[2)] main fertilizers (1962-89)

Phase 2-Period of subsidy removal (1990-94)

Phase 3- Re-introduce the subsidy for three main fertilizers (1995-96)

Phase 4- Subsidy provided only for Urea (1997-2005)

Phase 5- Subsidy provided for all three main fertilizers at a fixed price (Rs. 350 per kg bag[3]) from 2005.

Phase 1: Subsidy Provide for Three Main Fertilizers

At the initiation of fertilizer subsidy programme in 1960's the government introduced a fixed fertilizer subsidy rate for different types of fertilizer. Four main types of fertilizers namely, Urea and Sulphate of Ammonia, Muriate of Potash (MOP) and Triple Super Phosphate (TSP) which provide Nitrogen (N) Phosperous (P) and

[2)]Three main fertilizers use in paddy cultivation are Urea, (Triple Super Phosphate)TSP and (Muriate of Potash) MOP

[3)] Price increased up to Rs. 400 per 50kg bag from 2014 budget.

Potassium (K) respectively were given to farmers until 1975 and the subsidy level varied according to the type of crop. However, this system was then replaced by introduction of a uniform subsidy rate for all crops. According to the Kuruppu (1984), different rates of subsidy for the fertilizers used on different crops led to a leakage of fertilizer from one crop to another because of comparative cost advantage. The subsidy rates subjected to revisions over time and in 1979, the rate was increased to 85% and 75% for urea and other fertilizers respectively. Fertilizer prices were declined sharply due to increased subsidy rate provided by the government hence urea consumption enhanced remarkably in 1980. The subsidy rates ranged from 60% to 85% for urea and 40% to 75% for NPK mixtures during 1979-83.

Since 1981, the government has provided an annual allocation of Rs. 1000 million in its budget for fertilizer subsidy (2% of total government expenditure). However, the actual expenditure has declined from Rs. 1200 million in 1981 to Rs. 705 million 1983 due to government intension of progressively reduce their subsidies with the gradual realization of importance of fertilizer for efficient cultivation by farmers. In 1983, from the total fertilizer subsidy 63% was used by the paddy sector (Kuruppu, 1984). An increase in the retail price of fertilizer was observed due to subsequent reduction in the fertilizer subsidies in 1983 and these prices were not reduced until 1988. Although, not announced as a variable subsidy policy, fixed fertilizer prices had been maintained during 1983-87 regardless of the world market price fluctuations (Wicramasinghe, Samarasinha, and Epasinghe, 2009). Government reduced it subsidy rates in 1988, to cut the cost of the subsidy programme due to remarkable increase of global fertilizer prices (prices of 3 fertilizers increased by around 30%). Later in 1990, the government completely removed the fertilizer subsidy for all types of fertilizer.

Phase 2: Removal of Subsidy for all 3 Types of Fertilizer

Fertilizer subsidy was removed completely by the government from January 1990 to October 1994 in line with increasing fertilizer prices in the international market with rising oil prices and depreciation of exchange rate. This results in sharp escalation of farm gate fertilizer prices from the beginning of 1990s, which led to sharp decline of total fertilizer use by farmers. In the wake of increase in fertilizer prices with the removal of subsidy, fertilizer consumption declined but it was not as much as anticipated amount. Upward revision of guaranteed price of paddy was one of the reasons for this trend as described by the policy makers.

Phase 3- Re-introduce the subsidy for three main fertilizers

The fertilizer subsidy was re-introduced in October 1994 under the new government. Under the new system Rs. 500 per acre was granted to farmers as fertilizer subsidy. Subsequently, this scheme was changed and importers were paid a portion of the subsidy with the domestic price of fertilizer was fixed at Rs. 6,100 per metric ton. If cif price was above this, the importers were paid the difference by the government. The government allocated Rs. 1500 million per year as budgetary provision to maintain the fertilizer subsidy.

Phase 4: Subsidy Provided only for Urea

From October 1997, the government decided to limit the fertilizer subsidy only for urea to provide a higher benefit to paddy farmers who were the main users of urea. Accordingly, the price of a 50kg urea bag was set at Rs. 350 during the period of 1997-2002 and retail price of urea unchanged during the period. Prices of other fertilizers were determined according to the price fluctuations in the international market and exchanges rate changes. However, with the pressure from rising international prices, the subsidy scheme was revised by paying fixed sum of subsidy to urea importers (Rs. 6,000 per metric ton). Therefore, retail prices of Urea varied according to world market prices since October 2002 and annual average price of urea increased to Rs. 9,400 per metric ton from Rs. 7,000 per metric ton prevailed in 2001. The retail prices of fertilizer was further increased and reached to Rs. 17,000 per metric ton in 2003. However, in 2004 retail price of Urea was fixed to Rs. 550 per 50 kg bag of fertilizer and this was applied only to Urea.

Phase 5: Subsidy provided for all Three Main Fertilizers at a Fixed Price

In keeping with a pledge made during the Presidential election campaign, the new government came in to power in 2005 took measures to fix the retail price of three main fertilizers at Rs. 350 per 50 kg bag since 2005 *Maha* season. In the meantime, fertilizer subsidy as a percentage of market price exceeds 90% in all three major fertilizers allowing the farmer to bear only about 10% of its actual costs, while cost share of fertilizer for paddy farmers is less than 5% from the total production cost. According to the fertilizer recommendations from the Department of Agriculture, all farmers including tenant farmers who cultivate less than 5 acres of paddy land are eligible for the subsidy and amount of fertilizer issued based on different agro climatic zones and amount of paddy

land. However, the new coalition government came to power in 2015 suggested in revising the price subsidy to a cash transfer system since 2016.

Administration Process and Issues of the Fertilizer Subsidy Programme

Sri Lanka does not produce inorganic fertilizer despite having its own large rock phosphate deposit in Eppawala, Anuradhapura. Therefore, the country is completely depending on the imported fertilizer for cultivation. In addition, importation and distribution of fertilizer for paddy is handled by two state owned companies namely the Ceylon fertilizer Company and the Colombo Commercial Company. The Agrarian Service Centres (ASCs) play a major role in distribution of fertilizer to farmers with the assistance of Agricultural Production and Research Assistants (ARPA) and Divisional Officers (DO). Prior to begin the each season, farmers are responsible for submit their requests and money to the relevant ASCs. The DO is responsible for bringing the fertilizer and distributing among the farmers according to the requirement and recommendation level. However, it is reported that relevant ASCs do not receive their requirements at the beginning of season due to limited capacity of the fertilizer stores. Therefore, farmers could not obtain their requirements at the beginning of the season. In addition, some farmers have difficulties in paying money to purchase fertilizer, because they face financial problems when they unable to sell their produce in time due to difficulties in obtaining reasonable price for paddy in the market.

Farmers in the major irrigated areas are given 106 kg of Urea, 35 kg TSP and 30 kg MOP per acre of paddy land according to the recommendations of DOA. According to the government subsidy policy, subsidy is restricted to the small scale farmers who cultivate up to 5 acres of land. However, researchers noted that the there are some misallocations in the current subsidy as total amount of fertilizer issued is much higher than the total area of 5 acres of paddy lands in the country (Wijetunga, 2013). Due to shortage or lack of storage facilities at the ASCs, officers face difficulties in fulfilling their duties regarding timely distribution of fertilizer. Most of the stores do not have store keepers. Due to high demand at the beginning of the season, handling of fertilizer distribution is complicated and difficult. It is also noted that most of the farmers pay additional money to the ASCs as transport cost of fertilizer from private company to the ASC centres[4]. In addition, there are several other shortcomings regarding the current fertilizer subsidy program. As example, subsidy is given out without any targeting mechanism and a large proportion of the benefits are captured by relatively wealthy farmers (Tibbotuwawa, 2010). This study further

[4)] However as per the circular issued by the Ministry of Agrarian Services ASCs are not allowed to charge any cost higher than Rs. 350 per 50 kilograms of fertilizer bag.

noticed a large proportion of farmers do not receive the fertilizer at the subsidized price and a substantial amount is sold on the black market as a result of the weaknesses in targeting, combined with rent seeking at various stages in the distribution chain. On the other hand, existence of two methods of subsidies as SLRs 350/50 kg for paddy and SLRs. 1200/50kg for other crops resulted in paddy farmers selling fertilizer at a higher price which leads to lower utilization of fertilizer in paddy sector than purchased amount under the subsidy price (Central Bank, 2014).

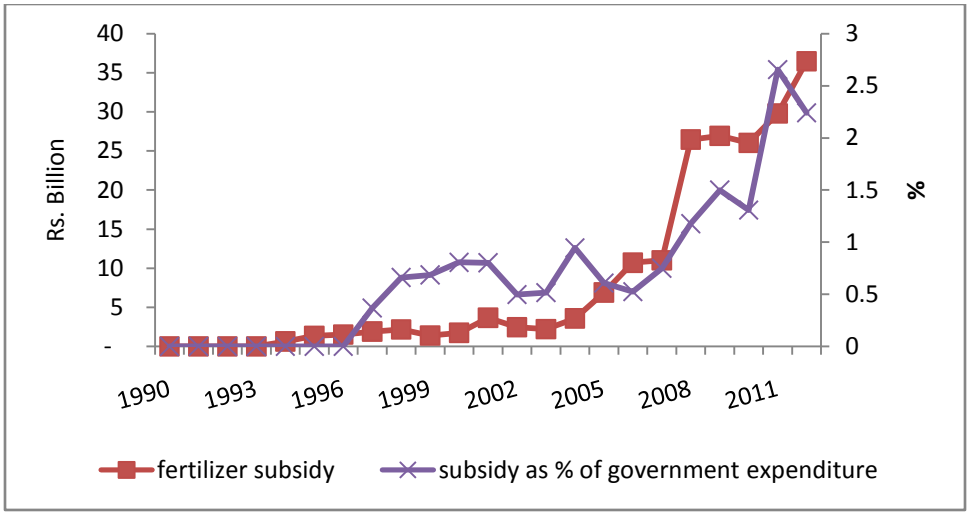
The quality of fertilizer imports are also subjected to many criticisms in the recent years while recent research findings reveal that low quality of chemical fertilizer is the reason behind the increasing number of kidney diseases in areas where paddy is cultivated. (Jayasumana *et al.*, 2014). In addition, Chandrajith *et al.* (2010) has reported trace element content in different fertilizers applied to paddy soils in different areas in North Central Province in Sri Lanka where majority of paddy farmers live. The data reveals that considerable amount of cadmium and lead accumulates in agricultural soil due to application of fertilizer in the long run. World Bank (2015) also reported that the intensive use of chief fertilizers lead to environmental and potential human health hazards, thus it negatively affect those in the bottom 40% engage in agriculture across multiple dimensions. Further this report reveals that subsidies distorted market decisions by encouraging cultivation of certain crops especially paddy, hindering the movement to value added crops.

Budgetary Burden due to Fertilizer Subsidy

Most of the country's requirement of inorganic fertilizer is imported primarily from China and United Arab Emirate. Even amidst the massive increases in the international market and subsidy cost making immense pressure on the government recurrent expenses, fertilizer subsidy is continuing since 1962 (except in 1989-1994 period) though it was revised time to time (Semasinghe, 2012). According to the annual reports of National Fertilizer Secretariat, the annual budget for fertilizer subsidy increased from Rs. 870 million in 1979 to Rs. 1500 million in 1997. The actual expenditure was higher than the annual allocation from 1997 to 1981, indicating an excess demand for the subsidy. In 2008, the money allocated to the subsidy programme was exhausted within five months as the world market price of fertilizer rose significantly and the government had to make available another Rs. 30 billion through a supplementary budget (Weerahewa *et al*, 2010). Despite huge burden on the government budget, fertilizer subsidy cost increased 400% from Rs. 6.9 billion in 2005 to Rs. 36.4 billion in 2012 (National Fertilizer Secretariat, various years). The subsidy accounts 4.4% of agriculture GDP and 2.2% of the total government expenditure in

2012 (Central Bank of Sri Lanka, 2013). Figure 2.2 illustrates the fertilizer subsidy in nominal and real terms as a percentage of total government expenditure during 1990-2014 periods.

Figure 2.2: Government Expenditure on Fertilizer Subsidy; 1990-2014



Source: Central Bank of Sri Lanka

As illustrated in the above figure, the outlay for the subsidy has been rising due to rising fertilizer prices in the world market. At the end of 2005, the spending on fertilizers recorded a 73.4% jump from the previous year (Central Bank of Sri Lanka 2007). In the 2015 fiscal budget, the government allocated Rs. 35 billion for the fertilizer subsidy (Budget Estimates, 2015). In the meantime, subsidy could leads to less resource allocation for other public goods such as health, education and research activities.

2.2.7 Irrigation Development

Irrigation is a vital input in rice cultivation in Sri Lanka specially in the dry zone paddy farming due to scarcity of rain water. Therefore, the development of irrigation sector has been critical for the agricultural sector development in the country and this process has attributed with major settlement projects mainly in the dry zone (Kikuchi, 2000). Dynamic interaction between the irrigation infrastructure and seed-fertilizer technology have stimulated the rapid development of irrigation in the dry zone which cause to dramatic increase in rice production in

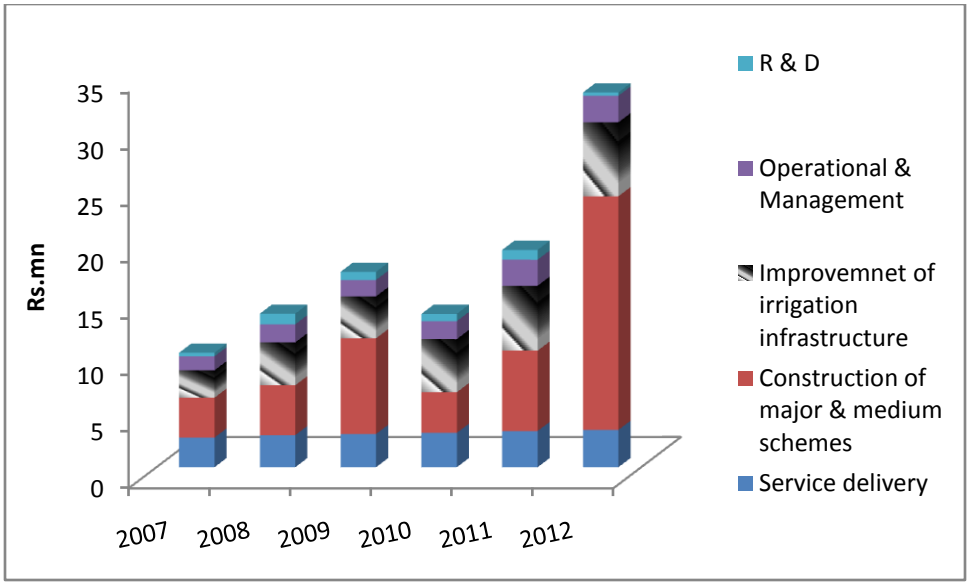
Sri Lanka during 1950-1990. Using the rice fertilizer response function, Kikuchi (2000) estimated the 32% of rice production increased between 1952 and 1985 was due to irrigation development in the country.

Meanwhile, irrigation development in the country has attained mainly through the public investments. In the early 1950s, total irrigation investments (construction, rehabilitation and Operational and management (O & M)) accounted 40% of the total public investments (Kikuchi, 2000) while huge investments appeared during 1975-1990 periods, with the onset of rapid Mahaweli Development Programme. However, the share of total irrigation investments declined towards mid 1970s while reinstate around 1980s to the 20% of total public investments. During 1989-93 there were reductions in investment on new irrigation. The share of O& M also has become insignificant over the years.

Despite major construction of new irrigation systems, recent irrigation development has shifted to the improvement of existing systems. The total irrigated land area is about 745 thousand hectares in Sri Lanka of which 311 thousand hectares is fed by the minor irrigation schemes while remainder is fed by major and medium scale reservoirs. The major tanks in the country are administered by the Department of Irrigation and the minor irrigation schemes are under the responsible of Department of Agrarian Development. There are 336 major irrigation schemes under the Department of Irrigation, 98 major and medium scale provisional irrigation schemes and 29,369 of minor irrigation schemes. During 2007-2012, the total investment in irrigation sector amounted to Rs. 117 billion of which 96 billion has been on capital expenditure (Annual Report 2012, Department of National Budget). Figure 2.3 shows the irrigation sector investment in Sri Lanka during 2007-12 periods.

Irrigation water is provided to the paddy farmers at free of charge except for a marginal levy that has been imposed for the operation and maintenance of the irrigation systems and the acreage tax in minor irrigation schemes. Although it is difficult to estimate the irrigation costs alone, the effective irrigation subsidy has been estimated in some studies (Aluvihare and Kikuchi, 1991). Since most of the irrigation systems were developed many years ago, they need great repair to store adequate amount of rain water. However, most of the irrigation canals have not been managed properly for a long period of time.

Figure 2.3: Irrigation Sector Investments in Sri Lanka; 2007-2012



Source: Department of National Budget

2.2.8 Agriculture Extension, Research and Development

Agricultural research plays an important part in generating new technology. The main institute contribute generating technology and dissemination knowledge in Sri Lanka's food sector is the Department of Agriculture (DOA) and research activities have been restructured several times (Pain, 1986). As of 1994 there were three crop research institutions (with include regional stations), the Rice Research and Development Institute, Horticultural Research and Development Institute and Dry Zone Crops Research and Development Institute. In early 1970s research expenditure as a percentage of total government expenditures was only 0.52. It has continuously declined both in terms of total real expenditure and expenditures per scientists and by 1993 it was only 0.26 as a percentage of total government expenditure (Annual Report 2012, Department of National Budget). Conversely, only 0.02% of public expenditure is spending on agriculture research and development in the recent time (Annual Report 2012, Department of National Budget). There is little participation from the private sector and universities in research activities.

In addition, extension and training service in the country is also weakly planned. The government provides the technical services to paddy farmers through farmer visits and through the ASC. Some private sector institutions

and banks also provide different services to farmers through their officers. The lack of well trained and committed extension services is one of the factors that caused not developing a highly productive agriculture. Schickele (1971) pointed out that in the settlement schemes there was no one to demonstrate the new techniques, to guide farmers in the adoption of innovations or to help them in organizing multi-purpose cooperatives and cultivation committees. Under the devolved system of administering the agriculture sector activities, the central government is responsible for carrying out all agriculture research in the country while Provincial Councils are responsible for operating agriculture extension activities in most parts of the country (Wijetunga and Abeysekera, 2010). In addition to the DOA, provincial administration is also providing funds independently to carry out extension functions in the provinces. The devolution of extension responsibilities to provincial government has exacerbated an already weak link between extension and the research service.

2.2.9 Trade and Tariff Policy

Although Sri Lanka was the first South Asian country liberalized her economy in 1977, the trade openness was started in 1988. It included devaluation of exchange rate, removal of import licencing system, elimination of state monopolies in importing food commodities and use of import tariff system. However, the extent of intervention is still continuing.

Currently, the process of determination and implementation of import tariff in agricultural commodities is handled by the Department of Trade and Tariff, functioning under the Ministry of Finance and Planning. Specific issues and decision on import tariffs are handled by a "Trade and Tariff Cluster" comprising of representatives of the public and private sector representatives. This committee gathers at regular intervals to review the status and to provide feedback and recommendations to the Ministry. However, the final decision is taken by the Minister of Finance and Planning and published in the government gazette with a view to communicate the agreed decision to the general public.

Before 1990, rice and other major food commodities were imported by the Food Department based on the decisions made by the Ministry of Agriculture and the imported rice was distributed through CWE, MPCS and private wholesalers (Weerahewa, 2006). With the introduction of "bondsmen" scheme in August 1990, private traders were allowed to import and maintain buffer stocks subjected to the payment of import duties, when stocks

were released to the local market. As a result, imports of rice generally increased. By 1995, the government decided to further liberalize the agricultural trade and applied the 35% tariff on rice. Then, it was further reduced to 20% and time to time waivers were granted at different rates to reduce the pressure on increasing rice prices in domestic markets as a result of production shortage. Trade was further liberalized by removing import licence imposed on rice in July 2000. In addition, the official import duty rate imposed on rice was changed from time to time with the variations in domestic production and under the internal political pressure (Henegedara, 2002). For instance, during 1996-2002, the tariff levied on rice was modified at least ten times[5]. Though there has been a degree of flexibility in regard to tariff rates, no rational policy has been adopted in this regard (Rupasena, 2000).

Moreover, Sri Lanka signed the Uruguay Round WTO agreement in 1994 to open of its trade by committing to "bound" tariffs on agricultural products and as result, Sri Lanka has bound all tariffs on import (agricultural products including cereals, sugar, maize, spices, fruit, milk powder) at a uniform rate of 50 % (World Trade Organization, 1995). Since Sri Lanka, had not previously bound its agricultural tariffs under the GATT, there is no obligation to reduce tariff from bound level of 50%.

The *ad valorem* tariffs levied on certain food items were replaced by specific duties in 2002. In line with these modifications, 35% import duty on rice was changed to a specific duty of Rs, 7 per kg with effect from January 2002 and further reduced to Rs, 5 per kg with effect from November 2002. According to the authorities, "the conversion from *ad valorem* to specific duties would provide domestic farmers with adequate protection, minimizing price risk due to seasonal fluctuation of commodity prices".[6] Even though specific duties may use to stabilize producer prices, it hinders predictability and is equivalent to an increase in *ad valorem* duties when prices fall (Trade Policy Review in Sri Lanka, 2004).

(Import tariff and trade policy in Sri Lanka is described in detail in Chapter 6).

2.3 Political Economy of Food Crop Sector Distortions

All the successive governments since independence intervened in to agriculture sector in many different ways. Among them (i) protection for rice and other subsidiary food crops (2) taxation of plantation crops (3) food

[5] Epaarachchi et al. (2002).
[6] Central Bank of Sri Lanka (2002a).

subsidies to consumers (4) input subsidies in the form of free irrigation, fertilizer etc. are significantly important. Up to now the country is ruled and governed by only two main parties; namely United Nations Party (UNP) and Sri Lanka Freedom Party (SLFP) led coalitions. Since its inception, the UNP is considered as right-wing party, adopted basically a liberalization ideology in combination with element of social democracy. Moreover, the UNP government is regarded as the market oriented and pro-free trade party which is more oriented to the Western society. In contrast, the SLFP is followed more socialist oriental model and considered basically as the left wing government and work closely with the socialist countries like Soviet Union, and China.

2.3.1 1948-1956 period

Economy evolved under the British colonial rule was predominantly oriented towards agriculture and plantation crops of tea, rubber and coconut (called tree crops) were the major contributors to the national economy (30% of the GDP). The country earned 90% of export earnings from plantation crops in 1951-55 while tree crop taxation accounted for an average 28% of total government revenue during the same period. Meantime, the government expenditures on food subsidies were Rs. 48 million which covered mainly from tree crop tax. Among the domestic agricultural crops, rice drew the main attention while industrial sector played insignificant role before the independence. After that, the country's economy becomes diversified and service sector become prominent followed the industrial sector. Such transformations in the economy of Sri Lanka attributed mainly due to varying economic policies implemented under different political parties that governed the country.

The UNP government assumed power in 1948 with Mr. D. S. Senanayake became the first Prime-minister of the independence country. The country adopted the open non-interventionist free market policies at the beginning (Bandara and Jayasuriya, 2009). Although the UNP government continued the classical export economic policies, there was a bias towards domestic food production agriculture and objective of rice self sufficiency remains high in political agenda (Athukorala and Kelegama, 1998). The UN party represented largely the interests of the rich and commercial groups. At that time Sri Lanka imported more than 60% of their domestic requirement from outside of the country and much of the revenue derived through the taxation of foreign trade was used for the importation of food commodities. Quantitative restrictions on imports and foreign exchange transactions were more or less absent hence Sri Lanka enjoying a high level of consumption with the free flows of imports. However, The UNP government continued the universal rice rationing scheme which was initiated in 1942 as a war time necessity to

ensure that limited supply were distributed equitably to consumers because of the burden on food imports due to war. Under this programme 3 pounds of rice per week per person was provided during 1948-1952 period at the subsidized[7] price to the whole population (Edirisinghe, 1987). The government was pressed to reduce this subsidy due to largely increased food subsidies from Rs. 132 million in 1952 to Rs. 247 million in 1953. This resulted that the Prime minister was forced to resign due to political protest by the people which showed the political sensitivity of the subsidy programme in the country. Hence, the new government came to power in 1954 took measures to increase the subsidy to four pounds of rice per week per person. In addition, rice producers received low protection[8] until UNP government was defeated in the 1956 election.

2.3.2 Closed Economy during 1956-1977

After winning the 1956 election, Mr. S.W.R.D. Bandaranayake became the Prime Minister of Sri Lanka. He led the SLFP a centre-left based coalition which adopted Soviet type of central planning system. Since this party embraced both socialist ideology and nationalism, it influenced the economic and social development of the country. During that time state played the major role in decision making of the economy and the government extended the agricultural import substitution policy to industrial sector also. State took the role as a producer in the economy and government imposed measures to restrict the imports in terms of tariffs and quantitative restrictions on imports and controls over foreign exchange payments. Meanwhile, the government established large number of state owned enterprises in industry for production of wide range of goods such as paper, fertilizers, steel and hardware. Rice protection increased to 105% and it further reached to 144% in 1958, Meantime, food subsidy expenditures also accelerated. In 1960, Mrs. Sirimavo Bandaranayake came to power[9] after the assassination of his husband Mr. S.W.R.D Bandarnayake and she also continued Mr. Bandaranayake's policies of nationalizing main sectors until defeated from the election in 1965. During her period, import tariffs increased where as food subsidy expenditure accounted for 19.4% of the government revenue in 1964. Moreover, fertilizer subsidy for paddy was also introduced during this period. Under the food subsidy policy, 4 pound of rice ration was granted per person per week until 1966. Meantime, rate of growth during 1956-60 was negative and it was -0.5%.

[7] Ration price was 12.5 cents per pound in 1952 (Edirisinghe, Table 1)
[8] NRP of rice was 46% during 1953-55 period and was increased to 105% in 1956-60 period. (See Table 6-6 of (page 214) Bhalla, 1991)
[9] Mr. Wijayananda Dahanayake from UPFA and Mr. Dudley Senanyake from UNP governed the country in between the assassination of Mr. S.W.R.D. Bandaranayake and then Mrs. Sirimavo Bandaranayake came to power.

With the assumption of power by UNP led coalition under the Prime Minister Mr. Dudley Senanayake during the 1965-1970 periods, it partially deviated from the previous regime policies. Although continuing import substitution policy, the government attempted to partially liberalize in the fields of import trade and foreign exchange payments. In addition, the government took measures to restrict the state intervention in economic activities and resurgence of the policy emphasis on import substitution agriculture. The exchanged rate devaluated from 4.78 rupees in 1966 to 5.93 rupees in 1968. Moreover, rate of growth increased to the 4.6% in 1966-70 periods while rice production increased continuously. Meanwhile, due to worldwide rice shortage and balance of payment problems the government took measures to reduce the rice ration for each consumer from 4 pounds to 2 pounds, while also reducing the ration price. However, the government introduced the free rice ration of 2 pounds per person per week. With the cut in the rice subsidy, the UNP government was capable of improving the rice cultivation up to two thirds of the country's requirement. However, the UNP government defeated from the next election mainly as result of cut in the rice subsidy. Therefore, rice subsidy was the key concern in general election in 1970.

Wining the general election in 1970, a coalition of SLFP government and left-wing parties (United Front) formed a new government under the power of Mrs. Sirimavo Bandaranayake and this regime again reversed the liberal economic policies initiated by previous UNP government. Besides that the rice subsidy was reintroduced (2 free ration and 2 subsidized price ration) which was cut by the previous regime. However, in 1973 the free ration was cut from 2 pounds to 1 pound. The state again took the main role as a producer and import substitute policies were implemented. The country was pushed more towards the socialist society and expanded their relationships with China and Soviet Union. Meanwhile, the five year plan (1972-76) was introduced by the government to guide the development policy of the economy. The government took measures to increase the level of tariffs and quantitative restrictions for imports, introduce licensing systems and monopoly power by the government. However, tree crop revenues decreased to 78% of total export revenue during 1971-77 (Bhalla, 1991). In addition, the Land Reforms Law of 1972, nationalization of plantations and state control of trade and industry sector were the some measures initiated during this regime. However, the government became unpopular and in the 1977 election the UF lost the power. The per capita Gross Domestic Product (GDP) grow at very small rate of 0.2% per year during the 1951-1976 period due to closed economic policies adopted in the country. Between 1970-77 period, paddy production was slowed at 0.5% and Sri Lanka imported 30% of domestic consumption of rice (Shilpi,1995).

2.3.3 Open Economy in 1977-2004

The 1977 election resulted in landslide victory for the UNP while Mr. J. R. Jayawardena was appointed as Prime Minister by the election. In 1982 he became the first executive president in the country by amending the constitution. During this period, the country's economy did away with protectionist policies of the preceding regimes and successfully shifted towards free market economy hence introduced the trade liberalization policies in 1980s. Meanwhile, private investments were promoted and the private sector was considered as engine of economic growth in the country. Moreover, import controls and quantitative restrictions were abolished and reduced the import tariffs. The implicit import tariff rate for the 1978-85 declined to 48% and during 1984-86 the rate ranged between 17-29% (Bhalla, 1991). In addition, the UNP government took several measures to expand the export industries and export licensing was gradually phased out. The government accelerated the Mahaweli irrigation project which initiated in the late 1960s to provide free irrigation water to the farmers and supply electricity to the country. The irrigation subsidy was increased to Rs. 7.2 billion in 1982. The major irrigation works resulted in the area of land cultivated increased from 514,000 acres in 1977 to 771,000 acres in 1984 (Bhalla, 1991). This caused to increase rice output and declining real price of rice to consumers and producers. Due to accelerated growth of paddy production during 1978-85 periods, rice imports reduced to less than 10% of domestic production (Shilpi, 1995). Meantime, in 1980, UNP government decided to replace the Universal rice rationing with food stamp progrmme. Under this programme, only households with five members or more earning less than Rs. 300 per month would be eligible to receive food stamp which could be used to buy foods at unsubsidized market price. The value of food stamp was Rs. 18 per capita per month (Edirisinghe, 1987). This programme was aimed to reduce the fiscal burden while targeting subsidy to the poor. Again, in 1987 food stamp programme was adjusted and all members of a household receive stamps if the family income is below Rs. 300 per month. But only two members received stamps if the income is range between Rs. 600-700 per month.

The GDP growth rate was increased to 4.8% while tree crop revenue only accounted 55% of the total export revenue during 1978-85 periods. Free Trade Zones were established to absorb surplus rural labor and produce export goods for export market. In addition, the rural credit programme expanded with the introduction of the New Comprehensive Rural Credit Scheme and several other medium and long-term credit schemes aimed at small farmers. The government spent Rs. 782 million rupees for fertilizer subsidy in 1980, but reduced to Rs. 369

million in 1986 (Bhalla, 1991). However, the Floor Price Scheme and the fertilizer subsidy scheme were withdrawn under the UNP government, President Mr. R. Premadasa in 1990 in line with increasing fertilizer prices in the international market due to rising oil prices and depreciation of exchange rate. But he also continued trade liberalization policies. The PMB had monopoly over domestic paddy procument was removed which caused to reduce the previously procured 30% of domestic rice production to below 2% in 1990 (Shilpi, 1995). The significance of the agriculture sector decreased continuously over the years and the earnings from three major export crops has fallen to 16% in 1999.

Farmers perceived that chemical fertilizer is the easier and more effective way of increasing rice yield compared to the organic fertilizer which has many limitations in producing and using adequately. Therefore, granting subsidy on fertilizer create enormous interest among the farmers to engage in rice farming. On the other hand it is a good trump for political parties to remain in power. Any suggestions to remove or cut the subsidy policy confront widespread anger among the farmers and it is strong enough to overturn the power. Because of that the UNP government that was able to rule the country for 17 years lost its power in 1994 election just after they completely remove subsidy. Consequently in 1994 parliamentary and presidential election, Mrs. Chandrika Bandaranayake Kumarathunga was elected as the president as part of SLFP led People's Alliance coalition. Although the ideology of this political party was traditionally considered as left-wing, her government marked the changes in traditional socialism policy of SLFP and followed combination of both free market policies and people's friendly policies. Their main campaign slogan was "an open economy with a human face". The fertilizer subsidy which was removed under the previous UNP government was reintroduced in 1994 as an election pledge and price level for a 50 kg bag for urea was set at SLRs. 350 in 1994, and again increased to SLRs. 600 in 1996. In 1997, the government decided to restrict the subsidy only to urea fertilizer and it was continued until 2005 under different fixed price levels[10]. Presidential election was called in 1999 resulted in Mrs. Bandaranayake was sworn in for another term. However, the government was less stable as it comprised of several political parties with diverse political ideologies. Therefore, the SLFP led coalition was defeated from the parliamentary election in 2001 while UNP came to the power and ruled until 2004.

[10] The 50kg of urea bag was increased to SLRs. 800 in 2003 and reduced again to SLRs. 600 in 2004 (Weerahewa *et al.*, 2010).

2.3.4 Economy during 2004-2015

The general elections in 2004 brought about a change of the government and a shift in economic policies. The UNP that had a majority in Parliament[11] lost to the United Peoples Freedom Alliance (UPFA), an SLFP-led coalition that included the Janatha Vimukthi Peramuna (JVP) and the Jathika Hela Urumaya (JHU). This change of government was interpreted as a rejection of 'neoliberal economic policies' and the adoption of 'home grown' nationalistic policies (Sandarathna, 2012). SLFP leader Mr. Mahinda Rajapaksha was assumed power as a president from the presidential election that was held in 2005. Under the Presidency of Mr. Rajapaksha the UPFA government shifted back to the left oriented social democratic programme and retained the liberal economic framework. Further, he introduced ten year horizontal plan called 'Mahinda Chinthana' policy document (2006-2016) which become the government manifesto. It supported a policy of import substitution in food and gave greater emphasis on domestic agriculture and infrastructure development in the country. The government has concentrated on production of foods of rice, grains and other agricultural crops for domestic consumption in order to increase the food self sufficiency. Trade policies turned towards import substitution and tariffs on many imported items were increased. This government halted the privatization process and re-nationalizes most of the previously privatized companies. Meanwhile, the government tended more towards the greater state control of the economy. As to fulfill the pledge made during the election campaign, the fertilizer subsidy was granted again to the three main fertilizers (urea, TSP and MOP) at fixed selling price of SLRs. 350 per 50kg bag, for paddy farmers and was extended to several other plantation crops in 2007. This was finally covered all other crops in 2011 to subsidize price of Rs. 1,200 per 50kg bag of fertilizer. With the huge amount of fertilizer subsidies granted and powerful leadership given to defeat the long term existed civil war, President Rajapaksha was able to maintain his position despite continuous deteriorate of the government popularity over the years. In addition, increased foreign borrowing obtained to finance the infrastructure projects, left the country in a huge budgetary burden. Moreover, on the supply side, economic liberalization has been reversed and trade protectionism has increased. In addition, policies have become more complex, inward looking and high levels of protection to importables in Sri Lankan agriculture lowers investments in producing exportables since 2004 (World Bank, 2013). Sri Lanka's import regime during 2009-11 was cited as

[11] In parliamentary election in 2001, UNP led by Mr. Ranil Wicramasinghe won the majority seats and formed the government, but Mr. Kumarathunga remained the President of the country which led to confusion situation. However, the term of the government was ended early in 2004 when the President dismissed his government and called for a general election in 2004.

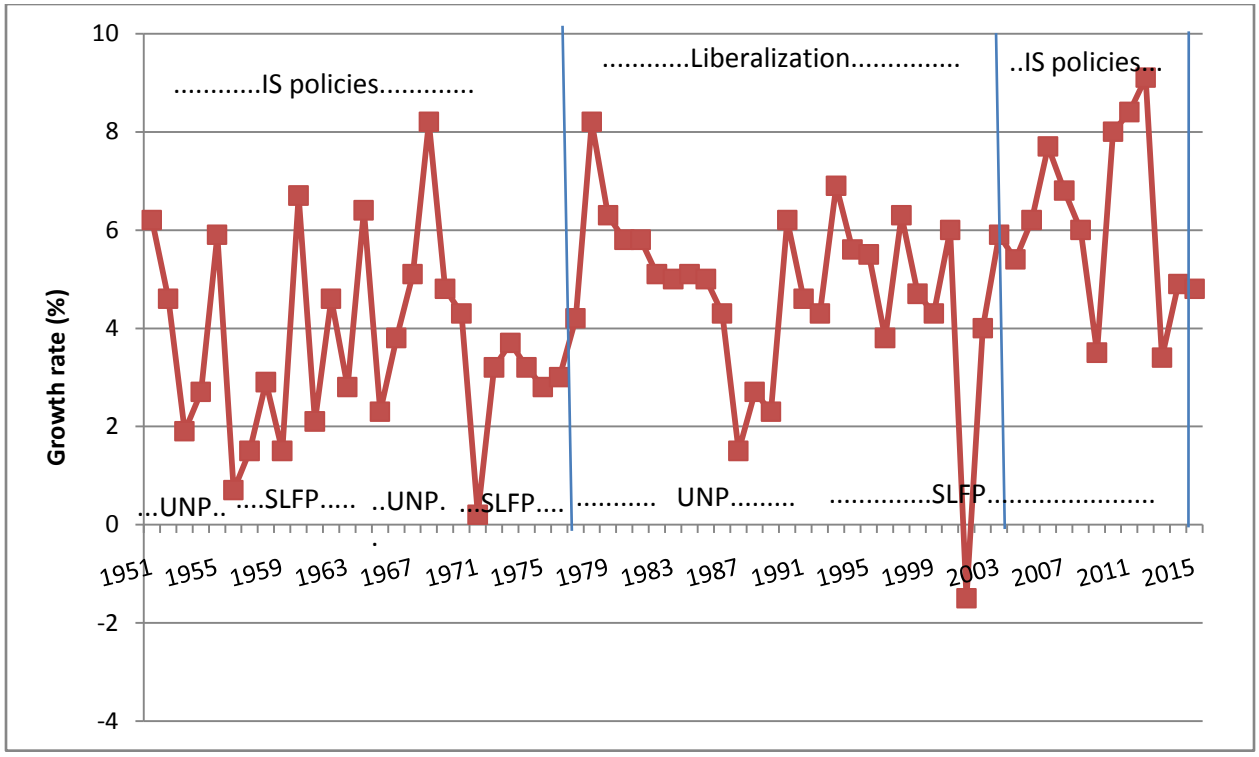
one of the most complex and protectonist in the world (Pursell and Ahsan 2011). The government intervened much more to expand the public sector resulted in inefficiencies in many sectors. Further, export competitiveness and overall level of productivity declined. Moreover, the government turned away from Western countries as well as India and moved more towards China. In addition, the government becomes more unpopular among the general public due to huge corruptions and frauds occurred during this period.

2.3.5 Current Economic Policies Since 2015

The opposition coalition's common candidate Mr. M. Sirisena won the Presidential election 2015 and later he voluntarily transferred the presidential powers to the parliament[12]. In the absence of an overall parliamentary majority for any one party, Sri Lanka's two main political parties - the United National Party (UNP) and the Sri Lanka Freedom Party (SLFP) joined to form a national unity government for at least the first two years of a five-year term. However, this government can consider as a loose coalition government because two parties have two types of policies while UNP is more towards Western the SLFP is more towards left wing party. The government policy document presented in November 2015, focused promoting a global competitive, export led economy. Economic policy set to shift away from public investment and introduced more on privatization and renewed of it tax, tariff and foreign investment regimes. In addition, the government suggested some modifications to the long term continued fertilizer subsidy policy. Accordingly, the government proposed to convert the subsidy to a cash allowance. In contrast to the previous government, the new government was able to expand their relation with Western countries as well as India and China.

[12] The parliament approved the 19th amendment which gives power of parliament to the Prime minister and UNP leader Mr. R. Wicramasinghe appointed as Prime minister of this government. From the parliamentary election Wicramasinghe's coalition alliance United National Front for Good Governance won but could not obtain the majority to form a government.

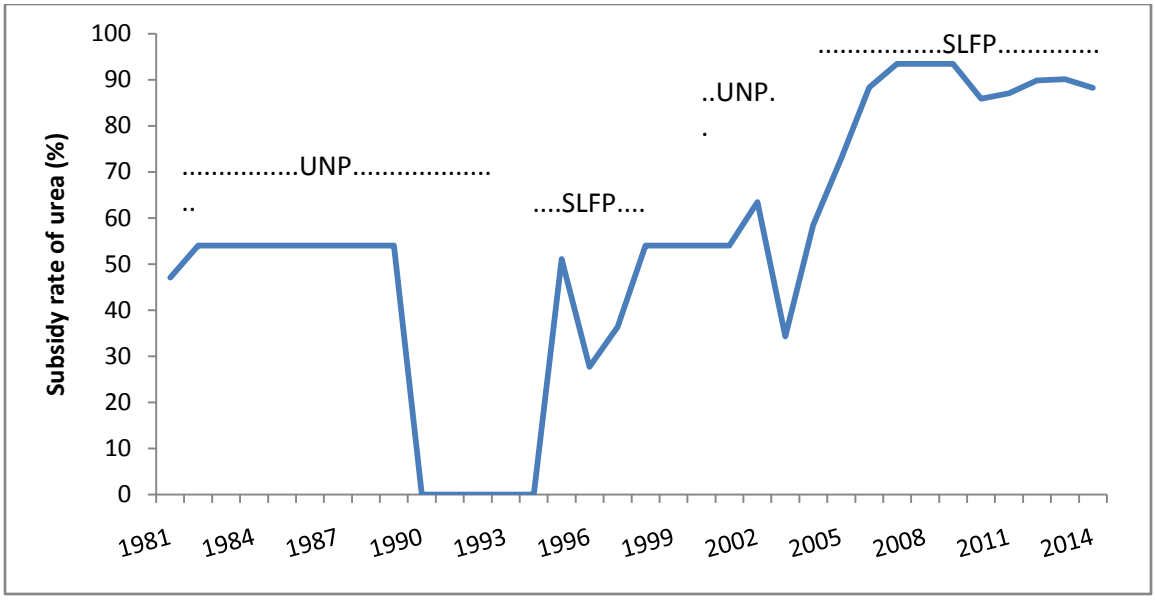
Figure 2.4: GDP Growth Rate in Sri Lanka under Different Governments: 1951-2015



Source: Department of Census and Statistics and Central Bank of Sri Lanka

As seen in Figure 2.4, GDP growth rate is small before the trade liberalization and especially in 1971 the growth rate is considerably small. After the trade liberalization, GDP growth rate increased immediately at a higher rate in 1978 and growth rate was higher than 4% on an average during 1990-2000 periods. However, it recorded negative growth rate in 2001 which was recovered rapidly in 2002. The highest GDP growth rates were recorded during 2010-2012 period just after the civil war ended in 2009 under the SLFP government. As shown in Appendix 2.3 the value of rupee which was more stable before the trade liberalization, immediately weaken with the trade liberalization in 1980s. Although the per capita GDP declined just after the liberalization it has been continually increasing since then. Moreover, when the UNP government governs the country they adopted privatization policies all the time and expand the trade liberalization while reducing subsidies. As evident from Figure 2.5, it is understandable that the fertilizer subsidy rates were low under the UNP governments and they cut the subsidy in 1990-94 periods. In contrast, subsidy rate increased notably under the SLFP governments. Moreover, they focus more on nationalization and tighten the trade barriers.

Figure 2.5: Changes of Fertilizer Subsidy Rate under Different Governments, 1980-2014



Source: Department of Census and Statistics and Central Bank of Sri Lanka

2.4 Conclusions and Policy Implications

This chapter presents the food crop sector policies in the country with emphasize on rice policies since independence. The consecutive governments followed several agricultural policies such as food subsidies, settlement schemes, free irrigation, fertilizer subsidy, guaranteed price and marketing policies, import trade and tariff policy etc. mainly to protect the producers (Appendix 2.4).

Further this chapter suggests that, political economy in the country has been continued to play an important role in changing food crop sector incentives in Sri Lanka. Alternatively, only two major parties called right-wing UNP and left-wing SLFP have been ruling the country. The country implemented mostly closed economic policies since independence until 1980s. However, there has been a dramatic change in agricultural policies in the country since 1980s. The UNP government is more oriented to the pro-west and SLFP government follows more social oriented policies. It seems that country's agricultural policy is highly distorted under the protectionist policies applied by SLFP governments because they committed to sociologist ideology and designs their economic policies more to enhance the producer welfare. In contrast under the UNP governments' agriculture sector is less distorted because of their open economic policies. However, agricultural productivity in the country is remained low for a

long period of time due to unbearable amount of subsidies delivered to the producers. Efforts of changing this welfare policy and protection at various times have caused huge protest from the general public as well as opposition parties that finally created political instability in the country. In addition, removal or reduction of subsidies resulted in overturning the government. As example the subsidy cut in 1990-94 resulted in UNP government lost its power from the next election. However, it is important to remove the price and trade distortions since it help farmers to allocate their resources from low value crops to high value commercial crops as well as increase the welfare of the public.

In addition, lack of long term national agricultural policy, weaknesses in monitoring and implementation of policies, political interference, lack of transparence on public expenditure incurred, misallocation of funds and corruptions leads to poor performance in the food crop sector development.

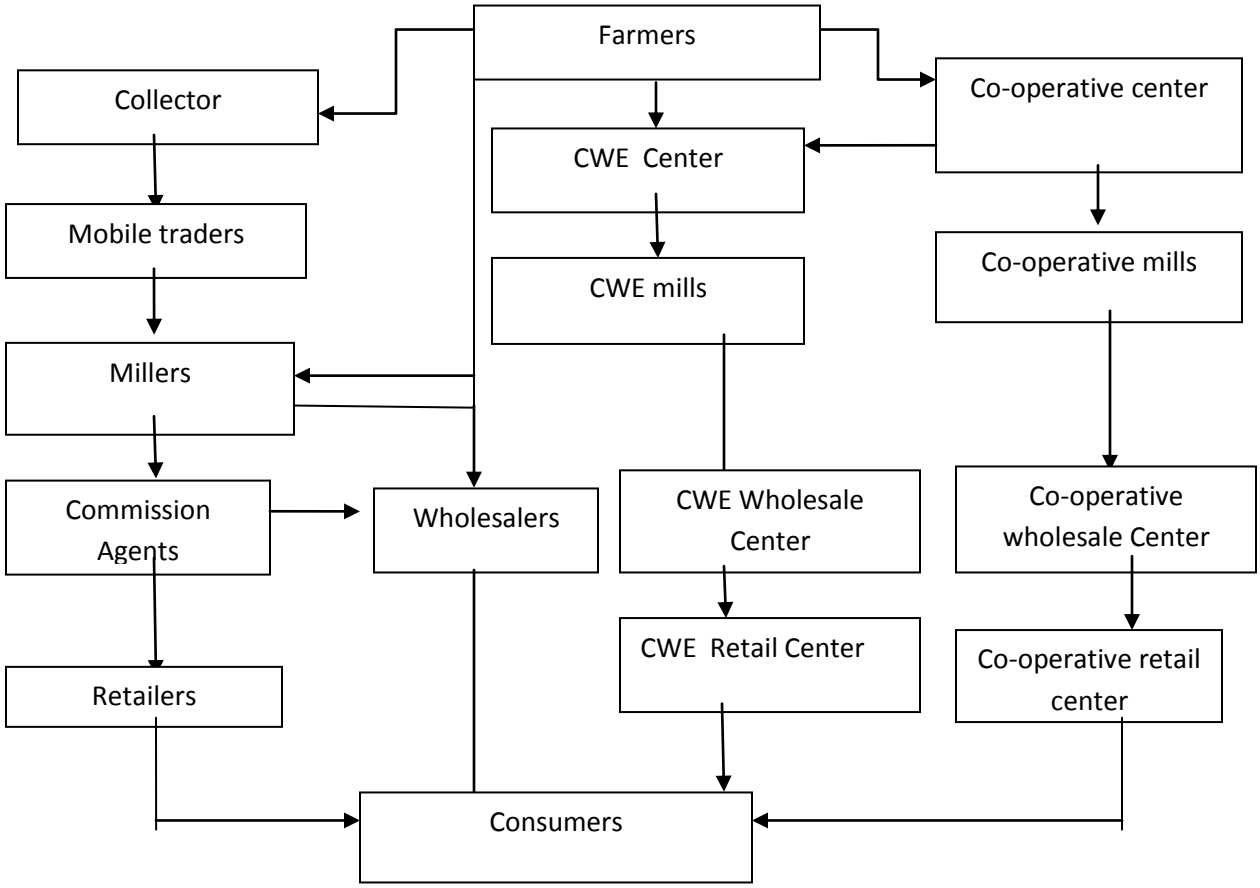
Appendices to Chapter 2

Appendix 2.1: Paddy Purchases by PMB

Season	Paddy purchases		Purchases as a % of total production
	Quantity ('000 mt)	Value (Rs. Mn)	
1972	551	NA	42.0
1975	242	NA	21.0
1977	513	NA	31.0
1980	212	NA	10.0
1985	324	NA	13.0
1990	31	NA	1.2.0
1995	282	NA	10.0
2006 yala	36.8	615	3.1
2006/07 maha	91.0	1543	4.6
2007 yala	-	-	-
2007/08 maha	-	-	-
2008 yala	5.7	158	0.3
2008/09 maha	37.4	1062	1.6
2009 yala	13.0	367	1.0
2009/10 maha	70.8	1995.4	2.7
2010 yala	111.7	3184.2	6.7
2010/11 maha	3.5	98.2	0.2
2011 yala	75.2	2137.2	4.0
2011/12 maha	115.8	3258.9	4.3
2012 yala	10.5	294.4	0.9
2012/13 maha	138.7	4,530.0	4.9
2013 yala	88.9	2,881.0	5.0
2013/14 maha	4.6	148.0	0.2

Sources: Paddy Marketing Board and Sri Lanka Agricultural Product Marketing Authority

Appendix 2.2: Marketing Channel of Paddy



Source: Rupasena and Ravichandran, 2000

Appendix 2.3: Exchange Rates and Per Capita GDP, 1980-2015

Year	US$ exchange rate (SLRS)	Per capita GDP (US$)
1950	4.76	NA
1955	4.76	NA
1960	4.76	142
1965	4.76	152
1970	5.95	184
1975	7.01	281
1980	16.53	273
1985	27.20	377
1990	40.06	472
1995	51.25	718
2000	75.78	869
2005	100.50	1,242
2010	113.06	2,744
2015	135.94	3,924

Source: Department of Census and Statistics and Central Bank of Sri Lanka

Appendix 2.4: Summary of Political Economy of Sri Lanka

Year	Ruling party	Prime Minister/Executive President	Subsidies	Trade policy	Other Comments
1948-56	UNP	.Mr. D.S. Senanayake (1947-52) .Mr. Dudley Senanayake (1952-53) .Mr. John Kothalawala (1953-56)	.Universal food ration-2-4 pounds/ week/ person (highly subsidized price) .No fertilizer subsidy .Free irrigation	.50% protection to rice .Free trade	.Right-wing party .Open non-interventionist free market policies
1956-60	SLFP coalition	.Mr. S.W.R.D. Bandaranayake (1956-59) .Mr. W. Dahanayake (1959-60) .Mr. Dudley Senanayake (1960 March-July)	.Universal food ration-4 pounds/ week/ person (highly subsidized price) .No fertilizer subsidy .Free irrigation	.Rice protection increased to 105% (144% in 1958) .Restrict imports .Increased the tariffs & quantitative restriction on imports	.Centre-left based coalition .State intervention begins .Sociologist ideology .Import substituting industrialization .State owned enterprises

1960-65	SLFP coalition	.Mrs. Sirimavo Bandaranayake	.Universal food ration- 4 pounds/ week/ person (highly subsidized price) .Fertilizer subsidy started .Free irrigation	.Import tariff increased	.Centre-left based coalition .State intervention .Import substituting industrialization
1965-70	UNP coalition	.Mr. Dudley Senanayake	.Rice ration was reduced to 2 pounds/person/week .Free ration of 2 pounds/week/person	.Partially liberalized the import trade	.Right-wing government .Import substitution policy .Restrict state intervention
1970-77	SLFP coalition	.Mrs. Sirimavo Bandaranayake	.Reintroduce rice subsidy (2 subsidized and 2 free ration) .reduced to 1 free ration in 1973	.Import tariffs and quantitative restriction increased .Introduced licensing system .State monopoly .30% of rice imported	.State intervention increased .Relationship with China & Soviet union developed .Land reform law .Nationalization of plantations & state control of trade .Import substituting industrialization
1977-88	UNP	Mr. J.R. Jayawardana	.Universal rice ration replaced with food stamp programme (subsidy only to selected poor) .Irrigation subsidy increased .Fertilizer subsidy reduced	.Trade liberalization .Reduced the import tariffs .Removed quantitative restrictions	.Export oriented liberalization .Free trade zones started .Promote private investments .Remove monopoly power of the PMB .Accelerated Mahaweli development irrigation project
1988-93	UNP	Mr. R. Premadasa (1988-93) Mr. D.B. Wijethunga (1993-94)	.Completely removed the fertilizer subsidy (1990-94) .Free irrigation	.Export oriented liberalization	.Removed the monopoly over domestic paddy procument

1994-2005	SLFP	Mrs. C.B. Kumarathunga	.Fertilizer subsidy reintroduced at Rs. 350/50kg bag in 1994 for rice .Reduced the fertilizer subsidy & limited only for urea	.Open economy with human face	.Left-wing party (President) .Government was under the UNP during 2001-2004 period
2005-2015	SLFP	Mr. M. Rajapaksha	.High fertilizer subsidy for all three fertilizers at Rs. 350/50kg (more than 90% from the market price) for rice & plantation crops .Subsidy extended to other crops at Rs. 1200/50kg .Free irrigation	.Trade policy more complex and inward looking .import tariff increased	.left-wing party .Increased government intervention .Expand the public sector .Import substitution policy .Enhance the relation with China .Export competition declined
2015-present	UNP-SLFP coalition	Mr. M. Sirisena	.Fertilizer subsidy continued but proposed to convert it to cash transfer .Free irrigation	.Focused on promoting trade liberalization and privatization	.Weak fiscal condition .Improve relation with both Eastern & Western countries .Increased domestic taxes .Export led economy

CHAPTER 3

LONG TERM TRENDS IN PADDY PRODUCTION SECTOR

3.1 Introduction

Paddy has been the single most important food crop in Sri Lanka like many other developing countries in Asia, and it has long been an important national target for attaining rice self-sufficiency. The share of agriculture sector GDP in paddy is 11% in 2015 (Central Bank of Sri Lanka), and it provides livelihood for nearly 1.8 million farmers in the country. Meanwhile, more than 30% of the total labour force directly or indirectly depends on paddy farming (Weerahewa, 2010). In addition, rice provides 42% total calorie and 34% total protein requirement of an average for the majority of population in Sri Lankans. Moreover, per capita rice calorie intake in the country is around 1,062 Kcal per day/person while the average rice consumption has increased from 91 kg per year in 1980 to 109 kg per year (FAO) in 2015. Further, it is revealed that an average consumer spends 14% of total food expenditure on rice in 2012/13 which has declined from 32% in 1980/81 (HIES of Department of Census and Staistics, 2012/13). However, paddy farming is currently considered as unprofitable due to escalating cost of production and declining economies of scale with land fragmentation over the years. Therefore, this chapter focuses on investigating the long term trends in production, inputs use, cost of production and changing profitability of paddy farming in the country.

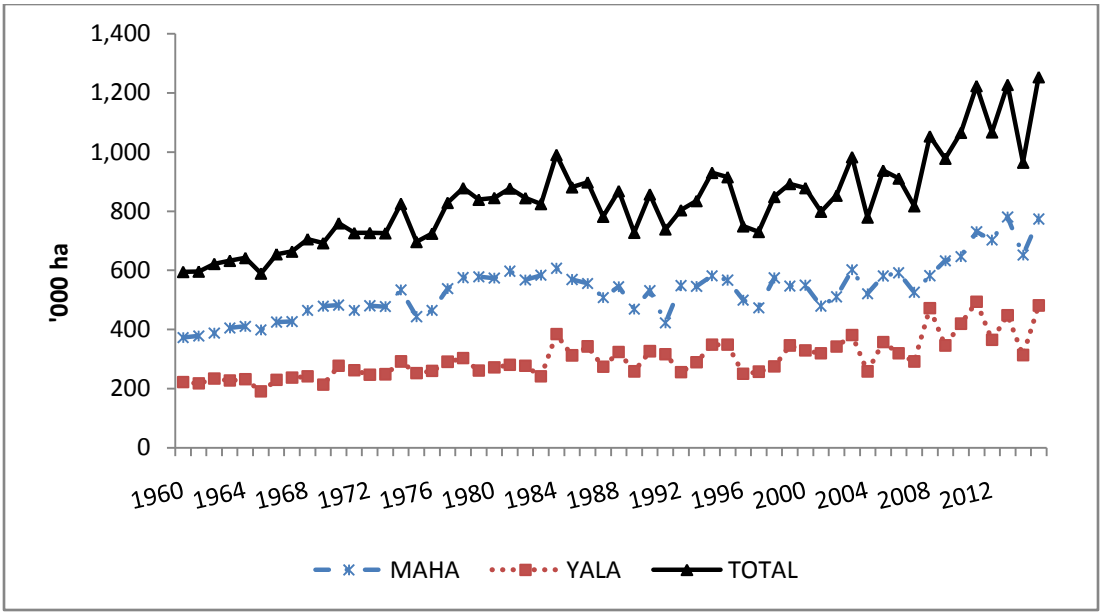
3.2 Extent Cultivated and Land Fragmentation

Rice is the single most important crop occupying 34% (0.77 million ha) of the total cultivated area in Sri Lanka (Department of Agriculture, 2016). On average 570,000 ha are cultivated during *maha* and 325,000 ha during *yala* making the average annual extent sown with rice to about 895,000 ha (average during 1980-2014). It is grown under both irrigated and rain-fed conditions in the Dry, Intermediate, and Wet zone of Sri Lanka during two cropping seasons: *maha* (October to March) and *yala* (April to September). Based on the source of water supply rice growing areas can be divided in to three major categories; major irrigation schemes, minor and medium irrigation schemes and rain-fed conditions. Minor and medium schemes provide facilities 80 ha-200 ha while major schemes provide facilities for more than 400 ha. The extent cultivated under paddy in Sri Lanka has been increased substantially over the years (Figure 3.1) particularly with the huge public investments in irrigation development and

fertilizer subsidy provided to paddy cultivation. The total land area under the paddy has increased from 594 thousand hectares in 1960 to 1,254 thousand hectares in 2015 (Department of Census and Statistics, 2015) where as total irrigated rice land has increased from 253 thousand hectares in 1950 (Aluwihare and Kikuchi, 1991) to nearly 558 thousand hectares (Department and Census and Statistics, 2015) and the significant proportion of paddy lands are under the major schemes. The variation in extent cultivated in *yala* and *maha* seasons are mainly due to variations in water availability in different weather conditions that prevailed in the respective years.

Majority of paddy farmers (about 86%) are small holders with a land area of less than one hectare while only 3% of paddy farmers cultivate larger than 2 hectares (Department of Census and Statistics, 2002). Therefore, paddy cultivation in Sri Lanka takes place mainly on small scale where as such small farm sizes limit farm income because it prevents farmers from exploiting economies of scale through increased mechanization. Considering the land tenure system in the country, it is revealed that the large portion of land is owned by the government and transferred to farmers under various settlement schemes from time to time. Although fragmentation or transferring of land has been restricted by the Land Development Ordinance of 1935 and its amendments, there are evidences to show that fragmenting as well as transferring of land among family members and others have been happening at large scale in settlement schemes due to various reasons. Abeyratne (1982) found that the average size of low land plots for the second generations were 1.2 acres although the original lowland size was 5 acres at the beginning and 3 acres in later stage. Among the second generation only 39% owned some low land. Therefore, the existing land laws caused to concealed fragmentation which finally lead to landlessness among the new generations. Abeysekara (1986) in his study at Mahavillachiya settlement has found that sub-division of allotments among children is a common practice in the settlement. Such sub division occurs informally and sub divisional units ranged in size from 0.5 to 2.5 acres. Although the original land size is 3 acres this original operation unit is seen only in 60% of the allotments. 26% of the allotments have two sub divisions, while 14% of the allotments have three sub divisions. In addition, Senevirathne *et al* (2007) highlighted that due to informal fragmentation of colony lands, the total extent owned settlers involved in agriculture is comparatively very low. They further revealed the average land holding size of the second and third generation settlers is only 0.4 acres in 'Mahaweli H'area. Therefore, currently land fragmentation has become one of the major issues in paddy farming sector because it reduces the economic efficiency of resource use.

Figure 3.1: Changes in Extent Cultivated under Paddy; 1961:2015



Source: Department of Census and Statistics, Sri Lanka

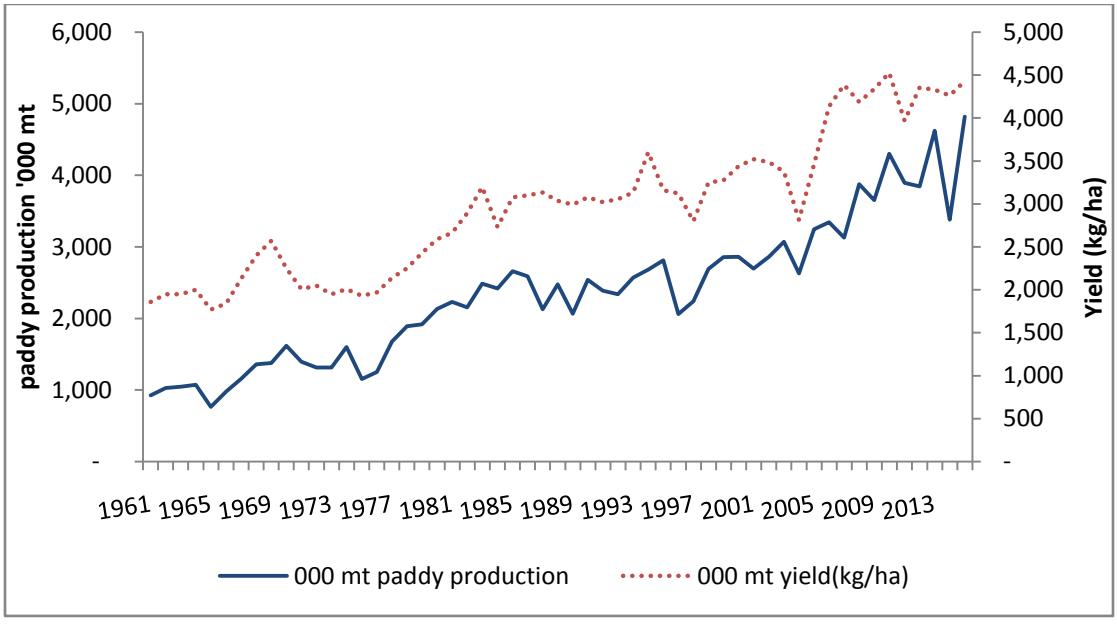
3.3 Domestic Rice Production

Paddy is cultivated during two seasons in Sri Lanka which accounts 65% of the annual production in *Maha* season and 35% in the *Yala* season. Over 80% of the total output comes from the irrigated areas while the production under the major schemes has become increasingly important in terms of productivity and the overall contribution to the national output. Although, paddy is grown in the entire country, the significant proportion is comes from Ampara (17%), Kurunegala (12%), Polonnaruwa (12%), Batticaloa (7%), Hambantota (6%), Anuradhapura (5%), Badulla (5%), Trincomalee (4%), Moneragala (4%) districts (Department of Census and Statistics, 2014). The country was producing only 40% of its total requirement immediately after independence, and remaining 60% was imported (Kikuchi, 2000). Rice production has also been adversely affected by the wheat/bread subsidy, as consumers substitute bread for rice.[13] However, it has experienced a dramatic rise in yield and therefore, increases in production (Figure 3.2) as a result of adoption of HYV and chemical fertilizer during the period of 1960 to 1970s. From 1961 to 1970s, the total production rose from 0.9 million mt in 1961 to 1.5 million mt in 1970 and

[13] Imports of wheat and meslin flour are duty free (Customs Notification, Revenue Protection Order No. 07/2002, The Gazette of the Democratic Socialist Republic of Sri Lanka No. 1261/12, 6 November 2002), and Ranaweera (2002).

then to 2.3 million mt in 1980s. Meantime, the average yield has increased from 2 to 2.5 mt per hectare between 1970 to 1980s period and to 3mt/ha in 1990. The rice yield has stabilized during 1990 to 1995 period. However, the country was technically self-sufficient and total production was more than the requirement of domestic consumption (Borsdorf, 1993). The paddy production in 2014 was lower by around 27% to 3.38 million mt due to significant decline in the extent cultivated and low yields arose from drought weather conditions that prevailed in both *yala* and *maha* seasons. As a result of that, rice production in 2014 was sufficient to meet only 11 months of the domestic consumption (Central Bank of Sri Lanka, 2014). Conversely, average rice yield is recorded as 4.4 mt per hectare in 2015, while paddy production increased to all time high level of 4.8 million mt. In spite of remarkable increase, rice yield is significantly varied in the country and the average yield in dry zone is 4.2 mt per hectare where as in wet zone it is 3.8 mt per hectare (Department of Census and Statistics, 2014).

Figure 3.2: Trends in Paddy Production and Yield; 1961-2015



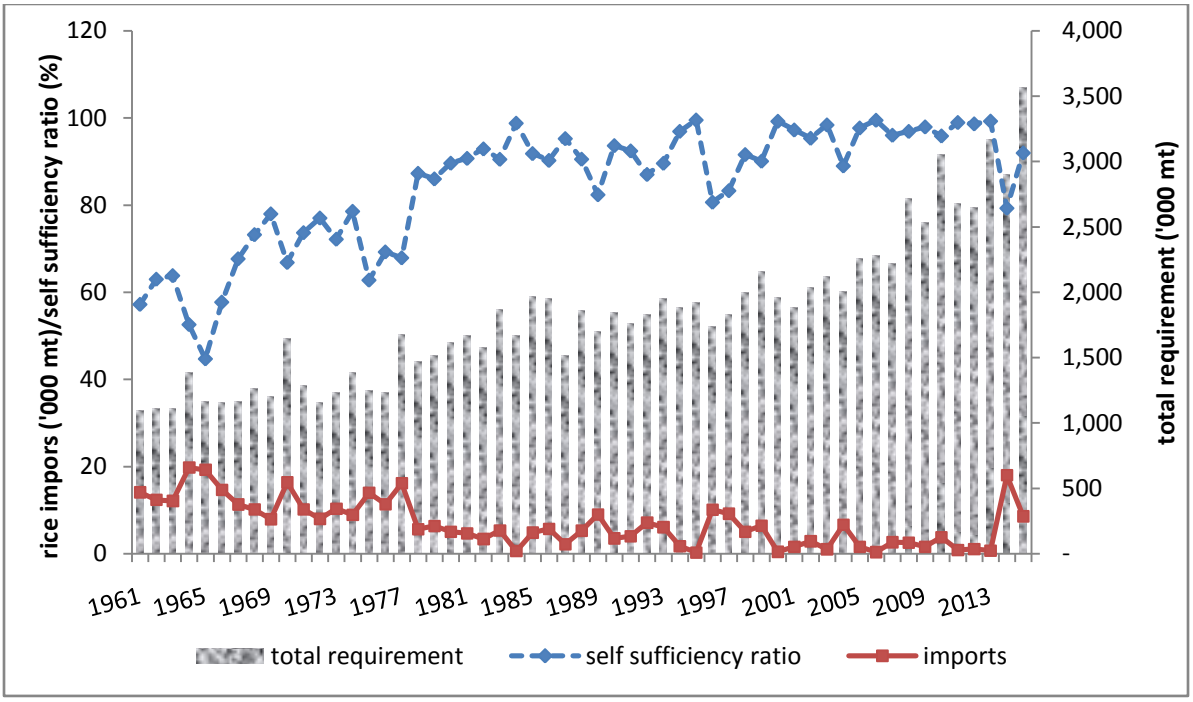
Source: Central Bank of Sri Lanka and FAO

3.4 Rice Imports and Self Sufficiency

The country was imported 60% of its total rice requirement just after the independence (Kikuchi, 1990). However, rice imports reduced to 30% of domestic consumption of rice in 1970-77 period (Shilpi, 1995) and as a result of the protection policies adopted by the successive governments to achieve self sufficiency, rice imports

decreased to about 20% of the peak level by the mid 1980 (Aluwihare and Kikuchi, 1991). It further reduced to 10% of domestic production during 1978-85 period while, self sufficiency in rice reached more than 90% by 1985. In the beginning, the government had the monopoly of rice imports that was handled through the Food Commissioner's Department until 1993 and gradually private sector was allowed to import rice under the licenses. The variations of rice production and self sufficiency ratio could be observed time to time due to variations in climatic and weather pattern of the country. Thiruchelvum (2005) pointed out that, Sri Lanka maintains high level of rice sufficiency at a cost to the economy. Figure 3.3 shows the quantity imported and self-sufficiency of rice over the year.

Figure 3.3: Total Requirement, Imports and Self Sufficiency Ratio of Rice; 1961-2015



Source: Central Bank of Sri Lanka and FAO

Despite the changing weather conditions, lack of long term government policies are also significantly contributes to large volatility of rice production in the country. Sri Lanka has to import substantial amount of rice in the recent years to meet the domestic demand of the country while government expenditure on rice imports remarkably increased during the past decades. The shortage in the supply of paddy in 2014 caused an increase in retail prices and government took measures to increase the supply with imported rice (Central Bank of Sri Lanka, 2014). As a result, total rice imports increased to 600 thousand mt in 2014 in comparison to 23 thousand mt in 2013.

The large volatility observed in paddy production in the past few years highlights the importance of improving storage facilities and other infrastructure facilities in paddy growing areas in order to avoid the huge price movements.

3.5 Rice and Wheat Market Interactions

Although rice is the staple food in the country, wheat also plays a secondary role specially for the poorest population in urban and estate sectors of the economy. Therefore, interaction between rice and wheat market is affected by changing government policies in the country. However, wheat is a wholly imported commodity in Sri Lanka and government spends 48 billion rupees to import wheat and wheat flour in the recent years (Central Bank of Sri Lanka, 2014). Under the agreement sign with Sri Lankan government and Prima Ceylon Limited in 1978, Sri Lankan government acted as the sole importer of wheat grain and it has been processed to flour with 74% of milled flour for every 100 units of grain supplied through the private mills. Even though, wheat flour subsidy was introduced in 1994, it has been withdrawn in 2001. High tariff protection given to the Prima Company leads to serve as a monopoly power in the milling of wheat flour at the beginning. However, wheat imports were liberalized since Prima Company was privatized in June 2001 while the second flour mill commenced its operation in August 2008. Since removal of monopoly power of wheat milling wheat flour imports has increased into the country while wheat grain imports were insignificant in quantity. The reduction of rice imports also accompanied by increased imports of wheat during the period of 1980 to 2003 while wheat imports have increased threefold from 300 million mt in 1980 to 919 million mt in 2003. Consequently, as a result of the government long term objective of reducing the consumption of wheat and encouraging domestic rice production and consumption in the country leads to significant cutback of consumption of wheat flour and wheat products in the recent years. Currently, on an average consumer spend only 4% of total food expenditure on the consumption of wheat flour and bread (HIES of Department of Census and Statistics, 2012/13).

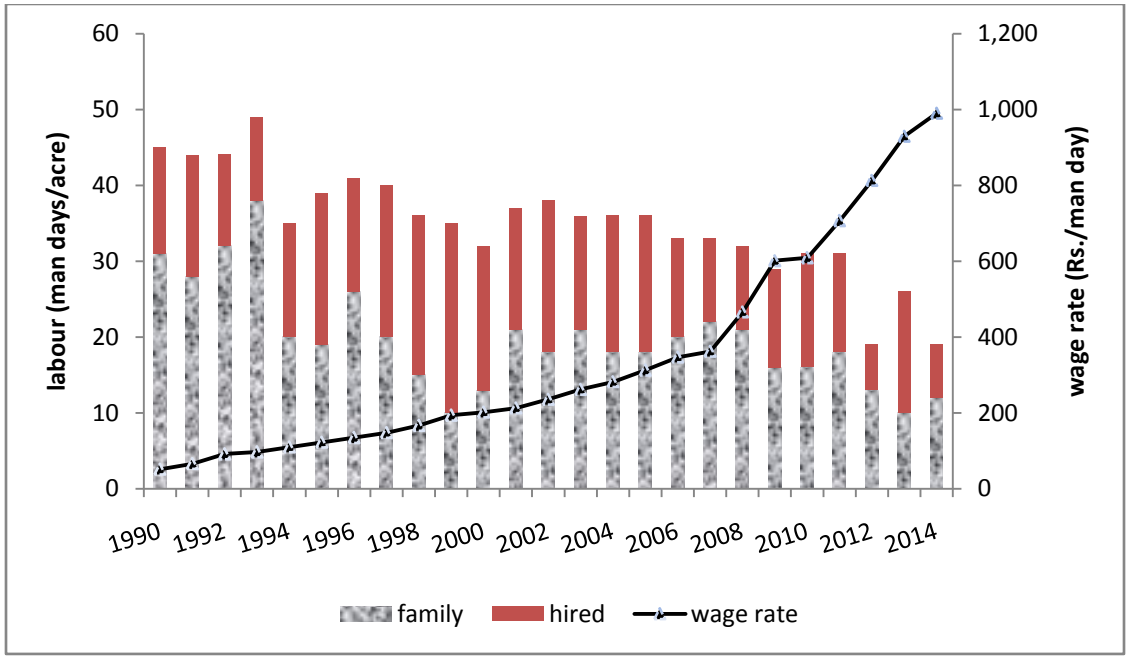
3.6 Input Use, Cost of Production and Profitability of Paddy Sector

3.6.1 Labor and Wage Rate

Paddy farming in Sri Lanka is mainly labour intensive and family labour was the major component rather than hired labour several years ago. However, this has changed during the past few years with farmers turn away

from agriculture with the expansion of services and industrial sector (Weerahewa *et al*, 2003). With the reduction of family size and reluctance of young generation to engage in paddy cultivation, there aren't enough family members in the present family system to contribute their time to paddy farming. This results in use of hired labour from outside while persistent increase in wage rates in the country (Figure 3.4). Despite these changes, family labour is still accounts for more than 50% of the total man days in the paddy farming in most of the districts in the recent years. Moreover, emerging mechanization in the paddy sector results in decline of total labour by 58% during the period of 1990-2014. In addition, wage rate also increases by 19 times during same period.

Figure 3.4: Changes in Labour use in Anuradhapura District; 1990-2014 *Maha* Seasons



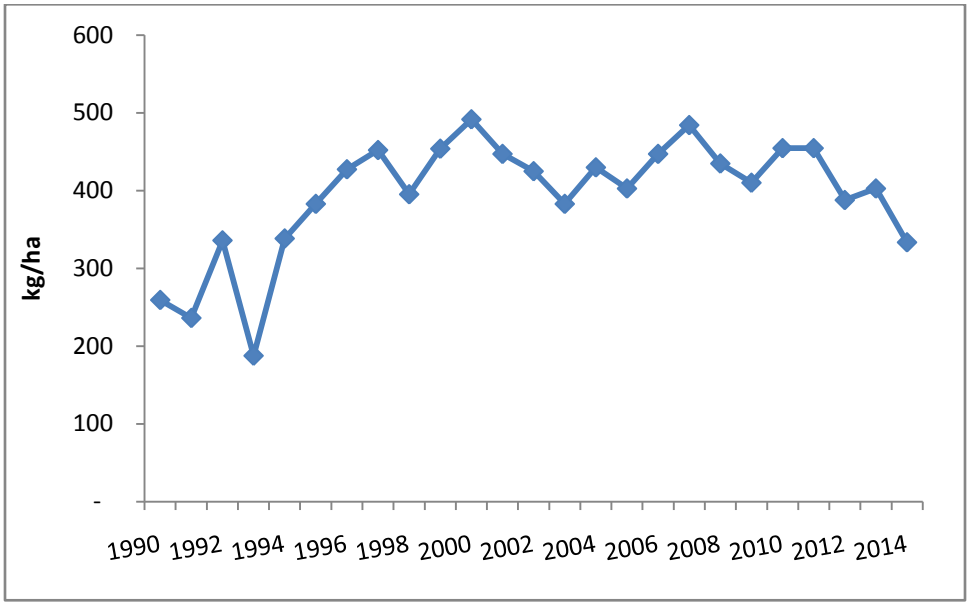
Source: Cost of Cultivation of Agricultural Crops, DOA

3.6.2 Fertilizer Use in Paddy

Among the inputs use in paddy farming, the use of fertilizer has greatly increased with national level urea usage increased from 4.36 kg/ha in 1965 to 284 kg/ha in 2005 (Wickramasinghe *et al.* 2009). The main factor for the rapid diffusion of fertilizer use among farmers appears to be its relatively low price as a result of the subsidy. The government did not increase its price according to the world price increases. This made fertilizer a low-cost input for producers. Figure 3.5 shows the changes in fertilizer use in Anuradhapura district from 1990-2014 *maha* seasons.

There was a significant reduction of fertilizer use in 1993 due to high cost of fertilizer as a result of subsidy cut. However, fertilizer use in paddy gradually increased in the country after reintroducing the subsidy at low farmgate price. The highest use of fertilizer can be seen in 2007 (484 kg/ha). In general the fertilizer usage in paddy contributes to the improvement in paddy yield and production in the country. Due to the fertilizer subsidy scheme in the recent years, paddy farmers' cost share of fertilizer has significantly declined which currently accounts 16-20% of the material cost while it accounts only 3% of the total cost.

Figure 3.5: Changes in Fertilizer Use in Anuradhapura District; 1990-2014



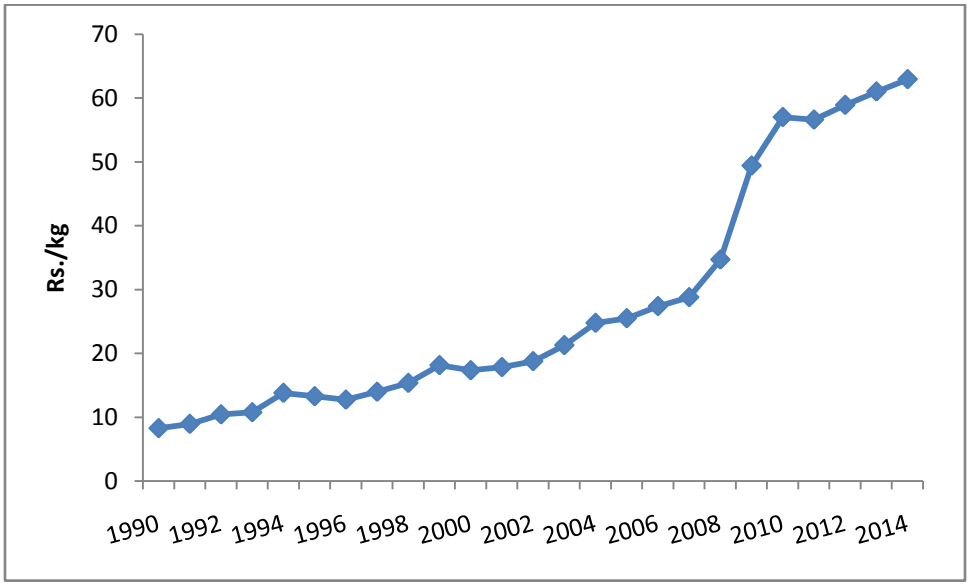
Source: Cost of Cultivation of Agricultural Crops, DOA

3.6.3 Seed Paddy

After the green revolution almost all the paddy farmers in the country adopted High Yielding Varieties (HYV) for cultivation. The most popular seed varieties among the paddy farmers in the country are: Bg 352, Bg 358 and Bg 360. Nearly 25% of farmers use their own seeds obtained from the previous season, mainly because of low cost of production and purity of seed paddy while remaining farmers use other sources such as private companies (22%), other farmers (19%), Agrarian Service Centers (18%) and seed farms and farm societies (15%) (Wijetunga, 2013). Farm gate price of seed paddy has increased more than seven folds from Rs. 8 to 63 per kilogram during 1990-2014

(Figure 3.6). Meanwhile, the majority of the farmers cultivate 3-3.5 month age paddy varieties mainly due to less water availability and high production within a limited time period. The share of seed paddy cost to the total cost is around 8% in recent years. However, quality and the consumer preference are low for most of the rice varieties cultivate in the country and these varieties do not have export potential also.

Figure 3.6: Changes in Farm gate Price of Seed Paddy; 1990-2014 *Maha* Seasons



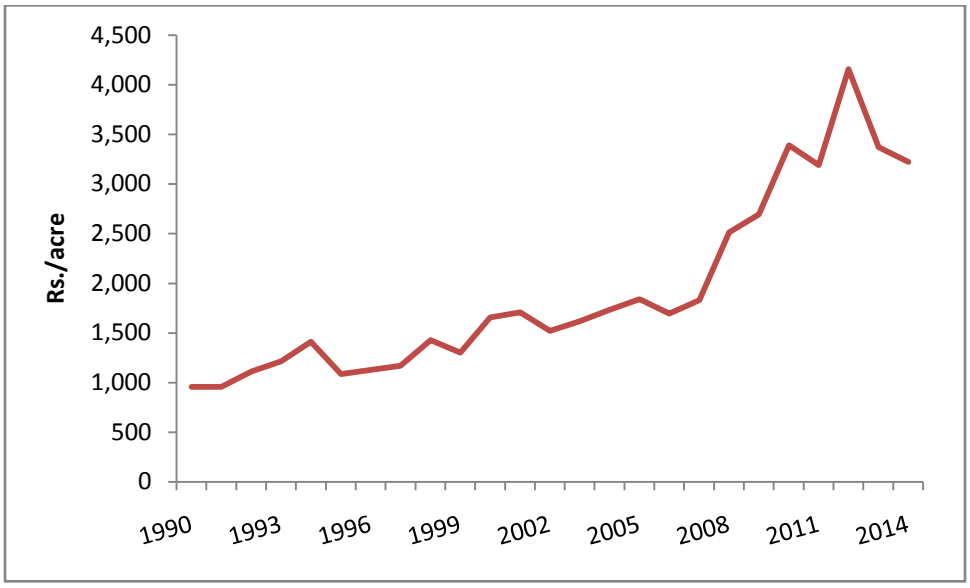
Source: Cost of Cultivation of Agricultural Crops, DOA

3.6.4 Agro chemical

Wide adoption of high yielding paddy varieties, made farmers depend largely on agro chemicals such as weedicides, pesticides and fungicides which have become vital components to cultivate HYV. Therefore, agro chemical usage in paddy cultivation and its cost share in the total cost have shown noticeable increase (Figure 3.7) in the recent years. However, excessive and careless use of agro chemicals and fertilizer may result in spread of high incidence of unidentified diseases among the farmers in the recent period. In addition, most of the farmers do not apply proper protective measures such as face masks and gloves when they apply agro chemicals to the fields. Therefore, it is important to enhance farmer awareness regarding the proper use of agro chemicals while introducing and implementing national policy regarding the use of agro chemicals in the country. It is further important to

produce pest and disease resistant rice varieties and use alternative methods such as biological and environmentally friendly methods to reduce the agro chemical application.

Figure 3.7: Changes in Agro-chemical Cost in Hambantota District; 1990-2014 *Maha* Seasons



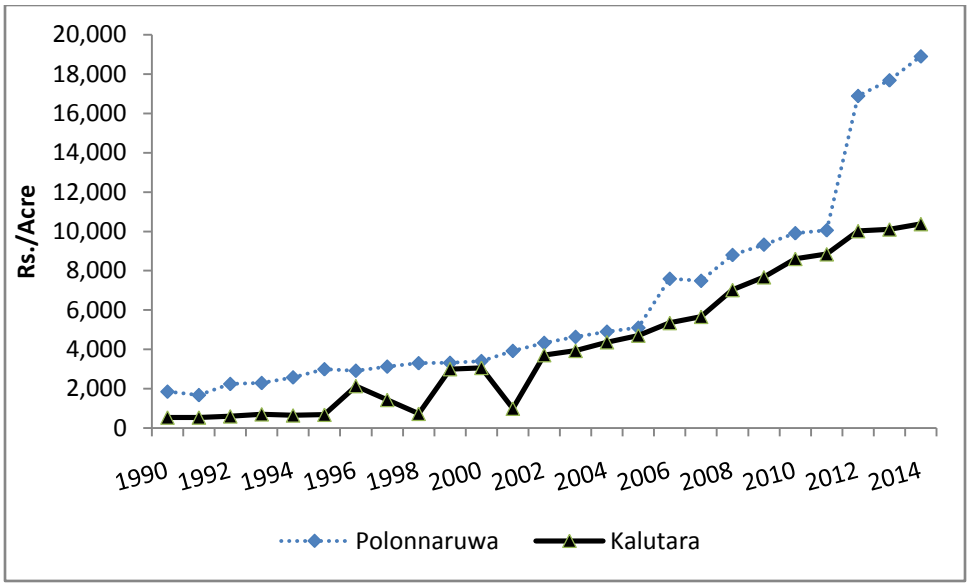
Source: Cost of Cultivation of Agricultural Crops, DOA

3.6.5 Machinery

Paddy farming has a long history in labour use, but in the recent period labour is substituted by machineries in almost all the districts. Land preparation, harvesting, drawing, threshing and winnowing are the main operations in paddy cultivation which have been subjected to mechanization in last several decades leads increase in machinery cost in paddy farming both in commercial and non commercial areas of the country (Figure 3.8). Instead of using buffaloes as draught power, almost all the farmers have relied on two wheel and four wheel tractors while use of animals is very rare at present for ploughing and threshing. In addition, combine harvesters have been heavily use in most of the irrigated areas in the country for harvesting and drawing because of its low cost, difficulties in finding labour and time saving. The average cost of harvesting, threshing and winnowing by using combine harvesters is ranged from 7,200 in Kalutara to Rs. 11,043 in Kurunegala in 2012. The reduction in expenditure due to adopting combine harvesters vary between Rs. 2953 to Rs. 8758 in Kurunegala and Kalutara districts respectively in 2012 *Yala* season compared to the manual method. However, there are some drawbacks and disadvantages in

mechanization such as: minimize the use of machineries due to small land plots, difficulties in finding machines during the peak harvesting period, reduction in quality of paddy due to mechanical harvesting, high wastage of product etc. Therefore, these drawbacks have been compelled farmers to use human labour at higher rates.

Figure 3.8: Changes in Machinery Cost in Commercial (Polonnaruwa) and Non- commercial Areas (Kalutara); 1990-2014 *Maha* Seasons



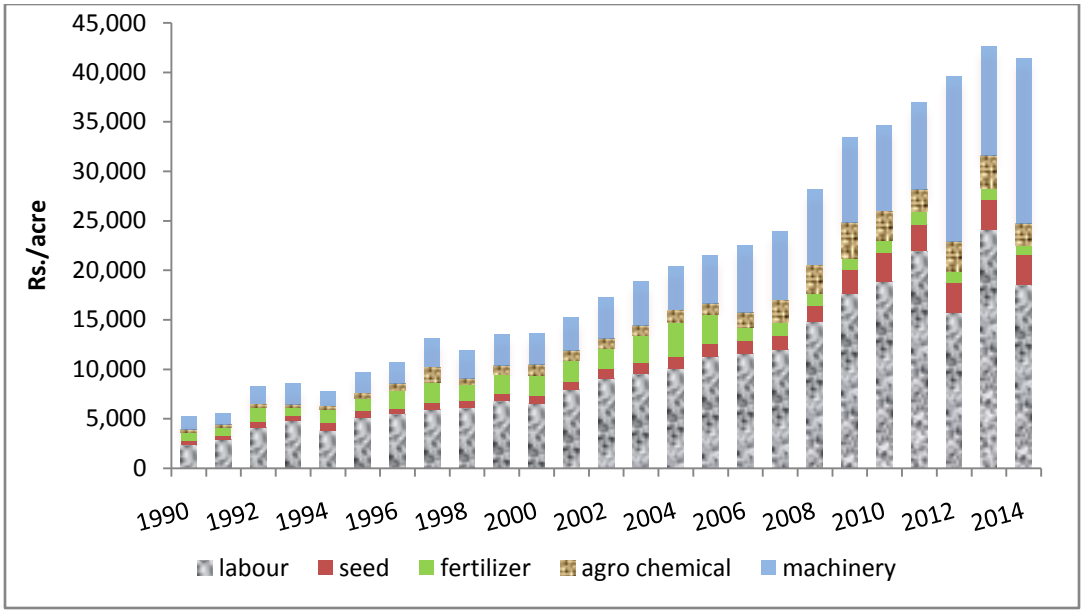
Source: Cost of Cultivation of Agricultural Crops, DOA

3.7 Cost of Production, Farm gate Price and Profitability

3.7.1 Long Term Trends in Cost of Production of Paddy Farming

One of the key issues affecting the rice sector profitability and sustainability is the steady and tremendous increase in production cost. Total cultivation cost is a cost of all inputs such as labour, machinery, seed, fertilizer and agro chemicals (weedicides, pesticides and fungicides) use in paddy production associated with different activities of the paddy farmers. As a result of using high inputs cost mainly due to labour and machinery cost increase, total cost per acre on paddy cultivation has drastically increased during the period of 1990-2014 (Figure 3.9). In contrast, cost incur on fertilizer has been significantly reduced due to massive subsidy granted on paddy farmers in recent years.

Figure 3.9: Changes in Total Cost of Production in Anuradhapura District; 1990-2014 *Maha* Seasons



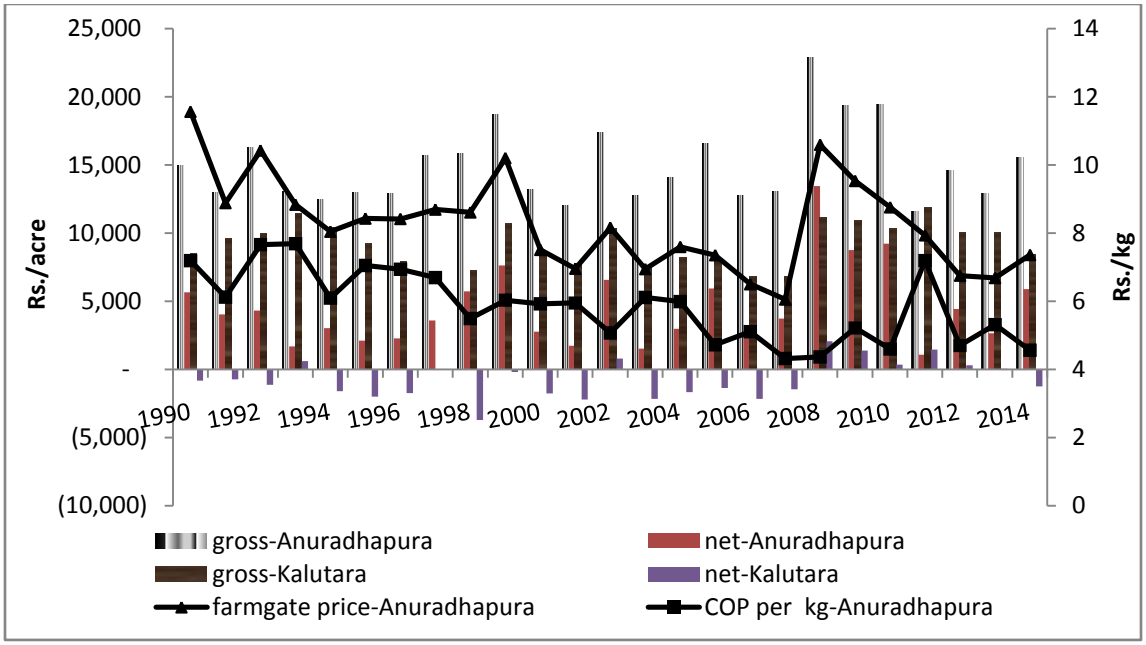
Source: Cost of Cultivation of Agricultural Crops, DOA

As seen in Figure 3.10, net returns[14] per unit of land are relatively smaller compared to gross returns in paddy farming (in real term). In some districts, specially in non-commercial rain-fed areas, the net returns from rice cultivation seems to be negative in some years due to low yields and production compared to high cost of production. The farm gate price of paddy shows up and down ward movements during the period of 1990 to 2014 while attractive price increase in 2008. However, after 2008 farmgate price declined (in real term) until 2013 and there is a gradual price increase in 2014 due to shortage in supply of paddy in that year. The majority of farmers have to sell their produce to the private sellers at very low price below the price announced by the government, to cover their cash requirements or due to lack of storage facilities. Therefore, there is no considerable increase in the net profit generated from paddy cultivation even in the irrigated areas. Therefore, examination of profitability from rice farming reveals that paddy faming is not an attractive and profitable enterprise. This situation is more worsen especially in the non-commercial areas of the country.

[14] constitute the difference between the gross returns and the value of all the inputs that have added to the paddy production including family labour

Similarly, the study conducted by Aheeyar *et al* (2005) pointed out, paddy cultivation has become an unprofitable enterprise over the years except in major irrigated areas and in some minor irrigation schemes. Meantime, Thiruchelvum (2005) has revealed that paddy farming is unprofitable in minor tank schemes and in the case of poor performing farmers, it was not profitable for them to produce paddy as their production was not even at breakeven level. In addition, Weerahewa *et al* (2003) pointed out that paddy farming will not provide sufficient income for farm families if the current holding sizes are maintained.

Figure 3.10: Changes in Gross and Net Returns in Paddy in Commercial and Non-commercial Areas; 1990-2014 (in Real Price)



Source: Cost of Cultivation of Agricultural Crops, DOA

3.7.2 Net Income Comparison with Non-Paddy Crops

Despite paddy farming is continued to play a key role in Sri Lankan economy, the market price of paddy has failed to compensate the increasing cost of cultivation hence farmers obtain low net return. Therefore, it is important to compare the profitability of paddy farming with non paddy crops cultivated in the same areas of the country. As seen from the Table (3.1), cash cost for chilli, big onion and potato cultivation is drastically higher than the paddy cultivation. In addition, labour requirement is considerably high in non-paddy cultivation compared to rice

farming. The study also suggests that farmers who cultivate non-paddy crops receive attractive net returns and their returns to investment is also high compared to paddy farmers. However, the majority of poor farmers do not able to cultivate high value commercial crops due to high cost incur on cultivation of these crops as well as difficulties in obtain labour, credit and good quality seeds. In addition, crop and income diversification is still not popular among the traditional paddy farmers and they rely entirely on paddy cultivation to protect their land titles. Besides, commercial paddy production is still difficult in Sri Lanka due to several reasons such as small farm lands, existing land laws, objection from the farmers and political reasons.

Table 3.1: Comparison of Returns of Paddy and Non-Paddy Crops

Indicator	2001 yala			
	Paddy-Anuradhapura	**Chilli-Kalawewa**	**Big onion-Matale**	**Potato-Nuwara Eliya**
Cash cost (Rs./ac)	12,007	37,216	51,886	135,478
Labour requirements (man days/acre)	36	198	196	133
Net return (Rs./ac)	7,622	19,158	55,124	102,363
Return to labour[15]	463	312	495	987
Return to capital[16]	2.02	2.21	2.47	1.86
	2012 yala			
Cash cost (Rs./ac)	24,768	91,167	137,632	249,241
Labour requirements (man days/acre)	19	173	137	111
Net return (Rs./ac)	20,112	418,892	288,290	208,423
Return to Labour	2,122	3,173	2,858	2,815
Return to capital	2.42	6.60	3.46	2.03

Source: Cost of Cultivation of Agricultural Crops, DOA

[15] (Profit excluding imputed cost+ cost of hired labour)/man days
[16] Gross return/Cost of cultivation excluding imputed cost

3.8 Conclusions and Policy Implications

This chapter examines the huge volatility in rice production and imports over the recent period despite great emphasize given to increase paddy production and yield by successive governments. Labour is the predominant cost component in paddy farming followed by machinery cost. In contrast, fertilizer cost has been gradually dropped due to huge subsidy granted by the government. The net return from paddy farming is continued to drop over the years due to increase in cost of production at a higher rate than the paddy price increases. Therefore, the majority of farmers consider the rice cultivation is economically unprofitable due to the fact that income derived from paddy is inadequate to fulfill their basic needs in the recent period. Therefore, this chapter suggests, crop diversification in order to increase farmers' income while use of new technology to reduce the cost of production in paddy farming. In addition, provide proper storage and other infrastructure facilities in the rural paddy growing areas are important to reduce the high volatility in rice production in the country. Further, lack of long term national policy in agriculture sector and weaknesses in implementing government policies are also contribute to low performances in paddy farming.

CHAPTER 4

FERTILIZER SUBSIDY REFORMS IN THE RICE PRODUCTION SECTOR: A SIMULATION ANALYSIS

4.1 Introduction

Fertilizer subsidy is politically more litigious agricultural policy in Sri Lanka for more than five decades. It considers mostly necessary to induce farmers to adopt high yielding varieties to increase rice self sufficiency in the country as well as to ease the burden on farmers' budget. Many governments consider adjustments to the previously granted subsidy policy while switching it to a direct transfer payment system is the most widespread adjustment method considered by many governments those who granted fertilizer subsidy to producers previously. This is largely driven by the logic that generalized subsidies can be ineffective, costly and inequitable, while replacing them with targeted transfers can remove market distortions and more cost effectively support vulnerable groups (Coady *et al*., 2010). Conversly, adequate subsidies and the distribution of productive inputs can bolster local production, and their removal should be carefully assessed given the negative impacts (Khor, 2008).

Fertilizer subsidy policy in Sri Lanka has been introduced in 1962 and this has been continued up to now with several changes, while populist governments have used the subsidy to appeal to the politically important farming community (Bandara and Jayasuriya, 2009). Over the years, subsidy has significantly contributed to increase paddy production and help the country for attaining self-sufficiency in rice. However, there are numerous concerns over the effectiveness and financial sustainability of program as well as anxiety over soil and water pollution, health and food safety in the country in the more recent years. Meantime, the government is under increasing financial pressure due to low income and increasing external debt. Inefficient resource allocation is another concern. These problems raise a question about continuing fertilizer subsidy policy in rice sector in Sri Lanka. Therefore, this mounting burden of fertilizer subsidy compelled the newly elected government who came to the power in end of the 2015 to suggest some modifications to the fertilizer subsidy policy. Accordingly, the government considers of converting the subsidy to a cash allowance of Rs 25,000 per year for 1 hectare (up to 2 hectares) for paddy farmers. In order to depend their proposition the government argues that their intention is encouraging farmers to move away from using chemical fertilizers and to ensure that farmers are given good quality fertilizer, instead of the unsafe that is often given on the subsidy. However, the All Ceylon Farmers' Federation and opposition parties have not taken this

proposal as from a benevolent government. Recently, the market price of a 50 kg bag of the fertilizers urea, TSP and MOP has risen to Rs. 2,641, 2,829 and 3,014 respectively. This means that farmers now have to pay more than 6.5 times high price for fertilizer compare to previously paid price of Rs. 350 per 50kg. Hence, farmers complained that they cannot afford to buy standard fertilizer and there is a fertilizer shortage as a result of stockpiling by traders, lead farmers face difficulties in purchasing fertilizer stocks. As a result, the government made a decision to fix the price of 50 kg bag of fertilizer at Rs. 2,500. However, since there is no obligation for paddy farmers to obtain such direct cash transfer as a replacement for previously given subsidy, its effectiveness is questionable.

With such background, we find that modifications to fertilizer subsidy policy in the country are currently a concern. Although few indirect studies have been carried out to assess the impact of elimination of fertilizer subsidy in the country, until now, no attempt have been made to use two stage technology which specify bio chemical (BC) and Machinery (M) technology process in Sri Lanka. One stage Constant Elasticity of Substitution (CES) technology assumed in most synthetic models is too restrictive; hence we assume BC and M technology which is closer to the reality than one stage CES. It is important to evaluate the changing relative prices of inputs and thus cause the substitution effect among the factors of production as a result of subsidy cut which is possible using our model. Moreover, this is the first attempt to evaluate the impact of currently proposed direct transfer payment system in the Sri Lanka.

Therefore, the main objective of this chapter is to evaluate the various adjustment techniques (reduction/complete removal of subsidy and direct transfer) to the fertilizer subsidy policy in Sri Lanka using simulation under different subsidy rates, with a view to understand its impact on the paddy production, input demand and their prices. Moreover, this chapter evaluates the effect of subsidy adjustments on government budget, farm income and cost effectiveness in terms of transfer inefficiency.

The remaining sections of the chapter are organized as follows. The next section briefly reviews the fertilizer subsidy reforms in other countries. Section 4.3 describes the data and methodology used while the Section 4.4 discusses the results. The final section concludes the paper.

4.2 Literature Review

Lessons from Fertilizer Subsidy Policies in other Countries

The fertilizer subsidy provides in different forms such as straight supply of fertilizer inputs, cash payment, voucher/coupon system, reduced market price or transport subsidy etc. Subsidization of inputs regarded as an unsatisfactory way of fostering agricultural growth (Timmer *et al,* 1983). In a world of perfectly competitive markets, conventional economic analysis demonstrates that subsidies are not desirable as they inevitably result in economic inefficiencies and welfare losses (Crawford *et al,* 2006). Moreover, models for OECD countries indicate that subsidies are the least efficient way of transferring income to agricultural households (Filipski and Taylor, 2012). In South Asia, fertilizer subsidies are crowding out investments in essential public goods. As example, World Bank (2010) estimated that investment in Bangladesh has fallen from 5.2% over less than a decade, mainly because of increased spending on the fertilizer subsidy (World Bank, 2010). Also the government control of the fertilizer market in Bangladesh resulted in misallocation of resources and inefficient production distribution (World Bank, 1997). In the case of high income countries, OECD analysis suggests that less than half the value of an input subsidy translates into higher net incomes for farm households, with the majority of the transfer leaking to input suppliers or incurred as efficiency losses (OECD, 2001).

Conversely, some authors argued that input subsidies may be useful in stimulating the adoption of new technologies of production (Dalrymple, 1983; World Bank, 1986). Analysis by Chand and Pandey (2008) shows that in India, if subsidy on fertilizer is removed completely, then the price of fertilizer will increase by 69% and this would cause to 9% reduction in food grain production. Minot *et al.* (2009) conclude that fertilizer subsidies are a cost effective way of assisting the rural poor, if they can be justified on the grounds of equity.

In the review of numerous studies in Malawi, Holden and Lunduka (2013) conclude that most vulnerable households are not sufficiently included the subsidy program, and the targeting system is not particularly effective. Moreover, they found that vouchers tend to be sold by smaller farms and purchased by large farms. Although targeting poor and female-headed households is a program objective in Malawi, female headed households were less likely to be target in practice (Dorward *et al.*, 2008; Chibwana *et al.*, 2010) and wealthiest households acquired more subsidized fertilizer. Evidence from empirical studies on the cost effectiveness of the subsidy programs overwhelmingly suggest that the high costs associated with them exceeded their benefits (Morris *et al.*, 2007). Meantime, Kherallah *et al.* (2002) present a broader discussion of the impact of fertilizer market reform on fertilizer

prices and they argue that eliminating subsidies can cause the fertilizer price to rise less than proportionately. However, Sharma and Thaker (2010) found that small and marginal farmers have a large share in cultivated area in India, thus reduction in fertilizer subsidy is likely to have an adverse impact on farm production and income of small and marginal farmers and un-irrigated areas.

In addition, there are some positive and negative factors highlights about India's direct cash transfer program. As mentioned by Kapur *et al.* (2008), the poor people tend to misspend some of the money they receive. However, it would relieve financial constraints faced by the poor, many of whom turn either to usurious money lenders or to micro credit institutions. The administrative costs of cash transfer program will be much less because though it has high initial fixed costs but modest subsequent annual costs. Further, cash transfer would help to remove the inherent inequality in subsidies. As highlighted by Kapur (2011), cash transfers could be seen as basic income support for the poor, allowing them to make their own choices more effectively as market infrastructure improves and production stabilizes. Conversely, some researchers justify the fertilizer subsidies and question the rationale for direct transfer. As per the Sharma and Thaker (2010), the direct transfer of subsidy to farmers is not a right policy decision in India because it would be difficult to ensure that direct transfer of subsidy to farmers is actually used by farmers for only buying fertilizer and there are no leakages in the transfer of subsidy. Hence, it might adversely affect agricultural production in the country, if the subsidy is not used for fertilizer. In Nicargua, Maluccio (2010) finds that nearly all the transfer from Red de Proteccion Social is used on consumption and education with little spending linked to agricultural or non agricultural activities.

In addition to the cash transfer some countries use voucher system to supply fertilizer to farmers. Malawi's voucher program is the largest success story in smart subsidies. After eliminating the universal subsidy in mid 1990s it reintroduced limited subsidies in 1998 and in 2005 the program was redesigned as the Agricultural Input Subsidy Program (AISP) , a voucher based universal subsidy program has resulted in substantially increased maize production leading to food security increases and exporting some maize (Dorward and Chirwa, 2011). The input vouchers are preferable to direct state distribution of fertilizer because the use of input vouchers promises to stimulate the development of a private sector input supply chain (Minot and Benson, 2009). However the experience of Malawi reveals that voucher based subsidies do not necessarily promote the development of private distributors. They further noted that vouchers appears to be a poor choice for attaining social safety net and poverty reduction

objectives, even in rural farming communities. In addition, Banful (2011) who studied the new subsidy program introduce 2008 in Ghana finds that more vouchers were targeted to districts that the ruling party has lost in the previous presidential election and more so in districts that had been lost by a higher percentage margin and hence there is significant threat to the efficiency of fertilizer subsidies remains.

4.3. Methodology

4.3.1 Data

The analysis is based on cost of cultivation data published by the Department of Agriculture in Sri Lanka and Whole Island Cost of Cultivation data during 2009/10 *Maha* season and 2010 *Yala* season in both irrigated and rain-fed areas are used. Benchmark year of 2010 is selected for the analysis due to normal domestic production as well as normal world market fertilizer prices prevailed in 2010. Average production cost per acre of *Yala* and *Maha* season, in both irrigated and rain-fed areas were averaged using 2010 production extent data obtained from the Department of Census and Statistics. As the land cost is not shown in the cost of cultivation books, residual is assumed as land rent.

According to the benchmark data, total paddy production was 4.8 million tons and total production cost of paddy was SLRs 126.4 billion. Among the inputs, labor is the predominant cost component which represents 29% share of the total cost. The machinery cost is the second highest cost component corresponding to 19% of the share. Agrochemical and seed cost used for analysis are 6.7% and 5.6% respectively. However, fertilizer cost share is only 2.3% to the total cost because of the low fertilizer price set by the government. Land rent represents 37% of the total cost. Producer price of paddy was SLRs. 26.2 per kg and the total extent cultivated was 937 thousand ha.

4.3.2 Model

Demand supply equilibrium model with input markets is employed for the analysis.

The production technology is assumed to be two stage with BC process (seed, agrochemicals, fertilizer, land) and M process (labor and machine). It is an extension of Egaitsu and Shigeno (1983) and Kaneda (1982) type technology specifications. We specify cost function as a dual to the technology. In the two stage CES technology,

the first stage CES for BC and M technology (elasticity of substitution is assumed to be low, 0.05[17]) and second stage CES for BC process (elasticity of substitution is assumed to be 0.2[18]) and M process (elasticity of substitution is assumed to be 0.6[19]).

Input supply and rice demand functions are assumed to be constant elasticity form. Price elasticities of factor supply are relatively hard to find. OECD (2001) suggests smaller price elasticity values for farm owned inputs and higher values for purchased inputs. Therefore, we follow the OECD (2001) and elasticity of supply for labor, purchased inputs (agrochemicals and machinery) and seed are assumed to be 1, 1.5 and 0.5 respectively. Since Sri Lanka is small open economy in fertilizer import, we assume fertilizer market supply is horizontal at benchmark market price. Paddy land is treated as specific factor of production (supply is fixed at the benchmark level). We employ -0.9 for price elasticity of rice demand[20].

Farmers wish to sell their product to private intermediaries as soon as they obtain the harvest to cover their loan requirements even at lower prices. Though there is Paddy Marketing Board (PMB) which is supposed to intervene in paddy market in order to maintain farm income, the quantity of purchase is very small[21] and farm gate paddy price remains low. Intermediaries purchase paddy at low prices and sell to consumers at high prices. As a consequence, there is a big gap between consumer price and producer price of rice. Even if it is interesting to understand how this gap is endogenously determined, we assume this gap (marketing margin) is exogenous in this study and set at the five year average margin. The farm gate fertilizer price is a policy variable, which is exogenously determined by the government. It is set at 0.1 (SLRs. 7/kg) at the benchmark.

Therefore, we can define the cost function by;

$$C(P_{Seed}, P_{Che}, P_{Fert}, P_T, P_L, P_M, Q) = C\big(C_{BC}(P_{Seed}, P_{Che}, P_{Fert}, P_T), C_M(P_L, P_M)\big)Q \qquad (1)$$

[17] Binswanger (1974) found that the elasticity of substitution between machinery and fertilizer were insignificantly different from zero. Therefore we guess the elasticity is very small. Sensitivity analysis is conducted with different elasticity values ranging from 0.05 to 0.2, and we found that the results are not changed significantly.

[18] We did simulation for various values of elasticity of substitution ranging from 0.2-0.9 and calculate output. The result is relatively consistent with that of Kikuchi and Aluwihare (1990) when elasticity of substitution is 0.2.

[19] Kondo (1991) specified BC process and M process of Egaitsu-Shigeno production structure as translog functions and results of elasticities of substitution between machine and labor are from 0.5 to 0.9.
Also please note that elastcities of substitution values used in this chapter is different from the elasticities of substitution values calculated in Table 5.3 of the Chapter 5 because it is difficult to assume one proper value for each elasticity of substitution from Table 5.3 due to limitations of the data we used in the Chapter 5.

[20] Obtained from Table 12, Weerahewa, 2004.

[21] In 2012, less than 5% of the total paddy production of the country is purchased by PMB (Department of Census and Statistics, 2015). Therefore, we do not consider their impact.

where$P_{Seed}, P_{Che}, P_{Fert}, P_T, P_L, P_M, Q$ denote seed, agrochemical, fertilizer, land price, wage, machinery cost and output level, respectively.

$C_{BC}$and $C_M$describe sub-cost function for BC and M technology, respectively. Using the above cost function, the structure of the model employed in this study is as follows:

$$\frac{\partial \mathrm{C}}{\partial P_j}(P_{Seed}, P_{Che}, P_{Fert}, P_T, P_L, P_M, Q) = S_j(P_j) \quad (2)$$

for $j = Seed, Che, T, L, M$

$$\frac{\partial \mathrm{C}}{\partial P_{Fert}}(P_{Seed}, P_{Che}, \bar{P}_{Fert}, P_T, P_L, P_M, Q) = S_{Fert}(P_{Fert}) \quad (3)$$

$\bar{P}_{Fert}$: Exogenous

P_{Fert}: Exogenous

$$P_{rice} = \mathrm{D}(P_{rice}) \quad (4)$$

$$P_{rice} = C\big(C_{BC}(P_{Seed}, P_{Che}, \bar{P}_{Fert}, P_T), C_M(P_L, P_M)\big) + \text{ marketing margin} \quad (5)$$

$\bar{P}_{Fert}$ is the farmers fertilizer price set by the government, P_{Fert} is the domestic market price of fertilizer. Since Sri Lanka is small open economy in the fertilizer trade, domestic market price of fertilizer is assumed to be constant as unity (bench mark domestic market price of fertilizer).

For comparison, one stage CES technology (elasticity of substitution is assumed to be 0.4[22)]) is also employed. We set the benchmark year market price indices as one. Since benchmark data are available, we can simply calculate the real values. Simulations are based on assumed farm gate fertilizer price index of 0.3, 0.5 and 1 set by the government. Since there is no obligation to receive the direct transfer payments, it does not have any impact on the model. Therefore, we have to consider only the change in farm gate price of fertilizer. Since government announced the maximum price as SLRs. 2,500 per 50 kg fertilizer bag, still there is some government intervention in fertilizer market and we estimate the weighted farm gate price index value using the market price of Urea (SLRs. 2,641), and, TSP (SLRs. 2,829) and MOP (SLRs. 3,014). Accordingly, we used farm gate fertilizer price index of 0.8 to specify the direct transfer payment proposed by the government. In addition cost effectiveness of the fertilizer subsidy is calculated in the form of transfer inefficiency. Transfer inefficiency is the ratio between decrease in subsidy

[22)] This value is average of two elasticity of substitution in two stage CES technology. We did sensitivity analysis with different elasticity values ranges from 0.2-0.9. There are no big differences in results.

expenditure and decrease in farm profit (Transfer inefficiency 1). Also Transfer inefficiency 2 is calculated according to the methodology based on the World Bank 2013 to compare the results (See Table 4.1).

Sensitivity analyses are conducted assuming different values for the elasticity of substitution for one stage CES of BC and M technology (values ranging from 0.05 to 0.2), two stage CES of BC process (values ranging from 0.2 to 0.9) and M process (0.5 to 0.9) to check the robustness of the results (Appendix 4.1).

4.4. Simulation Results and Discussion

The results of simulation analysis explained above are summarized in Table 4.1.

The figures from the two stage CES shows that paddy production decline by 3.8% compared to the base year production level, if the subsidy is completely withdrawn. However, when one stage CES technology is used, production goes down only by 3.2% if the fertilizer subsidy is totally removed. The analysis further shows that fertilizer supply and demand trim down by 19%, 27%, and 36% if the government increases the issue price of one kilogram of fertilizer to farmers by 0.3 (21 SLRs.), 0.5 (35 SLRs.) and 1 (70 SLRs.) which is equal to the market price) respectively with two stage CES technology. In addition, the results reveal that the demand/supply of machinery and labor decrease by 3.2% and 2.8% respectively if the fertilizer subsidy is totally removed. Contrast to that demand/supply for agro chemical and seed rise by 1.4% and 1.2% respectively. Meanwhile, results show that the value of rice production decrease by 3.1% under the proposed direct transfer payment method. However, the fertilizer demand under this system decline by 33% in the short run and machinery and labor demand also decrease by 2.6% and 2.3% respectively. In addition, reduction in seed and agro chemical demand is nearly 1%.

As observed in two stage CES, rice price increase is around 9% and 18% if the issue price of fertilizer to farmers is increased to 0.5 and 1 respectively. However, it is around 8% with the one stage CES if 50% subsidy (0.5) is applied. It is estimated that rice price will increase by 14.5%, if the farm gate price of fertilizer increase to 0.8 under the direct transfer method. Compared to output price increases price of input such as seed and agro chemical also increases while market prices of machinery and labor are decrease with the two stage CES technology.

Table 4.1: Simulation Results

Item	Bench mark value	Simulation results (%)				
		2SCES				1SCES
Issue Price of fertilizer to farmers (Index)	0.1	0.3	0.5	0.8	1.0	0.5
Production Value (bil. SLRs)	126.4	-1.1	-2.0	-3.1	-3.8	-1.8
Factor Demand and Supply						
seed (bil. SLRs)	7.0	0.4	0.7	1.0	1.2	0.7
fertilizer (bil. SLRs)	28.9	-19.2	-26.8	-33.1	-35.9	-46.8
chemical (bil. SLRs)	8.4	0.5	0.9	1.3	1.4	1.0
machinery (bil. SLRs)	24.2	-0.9	-1.6	-2.6	-3.2	1.0
labor (bil. SLRs)	36.7	-0.8	-1.4	-2.3	-2.8	0.9
Market Prices						
rice (Index)	1.0	4.9	9.0	14.5	17.8	8.1
seed (Index)	1.0	0.9	1.4	2.0	2.3	1.5
chemical (Index)	1.0	0.4	0.6	0.8	1.0	0.7
machinery (Index)	1.0	-0.6	-1.1	-1.7	-2.1	0.7
wage (Index)	1.0	-0.8	-1.4	-2.3	-2.8	0.9
Shadow rental (Index)	1.0	3.0	5.1	7.3	8.4	3.3
Farm Profit (bil. SLRs)	46.9	-10.8	-20.0	-32.6	-40.3	-16.6
Fertilizer subsidy expenditure (bil. SLRs)	26.0	-37.2	-59.3	-85.1	-100.0	-70.4
Transfer inefficiency 1 (decrease subsidy expenditure/ decrease farm profit)		1.91	1.64	1.45	1.38	2.35
Farm Income (bil. SLRs) production value-fertilizer cost	123.5	-4.4	-8.3	-13.4	-16.6	-5.7
Transfer inefficiency 2 (decrease subsidy expenditure/decrease farm income)		1.76	1.51	1.34	1.27	2.59

Source: Authors' estimation

Note: Definition of farm income is based on World Bank, (2013)

The major difference in results obtained from one stage and two stage CES technologies is the changes in demand/supply as well as the market prices of labor and machinery. According to the results, when two stage CES technology is employed, demand/supply and prices of the labor and machinery declined. However, values increased with one stage CES. This means that the specification in production technology is important for evaluating factor market intervention.

Moreover, the study result reveals that if the government increases the issue price of fertilizer to farmers by 50% of the market price, public expenditure decreases by 59 % (SLRs 15.3 billion) compared to the base year subsidy expenditure of SLRs 26 billion. Meanwhile, the farm profit decreases by 20% (SLRs 9.4 billion). However, if the fertilizer subsidy is removed completely, farm profit decreases by 40% (SLRs 18.9 billion) where as market price of rice increase by 18% with two stage CES technology. In addition, the proposed cash transfer method will reduce the farm profit by 33%.

The simulation reveals that the government spends SLRs. 1.38-1.91 to increase farm profit by one rupee (Transfer inefficiency 1 in Table 4.1). World Bank (2013) estimated the transfer inefficiency in fertilizer subsidy program from the viewpoint of farm income increase. Since this study defines the farm income as farm gate production value minus fertilizer cost, we follow the same definition and estimate the transfer inefficiency. These values are shown as transfer inefficiency 2 in Table 4.1. Judging from the figures, our results are consistent with the results obtained by World Bank (2013)[23].

Results of our analysis are also in line with findings of some previous studies. Kikuchi and Aluwihare (1990) estimated that removing the fertilizer subsidy would reduce paddy yield by only 1-2% in the long run, since nitrogen demand was relatively inelastic with respect to price. Moreover, Ekanayake (2006) supported this conclusion and found low elasticity of fertilizer policies on consumption of the three main fertilizers. Gunawardena and Flinn, (1987) estimated short run production elasticities by using micro level data and concluded that there is relatively small incentive to increase paddy production in response to reduction in the price of fertilizer (-0.01). According to these results, complete subsidy cut reduces output by 0.9% which is smaller than our estimation result. However, our results seems to underestimate, compared to the recent findings of the World Bank (2013) which estimated the rice yield reduction by around 8% with the removal of the subsidy.

In contrast to the negative impact on paddy production and farm profit, current fertilizer subsidy (before 2016) leads to unnecessarily usage of fertilizer more than the optimal level and other adverse environmental and health effects, also reported. Also it is a huge burden on the government budget. On the other hand, there are evidences that fertilizer usage is encouraged by the fertilizer subsidy and it increases the paddy production (yield). In addition, the elimination of subsidy is likely to create substantial political concern especially among rural groups in the society

[23] Subsidy program is highly cost ineffective as government spends between SLRs. 1.4 to SLRs. 2.4 per acre to increase farm income by one rupee (World Bank, 2013).

which we observe recently soon after the government proposed system of substituting it with direct cash transfer. Moreover, we cannot expect that the farmers apply more organic manure to their field as substitute for chemical fertilizer because there is no requirement to use organic fertilizer to receive the cash payments. Further, if the government intention is to convert farmers to apply organic fertilizer there should be some planned and regular mechanism to produce organic fertilizer in large scale. Otherwise it is not realistic to use organic fertilizer substituting chemical fertilizer to obtain the same yield. In addition, effectiveness of the proposed direct cash payment is doubtful since without obligation rural farmers might use this money for some other purposes or to drink alcohol without use them to apply fertilizer. Therefore, it is worth to consider all the impacts prior to introduce such policy change by the government and need to introduce less distortive and effective policy for the rice sector.

Sensitivity analysis is conducted assuming different values for elasticities of substitution for two stage BC_M, BC and M process from those determined arbitrarily in the text (Appendix 4.1). Therefore, it also suggests that simulation results are relatively robust under different parameter settings hence, the analysis is meaningful.

4. 5 Conclusions and Policy Implications

Fertilizer subsidy reforms are politically more concern and extremely difficult input policy because once adapted to huge subsidy it is not easy to get rid of them. Therefore, it is useful to consider various policy options and assess them for the effectiveness in the addressing different purposes. We developed one of the tools which is able to examine impact of fertilizer subsidy adjustment with more realistic functional form (BC-M specification). And the impact of fertilizer subsidy adjustment on national rice production, demand and supply of inputs, farm profit, government budget and the transfer inefficiency are examined.

The results suggest that, complete removal of current fertilizer subsidy reduce the fertilizer demand/supply and farm profit significantly while paddy production decline by around 4%. In addition consumer rice prices also increases drastically with the current fertilizer subsidy reduction. However, this will ease the massive burden on government budget. Moreover, the proposed cash transfer will reduce the paddy production by 3% and rice price increase by 14.5% in the short run. In addition input demand of fertilizer, labor and machinery decrease with two stage CES technology while demand for seed and agro chemical increase. Meanwhile, adjustment to the fertilizer subsidy will reduce the farm profit by 11 to 40%. Further, results reveal that government spends SLRs. 1.38-1.91 to increase farm profit by one rupee. Therefore, the current fertilizer subsidy program in the country is hardly cost effective. The results also suggest the labour reduction with the fertilizer subsidy adjustments. Hence, the

government needs to take steps to reduce the stress on households' income and smooth labour mobilization to other sectors in the economy. Even though the fertilizer subsidy program in the country is seems to be less efficient in economical terms, it is not easy to make any alteration because it is politically more sensitive in the country.

Appendices to Chapter 4

Appendix 4.1: Results of the Sensitivity Analysis

Description	Benchmark Value	BC_M=0.2	BC=0.9	M=0.9
		% Change	% Change	% Change
Production	126,382	-0.8	-2.0	-1.1
Factor demand				
Seed	7,034	-0.1	4.8	0.4
Fertilizer	28,902	-19.8	-57.6	-19.2
Chemical	8,473	-0.1	8.5	0.5
Machine	24,266	-0.1	-1.6	-0.9
Labor	36,783	-0.1	-1.4	-0.8
Land	46,935	0.0	0.0	0.0
Prices				
Rice	1.000	3.8	9.0	4.9
Seed	1.000	-0.1	9.7	0.9
Fertilizer	1.000	0.0	0.0	0.0
Chemical	1.000	-0.1	5.6	0.4
Machine	1.000	-0.1	-1.1	-0.6
Labor	1.000	-0.1	-1.4	-0.8
Land	1.000	-0.5	15.5	3.0

Source: Authors' estimations

CHAPTER 5

RICE PRODUCTION STRUCTURES: THE NORMALIZED TRANSLOG PROFIT FUNCTION APPROACH

5.1 Introduction

The development of the rice sector is vital to the wellbeing of the people since it still plays a key role in terms of employments, and main staple food in Sri Lanka. In spite of significant advances in rice production sector and various incentives provided to the sector, there is a rising concern about escalating the cost of production and declining profitability in rice cultivation. The main objective of this chapter, therefore, is to analyze input demand and output supply parameters of paddy production with special reference to the fertilizer subsidy. In addition, study intends to estimate elasticities of the paddy supply and input demand which are vast important for the accurate prediction of the responsiveness of farmers to changes in input-output prices. Further, this analysis aims to estimate the elasticities of substitution among different inputs used in paddy cultivation in Sri Lanka.

In order to meet the above objectives this chapter is arranged as follows. Next section presents brief review of literature focusing various econometric techniques employed for the estimation of output supply and input demand functions. Section 5.3 presents the methodology employs to achieve the intended objectives. Section 5.4 discusses the results using normalized translog profit function approach that jointly estimates output supply and input demand parameters in rice production. The final section presents the concluding remarks.

5.2 Literature Review

Different econometric techniques have been employed for the estimation of demand for inputs and supply of agricultural crops. Among them: production function approaches, cost function approach, profit function approach etc. are widely used. Direct or indirect application of Cobb-Douglas production function is based on highly restricted assumptions of unitary elasticity of substitution, constant returns to scale hence it yields invalid elasticities (Diewert 1971; Christensen *et al.,* 1973). In addition, production functions with Constant Elasticity of Substitution (CES), Variable Elasticity of Substitution (VES) and the nested CES production functions are applied to estimate the production structures. However, they are based on rigid restrictions and incapable of explaining exact relationships among variables (Chaudhary e*t al.,* 1998). Consequently, the duality approach was widely applied to provide a

comprehensive relationship among inputs and outputs (Beccera and Shuway 1992; Siregar 2007). The translog form is flexible because specific features of technology such as returns to scale or homotheticity may be tested by examining the estimated model parameters (Ray, 1982). Berndt and Christensen (1973), Berndt and Wood (1975), Christensen *et al.* (1975) and Binswanger (1974) also employed translog models. In addition, many authors have used profit function in empirical estimation of factor demand and output supply parameters (Yotopoulos *et al*., 1976; Sidhu and Baanante, 1979 and 1981; Bapna *et al*., 1984; Ball, 1988; Fulginiti and Perrin, 1990, Altemeier and Bottema, 1991).

Among the various functional forms a flexible functional form for the profit function is preferred (Diewert, 1973; Fuss *et al*., 1978; Lopez, 1985) and translog, normalized quadratic and generalized Leontief are some of them. Restricted normalized translog profit function is utilized as it is able to depict input demand and output supply simultaneously. The translog profit function is a flexible functional form to estimate the input demand as it can eliminate problems related to the restrictive as required by Cobb-Douglas profit function (Diewert, 1971). Therefore, many researchers chose to start from a profit function and derive input demand and supply response functions from the profit function based on Hotelling's Lemma (Wall and Fisher, 1988; Hattink *et al*., 1998).

So far, in Sri Lanka only one study (Rajapaksha and Karunagoda, 2009) has examined the relationship among the multiple inputs used in paddy cultivation by applying the translog profit function approach using time series data. Despite that there were some previous studies which estimated the demand for fertilizer in Sri Lanka using various approaches. As example, Thusiman *et al*. (1987) estimated short run production elasticities by using micro level data and concluded that it is relatively less sensitive to increase paddy production in response to decrease in the price of fertilizer. Meanwhile, a partial equilibrium model developed by Weerahewa (2004) to capture the changes in policy framework in demand and supply function of paddy has estimated the demand and supply elasticities for the period of 1978-2000. In that model, rice demand is a function of rice price, other crop prices and expenditure while supply is a function of paddy price and only two inputs: seed price and fertilizer price. In addition, Ekanayake (2006) has estimated the fertilizer demand elasticities for the period of 1981-2004 based on econometric method. According to his estimates fertilizer demand was relatively inelastic with respect to fertilizer prices. While, Weligamage *et al*. (2009) has estimated rice production functions in Kirindi oya area using household survey data. Recently, Weerasooriya and Gunaratne (2009) examined the link between the changes in productivity

and fertilizer use associated with the fertilizer subsidy using supply and area response functions for the period of 1983-2007. However, none of these studies have examined the elasticity of substitution of inputs used in paddy in Sri Lanka. Also there are no proper elasticity estimates for input demand and output supply in rice using recent input output data. Hence, this study seems to fill the knowledge gap in Sri Lanka using a normalized translog profit function approach.

5.3 Methodology

This study estimates the input demand and output supply functions in four selected districts in Sri Lanka for the period of 1990-2012. The selected districts are Anuradhapura, Hambantota Kurunegala and Polonnaruwa which contributed 11%, 6%, 11% and 13% correspondingly (average of 2009-12 periods) (Department of Census and Statistics, 2012) to the national rice production annually. Anuradhapura, Hambantota and Polonnaruwa districts belong to the dry zone where paddy cultivation is mainly under the irrigation schemes while Kurunegala district belongs to the Intermediate zone where paddy cultivation is under the rain–fed and irrigated schemes. In addition, commercial level paddy cultivation is conducted in all four districts.

The demand for a production input is a derived demand based on the demand for final products. Farmers are assumed to behave rationally and the general profit function can be expressed as:

$$\pi = PQ - wx$$

Production function is given by: $Q = f(x, z)$

Where π is profit, P and w are prices of output and inputs respectively. Output quantity is Q, while x and z are the vectors of variable input quantities and fixed factor quantities. Therefore, profit function can be solved for the maximization situation.

Max $PQ - wx$ subject to $Q = f(x, z)$

The solution for this problem is a set of input demand and output supply functions given by,

$$x = x(P, w, z)$$

$$Q = q(P, w, z)$$

Substituting the above equations in general profit function gives profit maximization level of input and output.

$$\pi = P^{'} q(P, w, z) - w^{'} x(P, w, z)$$

Inverse input demand function and output supply functions can be obtained by differentiating the profit function with respect to the input price w and output price P.

$X_i^* = -\frac{\partial \pi}{\partial w_i} = X^*(P, w, z)$ and $Q^* = \frac{\partial \pi}{\partial P} = Q^*(P, w, z)$

A generalization of the Normalized trans-log profit function for a single output is given by Diewert (1974), Christensen *et al*. (1973);

$$\ln \pi^* = \alpha_0 + \sum_{i=1}^{n} \alpha_i \, lnP_i^* + \frac{1}{2}\sum_{i=1}^{n}\sum_{h=1}^{n} \gamma_{ih} lnP_i^* \, lnP_h^* + \sum_{i=1}^{n}\sum_{k=1}^{m} \delta_{ik} \, lnP_i^* lnZ_k + \sum_{k=1}^{m} \beta_k \, lnZ_k +$$

$$\frac{1}{2}\sum_{k=1}^{m}\sum_{j=1}^{m} \emptyset_{kj} \, lnZ_k lnZ_j + \varepsilon_i \qquad (1.1)$$

Where, $\gamma_{ih} = \gamma_{hi}$, $\delta_{ik} = \delta_{ki}$ and $\emptyset_{kj} = \emptyset_{jk}$ and for all h, i and k and the function is homogeneous of degree one in prices of all variable inputs and outputs. The definition of the variables and notation used in the profit function are as follows: π^* is the restricted profit (total revenue less total cost of variable inputs) normalized by P_q, the price of output, P_i^* is the price of variable input X_i, normalized by P_q, Z_k is the k[th] fixed inputs; $i = h = 1, \ldots . n$, $k = j = 1, \ldots m$; ln is the natural logarithm; and $\alpha_{0,}\alpha_i$, γ_{ih} , δ_{ik}, β_k and $\emptyset_{kj}$ are the parameters to be estimated and ε_i is random error.

The partial derivatives of restricted profit function with respect to logs of input price yield the share equations as follows;

$$S_i = \frac{P_i^* X_i}{\pi^*} = \frac{\partial ln \, \pi^*}{\partial ln \, P_i^*} = \alpha_i + \sum_{h=1}^{n} \gamma_{ih} lnP_h^* + \sum_{k=1}^{m} \delta_{ik} \, lnZ_k \qquad (1.2)$$

$$S_q = \frac{P_q^* X_q}{\pi^*} = 1 + \frac{\partial ln \, \pi^*}{\partial ln \, P_q^*} = 1 - (\alpha_i + \sum_{h=1}^{n} \gamma_{ih} lnP_h^* + \sum_{k=1}^{m} \delta_{ik} \, lnZ_k) \qquad (1.3)$$

Where S_i is the share of i th input and S_q is the share of output(q). S_q is equivalent to the ratio of the total value of output to restricted profit. Since the output and input shares come from singular system of equations, their summation is equal to one and one of the share equations can be ignored.

The normalized input prices and quantities of fixed factors are considered the exogenous variables under the price taking behavior. Using Hotelling Lemma, the translog profit function can be served to obtain the following share equations:

Derived factor demand function:

$$X_i = -\frac{\pi^*}{P_i}[\alpha_i + \sum_{h=1}^{n} \gamma_{ih} lnP_h^* + \sum_{k=1}^{m} \delta_{ik}\, lnZ_k] \quad (1.4)$$

Derived output paddy supply function:

$$X_q = \frac{\pi^*}{P_q}[1 - (\alpha_i + \sum_{h=1}^{n} \gamma_{ih} lnP_h^* + \sum_{k=1}^{m} \delta_{ik}\, lnZ_k)] \quad (1.5)$$

By using share equations and estimates of the profit function, output supply elasticity and input demand elasticities will be estimated simultaneously.

Estimation of Elasticities

The elasticities of variable input demands and output supply with respect to all exogenous variables evaluated at averages of the S_i and at given levels of variable input prices. These are the linear transformations of parameter estimates of the profit function.

From (1.2) the demand equation for the i^{th} variable input can be written as,

$$X_i = \frac{\pi}{P_i} \ln\left(-\frac{\partial ln\pi}{\partial \ln P_i}\right) \quad (1.6)$$

$$lnX_i = ln\pi - lnP_i + \ln\left(-\frac{\partial ln\pi}{\partial \ln P_i}\right) \quad (1.7)$$

The own- price elasticity of demand (η_{ii}) for X_i is,

$$\eta_{ii} = \frac{\partial \ln X_i}{\partial \ln P_i} = \frac{\partial \ln \pi}{\partial \ln P_i} - 1 + \frac{\partial ln}{\partial \ln P_i}\left(-\frac{\partial ln\pi}{\partial ln P_i}\right) \quad (1.8)$$

$$\eta_{ii} = -S_i^* - 1 - \frac{\gamma_{ii}}{S_i^*} \quad (1.9)$$

Where S_i^* is the simple average of S_i.

Similarly from (1.7), the cross price elasticity of demand (η_{ih}) for input i with respect to the price of h th input can be obtained:

$$\eta_{ih} = \frac{\partial \ln X_i}{\partial \ln P_h} = \frac{\partial \ln \pi}{\partial ln P_h} + \frac{\partial ln}{\partial ln P_h}\left(-\frac{\partial \ln \pi}{\partial ln P_i}\right) \quad (1.10)$$

$$\eta_{ih} = -S_h^* - \frac{\gamma_{ih}}{S_i^*} \quad (1.11)$$

Where$i \neq h$.

The elasticity of demand for input $i(\eta_{iq})$ with respect to output price, P_q, can also be obtained from (1.7);

$$\eta_{iq} = \frac{\partial \ln X_i}{\partial \ln P_q} = \frac{\partial \ln \pi}{\partial \ln P_q} - \frac{\partial \ln P_i}{\partial \ln P_q} + \frac{\partial ln}{\partial \ln P_q}\left(-\frac{\partial \ln \pi}{\partial \ln P_i}\right) \quad (1.12)$$

$$\eta_{iq} = \sum_{i=1}^{n} \frac{\partial \ln \pi}{\partial \ln P_i} \cdot \frac{\partial ln}{\partial \ln P_q} - (-1) - \sum_{h=1}^{n} \frac{\gamma_{ih}}{S_i^*}(-1) \quad (1.13)$$

Where $i = 1, \ldots\ldots\ldots, n, h = 1, \ldots\ldots n,$

$$\eta_{iq} = \sum_{1=1}^{n} S_i^* + 1 + \sum_{h=1}^{n} \frac{\gamma_{ih}}{S_i^*} \quad (1.14)$$

The elasticity of demand (η_{ik}) for input (i) with respect to the k th fixed factor Z_k is also obtained from (1.7):

$$\eta_{ik} = \frac{\partial \ln X_1}{\partial ln Z_k} = \frac{\partial \ln \pi}{\partial \ln Z_k} - \frac{\partial \ln P_i}{\partial \ln Z_k} + \frac{\partial ln}{\partial ln Z_k} - \left(-\frac{\partial \ln \pi}{\partial \ln P_i}\right), \quad (1.15)$$

$$\eta_{ik} = \sum_{i=1}^{n} \delta_{ik} \ln P_i + \beta_k - \frac{\delta_{ik}}{S_i^*} \quad (1.16)$$

Output Supply Elasticities

We evaluate the output supply elasticities with respect to output price, price of variable inputs and quantities of fixed inputs at averages of S_i and at given levels of exogenous variables. It can also be expressed as linear functions of restricted profit function parameters. Equation for output supply (q) can be written as (1.17) using the duality theory.

$$q = \pi + \sum_{i=1}^{n} P_i X_i \quad (1.17)$$

By using (1.4), gives the equation;

$q = \pi + \sum_{i=1}^{n} \pi \left(-\frac{\partial \ln \pi}{\partial \ln P_i}\right)$, or

$$q = \pi \left(1 - \sum_{i=1}^{n} \frac{\partial \ln \pi}{\partial \ln P_i}\right) \quad (1.18)$$

$$\ln q = \ln \pi + ln \left(1 - \sum_{i=1}^{n} \frac{\partial \ln \pi}{\partial \ln P_i}\right) \quad (1.19)$$

Elasticity of supply with respect to the price of i th variable input is given by equation (1.20) where $i = h = 1, \ldots . n.$,

$$\epsilon_{qi} = \frac{\partial \ln q}{\partial \ln P_i} = \frac{\partial \ln \pi}{\partial \ln P_i} + \frac{\partial ln}{\partial \ln P_i}\left(1 - \sum_{h=1}^{n} \frac{\partial \ln \pi}{\partial \ln P_h}\right) \quad (1.20)$$

for the translog profit function:

$$\epsilon_{qi} = -S_i - \sum_{h=1}^{n} \gamma_{hi} / (1 + \sum_{h=1}^{n} S_h^*) \quad (1.21)$$

The own price elasticity of supply (ϵ_{qq}) and elasticity of output supply (ϵ_{qk}) with respect to the fixed inputs Z_k is calculated by using following equations.

$$\epsilon_{qq} = \sum_{i=1}^{n} S_i^* + \sum_{i=1}^{n} \sum_{h=1}^{n} \gamma_{ih} / (1 + \sum_{h=1}^{n} S_h^*) \quad (1.22)$$

$$\epsilon_{qk} = \sum_{i=1}^{n} \delta_{ik} \ln P_i + \beta_K - \sum_{i=1}^{n} \delta_{ik} / (1 + \sum_{h=1}^{n} S_h^*) \quad (1.23)$$

Partial Elasticities of Substitution

The partial elasticities of substitution are normalized price elasticities, represents how factor income shares change as the ratio of the factors change.

Atkinson and Halvorsen (1976) defined the Partial elasticities of substitution as:

$$\sigma_{ii} = \frac{1}{S_i} \eta_{ii} \quad (1.24)$$

and

$$\sigma_{ih} = \frac{1}{S_h} \eta_{ih} \quad (1.25)$$

Where σ_{ii} is the own elasticity of substitution and σ_{ih} is the cross elasticity of substitution.

5.3.1 Data

To estimate the model, labour, seeds, fertilizer and agro chemicals are included as variable factors of production of paddy. In addition the machinery cost and land are included as fixed factors of production. The profit function analysis is based on the data obtained from the biannual Cost of Cultivation Surveys conducted by the Socio Economics and Planning Centre of the Department of Agriculture for the period of 1990 to 2012. Weighted average price of urea, TSP and MOP are used as fertilizer price for the analysis. GDP deflator index values obtained from the annual reports of Central Bank are used as proxy to calculate the machinery price index and real price index values are obtained compared to Year 2000 values. Total cost of each inputs are calculated for the districts by multiplying per acre input cost from the paddy extent harvested area in each districts obtained from the Department of Census and Statistics for the each year. *Yala* and *Maha* season cost data are aggregated to obtain the total annual cost. Farm gate price of paddy is obtained from the Department of Agriculture and one year lagged farm gate price is used for the model.

All the time series variables are tested for the presence of stationary prior to perform the econometric analysis. In order to test for unit root at its level or first difference, all the variables are subjected to Augmented Dickey Fuller (ADF) unit root test. Since the variables of the time series are stationary their variances and auto covariances are independent of time.

5.3.2 Model Estimation

From the general function (1.1), the normalized restricted translog profit function can be specified in actual variables as:

$$\begin{aligned}\ln \pi^* = {} & \alpha_0 + \alpha_L \ln P_L^* + \alpha_S \ln P_s^* + \alpha_F \ln P_F^* + \alpha_C \ln P_C^* + \frac{1}{2}\gamma_{LL} \ln P_L^* \ln P_L^* + \frac{1}{2}\gamma_{SS} \ln P_S^* \ln P_S^* + \frac{1}{2}\gamma_{\mathrm{FF}} \ln P_F^* \ln P_F^* \\ & + \frac{1}{2}\gamma_{\mathrm{CC}} \ln P_C^* \ln P_C^* + \frac{1}{2}\gamma_{\mathrm{LS}} \ln P_L^* \ln P_S^* + \frac{1}{2}\gamma_{\mathrm{LF}} \ln P_L^* \ln P_F^* + \frac{1}{2}\gamma_{\mathrm{LC}} \ln P_L^* \ln P_C^* + \frac{1}{2}\gamma_{SF} \ln P_S^* \ln P_F^* \\ & + \frac{1}{2}\gamma_{SC} ln P_S^* \ln P_C^* + \frac{1}{2}\gamma_{FC} \ln P_F^* \ln P_C^* + \delta_{LZm} \ln P_L^* \ln Z_m + \delta_{LZa} \ln P_L^* \ln Z_a \\ & + \delta_{SZm} \ln P_S^* \ln Z_m + \delta_{SZa} \ln P_S^* \ln Z_a + \delta_{FZm} \ln P_F^* \ln Z_m + \delta_{FZa} \ln P_F^* \ln Z_a + \delta_{CZm} \ln P_C^* \ln Z_m \\ & + \delta_{CZa} \ln P_C^* \ln Z_a + \beta_{Zm} \ln Z_m + \beta_{Za} \ln Za + \frac{1}{2}\emptyset_{ZmZm} \ln Z_m \ln Z_a + \frac{1}{2}\emptyset_{ZaZa} \ln Z_a \ln Z_a \\ & + \emptyset_{ZmZa} \ln Z_m \ln Z_a \qquad (1.26)\end{aligned}$$

Where π^* is the restricted profit (real value) from paddy production: total revenue less total cost of labour, seeds, fertilizer and agro chemicals normalized by the farm gate price of paddy; P_L^* is the wage rate of labour per man day normalized by farm gate price of paddy; P_S^* is the seed price normalized by farm gate price of paddy, P_F^* is the fertilizer farm gate price normalized by farm gate price of paddy, P_C^* is the agro chemical price normalized by farm gate price of paddy (import value of pesticides is included as a proxy for agro chemical cost). Fixed inputs included in the specifications of the profit function are Z_m machinery price (obtained by dividing the machinery cost by GDP deflator index) and Z_a is the land area index. All the price indices are in real value (2000=1).

The parameters α_0, α, β, δ, and θ are to be estimated and subscripts L, S, F, and C stand for the variable input of production labour, seeds, fertilizer and agro chemicals respectively.

The partial derivatives of normal restricted translog profit function (1.26) with respect to log of input price are the negative share equations for labour, seeds, fertilizer and agro chemicals as follows:

$$-\frac{P_L X_L}{\pi^*} = \alpha_L + \gamma_{LL} \ln P_L^* + \gamma_{\mathrm{LS}} \ln P_S^* + \gamma_{LF} \ln P_F^* + \gamma_{\mathrm{LC}} \ln P_C^* + \delta_{LZm} \ln Z_m + \delta_{LZa} \ln Z_a \qquad (1.27)$$

$$-\frac{P_S X_S}{\pi^*} = \alpha_S + \gamma_{SS} \ln P_S^* + \gamma_{\mathrm{LS}} \ln P_L^* + \gamma_{SF} \ln P_F^* + \gamma_{SC} \ln P_C^* + \delta_{SZm} \ln Z_m + \delta_{SZa} \ln Z_a \qquad (1.28)$$

$$-\frac{P_F X_F}{\pi^*} = \alpha_F + \gamma_{FF} \ln P_F^* + \gamma_{\mathrm{LF}} \ln P_L^* + \gamma_{SF} \ln P_S^* + \gamma_{FC} \ln P_C^* + \delta_{FZm} \ln Z_m + \delta_{FZa} \ln Z_a \qquad (1.29)$$

$$-\frac{P_C X_C}{\pi^*} = \alpha_C + \gamma_{CC} \ln P_C^* + \gamma_{\mathrm{LC}} \ln P_L^* + \gamma_{SC} \ln P_S^* + \gamma_{FC} \ln P_F^* + \delta_{CZm} \ln Z_m + \delta_{CZa} \ln Z_a \qquad (1.30)$$

WhereX_L,X_S, X_F and X_C are the quantities of variable inputs of labour, seeds, fertilizer and agro chemicals, respectively. Other variables and parameters are same as defined earlier.

Under the assumptions of profit maximizing and price taking behavior, the parameters in equation (1.26) must be equal to the corresponding parameters in equation (1.27), (1.28), (1.29), (1.30) and must fulfill the symmetry restriction. This concept will provide testing the hypothesis of profit maximization.

Since the input and output shares come from a singular system of equations (since by definition $S_q - \sum S_i$=1), one of the share equations, the output share is dropped and the profit and factor demand equations are estimated as simultaneous system.

An error term of the profit function and share equations are likely to be correlated contemporaneously due to large number of common explanatory variables. Thus Ordinary Least Square (OLS) is not applicable to estimate the equation in the system. OLS is also not appealing as we need to impose cross equation restrictions. This problem can be overcome by using Zellner's estimation procedure for Seemingly Unrelated Regression (SUR) to obtain estimates which are asymptotically equivalent to Maximum Likelihood Estimation (MLE) when iterated to convergence and invariant to which share equation is deleted. In addition to the symmetry constraints ($\gamma_{LS} = \gamma_{SL}$,$\gamma_{LF} = \gamma_{FL}$, $\gamma_{LC} = \gamma_{CL}$, $\gamma_{SF} = \gamma_{FS}$, $\gamma_{SC} = \gamma_{CS}$, $\gamma_{CF} = \gamma_{FC}$), the linear parametric constraints are also imposed across equations.

Before proceeding to the estimated parameter of normalized restricted translog profit and share equations, two hypothesis tests are carried out. They are test for the validity of profit maximization and Cobb Douglas hypothesis. The first empirical test checks the validity of symmetry and homogeneity restrictions across profit and share equations. The null hypothesis in the first test indicates that the parameters of the input share equations 1.27, 1.28, 1.29 and 1.30 are equal to the corresponding same parameters on the profit equation 1.26. An F test statistic with good asymptotic properties is conducted to test this hypothesis (Theil 1971). F test statistics indicates that the null hypothesis cannot be rejected at 0.05 level of significance. This means that the profit maximization assumption is valid for all four districts.

The second statistical test is conducted in order to check the Cobb-Douglas (C-D) hypothesis where the coefficients of all second order terms in profit function (1.26) should be zero. Therefore, an *F*-test is conducted to test the null hypothesis that all γ_{ih} equal zero and all δ_{ik} equal zero. Based on the F-test, the hypothesis on Cobb-Douglas is rejected, suggesting that the translog profit function is more suitable for the data.

The Stata 12 statistical software is used for the analysis.

5.4 Results and Discussion

The parameter estimates of translog profit function for each district is presented in Table 5.1 and output supply and demand elasticities derived are presented in Table 5.2 for the selected districts of Anuradhapura, Hambantota, Kurunegala, and Polonnaruwa respectively. These elasticities are evaluated at simple averages of the S_i and at geometric means of the variable input prices and of levels of fixed inputs.

Table 5.1: Estimated Normalized Translog Profit Function for Paddy

Variable	Polonnaruwa	Anuradhapura	Hambantota	Kurunegala
Lnpl	-0.8100*	-0.9823*	-0.9550*	-1.2126*
	(.1145)	(.1452)	(.1291)	(.1098)
Lnps	-0.0869*	-0.1148*	-0.1744*	-0.1241*
	(.0108)	(.0151)	(.0236)	(.0158)
Lnpf	-0.2279*	-0.2448*	-0.2434*	-0.2799*
	(.0315)	(.0292)	(.0385)	(.0375)
Lnpc	-0.1253*	-0.1176*	-0.1715*	-0.1493*
	(.0245)	(.0162)	(.0344)	(.0209)
Lnplpl	-0.7459*	-1.0896*	-0.9419*	-1.5480*
	(.1432)	(.1554)	(.1418)	(.1339)
Lnpsps	-0.0600*	-0.2128*	-0.0244	-0.0924*
	(.0076)	(.0316)	(.0371)	(.0194)
Lnpfpf	-0.1187*	-0.1290*	-0.1682*	-0.1508*
	(.0141)	(.0205)	(.0260)	(.0174)
Lnpcpc	0.0170	-0.0730	0.1790*	-0.0824
	(.0291)	(.0529)	(.0899)	(.0565)
Lnplps	-0.0348*	-0.0273	-0.1671*	-0.0597*
	(.0121)	(.0286)	(.0449)	(.0224)
Lnplpf	-0.0939*	-0.1950*	-0.1992*	-0.2572*
	(.0358)	(.0373)	(.0461)	(.0383)
Lnplpc	-0.2020*	-0.1190*	-0.3725*	-0.1309*
	(.0420)	(.0457)	(.0859)	(.0429)
Lnpspf	-0.0094*	-0.0321*	0.0016	-0.0181*
	(.0033)	(.0057)	(.0136)	(.0065)
Lnpspc	-0.0310*	0.0250	-0.1023*	-0.1023*
	(.0070)	(.0271)	(.0416)	(.0246)
Lnpfpc	0.0075	0.0090	-0.0707*	-0.0224*
	(.0118)	(.0106)	(.0252)	(.0094)
Lnplzm	-0.0782	-0.0815	0.0648	0.6210*
	(.2077)	(.1505)	(.0737)	(.1769)
Lnplza	-0.8363*	-0.7474*	-0.7869*	-1.5387*
	(.2706)	(.1530)	(.1116)	(.2123)
Lnpszm	-0.0392	-0.0299	0.0731*	-0.0238
	(.0127)	(.0224)	(.0211)	(.0222)
Lnpsza	-0.0438*	-0.0652*	-0.2422*	-0.1060*
	(.0197)	(.0228)	(.0294)	(.0250)
Lnpfzm	-0.1458*	-0.0240	-0.1518*	-0.0698
	(.0534)	(.0640)	(.0459)	(.0584)
Lnpfza	-0.2847*	-0.1016	-0.1449*	-0.1980*
	(.0823)	(.0693)	(.0711)	(.0643)
Lnpczm	0.0208	-0.0336	-0.1098*	-0.0215
	(.0596)	(.0399)	(.0412)	(.0365)
Lnpcza	-0.1752	-0.0120	-0.0606	-0.1326*
	(.0967)	(.0409)	(.0605)	(.0412)
Cons	7.6589	7.3038*	6.7770*	7.2074*
	(.0990)	(.1620)	(.1364)	(.1028)

Note: Standard errors are in parenthesis. * Significant at 5%.

As shown in Table 5.1, coefficient of factor prices of labor, seeds, fertilizer and agro chemicals and their interaction terms are negative in the profit function. Based on the results, price of labor, seeds, fertilizer and agro chemicals are significantly influence the profit function. Therefore, cheaper input prices increase the profit obtained from paddy cultivation. However, the coefficient values are less than unity, indicate the input prices affect inelastically on the profit. Moreover, the highest coefficient values for the labor wage rate, followed by fertilizer price indicates the profit is highly depending on labour wage rate and fertilizer price.

As shown in Table 5.2 (a, b, c, d), the farm gate price of paddy has a significant positive effect on paddy supply while variable factor prices have negative effects as expected. The supply elasticity with respect to previous year farm gate price is positive and inelastic; a 1% rise in the paddy price would expand the supply of paddy ranging between 0.4 to 0.6 and on an average it is 0.5%. Therefore, results indicate that the effect of paddy price is more important to determine the country's paddy supply than the price of fertilizer. And also our supply elasticity is in line with recent study findings of Weerahewa (2004) that estimated supply elasticity with respect to own price is 0.6 and with respect to fertilizer price is -0.07 for the 1978-2000 periods. But our elasticity values are smaller than the results obtained by Rajapaksha and Karunagoda (2009) that estimated own price elasticity of paddy supply raging between 0.85 in Polonnaruwa district to 2.37 in Kalutara district. Meantime, the aggregate paddy output elasticities with respect to price were relatively low in Sri Lanka in early years, with short-run supply elasticity falling between 0.09 and 0.13 and long-run elasticity 0.11-0.19 (Gunawardana and Oczkowski 1992; Bogahawatte 1983; Samaratunga 1984).

The negative supply elasticities with respect to variable inputs imply that the input use will decline with the increased input price thus would reduce the paddy yield and output. Moreover, the results show that wage rate and fertilizer price are the influencing variable inputs on paddy supply while fixed factor of land also affect significantly. The results show that the output supply with respect to fertilizer price is significant and -0.05 on an average. Therefore, fertilizer subsidy has a significant positive effect on paddy output in the country and the effect is relatively small compared to paddy price. According to the figures, supply elasticity with respect to fertilizer price is quite comparable in absolute values in Anuradhapura and Kurunegala districts (-0.05) whereas values are less than unity in all four districts. Thus, the paddy supply with respect to fertilizer price is inelastic as estimated. In addition, 1% rise in wage rate will decrease the paddy supply by 0.18% on an average.

Moreover, expansion of cultivable area would enhance paddy supply significantly and positively in all the districts. The largest supply elasticity in Kurunegala with respect to land area may be due to the fact that farmers in Kurunegala district cultivate paddy using rain-fed as well as irrigated system and when the irrigated water is available adequately so that increasing in land area would expand the paddy production significantly. But in other three districts paddy cultivation largely depends on irrigated water and supply is limited. Moreover, fixed input of machinery has slight positive impact in all the districts except in Kurunegala.

The own price elasticity of demand for inputs have negative signs as expected and are statistically significant except own price elasticity of agro chemical in Anuradhapura and own price elasticity of seed and chemical in Kurunegala district. Elasticity values are less than unity in absolute value for all the inputs in all four districts (except agro chemical in Hambantota and Polonnaruwa).

Table 5.2: Derived Elasticity Estimates for Paddy Supply and Demand for Variable Inputs in Rice Production

a) Elasticity values – Anuradhapura District

Output/ input	Price of Paddy	Price of Labour	Price of Seed	Price of Fertilizer	Price of Chemical	Machinery	Land
Paddy supply	.478*	-.231*	-.001	-.054**	-.042	.089	.503*
Labour demand	.617*	-.588*	-.078*	.022	.027	.044	.404*
Seed demand	.031	-.609*	-.830*	.087	-.339	.013	.028
Fertilizer demand	.596**	.090	.047	-.578*	-.155*	.015	.065
Agro-chemical demand	.868	.210	-.334	-.286*	-.457	.016	.006

Note: The figures are calculated at the mean value of shares. Significance test for each estimated elasticity can be conducted by making use of estimated standard errors as follows: $SE(\eta_{ih}) = SE(\gamma_{ih})/S_i$ and t statistics can be calculated by $t_{ih} = \eta_{ih}/SE(\eta_{ih})$ where η_{ih} is elasticity of factor demand

* Significant at 5%, ** Significant at 10%.

b) Elasticity values – Hambantota District

Output/input	Price of Paddy	Price of Labour	Price of Seed	Price of Fertilizer	Price of Chemical	Machinery	Land
Paddy supply	.422**	-.019	-.002	-.009	.012	.095	.667*
Labour demand	.056	-.535*	.086	.057	.336*	-.034	.378*
Seed demand	.040	.499	-.948*	-.215*	.623*	-.035	.116
Fertilizer demand	.100	-.505*	-.140	-.374*	.198	.109	.104
Agro-chemical demand	.521	1.708*	.547*	.267	-2.339*	.055	.030

Note: The figures are calculated at the mean value of shares. Significance test for each estimated elasticity can be conducted by making use of estimated standard errors as follows: $SE(\eta_{ih}) = SE(\gamma_{ih})/S_i$ and t statistics can be calculated by $t_{ih} = \eta_{ih}/SE(\eta_{ih})$ where η_{ih} is elasticity of factor demand

* Significant at 5%, ** Significant at 10%.

c) Elasticity values - Kurunegala District

Output/input	Price of Paddy	Price of Labour	Price of Seed	Price of Fertilizer	Price of Chemical	Machinery	Land
Paddy supply	.462*	-.168**	-.001	-.060*	.006	-.298*	1.205*
Labour demand	.422**	-.396*	-.051*	.021	.003	-.374*	.928*
Seed demand	.024	-.444*	-.285	-.079	.785*	.012	.054
Fertilizer demand	.607*	.086	-.037	-.618*	-.038	.052	.148
Agro-chemical demand	.120	.022	.670*	-.070	-.501	.012	.076

Note: The figures are calculated at the mean value of shares. Significance test for each estimated elasticity can be conducted by making use of estimated standard errors as follows: $SE(\eta_{ih}) = SE(\gamma_{ih})/S_i$ and t statistics can be calculated by $t_{ih} = \eta_{ih}/SE(\eta_{ih})$ where η_{ih} is elasticity of factor demand

* Significant at 5%, ** Significant at 10%

d) Elasticity values-Polonnaruwa District

Output/input	Price of Paddy	Price of Labour	Price of Seed	Price of Fertilizer	Price of Chemical	Machinery	Land
Paddy supply	.653*	-.281*	-.033	-.113*	-.052	.085	.971*
Labour demand	.795**	-.837*	-.003	-.101*	.145	-.053	.676**
Seed demand	.827	-.022	-.439*	-.062	-.304	.012**	.036
Fertilizer demand	1.143*	-.361*	-.025	-.679*	-.079	.109	.185
Agro-chemical demand	.905	.897	-.214	-.136	-1.452**	.016	.074

Note: The figures are calculated at the mean value of shares. Significance test for each estimated elasticity can be conducted by making use of estimated standard errors as follows: $SE(\eta_{ih}) = SE(\gamma_{ih})/S_i$ and t statistics can be calculated by $t_{ih} = \eta_{ih}/SE(\eta_{ih})$ where η_{ih} is elasticity of factor demand

* Significant at 5%, ** Significant at 10%.

Increase in output price would also encourage direct and significant expansion in demand for variable inputs especially labour and fertilizer in paddy cultivation. In quantitative terms, the 1% increases in demand for labour, associated with percentage increase in output price are 0.62, 0.06, 0.42 and 0.80 for the Anuradhapura, Hambantota, Kurunegala and Polonnaruwa districts, respectively. Meantime, the results also indicate that labour and agro chemicals in all four districts are substitute inputs in paddy production. Elasticity of labour with respect to fixed inputs of land is positive and significant for all the districts and the average elasticity value is 0.60. Therefore, degree of responsiveness to labour absorption is significant but inelastic. The significant negative elasticity value of labour demand with respect to machinery in Kurunegala district indicates that labour and machinery are complementary inputs and their combined application will increase paddy production. This might be due to the fact that in Sri Lanka the majority of the paddy lands are small plots of less than one hectare, thus mechanization in large scale cannot apply and consequently labour and small equipments are jointly use in paddy cultivation.

The study result suggests that the demand for seeds with respect to labour and fertilizer are complementary in inputs. Meanwhile, seed demand increase slightly with fixed inputs of machinery and land. Demand for fertilizer with respect to labor is negative and significant in the Hambantota and Polonnaruwa districts, while the elasticity values are positive but insignificant in Anuradhapura and Kurunegala districts. Hence, fertilizer and labour inputs in Hambantota and Polonnaruwa districts act as complementary inputs. Fertilizer demand elasticity with respect to land is in around 0.1. As can be seen from Tables 5.2 the own price elasticities of fertilizer are -0.58, -0.37, -0.62 and -

0.68 for Anuradhapura, Hambantota, Kurunegala and Polonnruwa districts respectively. Furthermore, fertilizer demand elasticity to the output price is highest in Polonnaruwa (1.14). Contrary, 1% increase in paddy price will increase the fertilizer demand only by 0.10% in Hambantota district. This is due to the fact that in Polonnaruwa district fertilizer use in paddy farming is noticeably higher than that of Hambantota district. Therefore, findings of our results show that fertilizer demand in the country is significantly affected by both farm gate price of paddy and fertilizer price. However, Ekanayake (2006) using a simple regression model, found that changes in the prices of fertilizer do not have a significant effect on fertilizer usage and own price elasticity of fertilizer demand is -0.1. Rajapaksha and Karunagoda (2009) also concluded that the fertilizer demand in the country is highly responsive to the paddy price rather than fertilizer price. According to their estimation, fertilizer demand is elastic with respect to its own price and paddy price. However, normalized translog profit function estimated by them seems to be unclear since they used interaction between paddy price and variable inputs in their model. Based on simple Cobb Douglas approach using individual farm level data, Weligamage *et al*. (2009) also found that the elasticity of paddy yield with respect to fertilizer application is 0.15 and this estimate implies that the elasticity of fertilizer demand with respect to fertilizer price is approximately -1.2.

Study results indicate that agro chemical demand with respect to output price is positive but not significant. Similarly, agro chemical demand with respect to fixed inputs is positive and relatively small. Moreover, the effect of wage rate on agro chemical demand is positive in all the districts indicates labour and agro chemicals are substitutes in paddy cultivation. This might be because instead of using more labour in general land preparation activities, weedicides can be used intensively to reduce the labour inputs. In addition, seed is also substitute to agro chemicals in Hambantota and Kurunegala districts.

The analysis also suggests that the expansion of capital in the form of agricultural machineries, decreases labour demand (except in Anuradhapura district) contributes positively to paddy production. In addition, exogenous increases in land area also increase the paddy production and demand for all variable inputs of production in the country. The expansion of land has relatively large influence on output supply and labour demand while seed, fertilizer and agro chemical demand have small impact.

Table 5.3: Estimated Elasticities of Substitution

Anuradhapura			
σ_{LL}=-0.69	σ_{Ls}= -0.71	σ_{LF}=0.11	σ_{LC}=0.24
σ_{ss}=-7.56	σ_{SF}=0.43	σ_{SC}=-3.05	
σ_{FF}=-2.81	σ_{FC}=-1.39		
σ_{CC}=-4.1			
Hambantota			
σ_{LL}=-0.70	σ_{Ls}=0.65	σ_{LF}=0.28	σ_{LC}=2.23
σ_{ss}=-7.17	σ_{SF}=-1.06	σ_{SC}=4.14	
σ_{FF}=-1.84	σ_{FC}=1.31		
σ_{CC}=-15.53			
Kurunegala			
σ_{LL}=-0.40	σ_{Ls}=-0.45	σ_{LF}=0.09	σ_{LC}=0.02
σ_{ss}=-2.55	σ_{SF}=-0.33	σ_{SC}=5.99	
σ_{FF}=-2.56	σ_{FC}=-0.29		
σ_{CC}=-3.83			
Polonnaruwa			
σ_{LL}=-1.06	σ_{Ls}=-0.03	σ_{LF}=-0.46	σ_{LC}=1.14
σ_{ss}=-4.91	σ_{SF}=-0.28	σ_{SC}=-2.39	
σ_{FF}=-3.09	σ_{FC}=-0.62		
σ_{CC}=-11.41			

Note: Elasticities of substitution values are evaluated at the means of the data**.** The subscripts L, S, F and C stand for Labour, Seeds, Fertilizer and Agro chemicals respectively. The own elasticities of substitution has little economic meaning.

The estimated elasticities of substitution between pairs of inputs are presented in the Table 5.3 for four districts. Labour is a substitute for agro chemicals and the highest substitutability value can be observed in Hambantota district. Nonetheless, labour is complement to the seed except in Hambantota district. The estimates also indicate that seed and fertilizer are complementary except in Anuradhapura district. In addition elasticity of substitution values between fertilizer and agro chemicals are also negative (except Hambantota). As seen from Table 5.3, the largest substitutability relation is between seeds and agro chemicals and the value is higher than the unity. However, the low elasticity of substitution between labour and fertilizer and other input pairs indicates that there is a complementary relationship among these inputs hence combined application of such inputs will synergistically increase the paddy production in the country.

From the analysis, following broad conclusions may be drawn about the paddy production in Sri Lanka.

5.5 Conclusions and Policy Implications

The overall estimations suggest that the changes in market prices of inputs and output affect significantly on farmer profit, rice supply and the resource use in paddy cultivation. Meanwhile, farmers maximize profit in paddy farming subject to given inputs (labour, seeds, fertilizer and agro chemicals), paddy prices and fixed factors of production (machinery and land).

The results show that paddy output in the country is more responsive to the increase in output price than change in fertilizer price. The impact of fertilizer price on paddy supply is relatively small (supply elasticity with respect to fertilizer price is -0.05) but significant. Generally fertilizer demand is thought to be more elastic in developing countries; this study outcome confirms that in Sri Lanka fertilizer demand is inelastic but significant to its own price. Consequently, fertilizer subsidy is one of the main factors to increase the fertilizer demand as well as output supply in the country. As indicated by the elasticity, fertilizer demand in the country is also significantly depend on the output price of supply. Therefore, paddy price has strong incentive to promote the fertilizer demand as well as paddy production in the country. In addition, the analysis shows that labour demand in paddy cultivation is more responsive to the wage rate while fertilizer price has fair degree of responsiveness. The low substitutability between labour and fertilizer and other input pairs indicates combined application of such inputs increase the paddy production in the country. Overall, this study suggests that farmers are price sensitive and assures prevalence of high output price is essential for higher production.

CHAPTER 6

DISTORTIONS TO FOOD CROP SECTOR INCENTIVES

6.1 Introduction

Government policy in any country provides incentives to producers directly or indirectly and among them agricultural price and trade policies have become major instrument for influencing the economy. Sri Lanka too has taken several important policy measures over the years to protect the farming community in the country and to enhance the food self sufficiency mainly in terms of rice. In spite of major attempts, the country still remains as a net food importer after the independence in 1948. Public expenditure incur on food imports has dramatically increased in recently and as example, in 2015 total food import bill is SLRs 221 billion (includes wheat and maize which classified as intermediary goods) which accounts 10% of the total imports (Table 6.1). The main food commodity imports of the country in 2015 are fertilizers (Rs. 40 bn), wheat & maize (Rs. 49 bn), milk and milk products (Rs. 34 bn), sugar (Rs. 34 bn), lentils (Rs. 20 bn), rice (Rs. 18 bn), onions (Rs. 17 bn) and potato (Rs. 4 bn).

As any other country in the world, there are two types of support policies namely: (i) price interventions and government expenditure (ii) government budget transfers or subsidies. Among them, price interventions are reflected in the difference between domestics and border price of a product of similar quality. Meanwhile, the government of Sri Lanka has intervened in food and other agricultural markets for long time, particularly via investment in irrigation and other infrastructure, input-output subsidies and trade policies despite the slowing growth rate in agricultural GDP in the country. Such price and trade intervention policies continue to protect number of import-competing food crops including rice, through tariffs and other charges that fluctuate seasonally. Moreover, striking balance between the two conflicting objectives of lower food prices for consumer and high commodity prices for producer is a difficult task for the government. Therefore, government adopts various policy measures mainly in terms of imposing tariffs and providing input subsidies to protect the domestic agriculture sector. This cause several implications for the consumer and producer welfare and government revenue. Meanwhile, undertake liberalization policies in the developing countries like Sri Lanka aimed at reducing domestic market distortions and raising allocative efficiency in resource use. However, it is suspicious in the Sri Lankan situation whether the current trade and price policies up to now achieved such objectives. In addition, some researchers examine that there are

back and forward in the previously followed liberalization attempts in the recent years and trade policies have become more inward looking and complex which can generate considerable uncertainty in the country's economy.

Table 6.1: Value of Composition of Imports to Sri Lanka, 2011-2015 (Rs. Mn)

	2011	2012	2013	2014	2015
Consumer goods	404,037	380,968	410,996	503,021	640,352
1.1 Food and beverages	173,277	166,003	176,423	213,308	220,828
lentils	12,917	8,891	13,434	15,818	20,108
onions	9,475	6,590	12,892	8,529	16,619
sugar	47,091	43,872	37,187	33,332	34,164
rice	2,035	3,083	2,297	36,795	17,956
flour	1,538	628	237	270	277
milk and milk products	38,182	39,023	37,572	44,308	34,088
fish	16,276	17,089	20,881	18,462	29,799
oil and fats	2,865	2,535	7,638	2,629	4,541
spices	12,242	8,588	10,308	12,822	15,425
other	30,657	35,703	33,977	40,343	47,852
1.2 other consumer goods	230,760	214,965	234,573	289,713	419,524
Intermediate goods	1,357,505	1,474,534	1,361,740	1,488,091	1,309,234
fertilizer	44,992	39,859	30,972	35,591	39,573
fuel	530,389	640,197	555,930	600,150	366,339
wheat and maize	47,382	46,352	41,551	52,844	48,658
other	734,742	748,126	733,287	799,506	854,664
Investment goods	473,974	582,921	548,604	542,169	620,730
unclassified imports	5,972	3,455	1,788	1,882	2,151
total	2,241,488	2,441,878	2,323,128	2,535,163	2,572,467

Source: Central Bank of Sri Lanka, 2015

Therefore, the main focus of this chapter is to estimate the level of protection of major food commodity imports in Sri Lanka during the period of 2007-2015. More specifically this chapter focuses on:

i. analyze the recent structure of import trade regime in the country

ii. evaluate the changes in total protection rate (TPR), their levels and trends in the recent years

iii. examine the distortions to incentive structure in terms of NRP and ERP for major food commodities

6.2 Literature Review

6.2.1 Policy Distortions in Food Crop Production in Sri Lanka

Sri Lanka's trade policy has been subjected to several studies over the years. Among them Bhalla (1991), Shilpi (1995), World Bank (1996), Ranaweera (2003), Bandara and Jayasuriya (2009), Pursell and Ahsan (2011) have provided much useful information.

The general understanding in the recent past regarding the paddy sector is that it does not have a comparative advantage in producing rice. For example, Shilpi (1995), Rafeek and Samaratunga (2000) concluded that Sri Lanka has no comparative advantage of producing rice using Domestic Resource Cost approach. Shilpi (1995) estimated the NPC, EPC and DRC in non plantation crops in Sri Lanka and found that NPC averaged 1.3 for chilli, 2.0 for big onion and 1.6 for potato for the 1985-93 periods. This study suggested that over the study period policy incentives have not changed in a significant way as to induce substantial land and other resources reallocation among the import competing crops. However, DRC estimated during this period implied that more than one rupee of resources are used to produce one rupee worth of foreign exchange hence Sri Lanka had no comparative advantage in growing rice. Conversely to that Kikuchi *et al* (2000, 2001) concluded that the country is still competitive in paddy cultivation under major irrigation schemes though the Sri Lanka's comparative advantage had been declining over the years. In addition, Weerahewa *et al* (2003) has shown that there is competitiveness in irrigated paddy farming in some areas, when farming is practiced on adequate scale. Kruger *et al* (1988) found import competing crop of rice in Sri Lanka has 18% and 11 % positive direct protection during 1975-79 and 1980-84 periods respectively and this positive direct effects were offset by negative indirect effects. Therefore, the average total protection was negative during these two periods. In contrast, study done by Bhalla for 1960-84 that was part of the World Bank Study (1991) found high rates of nominal protection of 40% of rice for the period.

A study conducted by Rafeek and Samaratunga (2000) reported nominal rates of protection for rice and described that rice farmers have positive protection. As per the analysis done by the authors, one rupee of resources is used to produce 56 cents worth of rice valued in foreign exchange. Meanwhile, the NPR for rice averages 42% while, EPR was 32% for the 1990-1998 period. Ranaweera (2003) reveals that with the disbanding of a large number of non tariff barriers and fixing tariffs at 35% on agricultural commodities there was a surge of imports of

agricultural crops to the country. He argued that it impacted negatively on extent, production and incomes of farmers as well as rural employment. As noted by the WTO's Trade Policy Review (2004), there were proliferation of tariff exemptions and waivers used in an ad hoc manner to benefit different groups at different points in time. It further noted that such policies not only discourage investments but lead to a wasteful use of resources. Meanwhile, the NPC and EPC calculated by Epaarachchi *et al* (2002) examined both estimates are greater than unity implying that there has been trade protection in both output and input markets. Further they found the average NPR of 138% for potato is the highest while the lowest NPR of 36% is recorded for big onion during the period of 1995-2000. Researchers emphasize that granting frequent duty waivers hurts the domestic agricultural sector and does not recommend specific duties as an alternative ad-valorem duties. Table 6.2 shows the changes in average nominal protection coefficient according to the different authors. Accordingly, for all years NPC estimates are greater than unity implying that there has been trade protection in rice output market. Bandara and Jayasuriya (2009) are also estimated the annual distortions of the selected agricultural products and they have calculated the data from 1955 to 2004 (as part of research led by Kim Anderson).

Table 6.2: Average Nominal Protection Coefficients for Rice, 1961-1993

Year	NPC
1961-65	1.9
1966-70	1.6
1971-77	1.8
1978-85	1.0
1985-89	1.1
1990-93	1.3
1995-2000	1.5

Source: 1961-85 are from Bhalla (1991), 1985-89 are from Edwards (1993) and 1990-93 are from Shilpi (1995), 1995-2000 from Epaarachchi *et al* (2002).

In addition, few studies also focus on evaluating the trade structure of the country for decades. Among them, World Bank (2002) reveals that unpredictability of tariff changes created a great deal of uncertainty in the domestic commodity market especially for traders and processors. They further noticed that because of this risk, they were subsequently reluctant to offer farmers prices which fully reflected the tariff protection once the duty waivers had been removed and higher tariff restored, so that these opportunitistic tariff policies undermined the protection for farmers that the tariffs were intended to provide. More recent study carried out by Pursell and Ahsan (2011) indicates that Sri Lanka is the one of the most protectionist countries in the world in terms of complexities of

and hidden para tariffs that inhibits trade. The authors further mentioned that Sri Lanka liberalized its economy gradually but it reversed in 2001 and the country progressively became an economy that more and more closed and protectionist. Another study by World Bank (2013) shows that under the current policies, producers of farm products that compete with imports gain at the expense of consumers. Meanwhile this study suggests the usefulness of reassessing the highly complex system of taxes, levies and other measures to address its impact on producers and consumers.

6.2.2 Forward and Backward Movements in Trade Liberalization Policies in Sri Lanka

Sri Lanka's agriculture trade regime has subjected to several changes over the years. It also noticed that the country's tariffs were much lower during the 1980s than tariffs in other South Asian countries. Sri Lanka abolished most of the QR measures during 1980s and 1990s and by 1998 only 3.7 were subjected to traditional QR. On the other hand, Chilies, potatoes and onions were subjected to seasonal import licensing in which licenses to import were only given outside the marketing season for the domestic crops. Initially the government applied six band tariff structure and this replaced the most QR used in food commodity imports. As noted by Cuthberston and Athukorala (1991) this imposed high CD on final and locally produced goods and lower CDs on raw materials and essential imports.

During the 1990s and before imports were subjected to turn over tax based on dutiable value plus custom duty and 25% margin. This was replaced by a Goods and Services Tax (GST) in 1998. In addition Defense Levy (later known as National Security Levy) is applied to finance the civil war initially 3.5% and increased to 4.5% in July 1995. From 1995, Sri Lanka bound 99% of the tariff lines of the agricultural goods at uniform rate of 50%, as part of the GATT's Uruguay Round Agreement on Agriculture. The remaining 1% of tariff lines are 175%, 60%, 45%, 40%, 20%, 10% and 5% ad valorem and 60% non-ad-valorem (Weerahewa, 2004). In 1998, Sri Lanka removed quantitative restrictions on all agricultural imports except for monopoly over wheat and wheat flour. But high protection of the import substitution crops has continued with the use of seasonal varying tariffs and other specific tariffs. Subsequently, wheat imports also liberalized in 2005 by ending the long term monopoly on flour milling to PRIMA Company.

However, there has been some backtracking from this earlier attempts and liberalization proceeded in an uneven way following the initial measures (World Bank 2004). As example crops that were widely cultivated in the North Province including red onions, chillies and grapes were subjected to trade liberalization while protection increased for other crops such as potato. During 2000 Sri Lanka reintroduced the import licensing for rice and 40% tariff surcharge in February 2000 and use of specific tariffs rather than *ad valorem* tariffs were some of the changes introduced in 2000-2002 period. In addition, introduction of PAL at 1% of cif prices in 2002, increase custom duties for most of the agricultural commodities in 2004 and increasing use of specific duties were common in this period. Besides, introduction of VAT replacing Goods and Service Tax (GST) in August 2002, have improved transparency and reduced the complexity of custom clearance.

In addition, in November 2004 Sri Lanka explicitly reversed its earlier commitment to open trade policies with issue of a long list of products that subject to a para-tariff called Cess (Pursell and Ahsan, 2011). With such changes it is cited that Sri Lanka holds a world record for the complexity in its tariff structure in the recent years. Further, Sri Lanka made major changes to its tariff schedule in 2007 by introducing Special commodity Levy (SCL) for 11 essential food commodities including dhal, milk powder, sugar, potatoes and onions. This single composite levy replaced the various duties and taxes applicable with a view to controlling the price escalation of these products. The tariff lines which subjected to SCL have been changed time to time and rates are adjusted periodically which has resulted in lower import duties for these products. Although the SCL might stabilize the domestic price of a product, the evidence is unclear as to whether SCL revisions have been made to absorb fluctuations in world market price (World Bank, 2013).

Regardless of several back and forward movements, Sri Lanka made substantial efforts over the years to enhance the transparency (easily available the tariff charges online). In 2008 VAT has been removed from a number of domestically produced products where RIDL was repealed in January 2011. Further, in 2009 five band tariff structure (0, 2.5, 6, 15, 28 %) was introduced to simplified the tariff process in the country. Some major changes were made to the tariff structure in June 2010 as to change the previously applied five band custom duty structure to a four band structure (0, 5, 15, 30 %). Again in November 2013 the four band structure was revised to 0, 7.5, 15, 25%. According to the new custom duty rates for essential inputs, not manufactured locally is subject zero custom duty, custom duty on raw materials and semi raw materials, increased from 5% to 7.5%, custom duty on

intermediate goods 15% and custom duty on end user products decreased from 30% to 25%. In order to simplify the trade structure further, a three bands custom duty tariff structure of zero, 15% and 30% was introduced in November 2015, instead of previous four band structure.

6.3 Methodology and Data

A simple diagnostic of the trade structure based on tariffs would not give complete picture of the trade protection. Hence a deeper analysis requires understanding the changes in other duties (para tariffs) and subsidies also (Valdes, 2013). Two basic approaches to calculate rates of total protection are: i. comparison of border prices (adjusted to farm gate) and actual farm price or ii. using information only at the border. Current import trade regime in Sri Lanka has 10 basic types of tariffs and para tariffs[24)] including;

1. The Custom duty(CD): CIF value* custom duty rate
2. Value Added Tax (VAT) = (CIF+ 10% of CIF+ custom duty + Cess+ PAL+ Excise duty)*VAT rate
3. Cess levy= (CIF +10% of CIF)*Cess levy rate
4. Port and Airport Development Levy (PAL) = CIF value*PAL rate
5. Excise duty=(CIF+15% of CIF+ Custom duty+ Cess + PAL)*Excise duty rate
6. Social Responsibility Levy (SRL) =(custom duty + surcharge + excise duty)*SRL rate
7. Special Commodity Levy (SCL) = quantity*SCL rate
8. Nations Building Tax (NBT) = (CIF+ 10 % of CIF+ Custom duty + Cess+ PAL+ Excise duty) * NBT rate
9. Regional Development Levy (RIDL)
10. Surcharge

The introduction of various tariffs and para tariffs provide protection for domestic producers from potential competition from foreign products. Removal of import duties on selected commodities by government are directly affected by changing domestic prices. In addition domestic prices of some goods are influenced by subsidies. Therefore, both tariffs and subsidies should take into account when analyze the change in incentive structure.

[24]Several agricultural commodities are exempted from some of these para tariffs.

Calculation of Measures of Trade Protection (TPR)

This Chapter employs the following formula adopted by Pursell and Ahsan (2011), World Bank (2013) and Valdes (2013) to calculate the "Total Protection tax[25]" at the border. Accordingly, implicit Total Protection Rate (TPR) is defined as the sum of the protection provided by custom duties and other para-tariffs. When the specific custom duties applied for some commodities, their cif price equivalents are calculated to measure the TPR.

TPR= CD + VAT + Cess levy+ PAL+ Excise duty + SRL + SCL + RIDL +NBT+ Surcharge

where all these import taxes are expressed as percentage of cif price.

In addition to the TPR, Nominal rates of protection (NRP) and Effective Rates of Protection (ERP) which widely used in the literature are used to measure the effect of government policy on agricultural incentives of selected major food commodity imports to Sri Lanka.

Nominal Rate of Protection (NRP)

The level of trade distortion on the output side can be measured using the nominal rate of protection (NRP) which is the simplest and most widely used indicator. This can be defined as the ratio between the domestic price and border price of commodity, measured by direct price comparison between the border and the farm gate price.

$$NRP = \frac{P_d}{E.P_w} - 1$$

Where P_d is the price received by producers and P_w is the border price and E is the exchange rate.

NRP expressed as the ad valorem tariff equivalent of tariffs, para tariffs, non tariff barriers and subsidies. Therefore, the TPR at the border conceptually corresponds to the NRP at the border (World Bank, 2013). To calculate the NRP at the farm gate level several adjustments were made and this allows for direct price comparison. The NRP captures only the trade distortions on the output side.

[25] Total protection tax is equivalent to the NRP.

Effective Rate of Protection (ERP)

The ERP measures the joint effects of trade barriers and price interventions on value added (returns to non tradable factors) via the impact of such interventions on both output and tradable inputs prices. Traded inputs in the ERP formula refer to inputs that are traded across borders or inputs that have the potential to be traded across borders (Tweetan, 1989). Due to data limitation this study focuses only on the four major food commodities of rice, potato, chilli and onions to evaluate the ERP. All inputs are separated into tradable and non tradable components. The labor and seeds are considered as 100% non tradable in rice. Inputs of fertilizer, agro chemicals (weedicides and pesticides) and machinery has tradable components in rice. For potato, chili and onions, seed, machinery, fertilizer and agro chemicals (weedicides and pesticides) are considered as tradable (Cost share of tradable inputs are given in the Appendix 6.1).

The ERP is calculated as the percentage difference between the value added per unit using the hypothetical farm gate prices (of output and inputs) without interventionVA_w, and the observed value added per unit, VA_d with intervention.

$$ERP = \frac{VA_d}{VA_w} - 1$$

The value added is a function of government interventions such as tariffs, taxes and subsidies on fertilizer. Table 6.3 gives explanation of calculation of ERP.

Table 6.3: Explanations for Calculation of ERP

Item	Explanation
(a) c.i.f. price	c.i.f . price at Colombo airport
(b) wholesale price Rs./kg	Central Bank of Sri Lanka
c) mill gate price Rs./kg	Farmgate price of paddy + milling cost
(A) farmgate price per kg	Central Bank of Sri Lanka
(B) border price farmgate equivalent per kg	(a*0.65)- milling costs-({$(b) * 0.65 - (c)$} 0.65 is the standard paddy to rice convertion ratio in the country
Implicit NRP on product at farmgate	$[(A)/(B) - 1]$
(C)observed cost per kilo of tradable inputs	Cost of all tradable inputs with intervention
(D) Hypothetical costs per kilo of tradable inputs	Cost of all tradable inputs without intervention
Implicit NRP on tradable inputs	$[(C)/(D) - 1]$
(E) Observed value added net tradable inputs	Farmgate price –Cost of all tradable inputs with interventions
(F) Hypothetical value added net tradable input	Border price farmgate equivalent-Cost of all tradable inputs without interventions
ERP	$[(E)/(F) - 1]$

Source: Calculations are based on Valdes, 2013 of "calculation of ERP for Basmati rice from Panjab 2008-10", Table A5 in page 36

Data

Analysis of trade structure in this chapter focuses on all tariff lines from Chapter 1 to Chapter 9 in the Import tariff guides in Sri Lanka Customs from 2007 to 2015. However, calculation of NRP and ERP at the farm level is limited to four commodities namely rice, potato, chilli and onions as mentioned before. The analysis is performed using tariffs and para tariffs rates obtained from the Sri Lanka Customs as soft copies for 2007-2015 periods. In addition that Custom Tariff Guides and various issues of "Major economic policy changes and measures" published by the Central Bank are also used. Data for wholesale price of the commodities are obtained from the Hector Kobbekaduwa Agrarian Research and Training Institute, and farm gate price according to the Central Bank annual reports. Cost of production data obtained from biannual cost of cultivation publications issued by DOA. In addition, the CIF price of the commodities are obtained from the data published by Sri Lanka Customs.

6.4 Results and Discussion

6.4.1 Trade Protection and Tariff Structure in Sri Lanka

The larger Custom Duty is applied to the products that government desires to protect where lower rates applied on intermediate goods and raw materials that do not compete with the domestic products or which are used

as inputs to local industries. Observations of the tariff formulas shows that the calculation of tariffs is highly complex because tariff formula is based on several tariff bases. Among the all para tariffs, only PAL has the cif price as its base. Meanwhile the tax base for Cess is cif price plus 10% of cif where as calculation of Excise duty and NBT is much more complicated. A number of import tariff and para-tariff observations explain that the tariff rates are frequently change and duty waivers are also granted intermittently on several products (See Appendix 6.2). Therefore, structure of import tariff changes is hard to predict and there is no regular system. In addition importation of most of the agricultural food products are subjected to the specific duty which is strongly discouraged by the WTO. Therefore, it is uncertain to predict the total protection as ad-hoc changes occur time to time hence need to implement more consistent trade policy to increase productivity and farmers' income.

As measured by unweighted average TPR, protection of all tariff lines is highest in 2009 where an average total protection of agricultural tariff line (1-24) increased from 25% in 2007 to the highest level ever recorded in 2009 to the value of 40% (Table 6.4). However, after that TPR of agricultural sector[26)] goes down in 2010 and 2011 but goes up in 2012. The average total protection rate for agriculture during 2007-2015 is 31%. Meanwhile, average protection of industrial commodities (tariff lines 25-97) is 24% on an average during the 2007-2015 period and the highest value of 33% recorded in 2015.

Table 6.4: Unweighted Average Total Protection Rates (TPR) in Sri Lanka, 2007-2015

Tariff lines	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Agriculture (1-24)	25.1	25.6	39.8	23.9	25.8	34.1	37.4	32.1	32.4	30.7
Industry (25-97)	30.4	19.2	27.9	25.3	22.1	19.6	20.2	21.3	33.0	24.3
All tariff lines	**27.8**	**22.4**	**33.8**	**24.6**	**24.0**	**26.9**	**28.8**	**26.7**	**32.7**	27.5

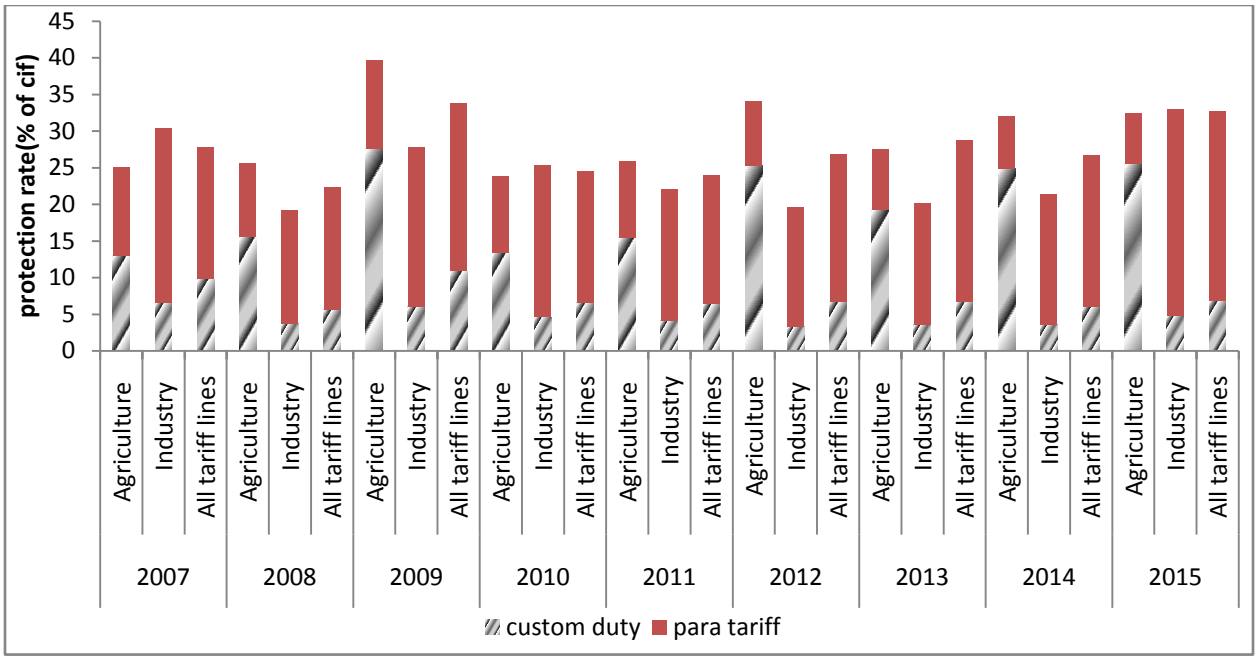
Source: Import Tariff Guide, Sri Lanka Customs

As can be seen from Figure 6.1, nearly most of the remarkable increase in the total protection rate in all tariff lines is due to additional protection given by para tariffs. Total protection in agricultural sector due to para tariffs is smaller compared to industrial sector. The breakdown of para tariffs applied in 2015 is given in the Figure 6.2 and it shows that the highest protection of para tariffs is due to the excise duty. As measured by average protection rate

[26] WTO definition of agricultural products including chapter 1-24.

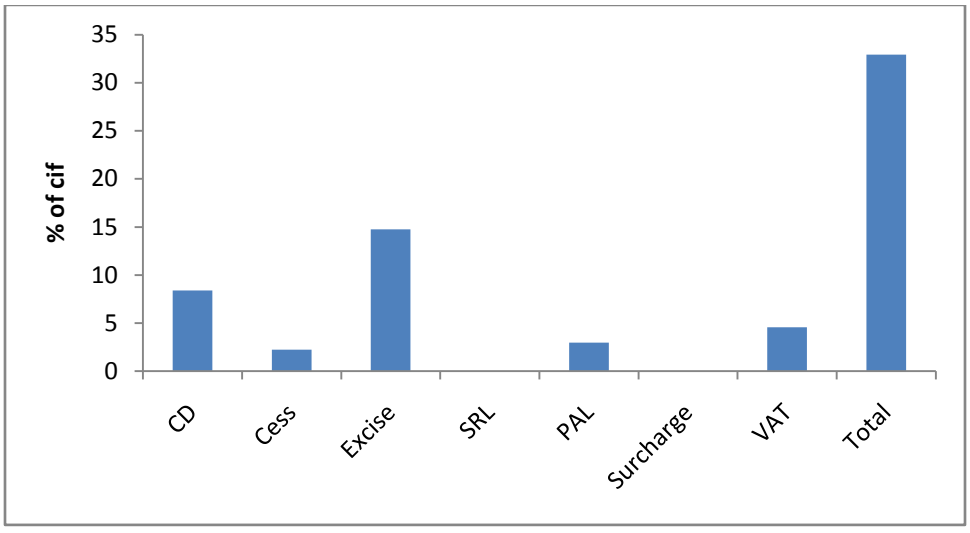
over all tariff lines, the protectiveness due to Excise duty is 15% which is higher than the protectiveness provide by CD. In addition VAT, PAL and Cess contribute respectively to the distortion in incentive structure in 2015.

Figure 6.1: Custom Duties and Para-tariffs in Average Total Protection Rate, 2007-2015



Source: Import Tariff Guide, Sri Lanka Customs

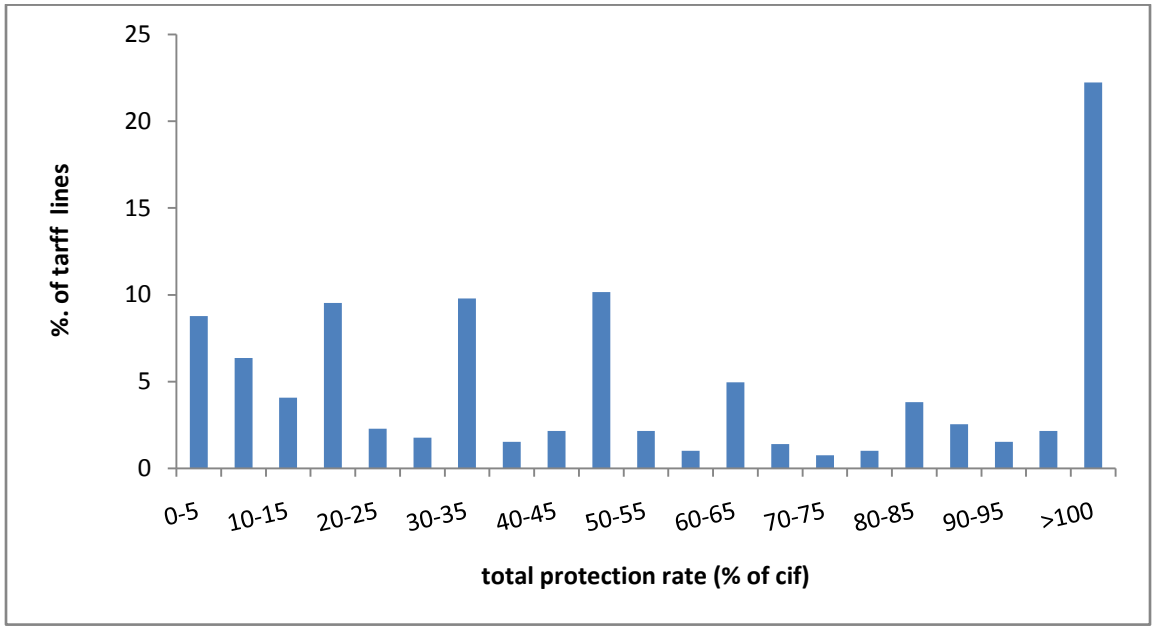
Figure 6.2: Contribution of Custom Duties and Para-tariffs to Total Protection (as % cif) in 2015 for All Tariff Lines



Source: Import Tariff Guide, Sri Lanka Customs

According to Figure 6.2, it is apparent that most of the agricultural tariff lines are not subjected to the para tariffs hence the highest protection is due to CDs. However, out of 787 tariff lines in agricultural sector, 121 tariff lines are subjected to the specific custom duty called SCL in 2015. Figure 6.3 illustrates the range of TPR in agricultural tariff lines in 2015 and it shows that the large number of tariff lines (175 tariff lines) are higher than 100%. Only 15% of agricultural tariff lines are less than 10% while more than 50% of agricultural tariff lines exceed TPR of 50%. Since Sri Lanka bound nearly all agricultural tariff lines at 50% of TPR at the Uruguay Round commitment, it seems that the country is away from their agreements. Besides that the highest number of agricultural tariff lines (233 lines) apply CD range between 25-30%. Out of all agricultural tariff lines 28% of tariff lines apply zero CD[27)] and only 1.6% tariff lines exceed 70% CD. Although the highest CD has been reduced from 30% to 25% according to the four band tariff structure in 2013, 272 tariff lines or 35% of agricultural tariff lines exceed this limit in 2015 (Table 6.5).

Figure 6.3: Distribution of Total Protection Rates of Agricultural Tariff Lines in 2015



Source: Import Tariff Guide, Sri Lanka Customs

[27] Tariff lines with SCL is not considered in this calculation.

Table 6.5: Distribution of Custom Duties in Agricultural Tariff Lines in 2015 (tariff lines except SCL)

CD range	No of tariff lines	%
0	215	28
>0-7.5	54	7
>7.5-15	61	8
>15-25	160	21
>25	272	36
total	762	100

Source: Import Tariff Guide, Sri Lanka Customs

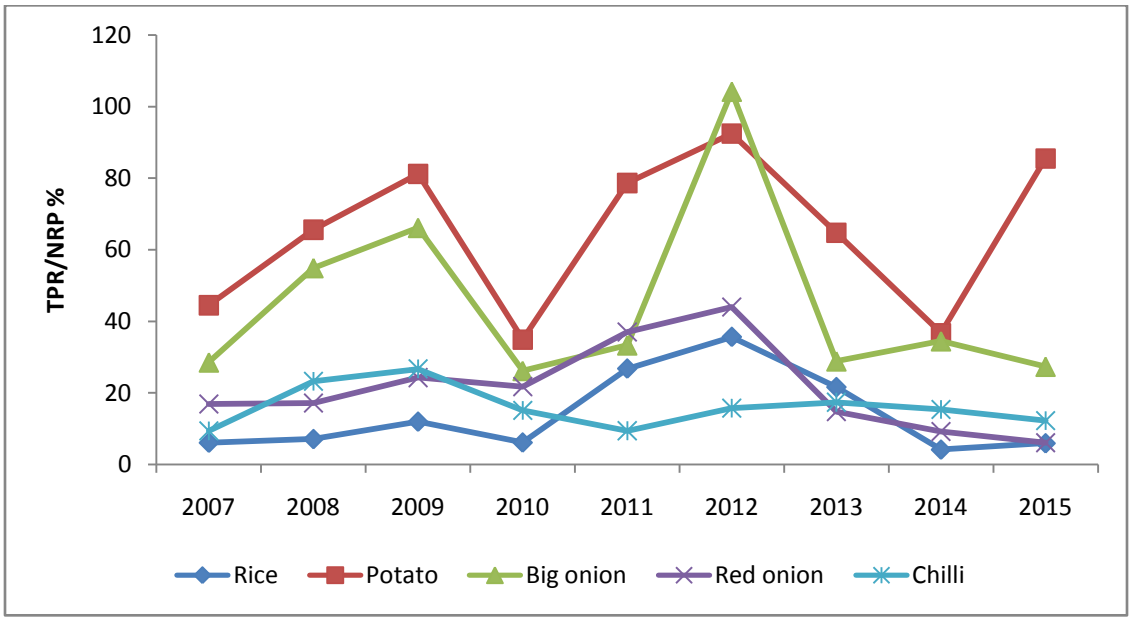
Table 6.6 presents the implicit TPR for selected agricultural food items for the period of 2007-2015 at the border. However, TPR at the border may differ from the TPR at the farm gate level because it is not adjusted for cost incurred between farm gate level and border. There is a high dispersion of TPR across different food commodities and time. As example TPR for rice is 35.6% and 4.1% respectively in 2012 and 2014 while for potato is 92.4% and 36.6% respectively. As shown in Figure 6.4, big onion and potato have largest TPR while chilli has lower rates during the period of 2007-2015.

Table 6.6: Total Protection Rate (TPR) on Agricultural Imports, 2007-2015 (at the border)

Commodity	TPR (% of cif)								
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Rice	6.07	7.09	11.95	6.13	26.76	35.60	21.59	4.15	5.92
Potato	44.49	65.59	81.17	34.90	78.63	92.43	64.72	36.66	85.51
Big onion	28.53	54.88	66.11	26.15	33.29	104.15	28.83	34.44	27.34
Red onion	16.91	17.15	24.27	21.76	36.99	43.94	14.77	9.18	6.09
Chilli	9.38	23.23	26.67	15.10	9.40	15.73	17.36	15.37	12.22
Green gram	10.46	16.65	17.00	9.83	13.20	69.35	71.34	57.73	NA
Dhal	5.10	4.97	10.67	2.74	13.51	22.57	20.81	5.26	1.54
wheat & mesline	9.06	13.66	38.56	22.45	28.82	21.61	20.94	27.56	7.36
sugar	26.43	31.36	24.25	1.60	5.12	18.89	24.58	31.22	29.45
Milk powder	9.18	1.56	36.97	10.72	5.12	17.81	26.70	19.84	46.06
Average	**17.38**	**26.06**	**33.41**	**15.63**	**27.30**	**47.14**	**31.66**	**24.62**	**21.93**

Source: Author's calculations from Import Tariff Guide, Sri Lanka Customs Note: This show the TPR at the border, which conceptually corresponds to the NRP. However, NRP at the border may differ from the NRP at the farm level.

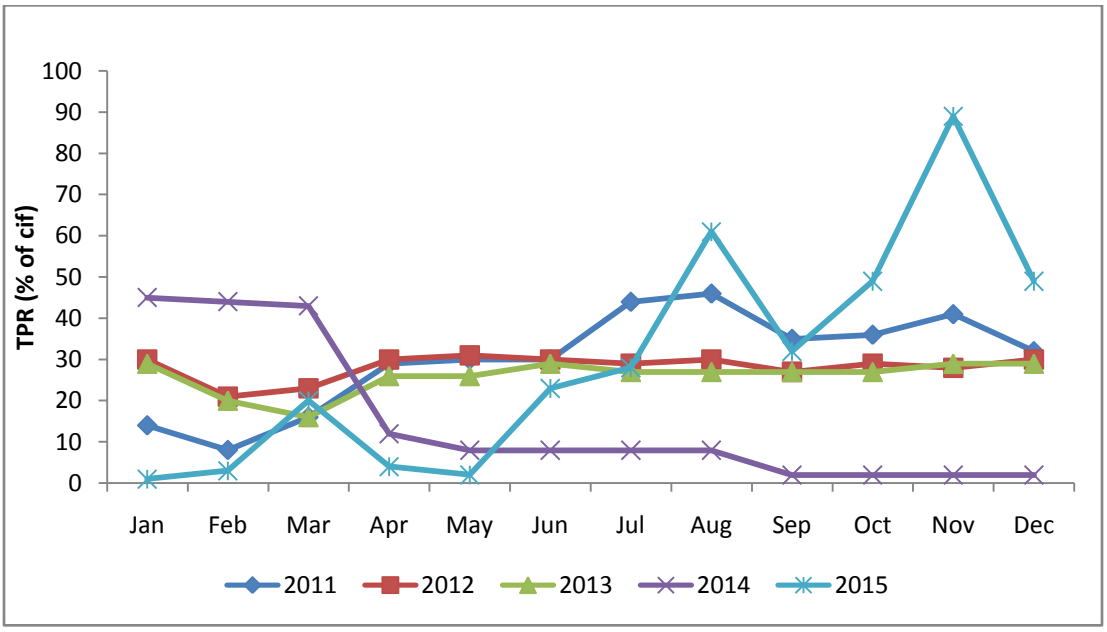
Figure 6.4: Trends in TPR/NPR for Selected Food Commodity Imports (at the border)



Source: Author's calculations from Import Tariff Guide, Sri Lanka Customs

In addition, TPR is also drastically changed throughout the year for most of food commodities which could be seen from monthly variation of TPR from Figure 6.5 and Appendix 6.6-6.9. Detail of tariff changes is given in Appendix 6.2. As example, with a view to discouraging rice imports, the SCL on the importation of rice was increased to Rs. 20 per kg with effect from 22 January 2015 from Rs. 1 per kg in 2014 and further to Rs. 40 per kg from 26 March 2015. On the 6 May 2015, the SCL was replaced with a Customs duty of Rs. 35 per kg and other para tariffs. Therefore, the structure of import tariff changes is hard to predict. Meanwhile, the Government grants some duty waivers for selected products time to time, to encourage the imports as to reduce the burden on consumers when the domestic prices are high.

Figure 6.5: Monthly Trends in TPR -Rice, 2011-2015



Source: Author's calculations from Import Tariff Guide, Sri Lanka Customs

In addition, importation of most of the agricultural food products are subjected to specific duties called Cess which is discouraged by the WTO. Therefore, total duty calculation is unpredictable as a result of ad-hoc changes introduce in to the import tariff structures. On the other hand, tariff rates are vary significantly over tariff lines. The variation of TPR (equivalent to NPR at the border) is largest for potato, rice big onion, sugar and milk powder (Table 6.5). The implicit tariff is influenced by fluctuations in world market price as well as changes in domestic price of these commodities.

Not only the trade policies on primary products but also tradable inputs also having considerable impact of change of TPR. This is because of the impact of price of tradable inputs on the cost structure of the commodity. Therefore, TPR of tradable inputs are present in the Table 6.7. Among the inputs, protection is highest for onion seeds and agro chemicals. The lowest TPR is applied on fertilizer and machineries used in rice cultivation. However, high duty rates are applied on importation on tractors in the recent years.

Table 6.7: Total Protection Rate (TPR) on Agricultural Inputs, 2007-2015

(at the border)

Tradable inputs	2007	2008	2009	2010	2011	2012	2013	2014	2015
Machineries	5.79	5.82	7.92	5.97	5.00	5.00	7.30	4.48	5.00
Fertilizer	5.79	5.92	7.92	5.97	5.00	4.81	5.00	5.00	5.00
Agro chemicals	23.18	23.30	22.08	19.88	18.80	18.80	18.80	18.80	17.65
Seed potato	3.00	3.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Red onion seed	16.91	17.15	24.27	21.76	36.99	43.94	14.77	9.18	6.09
B'onion seeds	28.53	54.88	66.11	26.15	33.29	104.15	28.83	34.44	27.34
Chilli	9.38	23.23	26.67	15.10	9.40	15.73	17.36	15.37	12.22
Fertilizer other	5.80	5.92	7.92	6.11	5.00	5.00	5.00	5.00	5.00
Tractors	24.97	3.09	5.33	5.04	5.00	5.00	5.00	18.33	17.61
Water pumps	21.68	21.13	18.95	16.05	11.06	7.96	7.77	11.54	10.29

Source: Author's calculations from Import Tariff Guide, Sri Lanka Customs

Table 6.8 and 6.9 shows the variety of taxes apply at the importation of import competing commodities and tradable inputs used in agriculture. Most of the agricultural commodities are not subjected to para tariffs. However, the applied tariff rates and types of tariffs applied are changed time to time hence there is no constancy in the structure of the trade policy.

Table 6.8: Average CD and other Para-tariffs of Selected Agricultural Commodities, December 2015 (as % of cif)

Commodity	CD	Cess	Excise	SRL	SCL	PAL	Surcharge	VAT	NBT
Rice	33.4	-	-	-	-	2.8	-	10.7	2.0
Potato	-	-	-	-	42.5	-	-	-	-
Big onion	-	-	-	-	6.1		-	-	-
Milk powder	68.3	-	-	-	-	5.0	-	-	3.7

Source: Author's calculations from Import Tariff Guide, Sri Lanka Customs

Note: "Ex"-exempted

Table 6.9: Average CD and other Para-tariffs of Selected Agricultural Tradable Inputs, 2014 (as % of cif)

Commodity	CD	Cess	Excise	SRL	SCL	PAL	Surcharge	VAT	NBT
Machinery	7.5	-	-	-	-	5	-	Ex	2
Fertilizer	Free	-	-	-	-	5	-	Ex	Ex
Pesticides	Free	-	-	-	-	5	-	12.65	2

Source: Author's calculations from Import Tariff Guide, Sri Lanka Customs

Note: "Ex"-exempted

6.4.2 Distortions to Food Crop Sector Incentives: Evaluating Nominal and Effective Protection Rates

The NPR indicates the percentage by which the domestic output price was kept above the world output price with the help of import barriers. NRP is appropriate indicator to assess the impact of policies on consumers while ERP measures impact of farm income. Tables 6.10 to 6.13 report NRP and ERP at the farm gate level for selected import competing major commodities.

To determine the NRP at the farm gate level, farm gate price of the product that would have prevailed in the absence of interventions is estimated (border price farm gate equivalent). Border price equivalent at the farm gate level is calculated by taking cif price and adjusting for customs related charges, conversion ratio for paddy is 0.65 for rice), wholesale mark up and milling costs. Assume no quality adjustments. There may be fertilizer subsidy and import tariffs that drive the wedge between domestically observed farm gate price and the border price. The wholesalers' margin is calculated from the difference between the observed wholesale price and the estimated price of paddy leaving the mill. The estimated mill gate price is equal to farm gate price plus milling charges per unit value.

(1) Rice

Comparing the border price and farm gate price shows fluctuations in both during the 2007-2014 periods. The lowest cif price of rice observed is Rs. 50.20 per kg in 2009 while the highest observed is Rs. 95.95 per kg in 2013. Farm gate price of rice is also increased significantly (78% compared to 2007) in 2008 with the sharp increase in world price. Farm gate paddy price was stable during 2010-2013 period despite drastic increase in border price. Converting the border price in to farm gate equivalent leads to a wide variation of NRP with highest 92% in 2010 to lowest NRP of 3% in 2013. The NRP is highest when the ratio between farm gate price and border price farm gate

equivalent price is high. As a result of significant decline in the paddy production due to adverse weather conditions prevailed during 2014, farm gate paddy prices increased considerably in that year. Consequently government took measures to reduce the effective rates of tariff from Rs. 25 per to Rs. 1 per kg, result in increase in total rice imports and decline in wholesale rice prices. Accordingly NRP increased considerably in 2014 compared to NRP in 2013.

To estimate the ERP, effects of the trade on input costs as well as output price is also need to consider. This analysis accounts import tariffs and fertilizer subsidies in each commodity selected. Hypothetical input price was calculated using the observed farm level cost per unit, adjusting downward by removing the import tariff and in the case of fertilizer, adjusting upward by removing the subsidy and adjust for import tariff also. The resulting hypothetical prices for tradable inputs except fertilizer are slightly lower. The massive subsidy rate of fertilizer (average 90%) causes to increase hypothetical fertilizer price by 900% on an average. The dominated impact of fertilizer subsidy result in negative implicit NRP for tradable input used in rice for all the years ranging between 27% to 48%. This negative NRP values for tradable inputs imply that the production cost of rice would increase significantly in the absence of intervention.

The ERP reflects the ratio between observed values added net tradable inputs to hypothetical value added net tradable inputs as a result of removal of import tariffs on output and inputs as well as removal of fertilizer subsidy. Table 6.10 gives the detail calculation of ERP for rice (Calculations are based on Valdes, 2013 of "calculation of ERP for Basmati rice from Panjab 2008-10", Table A5 in page 36 and explanation of calculation of ERP is given in the Table 6.3.). As seen from the table ERP for paddy is positive for all the years which mean there is positive protection to rice producers at the expense of consumers. Fertilizer subsidy is the main driver of the ERP for rice. Further, it shows that farm income as measured by value added would have been 368% lower in 2007 under a no-intervention policy but only 75% in 2008. This is mainly due to high ratio between observed and hypothetical value added for rice in 2007. Compared to 2007, there was a notable increase in farm gate price of paddy in 2008 but tradable input cost is same. In the meantime, border price farm gate equivalent also doubled compared to 2007 as a result of high world price occurred in 2008. As a result of small ratio between observed and hypothetical value added in 2008 leads significant drop in ERP for rice in that year. This means, under no intervention policy in 2007 farm income would have been significantly lower compared to the 2008. Paddy farmers were highly protected in 2007, but protection has lowered drastically after 2011. Though there is no noticeable difference in the farm gate

price during the 2010-2013 period, tradable input cost in terms of machinery and other input cost has been in a rising trends after 2010. The increased production cost and stable farm gate price caused to this trend result in lowered protection for paddy farmers. However, in 2014 ERP for rice increased noticeably mainly as a consequence of increased paddy prices. The values of NRP and ERP for rice show large volatility over the years. Meanwhile, there is a huge variation of ERP of rice in 2007 (368%) and 2013 (27%) is mainly as a result of differences occurred between the observed and hypothetical cost of tradable inputs.

Table 6.10: Calculation of ERP for Rice, 2007-2014

Description	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
cif price	48.42	56.42	50.20	53.60	73.00	85.22	95.95	61.32
wholesale price	56.96	67.49	75.70	76.96	80.30	88.35	97.49	79.18
milling price	4.72	4.72	4.72	4.72	4.72	4.72	4.72	4.72
farm gate paddy price	18.57	32.99	34.37	31.55	31.09	31.37	33.22	41.12
mill gate price	23.29	37.71	39.09	36.27	35.81	36.09	37.94	45.84
border price farm gate equivalents per kg	13.02	25.80	17.79	16.36	26.34	29.34	32.22	29.51
Implicit NRP on paddy at farm gate	0.43	0.28	0.93	0.93	0.18	0.07	0.03	0.39
NRP (%)	**42.61**	**27.88**	**93.15**	**92.79**	**18.02**	**6.93**	**3.11**	**39.34**
observed cost per kg of tradable inputs(with interventions)								
machinery	3.42	3.75	3.91	3.88	5.75	7.00	7.48	7.29
fertilizer	0.64	0.60	0.56	0.57	0.78	0.57	0.57	0.46
weedicide	0.76	0.94	1.14	1.19	1.44	1.37	1.48	1.10
pesticide	0.47	0.47	0.48	0.46	0.61	0.50	0.48	0.06
total	5.29	5.76	6.08	6.10	8.58	9.44	10.01	8.91
hypothetical cost per kg of tradable inputs(without intervention)								
machinery	3.22	3.54	3.60	3.64	5.47	6.65	6.93	6.96
fertilizer	6.01	5.66	5.19	5.40	7.37	5.42	5.44	4.37
weedicide	0.58	0.72	0.89	0.95	1.17	1.11	1.20	0.89
pesticide	0.36	0.36	0.37	0.37	0.49	0.40	0.39	0.05
total	10.18	10.27	10.04	10.37	14.50	13.59	13.97	12.28
implicit NRP on tradable inputs	-0.48	-0.44	-0.39	-0.41	-0.41	-0.31	-0.28	-0.27
NRP (%)	**-48.03**	**-43.90**	**-39.43**	**-41.16**	**-40.82**	**-30.57**	**-28.32**	**-27.42**
observed value added net tradable inputs	13.28	27.23	28.29	25.45	22.51	21.93	23.21	32.21
hypothetical value added net tradable inputs	2.84	15.52	7.75	6.00	11.85	15.75	18.25	17.24
ERP	3.68	0.75	2.65	3.24	0.90	0.39	0.27	0.87
ERP (%)	**367.56**	**75.39**	**264.96**	**324.34**	**90.04**	**39.29**	**27.17**	**86.88**

Source: Author's Calculations

Note: *Hypothetical farmgate price is that which would prevail in the absence of interventions and would corresponds to the border price adjusted for conversion ratio of paddy into rice, wholesale markup and milling costs. Tradable inputs include machinery, fertilizer, weedicide and pesticides. "Observed" value added calculation takes into account actual tariffs and subsidies of (whole island irrigated rice) while "hypothetical assumes no tariffs and subsidies (Calculations are based on Valdes, 2013 of "calculation of ERP for Basmati rice from Panjab 2008-10", Table A5 in page 36)

*Explanation of calculation of ERP is given in the Table 6.3.

*Milling price of rice is obtained from the Wijesooriya and Priyadarshana, 2013

(2) Potato

As seen in Table 6.11, the implicit NRP on potato at the farm gate level is positive for 2011-2014 and has the highest protection rate among the selected commodities. The highest NRP of 138% is due to the higher ratio of farm gate over border price equivalent at the farm gate level potato price in 2013. The implicit NRP on tradable inputs used in potato is positive for all the years and relatively constant. Further these positive NRP values for tradable inputs imply that the production cost of potato would decrease marginally in the absence of intervention. The positive ERP is mainly as a result of higher protection for potato at the border as well as due to higher farm gate price. Meanwhile, the positive ERP reflects that the farm income due to potato farming would have been lower in the absence of intervention. The implicit NRP on potato at farmgate level vary from 112% to 138%. However, there is a huge variation in ERP of potato between 256% (in 2011) to 677% (in 2013). This is mainly observed due to differences between observed value added net tradable inputs and hypothetical value added net tradable inputs costs in 2011 and 2013.

Table 6.11: Calculation of ERP for Potato, 2011-2014

Item	2011	2012	2013	2014
Border price per kg (Rs)	30.28	26.26	30.01	39.41
Wholesale price (Rs./kg)	95.80	93.39	98.55	104.49
Farm gate price per kg	79.02	76.52	84.62	88.88
Border price farm gate equivalent per kg	37.31	33.66	35.50	38.25
Implicit NRP on product at farm gate (%)	111.80	127.31	138.34	132.39
Observed costs per kg of tradable inputs	22.99	26.15	30.54	27.04
Hypothetical costs per kg of tradable inputs	21.56	24.44	28.55	25.43
Implicit NRP on tradable inputs (%)	6.62	6.97	6.97	6.34
Observed value added net of tradable inputs	56.03	50.37	54.08	61.84
Hypothetical value added net of tradable inputs	15.75	9.22	6.96	12.82
ERP (%)	255.80	446.45	677.43	382.36

Source: Author's calculations (Detail calculation is given in Appendix 6.3)

(3) Big onion

Table 6.12 shows the NRP of big onion for 2010-2013 period is positive and the highest NRP of 87% noted in 2013. This is mainly as a result of significantly larger farm gate price reported in that year mainly as a result of decline in production due to heavy rains. Although farm gate price increased sharply in 2013, the border price equivalent at farm gate is same as a result of lower average import tariff imposed[28)] in that year. Implicit NRP of tradable inputs also show positive values for all the years, imply that the cost of production would decrease slightly in the absence of intervention. Meanwhile, the significant increase in import tariff imposed on big onion seed in 2012 result in sharp increase in NRP on tradable inputs. The ERP of big onion is vary between 23% in 2010 to 100% in 2013 is mainly due to the large difference in the observed value added net tradable inputs between these two years. The positive ERP for big onion in 2010-2013 accompanies protection to big onion farmers particularly due to import tariff imposed on imported big onion at the border. The highest ERP in 2013 implies that farm income due to big onion was 100% lower in that year in the absence of intervention.

[28] Import tariffs was lowered sharply at the end of the 2013, result in lower annual average import tariff.

Table 6.12: Calculation of ERP for Big onion, 2010-2013

Item	2010	2011	2012	2013
Border price per kg (Rs)	42.32	38.36	25.87	54.62
Wholesale price (Rs./kg)	64.40	65.99	64.33	109.97
Farm gate price per kg	60.03	57.74	56.90	85.00
Border price farm gate equivalent per kg	49.02	42.88	45.38	45.40
Implicit NRP on product at farm gate (%)	22.47	34.66	25.38	87.24
Observed costs per kg of tradable inputs	7.09	7.08	9.93	8.93
Hypothetical costs per kg of tradable inputs	6.08	6.06	5.61	7.39
Implicit NRP on tradable inputs (%)	16.53	16.81	77.01	20.82
Observed value added net of tradable inputs	52.94	50.66	46.97	76.07
Hypothetical value added net of tradable inputs	42.94	36.82	39.77	38.01
ERP (%)	23.31	37.59	18.09	100.14

Source: Author's calculations (Detail calculation is given in Appendix 6.4)

(4) Chilli

Sri Lanka imports more than 70% of its dried chilli requirement annually and both farm gate price as well as border price of chilli is high as seen from the Table 6.13. The implicit NRP of chilli at farm gate level is positive but show small values compared to other commodities of rice, potato and big onion. The fertilizer subsidy granted on chilli farmers leading to negative NRP of tradable inputs means, the production cost of chilli increased marginally in the absence of intervention especially when the subsidy is removed. The ERP for chilli show small but positive values for all the years and the volatility is small compared to other commodities.

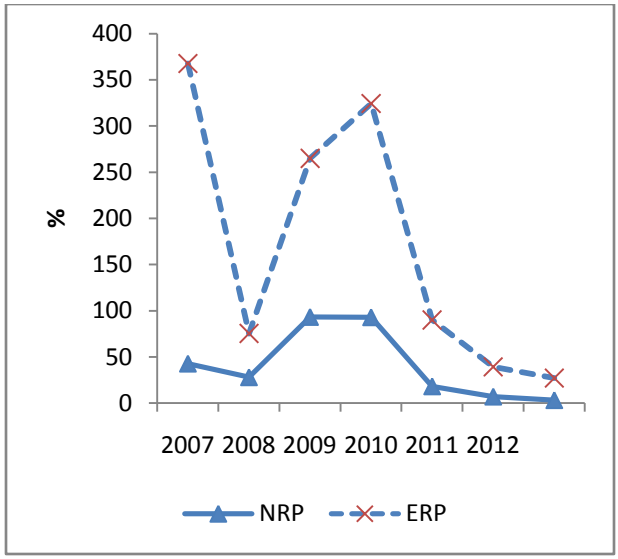
Table 6.13: Calculation of ERP for Green chilli, 2010-2014

Item	2010	2011	2012	2013	2014
Border price per kg (Rs)	132.61	212.69	144.40	144.17	162.65
Wholesale price (Rs./kg)	162.48	241.42	174.46	179.16	192.59
Farm gate price per kg	171.48	216.86	180.49	183.47	188.51
Border price farm gate equivalent per kg	161.63	208.11	173.14	173.51	183.57
Implicit NRP on product at farm gate (%)	6.10	4.20	4.24	5.74	2.69
Observed costs per kg of tradable inputs	7.20	8.52	10.38	8.82	9.08
Hypothetical costs per kg of tradable inputs	8.16	10.45	11.60	10.19	12.75
Implicit NRP on tradable inputs (%)	-11.69	-18.40	-10.53	-13.46	-28.73
Observed value added net of tradable inputs	164.28	208.34	170.11	174.65	179.43
Hypothetical value added net of tradable inputs	153.47	197.67	161.55	163.32	170.82
ERP (%)	7.04	5.40	5.30	6.94	5.04

Source: Author's calculations (Detail calculation is given in Appendix 6.5)

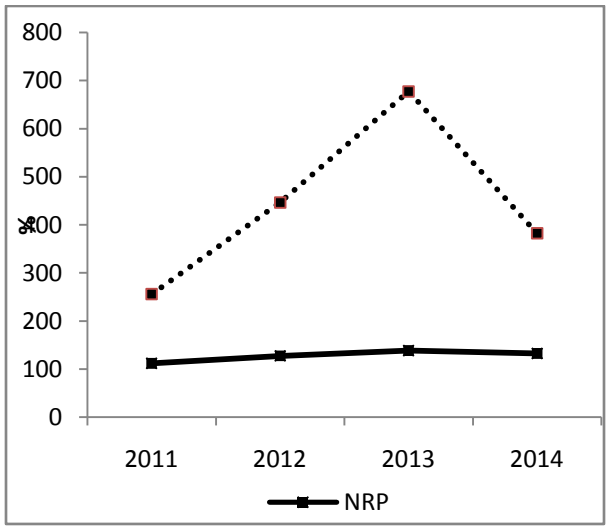
Figure 6.10 to 6.13 show the trends in NRP and ERP for rice, potato, big onion and chilli at the farm gate level. According to figures, potato farmers have highest protection while the chilli farmers have small positive protection. Meantime, the production of rice shows large volatility both in terms of NRP and ERP. As seen from Figure 6.10 and 6.11, there is a large gap between ERP and NRP for the commodities due to influence of tradable inputs in calculation of ERP. The highest gap between NRP and ERP could be observed for rice and potato. However, the gap between ERP and NRP is relatively small for big onion and chilli. Protection measured in terms of NRP and ERP shows there is wide dispersion among the commodities and if NRP and ERP calculated in monthly, very large dispersion could have been observed. In addition, the analysis show that protection to rice farmers have gradually declined after 2010 except noticeable increases in 2014.

Figure 6.6: Trends in NRP and ERP of Rice (at the farm gate level)



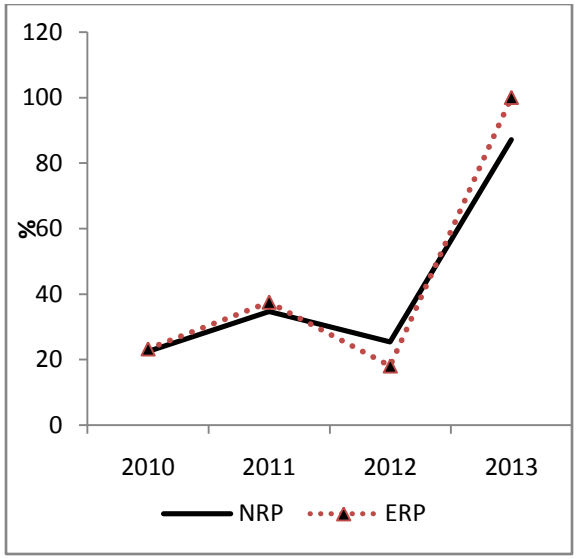
Source: Author's calculations

Figure 6.7: Trends in NRP and ERP of Potato (at the farm gate level)



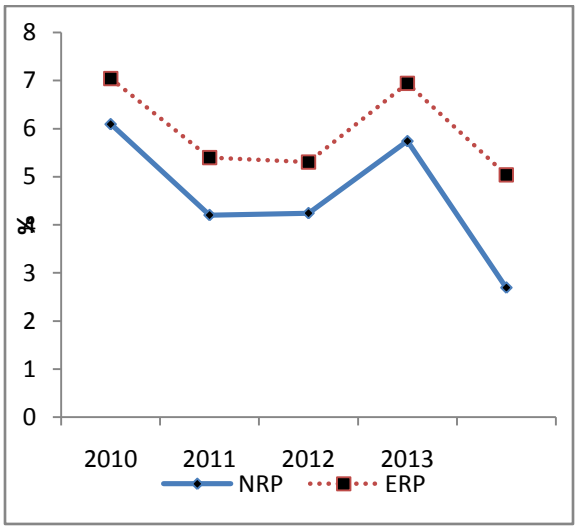
Source: Author's calculations

Figure 6.8: Trends in NRP and ERP of Big onion (at the farm gate level)



Source: Author's calculations

Figure 6.9: Trends in NRP and ERP of Green chilli (at the farm gate level)



Source: Author's calculations

6.6 Conclusion and Policy Implications

There are number of taxes (custom duty and para tariffs measures) used in the country and time to time the types of tariffs applied and their rates are changed in frequent manner. Taxes also vary across commodities. Observations show that the tax formula is complex and there are taxes on tax. Therefore, there is huge dispersion in the total tax amount (TPR) within a year. Despite only a few agricultural commodities are subjected to para tariffs, most of the agricultural tariff lines are subjected to high tariff rates. Although, the introduction of SCL is expected to minimize the cumbersome administrative procedures as noted by Razzaque and Basnett (2014), this specific tax, not based on *ad valorem* rate and time to time government made changes to the tax rate. Therefore, there is no uniformity in total tax and are less predictable which makes difficulties in measuring the protectiveness. Hence, it needs to simplify the existing taxes and tax bases to remove the complexity of the taxation procedure and to easily understand the taxable amount. In addition, Kelegama (2009), using different information sources has revealed that high import duties on certain goods have fuelled a growing illegal importation trade.

It is also noted that 15% of agricultural tariff lines in 2015 are subjected to SCL despite the fact that larger portion of protection in agricultural tariff lines are due to CD. Further it is understand that more than 50% of the agricultural tariff lines are exceed 50% of TPR. This would cause uncertainty in tariff calculation and create harmful impacts on the domestic economy. Therefore, simplifications of the tariffication process as well as tax rates are important.

All the selected commodities are positively protected over the years and farm income would have negative impact if the interventions are removed. Ad-hoc tariff changes in major import competing food crops of rice, potato, chilli and big onion would result in uncertainty in the market and cause adverse impact on society. In terms of ERP, potato farmers have the highest protection mainly due to import tariffs while production of chilli has relatively small protection. The high volatility observed in protection provide to rice and the import tariffs on rice imports is vary significantly with the domestic rice production. This is mainly due to uncertainty in the domestic production of rice which heavily depends on the variation in climatic conditions in the country. The unfavorable climatic conditions prevailed in the recent years result in larger volatility in farm income and consumer prices in the country. In addition, the massive fertilizer subsidy as well as irrigation subsidy[29)] grant on rice farmers result in significant

[29] Irrigation is completely free for rice farmers and was not acconted in the analysis due to inadequacy of data.

reduction in the cost of production. Therefore, distortions in rice and other food crops lead to increase in farm income at the expense to the consumers. The study also finds that the fertilizer subsidy is a main driver of the ERP for rice. Hence, the removal of such intervention in terms of tariffs or other taxes as well as fertilizer subsidy would be benefited on larger portion of consumers in the country. However, despite the marginal drop in paddy production in the country due to corrections of distortions, the farming community would affect badly as a result of decrease in their income. This would weaken the political power of the government which mainly depends on the voting power of the majority of farming community. Therefore, the next chapter analyses the implications of elimination of distortions on the income level and the poverty of rice producers and the consumers in the country.

Appendices to Chapter 6

Appendix 6.1: Cost Share of Tradable Inputs (%)-Share of each Input as a Proportion of Farm gate Price of Produce

1. Rice

Input	2007	2008	2009	2010	2011	2012	2013
machinery	22.73	12.81	13.26	14.00	18.80	26.37	25.11
fertilizer	4.24	2.05	1.91	2.08	2.53	2.15	1.92
weedicide	5.05	3.21	3.86	4.31	4.70	5.15	4.98
pesticide	1.33	1.60	1.62	1.65	1.99	1.87	1.60

Source: Cost of Cultivations, Department of Agriculture

2. Potato

Input	2011	2012	2013	2014
seed	23.98	26.68	28.47	22.81
machinery	1.34	3.01	3.24	1.97
fertilizer	2.26	2.07	3.79	1.30
pesticide	2.00	3.20	3.65	0.96

Source: Cost of Cultivations, Department of Agriculture

3. Big onion

Input	2010	2011	2012	2013
seed	2.31	2.67	6.24	3.95
machinery	4.47	4.72	6.01	3.03
fertilizer	3.00	2.41	2.25	1.42
pesticide	1.24	1.38	1.73	1.14
weedicide	0.78	1.07	1.22	0.96

Source: Cost of Cultivations, Department of Agriculture

4. Chilli

Input	2010	2011	2012	2013	2014
seed	0.50	0.40	0.26	0.38	0.63
machinery	1.74	2.28	3.94	5.87	2.77
fertilizer	1.89	2.33	1.44	2.21	3.35
agro chemical	5.54	4.63	3.30	3.96	2.16

Source: Cost of Cultivations, Department of Agriculture

Appendix 6.2: Major Economic Policy Changes and Measures on Food Commodity Imports, 2010-2015

25 January 2010	A custom duty waiver of 12.5% was granted on the importation of maize. Hence the applicable duty is 2.5%.
10 February 2010	SCL on the importation of dried sprats, potatoes, big onions, peas, chicken peas, green gram, dhal, canned fish, sugar, red onions and garlic was extended for another 3 months.
16 February 2010	Total recoverable tax rate on the importation of milk powder was reduced from Rs. 100 per kg to Rs. 50 per kg.

18 February 2010	Custom duty waiver of Rs. 25 per kg was granted on importation of certain categories of edible oil and their fractions
25 February 2010	The full custom duty waiver on the importation of malt extract was extended
20 March 2010	SCL on importation of rice was removed and custom duty and other applicable taxes and levies were re-imposed.
21 March 2010	SCL of Rs. 1 per kg on the importation of sugar was extended for another 3 months.
01 May 2010	The full custom duty waiver on the importation of wheat grain was reduced to Rs. 8 per kg. Hence the applicable custom duty is Rs. 2 per kg.
10 May 2010	SCL on the importation of dried sprats, potatoes, big onions, red onions, peas, chickpeas, dhal, green gram, dried chilies and canned fish was extended for another 3 months at the previous rates.
01 June 2010	-The five band custom duty structure (0, 2.5, 6, 15, 28 %) was reduced to a four band structure (0, 5, 15, 30 %) -The 15% surcharge on custom duty on imported goods were removed. -The 2.5% custom duty, which was mostly applied on importation of raw materials and machinery was abolished.
21 June 2010	-SCL on the importation of sugar was increased from Rs. 1 per kg to Rs. 5 per kg for 3 months. - The duty waiver of Rs. 8 per kg on the importation of wheat grain was removed and hence the applicable custom duty was increased to 15% or Rs. 10 per kg, whichever is high.
10 August 2010	-SCL on the importation of red onions and big onions was increased from Rs. 10 per kg to Rs. 25 per kg. -SCL on the importation of garlic was reduced from Rs. 30 per kg to Rs. 10 per kg. -SCL on importation of whole peas and whole chickpeas was reduced from Rs. 15 per kg to Rs.10 per kg. -SCL on the importation of whole masoor dhal and split masoor dhal was increased from Rs. 1 per kg to Rs. 10 per kg and Rs. 2 per kg to Rs. 15 per kg respectively. -SCL on the importation of dried sprats, potatoes split peas, split chick peas, greengram , dried chillies and canned fish was extended for another 4 months at previous rates .
27 August 2010	A surcharge of Rs. 20 per kg was imposed on potatoes until 9 September 2010.
10 September 2010	SCL on importation of potatoes was increased from Rs. 10 per kg to Rs. 30 per kg for another 3 months.
21 September 2010	SCL of Rs. 5 per kg on the importation of sugar was extended for another 3 months.
30 October 2010	-SCL on the importation of big onions was reduced from Rs. 25 per kg to Rs. 10 per kg. -SCL on the importation of potatoes was reduced from Rs. 30 per kg to Rs. 10 per kg. -Custom duty waiver of Rs. 45 per kg or 15% was granted on the importation of certain categories of edible oil and their fractions
23 November 2010	The tax formulae used by the Sri Lanka Customs were changed.
10 December 2010	SCL on importation of dried sprats, potatoes, big onions, peas, chickpeas, green gram, dhal, canned fish, sugar, red onions and garlic was extended for another 4 months at previous rates.
01 January 2011	-The 20% VAT rate was reduced to 12%. Hence there is only one VAT rate applicable other than the zero rate. -The NBT rate of 3% was reduced to 2%.
22 January 2011	A full custom duty waiver was granted on the importation of milk powder. Hence, only PAL and NBT will be applicable on importation of milk powder. -RIDL was removed.
20 February 2011	The SCL on the importation of potatoes was increased from Rs. 10 per kg to Rs. 20 per kg for a period of 3 months.
01 April 2011	The SRL was removed.
10 April 2011	The SCL on the importation dried sprats, red onions, big onions, garlic, peas, chickpeas, green gram, masoor dhal, chillies, canned fish and sugar was extended for another 4 months.
03 May 2011	The SCL on importation of potatoes was increased from Rs. 20 per kg to Rs. 30 per kg for

	a period of 4 months.
10 August 2011	-The SCL was increased on the importation of potatoes from Rs. 30 per kg to Rs. 35 per kg and big onion and garlic from Rs. 10 per kg to Rs. 25 per kg for a period of 4 months. -The SCL on the importation of dried sprats, red onions, peas, chick peas, dhal, green gram, chillies, canned fish, and sugar was extended for another 4 months.
14 October 2011	-SCL on the importation of green gram, and crushed or ground chillies was increase from Rs. 15 per kg to Rs. 30 per kg and Rs. 25 per kg to Rs. 40 per kg respectively. -SCL on the importation of black gram of Rs. 90 per kg, cowpea of Rs. 75 per kg, kurakkan and other varieties of millet of Rs. 30 per kg was introduced.
22 November 2011	-SCL on importation of green gram, black gram and cowpea was increased from Rs. 30 per kg to Rs. 50 per kg, Rs. 90 per kg to Rs. 100 per kg and Rs. 75 per kg to Rs. 100 per kg respectively. -SCL on kurakkan and varieties of millet was increased from Rs. 30 per kg to Rs. 75 per kg. -SCL on importation of selected food items such as maldive fish, dried fish, selected fruit, selected spices, millet flour, black gram flour, ground nut (shelled) was introduced for a period of four months. -Cess on importation of wheat flour was introduced.
10 December 2011	The SCL on the importation of potatoes was reduced to Rs. 20 per kg from Rs. 35 per kg for a period of 4 months.
13 January 2012	-SCL was increased on the importation of selected food items such as sugar (Rs. 5 to Rs. 10 per kg), masoor dhal-whole (Rs. 10 to Rs.18 per kg), masoor dhal-split (Rs. 15 to Rs.22 per kg) garlic (Rs. 25 to Rs. 40 per kg) peas-whole (Rs. 10 to Rs. 15 per kg) and peas-split (Rs. 15 to Rs. 20 per kg) for a period of 4 months. -SCL on the importation of the fresh or chilled and frozen fish (30 % of CIF or Rs. 35 per kg whichever is higher) and edible oils including soy bean oil, palm oil, sun flower oil (Rs. 65 per kg) and coconut oil (Rs. 75 per kg) was introduced for a period of 4 months.
02 March 2012	The SCL on importation of potatoes was increased from Rs. 20 per kg to Rs. 30 per kg.
22 March 2012	SCL on the importation of following items were increased for a period of 9 months. -green gram from Rs. 50 per kg to Rs. 7 per kg. -Mandarin-fresh from Rs. 35 per kg to Rs. 50 per kg. -Kurakkan from Rs. 75 per kg to Rs. 100 per kg.
10 April 2012	SCL on importation of dried sprats, red onion, b'onion, chick peas, chillies and canned fish was extended for a period of 4 months.
04 May 2012	Custom duty waiver of 15% or Rs. 33 per kg was granted on the importation of milk powder. Accordingly, the applicable duty rate is 15% or Rs. 92 per kg.
12 May 2012	SCL on importation of the following food items was increased for a period of 9 months. -B'onion Rs. 25 to Rs. 35 per kg, Peas-whole Rs.15 to Rs.20 per kg, peas-split Rs. 20 to Rs. 25 per kg, green gram Rs. 75 to Rs.100 per kg, chillies-neither crushed nor ground-Rs. 20 to Rs. 25 per kg, millet-other Rs. 75 to Rs. 100 per kg, soya-bean, palm oil, sunflower seed-crude oil Rs. 65 to Rs. 80 per kg, soya-bean oil, palm oil, sunflower oil and coconut oil Rs. 75 to Rs. 90 per kg
20 June 2012	SCL on the importation of sugar was increased from Rs. 10 per kg to Rs. 20 per kg.
14 July 2012	SCL on the importation of the following items was reduced for a period of 3 months. -Fresh or chilled and frozen fish from 30% of CIF or Rs. 35/kg, whichever is high to 10% of CIF or Rs. 10/kg, whichever is high. -Sprats from Rs. 30 to Rs. 10 per kg -Potatoes from Rs. 30 to Rs. 10 per kg -Dried fish from Rs. 100 to Rs. 75 per kg. -B'onion Rs. 35 to Rs. 25 per kg -Canned fish from Rs. 85 to Rs. 50 per kg
13 August 2012	SCL on the importation of B'onion and potatoes was increased from Rs. Rs. 25 to Rs. 50 per kg and Rs. 10 per kg to Rs. 30 per kg respectively for a period of 4 months.
18 September 2012	SCL on the importation of potato and canned fish was increased from Rs. 30 to Rs. 50 per kg and Rs. 50 to Rs. 75 per kg respectively for a period of 3 months.
09 November 2012	SCL on the following food items was increased/ imposed for a period of 4 months.

	-black gram from Rs. 100 to Rs.110 per kg, chillies-crushed or ground from Rs. 40 to Rs. 150 per kg, chillies-other Rs. 150 per kg, -Custom duty waiver on the importation of milk powder was reduced to 15% or Rs. 107 per kg.
08 December 2012	SCL on importation of the following items was reduced for a period of two moths. -potatoes from Rs. 50 to Rs. 15 per kg, red onions from Rs. 25 to Rs. 15 per kg, b'onion from Rs. 50 to 15 per kg.
03 May 2013	SCL on the importation of potatoes was increased to Rs. 25 per kg from Rs. 15 per kg.
08 June 2013	SCL on the importation of fresh and frozen fish, maldive fish, dried sprats, dried fish, b'onion, garlic peas, chick peas, green gram, cowpea, masoor dhal, kurakkan, soya bean/palm/sun flower/coconut oil, canned fish and cane or beet sugar was extended for a further period of 6 months.
11 July 2013	SCL on the importation of b'onion was increased to Rs. 30 per kg from Rs. 15 per kg for a period of 5 months.
18 July 2013	Restrictions imposed on export of paddy and rice were rescinded.
02 August 2013	SCL on the importation of sugar was increased to Rs. 27 per kg from Rs. 20 per kg.
23 August 2013	SCL on the importation of potato and b'onions was increased from Rs. 25 to Rs. 40 per kg and Rs. 30 to Rs. 35 per kg respectively for a period of 4 months.
17 November 2013	SCL on the importation of following items was reduced for a period of 4 months. -potatoes from Rs. 40 to Rs. 10 per kg, Red onions from Rs. 15 to Rs. 5 per kg, b'onions from Rs. 35 to Rs. 10 per kg.
22 November 2013	SCL on the importation of maldive fish, dried sprats, dried fish, peas-whole, chick peas-whole, green gram, crude oil of soya bean oil/palm oil, sun flower oil was increased for a period of 4 months
01 January 2014	VAT exemption granted on import or supply of following goods was removed and made liable 12% VAT. -paddy, rice, wheat, cardamom, cinnamon, cloves, nutmeg, pepper, desiccated coconuts, rubber, latex. Fresh coconut, tea including green leaf, rice flour, wheat flour, bread, eggs, liquid milk or powdered milk -agricultural tractors or road tractors for semi trailers -machinery and equipment for tea and rubber industries -machinery for modernization of factories
03 February 2014	Custom duty waiver granted on the importation of milk powder was increased to Rs. 68 per kg from Rs. 18 per kg. Hence, the applicable duty rate is Rs. 57 per kg.
06 February 2014	SCL on the importation of split masoor dhal was reduced to Rs. 5 per kg from Rs.22 per kg for a period of 5 months.
07 February 2014	SCL on the importation of potatoes was increased to Rs. 25 per kg from Rs. 10 per kg for a period of 5 months.
08 March 2014	SCL on the importation of whole masoor dhal was reduced to Rs. 10 per kg from Rs. 18 per kg for a period of 5 months.
17 March 2014	SCL on the importation of red onion and b'onion of Rs. 5 per kg and Rs. 10 per kg, respectively, was extended for a period of 5 months.
09 April 2014	SCL of Rs. 5 per kg was imposed on importation of rice for a period of 3 months in place of Custom duty of Rs. 20 per kg, VAT of 12%, NBT of 2% and PAL of 5%.
10 April 2014	Full Custom duty waiver of 7.5% was granted on the importation of infant milk foods. Hence, the applicable duty rate is 0%.
11 April 2014	SCL was introduced at 10% per kg on the importation of maize and grain sorghum in place of Custom duty of 15%, VAT of 12%, NBT of 2%, PAL of 5% and Cess of 35% for a period of 2 months
22 May 2014	-SCL on the importation of potato and sugar was reduced from Rs. 25 to Rs.15 per kg and Rs. 30 to Rs. 25 per kg for a period of 7 months. -SCL on the importation of fresh or chilled fish, maldive fish, dried sparts, dried fish, cowpea, kurakkan, chillies, vegetable oils, canned fish was extended for a period of 7 months.
24 May 2014	-SCL on the importation of the whole masoor dhal was reduced to Rs. 5 per kg from Rs. 10 per kg for a period of 7 months.

	-SCL of Rs. 5 per kg on the importation of the split masoor dhal was extended for a period of 7 months.
02 June 2014	Custom duty waiver granted on the importation of milk powder was reduced to Rs. 43 per kg from Rs. 68 per kg. Hence the applicable duty rate is Rs. 82 per kg.
11 June 2014	SCL of 10% per kg on the importation of maize and sorghum was extended till 15 July 2014.
09 July 2014	SCL of Rs. 5 per kg on the importation of rice was extended for a period of 5 months.
16 July 2014	-SCL on the importation of potatoes was reduced to Rs. 5 per kg from Rs. 15 per kg for a period of 3 months. -SCL on the importation of sugar was increased to Rs. 28 per kg from Rs. 25 per kg for a period of 3 months.
18 July 2014	SCL on the importation of following items was reduced for a period of 3 months. -peas whole from Rs. 22 to Rs. 15 per kg, peas split from Rs. 25 to Rs. 18 per kg, chick peas whole from Rs. 12 to Rs. 7 per kg, chick peas split from Rs. 15 to Rs. 10 per kg, green gram from Rs. 102 to Rs. 70 per kg, cowpea from Rs. 100 to Rs. 70 per kg, masoor dhal red lentils-whole from Rs. 5 to Rs. 2 per kg, masoor dhal yellow lentils-whole from Rs. 5 to Rs. 2 per kg, kurakkan from Rs. 100 to Rs. 70 per kg. -SCL of Rs. 10 per kg on the importation of maize and sorghum was extended for period of 3 months. -SCL of Rs. 5 per kg on the importation of masoor dhal red lentils split and masoor dhal yellow lentils split was extended for a period of 3 months.
12 August 2014	-SCL of Rs. 5 per kg on the importation of red onion was extended for a period of 4 months. -SCL on the importation of b'onion was increased to Rs. 25 per kg from Rs. 10 per kg for period of 4 months.
15 August 2014	SCL on the importation of potatoes was increased to Rs. 15 per kg from Rs. 5 per kg for a period of 4 months.
23 August 2014	-SCL on the importation of potatoes was increased to Rs. 40 per kg from Rs. 15 per kg for a period of 4 months. -SCL on the importation of b'onions was increased to Rs. 35 per kg from Rs. 25 per kg for a period of 4 months.
05 September 2014	-SCL on the importation of rice was decreased to Rs. 1 per kg from Rs. 5 per kg for a period of 3 months. -SCL on the importation of sugar was increased to Rs.33 per kg from Rs. 28 per kg for a period of 3 months.
06 September 2014	The importation of fresh or chilled potatoes was suspended.
02 October 2014	The importation of fresh, chilled or frozen fish excluding fish fillet and other fish meat was banned.
09 October 2014	Custom duty waiver granted on the importation of milk powder was removed. Hence, the applicable duty rate is Rs. 25% or Rs. 125 per kg.
25 October 2014	-Custom duty on the importation of milk powder was increased to Rs. 225 per kg from Rs. 125 per kg and a custom duty waiver of Rs. 100 per kg was granted. Hence, the applicable duty rate is Rs. 125 per kg. -SCL on the importation of peas, chickpeas, green gram, black gram, cowpea, masoor dhal (red lentils), yellow lentils, maize, grain sorghum, kurakkan, millet and margarine was extended for a period of 4 months. -Cess on the importation of certain items including meat, sea foods, butter and fats, vegetables, coconuts, nuts, fruits, tea etc. was revised.
08 November 2014	Custom duty waiver granted on the importation of milk powder was reduced to Rs. 90 per kg from Rs. 100 per kg. Hence the applicable duty rate is Rs. 135 per kg.
02 December 2014	SCL on the importation of potatoes was decreased to Rs. 20 per kg from Rs. 40 per kg for a period of 4 months. -SCL on the importation of b'onion was increased to Rs. 50 per kg from Rs. 35 per kg for a period of 4 months. -SCL on the importation of green gram was decreased to Rs. 40 per kg from Rs. 70 per kg for a period of 4 months.

	-SCL on the importation of sugar was decreased to Rs.28 per kg from Rs. 33 per kg for a period of 4 months. -SCL applicable on the importation of rice, red onion, chillies, garlic, fresh or chilled fish, maldive fish, sprats, dried fish, yoghurt, butter, dairy spreads, vegetable oils etc. was extended for period of 4 months.
13 December 2014	SCL on the importation of potatoes was decreased to Rs. 10 per kg from Rs. 20 per kg for period of 3 months.
01 January 2015	-SCL on the importation of b'onions was decreased to Rs. 10 per kg from Rs. 50 per kg for a period of 4 months. -The rate of VAT was reduced to 11% from 12%
22 January 2015	SCL on the importation of rice was increased to Rs. 20 per kg from Rs. 1 per kg for a period of 4 months.
30 January 2015	SCL on the importation of following food items was reduced for a period of 6 months -green gram from Rs. 40 to Rs. 10 per kg, black gram from Rs. 110 to Rs. 60 per kg, chillies (crushed or ground) from Rs. 150 to Rs. 125 per kg. Sugar from Rs. 28 to Rs. 18 per kg, canned fish Rs. 102 to Rs. 50 per kg. -A full duty waiver granted on custom duty on wheat grain.
15 February 2015	SCL on the importation of potatoes was increased to Rs. 40 per kg from Rs. 10 per kg.
25 February 2015	-SCL on the importation of maize and grain sorghum was removed . -SCL on the importation of following items was imposed for a period of 6 months. -peas whole Rs. 15 per kg, peas split Rs. 18 per kg, chick peas whole Rs. 7 per kg, chick peas split Rs. 10 per kg, cowpea Rs. 70 per kg, red lentils Rs. 2 per kg, red lentils split Rs. 5 per kg, yellow lentils whole Rs. 2 per kg, yellow lentils split Rs. 5 per kg, kurakkan Rs. 70 per kg, millet Rs. 70 per kg
02 April 2015	-SCL on the importation of following food items was imposed. -red onions Rs. 5 per kg, garlic Rs. 40 per kg, kurakkan flour Rs. 150 per kg.
07 May 2015	- SCL on the importation of rice was increased to Rs. 35 per kg from Rs. 20 per kg.
06 June 2015	SCL on the importation of potatoes was decreased to Rs. 30 per kg from Rs. 40 per kg and SCL on b'onion of Rs. 10 per kg was imposed.
18 June 2015	SCL on the importation of red lentils split and yellow lentils split was reduced to Rs. 0.25 per kg.
21 July 2015	SCL of following food items was imposed as follow. -green gram Rs. 10 per kg, black gram Rs. 60 per kg, chillies Rs. 25 per kg, chillies crushed or ground Rs. 125 kg, sugar Rs. 18 per kg
23 July 2015	Custom duty of Rs. 180 per kg is applicable on the importation of milk powder.
08 September 2015	SCL on importation of following food items was imposed. -potatoes Rs. 40 per kg, b'onions Rs. 10 per kg, masoor dhal red and yellow lentils split Rs. 2 per kg, kurakkan Rs. 70 per kg, sugar Rs. 30 per kg
22 September 2015	Surcharge of Rs. 20 per kg was imposed on importation of b'onions.
09 October 2015	SCL on importation of b'onions was increased to Rs. 30 per kg for a period of 4 months.
21 November 2015	-SCL on importation of potatoes was decreased to Rs. 15 per kg for a period of 6 months. -SCL on importation of b'onions was decreased to Rs. 5 per kg for a period of 6 months. -SCL on importation of red and yellow lentils (whole) was decreased to Rs. 0.25 per kg for a period of 6 months & SCL of Rs. 0.25 per kg on red and yellow lentils (split) was extended for period of 6 months. -3 bands custom duty tariff structure of 0, 15% and 30% was introduced.

Source: Annual Reports, Central Bank of Sri Lanka (various issues)

Appendix 6.3: Calculation of ERP for Potato, 2011-2014

Description	2011	2012	2013	2014
cif price	30.28	26.26	30.01	39.41
wholesale price	95.80	93.39	98.55	104.49
farm gate potato price	79.02	76.52	84.62	88.88
border price farm gate equivalents per kg	37.31	33.66	35.50	38.25
Implicit NRP on potato at farm gate	1.12	1.27	1.38	1.32
NRP (%)	111.80	127.31	138.34	132.39
observed cost per kg of tradable inputs(with interventions)				
seed	18.64	19.95	22.20	22.81
machinery	1.04	2.25	2.52	1.97
fertilizer	1.75	1.55	2.96	1.30
pesticide	1.56	2.40	2.85	0.96
total	22.99	26.15	30.54	27.04
hypothetical cost per kg of tradable inputs(without intervention)				
seed	17.71	18.96	21.09	21.67
machinery	0.93	2.07	2.33	1.74
fertilizer	1.67	1.47	2.81	1.23
pesticide	1.26	1.95	2.31	0.78
total	21.56	24.44	28.55	25.43
implicit NRP on tradable inputs	0.07	0.07	0.07	0.06
NRP (%)	6.62	6.97	6.97	6.34
observed value added net tradable inputs	56.03	50.37	54.08	61.84
hypothetical value added net tradable inputs	15.75	9.22	6.96	12.82
ERP	2.56	4.46	6.77	3.82
ERP (%)	255.80	446.45	677.43	382.36

Source: Author's Calculations

Appendix 6.4: Calculation of ERP for Big onion, 2010-2013

Description	2010	2011	2012	2013
cif price	42.32	38.36	25.87	54.62
wholesale price	64.40	65.99	64.33	109.97
farm gate big onion price	60.03	57.74	56.90	85.00
border price farmgate equivalents per kg	49.02	42.88	45.38	45.40
Implicit NRP on big onion at farmgate	0.22	0.35	0.25	0.87
NRP (%)	22.47	34.66	25.38	87.24
observed cost per kg of tradable inputs(with interventions)				
seed	1.39	1.54	3.55	3.36
machinery	2.68	2.73	3.42	2.57
fertilizer	1.80	1.39	1.28	1.21

weedicide	0.74	0.80	0.98	0.82
pesticide	0.47	0.62	0.69	0.97
total	7.09	7.08	9.93	8.93
hypothetical cost per kg of tradable inputs(without intervention)				
seed	1.03	1.03	-0.15	2.39
machinery	2.39	2.56	3.18	2.40
fertilizer	1.69	1.32	1.22	1.15
weedicide	0.60	0.65	0.80	0.66
pesticide	0.37	0.50	0.56	0.79
total	6.08	6.06	5.61	7.39
implicit NRP on tradable inputs	0.17	0.17	0.77	0.21
NRP (%)	16.53	16.81	77.01	20.82
observed value added net tradable inputs	52.94	50.66	46.97	76.07
hypothetical value added net tradable inputs	42.94	36.82	39.77	38.01
ERP	0.23	0.38	0.18	1.00
ERP (%)	23.31	37.59	18.09	100.14

Source: Author's Calculations

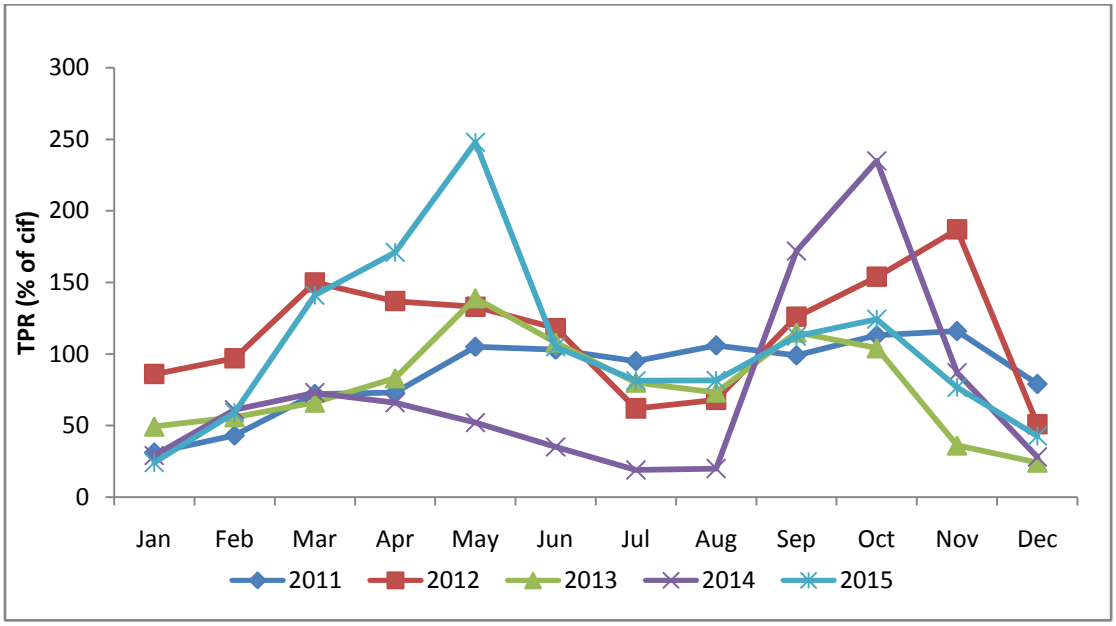
Appendix 6.5: Calculation of ERP for Chilli, 2010-2014

Description	**2010**	**2011**	**2012**	**2013**	**2014**
cif price	132.61	212.69	144.40	144.17	162.65
wholesale price	162.48	241.42	174.46	179.16	192.59
farm gate dried chilli price	171.48	216.86	180.49	183.47	188.51
border price farmgate equivalents per kg	161.63	208.11	173.14	173.51	183.57
Implicit NRP on chilli at farmgate	0.06	0.04	0.04	0.06	0.03
NRP (%)	6.10	4.20	4.24	5.74	2.69
observed cost per kg of tradable inputs(with interventions)					
seed	0.37	0.35	0.31	0.27	0.64
machinery	1.30	2.02	4.57	4.17	2.82
fertilizer	1.40	2.06	1.67	1.57	3.41
agro chemicals	4.13	4.10	3.83	2.81	2.20
total	7.20	8.52	10.38	8.82	9.08
hypothetical cost per kg of tradable inputs(without intervention)					
seed	0.32	0.32	0.26	0.22	0.55
machinery	1.23	1.91	4.26	3.96	2.31
fertilizer	3.30	4.88	3.97	3.72	8.11
agro chemicals	3.31	3.33	3.11	2.29	1.79
total	8.16	10.45	11.60	10.19	12.75
implicit NRP on tradable inputs	-0.12	-0.18	-0.11	-0.13	-0.29
NRP (%)	-11.69	-18.40	-10.53	-13.46	-28.73
observed value added net tradable inputs	164.28	208.34	170.11	174.65	179.43

hypothetical value added net tradable inputs	153.47	197.67	161.55	163.32	170.82
ERP	0.07	0.05	0.05	0.07	0.05
ERP (%)	7.04	5.40	5.30	6.94	5.04

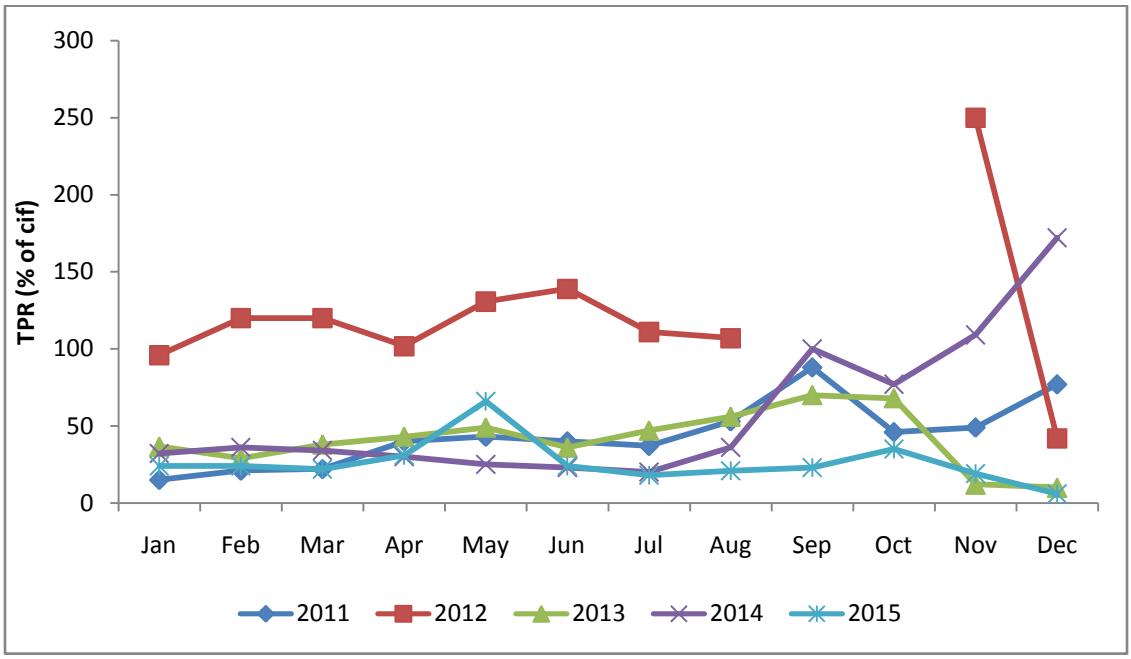
Source: Author's Calculations

Appendix 6.6: Monthly Trends in TPR Changes-Potato, 2011-2015



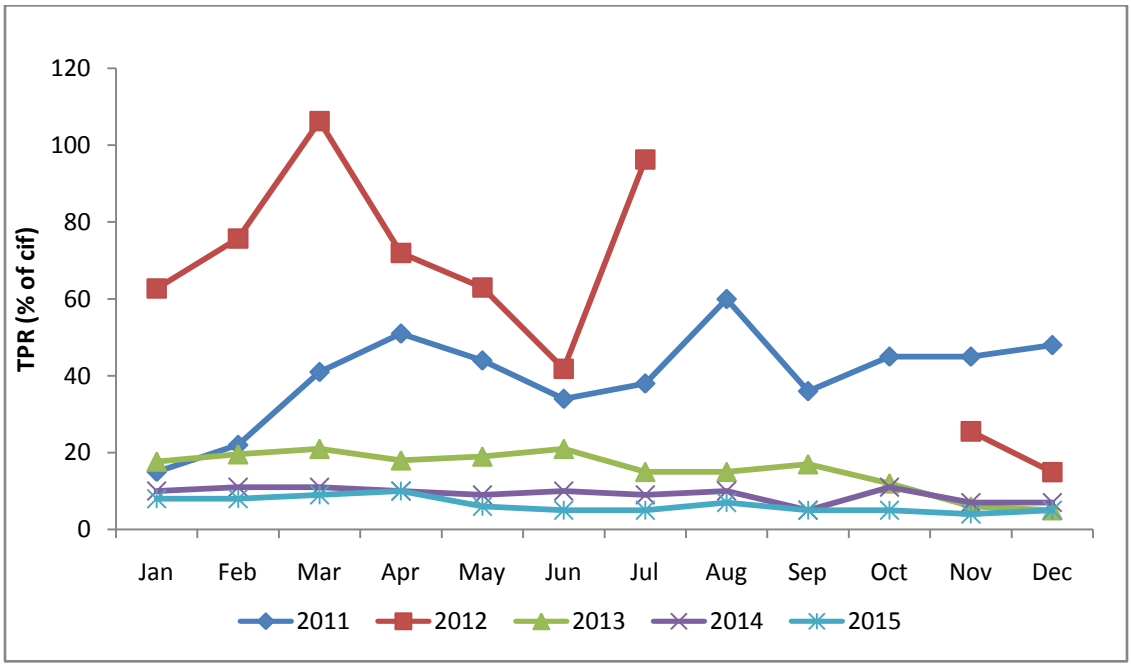
Source: Author's Calculations from Import Tariff Guide, Sri Lanka Customs

Appendix 6.7: Monthly Trends in TPR Changes-Big onion, 2011-2015



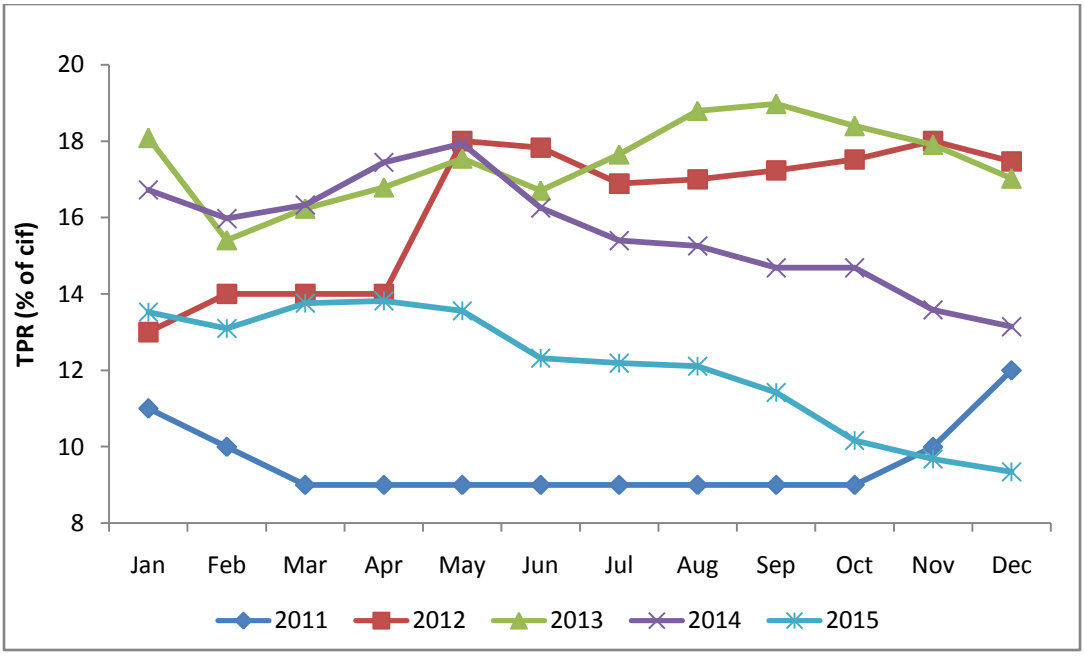
Source: Author's Calculations from Import Tariff Guide, Sri Lanka Customs

Appendix 6.8: Monthly Trends in TPR Changes-Red onion, 2011-2015



Source: Author's Calculations from Import Tariff Guide, Sri Lanka Customs

Appendix 6.9: Monthly Trends in TPR Changes-Chilli, 2011-2015



Source: Author's Calculations from Import Tariff Guide, Sri Lanka Customs

CHAPTER 7

IMPLICATIONS OF PRICE AND TRADE POLICIES OF RICE ON INCOME AND POVERTY

7.1 Introduction

Poverty is a dynamic issue which is not evenly distributed throughout the country and mainly concentrated in the rural areas where majority of people live. It is also believed to have a close relation with the main paddy producing regions in the country. Such dominance of poverty in rural areas and the importance of paddy sector as production and employment generation for poor people indicate a central role of dealing with poverty.

Many studies found that the growth and development of the agriculture sector has a strong impact on reducing poverty in the developing countries. In the meantime, contribution of trade to economic growth and resource efficiency has long been argued in FAO (The State of Food and Agriculture 2005). As recognized in the Rome Declaration and Plan of Action, trade is a key element for food security and also it permits the efficient transfer of food from surplus to deficit regions (Panitchpakdi, 2005). The government of Sri Lanka also seeks to enhance the food security in the country via self sufficiency by maintaining high border protection and granting subsidies to encourage the domestic production. Among the subsidies, fertilizer subsidy which accounts huge government budget plays a key role to reduce the cost of production of poor farmers. Although the policies are designed to generate higher income for paddy farmers' and alleviate poverty, achieving this target is still far behind the public expenditure incurred on the sector. In spite of protecting farming community, the larger segments of population who are net consumers of rice are adversely affected due to increase in rice prices and distortions introduced by such policies. Therefore, assessing the effects of recent trade and fertilizer subsidy policies of rice on income and poverty has growing interest in the agricultural policies in Sri Lanka.

Despite several attempts to study the poverty impacts of trade liberalization in whole agriculture sector, only few studies focus directly on poverty impact of eliminating distortions in the rice sector in Sri Lanka in the recent years. Among them; Weerahewa (2004) and (2006), Jayanetti and Tilakaratna (2005), Seshan and Deininger (2006), Narampanawa, Bandara and Selvanathan (2011) and World Bank (2013) have emerged in the recent years. However, these too have not focused on poverty impacts in detail.

The main objective of this section therefore is to conduct three main policy simulations in examining possible links between the current fertilizer[30] and trade policy distortions on change in income and poverty of both paddy producing and non paddy producing households in Sri Lanka. The results of the simulations will help to address some of the policy issues such as: who benefits from the price and trade liberalization in rice sector and to what extent? What kind of effect is on the welfare of paddy farmers if the fertilizer subsidy removed? What will be the impact on poverty ratio and poverty gap? What role can targeted transfers play in reducing disparity between rich and poor and farmers and non farmers as a result of policy change?

In order to meet the above objectives and to address policy issues the rest of this chapter arranged as follows. Section 7.2 gives the literature review of different methodologies employed in other countries to assess the impacts of liberalization policies as well as previous trade liberalization attempts in Sri Lanka in brief. Section 7.3 describes the methodology used in this chapter and Section 7.4 discusses the short run and long run effects of price and trade policy reforms using simulation results. The section 7.5 presents some policy implications and the final section concludes the chapter.

7.2 Review of Literature

7.2.1 Different Methodologies employed in other Countries

The relation between the agriculture and trade for poverty reduction has long time being subjected to a debated topic in both developed and developing countries using different methodologies. However, all methodologies proposed are based either on "bottom up"- which emphasizes the heterogeneity of individual households as reveled through survey, or "top-down" approach builds on the micro simulation assumption of a representative household. Based on the principal methodology employed, four broad categories can be identified (Reimer, 2002). Out of these four, one is cross country regression analysis that test for correlation among trade, growth, income, poverty and inequality variables observed at the national level. The second category is partial equilibrium or cost of living approach that based on household expenditure data. The third category is some form of general equilibrium model that usually based on a disaggregated economy wide SAM (Social Accounting Matrix).

[30] This chapter studies the fertilizer subsidy policy in 2012/13 before the changes introduced in the end of 2015.

The final category is micro macro simulation that is general equilibrium simulation coupled with some form of post simulation analysis based on household survey data.

The cross country regression approach used by Dollar and Kraay (2001) determined that non systematic relationship exists between changes in trade volumes and changes in the income share of the poorest. The approach enables the use of traditional statistical tools for testing results and hypotheses and may be able to account for some of the dynamic aspects of trade reform that are missed by statistic simulation models (Reimer, 2002). In addition, the partial equilibrium approach used by Levinsohn *et al* (1999), to study how the Indonesian economic crises affected poor household in the country found that very low income households were not insulated from the international shocks. Using the method of first order approximation of the welfare effect of small change in price is equal to the sum of changes in net income times change in price, Deaton (1989) considers the policy on rice prices using Socioeconomic Survey of 1981-82 to look at the effects of changes in prices on the distribution of income. This study found the net producers gain from higher price while net consumers will lose. Meanwhile, the overall change in household welfare in Morocco is estimated using the net sales-weighted price changes and found that tariff cuts on cereal imports have adverse impacts on rural poverty while favourably affected on urban poverty (Ravallion and Lokshin, 2004). The vertical inequality measured at this study reveals that inequality declines slightly because the poor tend to spend a disproportionate share of their income on grains, and grain prices fall under the reform. However, horizontal inequality increase as many of the rural poor in Morocco tend to be net sellers of grains and thereby lose from the price declines where as poor in urban areas gains as they are net buyers. Overall inequality due to trade liberalization rises because of the horizontal component dominates in import liberalization in Morocco. The study conduct by Minot and Goletti (2000) use the household level marketing data to estimate the impact of 10% increase in rice price on real income and poverty in Vietnam. This study uses net benefit ratio (income share of rice minus budget share of rice consumption) to find the effect taking into account both consumer demand and producer supply response to commodity price changes. Results of the study reveals a uniform 10 % increase in rice prices would hurt urban households and non farmers, although the effect on real income would be less than 2 % on average. After response effects of the rice price increase estimated using producer and consumer elasticities reflects it is more positive when consumer and producer responses are incorporated however, the difference between the short run and long run effects are small as a result of the relatively inelastic demand and supply. If a researcher is

interested in how trade liberalization will affect only a limited number of an economy's market or needs to incorporate a great amount of sectoral detail, the partial equilibrium analysis is logical approach.

A general equilibrium models are typically based on neoclassical theories of firm and household behaviors generally calibrated to a SAM. CGE modeling (Computable General Equilibrium) has been recently used in many scholars as response to the complexities of using econometric methods to track commodity price shocks. This model allows obtaining counterfactual simulation results of trade policy on sectoral output, employment and remuneration by different income categories (Vos and Jong, 2003). However, CGE models depends critically on parameters and functions which can barely be tested one-by-one, let alone in combination (Winters et al, 2004). Also it only provides simulation results for between group differentials in terms of employment and factor remuneration hence misses the full distribution effects and lacks detail for a meaningful assessment of poverty impacts (Vos and Jong, 2003). Moreover, the standard CGE approach is often only able to reach conclusions regarding the effects on the mean income of aggregate groups of workers and a reduced number of representative households. Ianchovichina *et al* (2001) use the CGE approach with a single 'representative' consumer to generate changes in commodity and factor prices and apply these household data to calculate poverty impacts, estimate that all households would gain from trade liberalization with larger proportionate changes for poor households. The household disaggregation approach of CGE model has the advantage of including behavioral changes. This approach used by Cogneau and Robilliard (2000) estimate a household model from survey data to Madagascar has embed it in three sector CGE model. Cockburn (2001) uses the similar approach for Nepal concludes that liberalization benefits the urban poor and harms the rural poor because it reduces agricultural prices.

Using household data in a micro simulation model that is integrated with the CGE model incorporates household heterogeneity and allows a better analysis of issues of income distribution and poverty. Robilliard *et al* (2001) used this approach to Indonesian crisis on poor households found that poverty increases over the 1997-98 period due in equal measure to the El Nino drought and to the financial crisis. They carried out the analysis using representative households to compare and determine that the representative household assumption biases most experiments and leads to incorrect results in the case of target policies. Hertel *et al* (2001) examine how the global trade liberalization affects poverty in each of seven different developing countries and focus their analysis on factor market, commodity market and terms of trade effect. They first conduct policy experiment in the Global Trade

Analysis Project (GTAP model) of trade to generate a vector of factor and commodity price changes for 17 regions of the world and then price changes are fed into post simulation framework that characteristics households according to factor income and consumption profiles. They suggest that multi lateral trade liberalization will reduce overall poverty in Indonesia, Philippines, Uganda and Zambia, but increase overall poverty in Brazil, Chile and Thailand. Vos and Jong (2003) applies this model, to Ecuador seen as a top down model because the CGE communicates with the micro simulation model through a vector of prices, wages and employment levels which is passed from macro to the micro level. Results of this study indicates that the trade opening in Ecuador induced mild aggregate welfare gains but arising income inequality due to rising wage differentials between skilled and unskilled workers implies no poverty reducing effect from trade liberalization. One of the advantages of the adopted the micro simulation model is the decomposition of poverty and inequality measures by population subgroups. However, it relies on summary indices of poverty and inequality, rather than considering the full distribution and in the residuals a lot is left unexplained.

7.2.2 Previous Study Attempts in Sri Lanka

The impact of rice trade liberalization in Sri Lanka has been subjected to a few research studies in the past. Among them, Weerahewa (2004) determined the trade liberalization impact using the of relative importance of rice in the expenditure and income of a household using the approach of Nicita *et al*. (2002). In the study she uses provincial level data and the trade liberalization was modeled as a drop in prices of rice and paddy by 25%. However, this study uses share of income from agriculture instead of share of income from the rice. Thus it overestimated the losses and underestimates the net gains from rice trade liberalization. The analysis revealed that the highest gains from liberalization of rice trade is obtained by the very poor people in the estate sector among the sectors and North western among the provinces, hence rice trade liberalization is pro-poor. Further, this study pointed out that as Sri Lankan rice producers are relatively inefficient, consumers gain while producers lose from the trade liberalization.

Jayanetti and Tilakaratna (2005) studied the impact of trade liberalization on poverty and welfare of households, with a special focus on the rice and potato sectors of Sri Lanka using a descriptive approach as well as analytical model. The results of the analytical model showed net welfare effect for all the income deciles is positive. However, the extent of gain for low-income deciles is high compared to richer deciles. District level analysis

showed welfare gains for all the districts except for two large-scale rice producing areas of Ampara and Polonnaruwa. Further they estimated estate sector households had the highest positive welfare effect while the urban sector had the lowest (positive) effect.

In addition, distributional impact of reducing import duties on rice, chillies, onions, potatoes and wheat in Sri Lanka subjected to a study by Seshan *et al* (2006) using the 2002 HIES household survey data and the model based on approach adopted by Minot and Goletti (2000). They estimate that the lowering of import duties in Sri Lanka on staple food items will benefit the vast majority of population who are net consumers of these commodities. Further it shows 50% reduction of custom duty will raise real income by 2.2% and headcount poverty will decline by 7% among the poorest households. Meanwhile, a total removal of import duties and levies on rice will raise real income by 5.1% and lift 17.8% of poorest households primarily reside in the estate and rural sector out of poverty.

Further, Weerahewa (2006) examine the impacts of liberalization of rice markets employing general equilibrium model using the input output table for 2000 with special emphasize to welfare at the provincial level. This model contains various trade shock transmission channels to households such as output prices, factor prices and employment and government transfers. Results show that liberal policies would increase economic efficiency and household welfare across provinces. In addition, study shows that import bans on rice would not only reduce overall efficiency in the economy, but reduces the household welfare even in some poorer agricultural provinces such as North Central and Uva which is contrary to the general belief of that protectionism is pro poor. However, the study does not incorporate the basic characteristics of economy in the model, which important in strengthen the transmission channels as well as disaggregation of households to identify where the inefficiencies concentrated in.

Based on the comparative multi sectoral SAM based CGE model using the top down approach Narampanawa *et al* (2011) examined the possible link between trade reform on absolute and relative poverty at different household groups. The overall results of the study suggests that trade reforms may widen the income gap between rich and poor thus increasing relative poverty. Thus they suggest that implementing targeted transfers to low income groups in the short run and investing physical infrastructure and human capital in the long run. In addition, study results reveals that paddy output is decreasing 0.15% in the short run and it reduces by 0.2% in the long run as a result of 100% cut in prevailing tariffs in agricultural industries. This tariff cut further lead to paddy sector employment decreasing 0.59% in the short run but it is only 0.43% reduction in the long run.

A recent study conducted by the World Bank (2013) using the HIES data of 2009/10 found that removal of border protection is resulted in smaller losses for the poor than the non poor, but relative to their income, poor suffer larger losses on the income side and larger gains on the consumption side. This study considered different simulations to show impact of polices on net income of rice producers expressed as a value added over tradable input cost. According to the analysis, the current trade regime is regressive from the perspective of poverty and small farms lose because removal of protection would have a small effect on real income of poor and for small farm households, where as main adverse effect is felt by the medium and large scale households.

7.3 Methodology

7.3.1 Model

This work adopts a partial equilibrium approach focusing on the rice market. The methodology draws on the approach of Nicita *et al.* (2002) in their study of the impact of trade reform in Cambodia and the later used by McCulloch (2002).

As described by Nicita *et al*, income of a household is a sum of three components; own production, wage employment and net transfers. Income Y of household is given by:

$$Y = \left(\sum_j P_j^o q_j^o - \sum_k P_k^I q_k^I\right) + \sum_f w_f L_f + \sum_m \sum_n T_{mn} \quad \ldots\ldots(1)$$

Where P_j^o is the price of output j; q_j^o is the quantity of output j; P_k^I is the input prices and q_k^I is the quantity of inputs. w_f is the wage rate for factor f, L_f is the net sale of factor f by the household and T_{mn} is the net transfer received by household member n from source m.

Short run consumption (C) of the household can be given by;

$$C = \sum_i P_i^C q_i^C \quad \ldots\ldots(2)$$

Where P_i^C is the buying price of good i and q_i^C is the quantity consumed of good i. q_i^C includes own consumption as well as goods purchased from the market.

Then we can simulate the impact on household income of price changes induced by structural reforms. Since we assume all quantities remain fixed in the short run, we can write the change in income as;

$$\Delta Y = \left(\sum_j \Delta P_j^o q_j^o - \sum_k \Delta P_k^I q_k^I\right) + \sum_f \Delta w_f L_f + \sum_m \sum_n \Delta T_{mn} \quad \text{.....(3)}$$

Similarly by assuming that quantities remains fixed in the short run the change in consumption can be written as:

$$\Delta C = \sum_i \Delta P_i^C q_i^C \quad \text{.....(4)}$$

According to Chen and Ravallion (2002), first order approximation of the change in money metric utility resulting from a change in price of a commodity can be given by;

$$\Delta MMU = \Delta Y - \Delta C \quad \text{..... (5)}$$

From equations (1), (2), (3) and (4) we can write,

$$\frac{\Delta MMU}{Y} = \left(\sum_j BS_j^O \frac{\Delta P_j^O}{P_j^O} - \sum_k BS_k^I \frac{\Delta P_k^I}{P_k^I}\right) + \sum_f BS_f^W \frac{\Delta W_f}{W_f} + \frac{\sum_m \sum_n \Delta T_{mn}}{Y} - \sum_i BS_j^C \frac{\Delta P_j^C}{P_j^C} \quad \text{.....(6)}$$

Where BS_j^O indicates the budget or income share of the output revenue in total income, BS_k^I is the budget share of input costs, BS_f^W is the income share of net factor income from factor f, and BS_j^C is the budget share of good j in consumption. Thus the first order percentage change in net income can approximated by the budget shares of income and expenditure on each item times the percentage change in prices experienced. Because the calculations are limited to the household level impact of a single producer price (rice), on farm income, the product subscripts describe the rice only and impact of labour wage rate is assumed as fixed due to data limitations of the study.

Therefore, the short term welfare effect of changes in rice prices is given by

$$\frac{\Delta MMU}{Y} = \left(\sum_j BS_j^O \frac{\Delta P_j^O}{P_j^O} - \sum_k BS_k^I \frac{\Delta P_k^I}{P_k^I}\right) + \frac{\sum_m \sum_n \Delta T_{mn}}{Y} - \sum_i BS_j^C \frac{\Delta P_j^C}{P_j^C}$$

The second order or long term welfare effect is calculated using,

$$\frac{\Delta MMU^2}{Y} = \left(\sum_j BS_j^O \frac{\Delta P_j^O}{P_j^O} + \frac{1}{2}\left(\frac{\Delta P_j^O}{P_j^O}\right)^2 BS_j^O \varepsilon_r^s - \sum_k BS_k^I \frac{\Delta P_k^I}{P_k^I}\right) + \frac{\sum_m \sum_n \Delta T_{mn}}{Y} - \sum_i BS_j^C \frac{\Delta P_j^C}{P_j^C} - \frac{1}{2}\left(\frac{\Delta P_j^C}{P_j^C}\right)^2 BS_j^C \varepsilon_r^d$$

ε_r^s = the own price elasticity of rice supply and

ε_r^d = the own price elasticity of rice demand

If the elasticities are set to zero, this expression collapses to the welfare measure popularized by Deaton (1989, 1997) and is commonly referred to as the Net Benefit Ratio (NBR). This is short term welfare measure that assumes no quantity or dynamic responses by consumers and producers.

Therefore, the impacts of price and trade policies affecting the rice production and consumption are determined by the relative importance of rice in the expenditure and income of the households. If a particular household depends more on paddy as an income source, there will be very high losses due to removal of trade and price interventions. Similarly, if a particular household spends a considerable share of expenditure on rice, there will be very high gains due to elimination of distortions. Therefore, relative difference between income share and expenditure share indicates whether the particular household gains or losses. In this chapter the real income effect in both short term and long term (after incorporate the response from producers and consumers) to the price change as a result of removal of trade protection and fertilizer subsidy is estimated for rice.

7.3.2 Data

In this section, individual household data from Household Income and Expenditure Survey (HIES) 2012/13 is used to estimate the impact of price and trade policy distortions on real income and poverty. The values of BS_j^O and BS_j^C are based on the HIES 2012/13 and the BS_k^I based on input cost data obtained from cost of production for the 2012. Since only the aggregate input cost data for each household is available in HIES, disaggregate tradable input cost of an every single household is estimated using the national budget shares given in Table 7.1 hence estimate the BS_k^I for each household. The supply and demand elasticities are based on an econometric analysis of time series data by Weerahewa[31)] (2004). In addition, the price changes of farm gate and retail price of rice and inputs use in rice resulting from the removal of distortions are obtained from the calculations in Chapter 6 (See Table 6.10 for Calculation of ERP for rice).

[31)] Weerahewa (2004) estimated rice demand as a function of rice price, wheat price, millet price and expenditure while paddy supply is a function of paddy price, seed paddy price and fertilizer price for the period of 1978-2000. Using the model, Elasticity of supply with respect to own price is 0.609 and elasticity of demand with respect to own price is -0.9126 obtained (Table 12, Weerahewa, 2004).

Table 7.1: Cost Share of Tradable Inputs Use in Paddy Cultivation, 2012

Tradable Inputs	Average Cost Share
Machinery	26.37
Fertilizer	2.15
Weedicide	5.15
Pesticide	1.87

Source: Cost of Cultivations, Department of Agriculture

Three policy simulations are conducted to estimate welfare change in the short run and long run.

Simulation 1: Removal of border tax of importing rice and tradable inputs used in paddy production (while maintaining the fertilizer subsidy)

Simulation 2: Removal of fertilizer subsidy only (while maintaining the border taxes of imports of rice and inputs used in paddy production)

Simulation 3: Removal of both (border tax and fertilizer subsidy)

In 2012, the government share of fertilizer subsidy is considered as 0.9 (ratio between farmgate price and market price of fertilizer in 2012). We assume that government considers to transfer money to households which is the expenditure savings resulting from the removal of fertilizer subsidy-either to all households who below the poverty line or only to the paddy producing households. These two cases also included in the policy simulation 2 and 3.

In addition to the real income change poverty ratio and poverty gap index are calculated before and after the policy changes using below equations.

Poverty ratio=number poor people in the population/total population

The number of poor households is calculated using the official poverty line of Rs. 3,624 per person per month in 2012/13 (Department of Census and Statistics, 2012/13).

Poverty gap index is given by; $(PG)=\frac{1}{N}\sum_{i=1}^{q}\left(1-\frac{X}{Z}\right)$

$i = 1$ if $X_i < Z$ and $i = 0$ if $X_i \geq Z$

Where, N-population, q-poor population, Z-poverty line and X_i-real per capita income.

7.4 Results and Discussion

7.4.1 General Characteristics of Paddy Farmers

From the total sample of 20,409 households which represents all 25 districts in the country, 2,509 (12%) households engage in paddy cultivation in 2012 as part time or full time farmers. The remaining of 88% households obtain their income from other agricultural (non paddy crops, livestock etc), or non agricultural activities (paid employment, mining, construction etc.) and cash receipts and ad-hoc gains other than paddy cultivation. There are wide variations in income earns from paddy farming and expenditure incurs on rice consumption across different households categorized by districts, income groups and farm size etc. The average per capita consumption of rice in Sri Lanka is 113 kg though it widely varies across different sectors. As can be seen from Table 7.2 paddy farmers' per capita monthly income is Rs. 11,174 (lower than national average of Rs. 11,819) of which only 11% obtain from paddy farming. Meanwhile, the average per capita monthly expenditure on all goods for paddy farmer is Rs. 9,051 of which Rs. 630 spend on rice (with imputed home grown rice consumption). Paddy farmers' average household expenditure on all goods total Rs. 36,586 is nearly 12% lower than national average (Rs. 41,444).

As observed in the Table 7.3, mean household income from rice cultivation is equivalent to 15%, and household's budget share of rice consumption is 11%. The highest income share of 16% is recorded in the rural sector and the estate sector receives the lowest income share of 3%. At the sectoral level, urban and rural paddy farmers are net producers though estate sector is net consumers of rice.

Among the regions, the importance of rice in household income is highest in Northern Province (28%), Eastern Province (22%) and North Central Province (20%) while it lowest in the Western Province (3%) (See Appendix 7.1). Meanwhile, the budget share of rice consumption ranges from 7% in Western province to 14% in Uva Province. As observed, the difference between budget share of rice income and expenditure is negative in the Western, Central and Sabaragamuwa Provinces indicate that these provinces are net rice consumers. Meanwhile, paddy farming communities in the Hambantota, Mulative, Kilinochchi, Ampara, Trincomalee and Polonnaruwa districts depend largely on paddy income which is more than 1/5 of total income and they can be considered as net

rice producing areas in the country. In addition, most of these areas are major paddy producing districts in the country (Appendix 7.2).

Table 7.2: Per capita Rice Income and Consumption of Paddy Farming Households by Sector

Sector	Per capita Monthly Income				Per capita Monthly Expenditure		
	No.	Net Paddy Income	Total	Income Share of Rice	Rice	Total	Expenditure Share on Rice cons.
Urban	105	1,280	21,482	6.0	551	13,041	4.2
Rural	2,376	1,191	10,692	11.1	634	9,051	7.0
Estate	28	411	13,446	3.1	556	14,101	3.9
Total	2,509	1,186	11,174	10.6	630	9,051	7.0

Source: Author's Calculations from HIES 2012/13, Department of Census and Statistics

Table 7.3: Budget Share of Net Rice Income and Consumption of Paddy Farming Households by Sector

Sector	No.	BS of Net Paddy Income	BS of Rice Expenditure	(BS of Net Income) - (BS of Expenditure)
Urban	105	13.08	6.78	6.30
Rural	2,376	15.50	11.02	4.48
Estate	28	3.26	5.92	-2.66
Total	2,509	15.26	10.78	4.48

Source: Author's calculations from HIES 2012/13, Department of Census and Statistics

Note: 'BS' is budget share

Furthermore, as seen in the Table 7.4, poor paddy households depend twice larger on rice income than non poor households. Among the income deciles, income share of paddy for households who below the poverty line is 27% while richest farmers depends only 6% on rice income. Therefore, it is observed that, as a proportion of income, rice is the important income source for poor farmers. In addition, farmers in the lowest income group spend notably larger proportion of their income (around 30%) on consumption of rice and it is only 2% for the highest income paddy households. Therefore, the difference between budget share of paddy income and expenditures is relatively large for non poor households compared to poor farmers. The gap is negative for the paddy farmers in the lowest income decile indicate that they are net rice consumers.

Table 7.4: Share of Net Rice Income and Consumption of Paddy Farming Households by Poverty Status and Income Group

Household category	Status	No.	BS of Net Paddy Income	BS of Rice Expenditure	(BS of Net Income) - (BS of expenditure)
Poverty status	Poor	409	26.79	26.60	0.19
	Non poor	2,100	13.02	7.70	5.32
Income deciles	<10,836	254	29.69	30.51	-0.82
	10,836-<=16,531	248	21.51	17.46	4.05
	16,532-<=21,286	258	18.95	12.54	6.40
	21,287-<=25,903	249	15.67	10.37	5.30
	25,904-<=30,814	255	13.85	9.65	4.19
	30,815-<=36,758	263	13.56	7.76	5.81
	36,759-<=45,000	263	12.84	6.77	6.08
	45,001-<=57,495	242	10.61	5.58	5.03
	57,496-<=83,815	244	8.57	4.14	4.43
	>83815	233	6.41	2.21	4.20

Source: Author's calculations from HIES 2012/13, Department of Census and Statistics

Note: 'BS' is budget share

As is evident from Table 7.5 the majority of paddy farmers (54%) cultivate less than one acre of paddy lands and totally 73% of households cultivate less than 2 acres. It is also observed that households with larger farm size depends more on rice income relative to small farm households. Results further show households with less than 1 acre of paddy lands earn 8% of their income from paddy while households with more than 10 acres of paddy lands derive 40% of income from paddy farming.

Table 7.5: Share of Net Rice Income and Consumption of Paddy Farming Households by Farm Size

Farm size (acres)	No.	BS of Net Paddy Income	BS of Rice Expenditure	(BS of Net Income) – (BS of expenditure)
<= 1	1,349	8.24	11.11	-2.87
>1-<=2	494	16.74	10.62	6.12
>2-<=3	284	27.20	10.70	16.49
>3-<=4	116	29.73	10.36	19.37
>4-<=5	136	28.73	11.02	17.72
>5-<=10	104	26.75	6.62	20.13
>10	26	40.10	8.76	31.34

Source: Author's calculations from HIES 2012/13, Department of Census and Statistics

Note: 'BS' is budget share

Results further how that among the rice farmers 44% of rural households are net rice producers and overall, more than 75% of Sri Lankan households are net rice consumers who would get more benefits from lower rice prices.

On an average budget share of tradable inputs including machinery, fertilizer, weedicide and pesticide are 5.29%, 0.46%, 1.14% and 0.46% respectively.

Poverty Ratio

As is evident from Table 7.6 poverty is predominantly an estate sector phenomenon in Sri Lanka while lowest poverty is recorded in the urban sector. However, when consider among the paddy households, poverty is mainly observed in the rural sector and it is nearly the two folds of urban poverty (8.85%). On an average paddy farmers' poverty ratio is larger than the national figures.

Table 7.6: Baseline Poverty Ratios by Sector in 2012/13

Household Category	Baseline Poverty Ratio	
	Rice Farmers	Total Sample
Average	**16.30**	**15.32**
Urban	8.57	8.85
Rural	16.79	16.73
Estate	3.57	23.00

Source: Author's calculations from HIES 2012/13, Department of Census and Statistics

As indicated from Appendix Table 7.3 the highest poverty incidence are observed in the districts of Matale, Jaffna, Mannar, Mulativu, Kilinochchi, Batticaloa, Ampara, Badulla and Moneragala in 2012/13. In contrast the lowest poverty ratio is recorded in Western province where Colombo, Gampaha and Kalutara districts included. In addition, among the provinces, Northern, Eastern and Uva province show the high incidence of poverty. In general it is observed that, poverty level is high in the regions where majority of paddy farmers reside.

Poverty Gap Index

Poverty gap index is an indication to measure the depth of poverty based on aggregate poverty shortfall of the poor relative to the poverty line. As can be seen from Table 7.7, the national poverty gap index in Sri Lanka is 5.38 in 2012/13 and the highest poverty gap is observed in the rural sector (4.03%).

Table 7.7: Poverty Gap Index by Sector

Sector	Poverty Gap Index (%)
Urban	0.70
Rural	4.03
Estate	0.65
Sri Lanka	5.38

Source: Author's calculations from HIES 2012/13, Department of Census and Statistics

7.4.2 Effects of Price and Trade and Policies: Simulation Results

7.4.2.1 Short Run and Long Run Impacts on Households' Income and Welfare

Three simulations are conducted to identify the direction and magnitude of short run and long run impacts of removal of distortions on households' income and poverty. The welfare change of a particular household due to drop in farm gate rice prices or, change in input costs and retail prices, can be determined by considering the net effect of reduction in net paddy income (change in paddy output value – change in cost of tradable inputs) and savings (change in rice consumption) as a result of removing distortions.

The simulation results indicate that welfare change of different simulation scenarios are varied widely between regions, farm size and income categories both in the short run and long run.

Simulation 1: Remove Border Protection only

Removing the border protection would cause a decline in the farm gate rice price by 6.9% and decrease in tradable input cost by 7% in 2012. Therefore, net paddy income decrease by 1.60% in the short run and 1.64% in the long run. However, since government fixed the fertilizer price at Rs. 7 per kg with whatever the imported fertilizer price, exclusion of border protection does not affect the farm gate price of fertilizer. Therefore, only the other tradable input cost (machinery, weedicide, pesticide) and producer price would change. In addition, removal of

border protection results in consumer rice price decrease by 35.6%, which cause drop of rice consumption expenditure by 3.84% in the short run and 4.46% in the long run. Moreover, this would increase welfare for paddy producers by 2.24% and 2.82% respectively in the short run and long run. In addition, non rice farmers' welfare increases by 3.66% in the long run (Table 7.8).

Table 7.8: Impacts of Removing Border Protection on Rice and Non-rice Farmers (without transfer)

Simulation Scenario	Household Category	Change in welfare	
		Short run	Long run
Simulation 1	Rice farmers	2.24	2.82
	Non rice farmers	3.15	3.66
	Average	3.04	3.55
Simulation 2	Rice farmers	-4.10	-4.10
	Non rice farmers	0.00	0.00
	Average	-0.50	-0.50
Simulation 3	Rice farmers	-1.64	-1.06
	Non rice farmers	3.15	3.66
	Average	2.56	3.08

Source: Author's calculations

The results suggest that removal of border protection has larger impact on consumption expenditure savings than on the net output value change. Therefore, paddy producers in rural sector who depend largely on rice consumption, would receive the largest welfare gain with the removal of border protection while, considering for all consumers (including paddy famers), estate sector gain the most (Table 7.9).

Table 7.9: Simulations Results on Household Welfare in the Long Run by Sector

Household Category	Simulation 1		Simulation 2		Simulation 3	
	Paddy Producers	Total Households	Paddy Producers	Total Households	Paddy Producers	Total Households
Urban	1.33	2.53	-4.03	-0.08	-2.49	2.45
Rural	2.89	3.73	-4.14	-0.73	-1.02	3.04
Estate	2.06	5.12	-1.18	-0.02	0.94	5.10
Total	2.82	3.55	**-4.10**	**-0.50**	**-1.06**	**3.08**

Source: Author's calculations

Further, the simulation results indicate that the welfare is declined with the farm size increases. The change in welfare is positive for the households with small paddy lands while welfare loss for the households who cultivate

more than 10 acres of paddy lands in the long run when border protection is removed (Table 7.10). The large scale paddy farmers' net income loss (due to drop in farm gate rice price) is larger than their savings in income from the rice consumption expenditure drop (due to drop in retail price). This is due to income share of paddy is significantly large for the larger paddy holdings and they receive huge losses when border protection remove, though for the smaller paddy holdings their income loss is compensated by the savings in consumption expenditure due to drop in rice prices. Consequently, only the largest farmers get adversely affected with the elimination of trade protection.

Table 7.10: Simulations Results in the Long Run by Farm Size

Farm Size	Simulation 1	Simulation 2	Simulation 3
<= 1acre	3.78	-1.71	2.16
>1-<=2	2.68	-3.85	-0.97
>2-<=3	1.49	-7.37	-5.48
>3-<=4	0.96	-8.88	-7.44
>4-<=5	1.19	-9.76	-8.05
>5-<=10	0.09	-11.93	-11.20
>10	-2.07	-14.40	-15.70

Source: Author's calculations

In addition, poor households including poor paddy producers receive larger welfare gain as a result of removal of border protection while rich households receive smaller gain (Table 7.11). This is because the high income category farmers rice income is less significant than the poor households. Also high income category farmers expenditure share on rice is smaller than the poor's. Hence removal of distortions due to border protection is important for the poor household categories. Meanwhile, paddy producers in Central and Uva provinces incur the largest welfare increase and if all consumers (including paddy households) take in to account, Eastern and Uva province incur the highest benefits with the removal of border protection (See Appendix Table 7.5).

Table 7.11: Impacts of Remove Border Protection by Poverty Status and Income Category

Household Category		Welfare Change			
		Short run		Long run	
		Paddy Producers	Total Households	Paddy Producers	Total Households
Poverty status	Poor	6.44	8.30	7.88	9.70
	Non poor	1.42	2.08	1.83	2.44
Income deciles	<10,836	7.31	9.33	8.97	10.89
	10,836-<=16,531	4.00	4.43	4.95	5.18
	16,532-<=21,286	2.54	3.44	3.21	4.04
	21,287-<=25,903	2.12	2.94	2.68	3.44
	25,904-<=30,814	1.96	2.59	2.47	3.03
	30,815-<=36,758	1.43	2.18	1.85	2.56
	36,759-<=45,000	1.10	1.85	1.45	2.17
	45,001-<=57,495	0.95	1.53	1.25	1.80
	57,496-<=83,815	0.64	1.15	0.86	1.35
	>83815	0.17	0.61	0.28	0.71

Source: Author's calculations

Note: Income categories are base on the income figures of the Department of Census and Statistics (values are in Sri Lankan Rupees)

Simulation 2: Remove Fertilizer Subsidy only

Removing fertilizer subsidy of 90% while continuing the border protection would increase the farm gate price of fertilizer by 900% and total tradable input cost by 54%. This would reduce the welfare by 4.1% for the rice producers. However, there is inequality in welfare loss among the regions, income groups and farm size with the removal of subsidy as a result of its relative importance among the different categories. As seen in the long run results of Table 7.9, welfare reduce for all categories of farm size with the marked reduction for farmers with large paddy holdings. The smaller farm households would have small negative effect on welfare.

As can be observed in the Table 7.12, poor paddy producers in the lower income categories suffer larger losses with the removal of subsidy because this category depends largely on rice income. With the subsidy cut their cost of production increase significantly. This results in net income loss for poor farmers than non poor farmers. Conversely, results show that in general, removal of fertilizer subsidy would have a relatively small negative effect for poor paddy farmers with small farm size, than the poor farmers who cultivate large farm size. Moreover, among

the provinces, paddy households in Northern, Eastern and North Central (where major paddy production come and households depend largely on paddy income) incur larger welfare losses (See Appendix Table 7.7).

Complete removal of fertilizer subsidy might eventually cause adverse impact not only on the paddy farmers' net income but also on the countries' paddy production and self sufficiency in rice.

Table 7.12: Impacts of Removing Fertilizer Subsidy on Poverty Status and Income Categories

Household Category		Welfare Change	
		Paddy Producers	Total Households
Poverty status	Poor	-8.95	-1.17
	Non Poor	-3.15	-0.38
Income deciles	<10,836	-11.33	-1.36
	10,836-<=16,531	-5.48	-0.66
	16,532-<=21,286	-4.68	-0.58
	21,287-<=25,903	-3.69	-0.44
	25,904-<=30,814	-3.94	-0.50
	30,815-<=36,758	-2.94	-0.39
	36,759-<=45,000	-3.21	-0.42
	45,001-<=57,495	-2.27	-0.28
	57,496-<=83,815	-1.82	-0.22
	>83815	-1.31	-0.15

Source: Author's calculations

Simulation 3: Remove Border Protection and Fertilizer subsidy

This would cause a reduction of farm gate paddy price and rice price by 6.9% and 35.6% respectively while total input cost increase by 44%. The main contributing factor is the increase in cost of production as a result of high fertilizer price. Simulation 3 revealed that it would cause relatively larger net paddy income loss (5.5% in the long run) for paddy producers than the rice expenditure savings (4.5% in the long run) in 2012. Hence net impact is the drop of paddy farmers' welfare by 1.6% and 1% respectively in the short run and long run. In contrast, non rice farmers (consumers) would benefit as a result of drop in purchasing price of rice.

Further, the simulation tends to reduce welfare in the urban and rural rice producers, while, welfare increase for rice farmers in the estate sector (Table 7.9). The main reason for this difference is the estate sector farmers are net consumers of rice who depend largely on non paddy income rather than paddy income. It further

reveals that, welfare gain for consumers belong to all the sectors in 2012 due to drop of purchasing rice price. Results further suggest that the negative welfare effect of the paddy producers' will get mild in the long run if incorporate the larger producer and consumer elasticites.

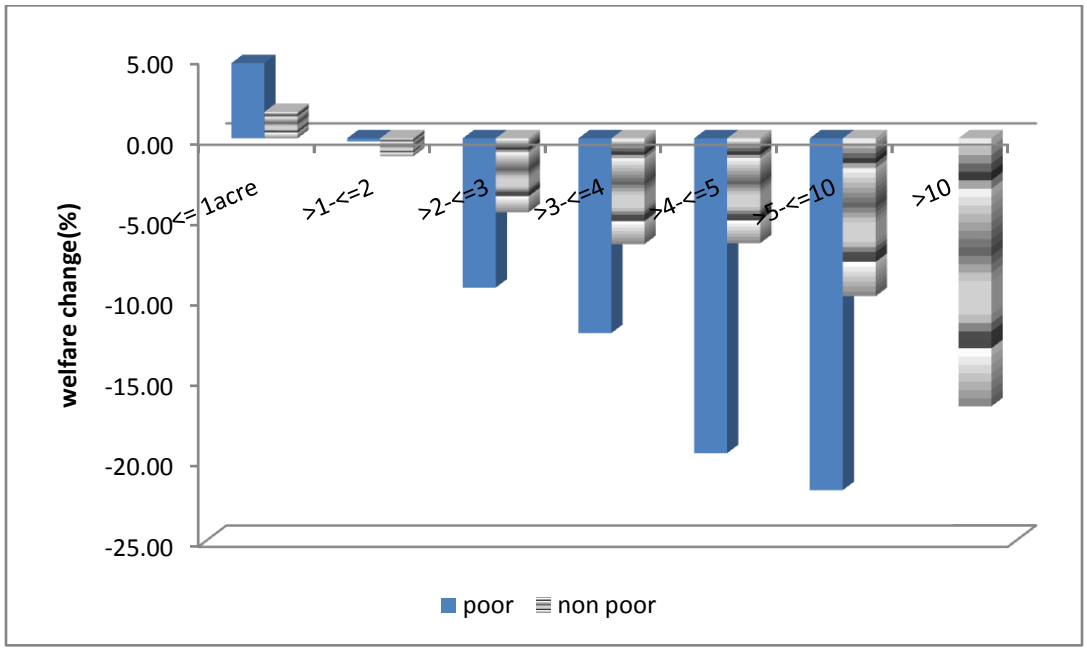
In addition, elimination of distortions in the rice sector would result in the farmers in the lowest income group suffer larger income losses (14% both in the short run and long run) relative to the consumption expenditure savings (11% and 13% in short run and long run respectively). As a result, farmers below the poverty line suffer larger welfare losses than the non poor farmers in the short run (Table 7.13). In contrast long run affects of simulation 3 result in small welfare loss for the poor farmers than the non poor farmers. Meanwhile removal of distortions benefited all the consumers, particularly consumers belonging to low income groups gain the larger portion of benefits. As seen in the Figure 7.1, the main adverse effect is received by non poor farmers with large farm size. Further, it is observed that poor farmers with less than 1 acre of paddy lands incur welfare gain while their negative loss increases when they cultivate large farm size.

Table 7.13: Impacts of Removing Border Protection and Fertilizer Subsidy by Poverty Status and Income Category

Household Category		Welfare change			
		Short run		Long run	
		Paddy Producers	Total Households	Paddy Producers	Total Households
Poverty status	Poor	-2.03	7.19	-0.59	8.59
	Non poor	-1.56	1.72	-1.15	2.08
Income deciles	<10,836	-3.41	8.04	-1.76	9.61
	10,836-<=16,531	-1.19	3.81	-0.24	4.56
	16,532-<=21,286	-1.89	2.89	-1.22	3.48
	21,287-<=25,903	-1.37	2.52	-0.81	3.02
	25,904-<=30,814	-1.77	2.11	-1.25	2.56
	30,815-<=36,758	-1.35	1.82	-0.94	2.20
	36,759-<=45,000	-1.94	1.45	-1.59	1.78
	45,001-<=57,495	-1.19	1.27	-0.90	1.54
	57,496-<=83,815	-1.08	0.95	-0.86	1.15
	>83815	-1.07	0.46	-0.96	0.57

Source: Author's calculations

Figure 7.1: Welfare Change for Paddy Farmers by Poverty and Farm Size



Source: Author's calculations from HIES 2012/13, Department of Census and Statistics

Besides, paddy households in Mulative, Polonnaruwa, Mannar, Vavuniya, Trincomalee, Kilinochchi, Ampara, Hambantota, Anuradhapura, Batticaloa and Puttalam districts receive welfare loss due to removal of distortions as they depend largely on paddy income (See Appendix 7.8). The above districts contribute largely to the national production which is around 64%.

Simulations with Transfer Payments

Removing the fertilizer subsidy rate of 90%, cut the public expenditure incurs on fertilizer imports. The government can use this savings as transfer payments to reduce the negative welfare incur on paddy households and low income households which result from removal of distortions. Therefore, this section is focused on analyzing the results of simulation scenarios of 2 and 3 with transfer payments granted to the households. It can be assumed that savings due to removal of subsidy can be transferred either to all the households who below the poverty line or only to all the paddy producing households. First, it is assumed that the expenditure savings is transferred directly to all households who are below the poverty line in equal amount (Rs. 853.11). Otherwise government can transfer the

amount only to the paddy producing households (Rs. 1,063 per farmer) if the government purpose is to increase the welfare of only the paddy farmers in order to reduce their income disparity.

As can be seen from Table 7.14, the long run results of simulation 2 with transfer revealed welfare gain for poor households' compared to the without transfers. It further shows marked increase in welfare of all consumers if transfer payment is given to households below poverty line. In addition, if the transfer made only to the paddy producers, poor farmers' welfare increases by 3.4% while non poor farmers too receive moderately high benefits.

Table 7.14: Long Run Impacts of Simulations with Transfer Payments

Poverty Status	Simulation 2		Simulation 3	
	Paddy producers	Total Households	Paddy Producers	Total Households
Transfer payment only to the households below the poverty line				
Poor	0.96	11.88	9.32	21.71
Non poor	-3.15	-0.38	-1.15	2.08
Transfer payments only to all paddy households				
Poor	3.39	0.44	11.76	10.21
Non poor	0.28	0.03	2.29	2.50

Source: Author's calculations

The simulation 3 with transfer to households below poverty line revealed significant welfare gain for all poor households in the long run. Moreover, if the transfer is made only to the paddy households, both poor and non poor groups receive welfare gain.

7.4.2.2 Implications on Poverty

Poverty Ratio

In this section, simulation impacts on the base line poverty head count index (SLRs. 3,624/person/month) and poverty gap index are estimated.

As can be seen from the Table 7.15 and 7.16, on an average poverty ratios would rise slightly for paddy farmers in all simulations without transfer. With the simulation 1 (removal of border protection only), urban sector poverty ratio drop by around 1% for the paddy households, even though rural sector paddy farmers' poverty ratio increased slightly. This is because that negative effect on rice income is more prominent for rural farmers as they

depend largely on rice income compared to the urban sector farmers. Moreover, total households get the benefits of low rice price hence their poverty ratios slightly get lowered. In the long run, the largest poverty reduction for rural households (including paddy farmers) is observed when the transfer payment is made only to the all paddy household under simulation 3. However, the highest poverty reduction for the rural farmers' is reported with simulation 2 if the transfer payment given only to the all paddy farmers. Besides, the small group of paddy producers in the estate sector does not affect and their poverty ratio remains the same in all the cases.

Table 7.15: Impact of Different Simulations Scenarios on Poverty Level (Short run)

Household Category	Baseline	Simulation 1	Simulation 2			Simulation 3		
			WOT	WT1	WT2	WOT	WT1	WT2
Rice farmers	**16.30**	**16.38**	**16.70**	**14.95**	**14.43**	**16.70**	**16.50**	**14.35**
Urban	8.57	7.62	7.62	6.67	6.67	7.62	6.67	6.67
Rural	16.79	16.92	17.26	15.45	14.90	17.26	15.11	14.81
Estate	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57
Total sample	**15.32**	**15.15**	**15.41**	**13.82**	**15.14**	**15.18**	**14.91**	**14.90**
Urban	8.85	8.73	8.87	7.95	8.85	8.73	7.76	8.71
Rural	16.73	16.58	16.87	15.14	16.46	16.64	14.78	16.21
Estate	23.00	22.46	22.95	20.45	22.95	22.46	20.07	22.46

Source: Author's calculations

Note: WOT- without transfer, WT1-trasfer to households below the poverty line, WT2-transfer only to all paddy producers

Table 7.16: Impact of Different Simulations Scenarios on Poverty Level (Long run)

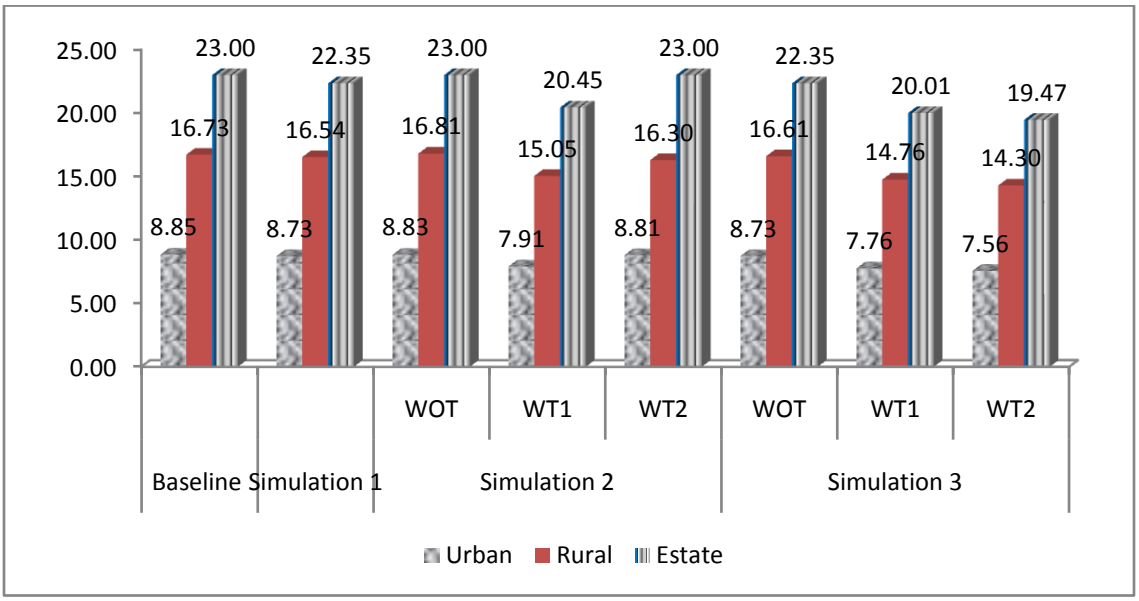
Household Category	Simulation 1	Simulation 2			Simulation 3		
		WOT	WT1	WT2	WOT	WT1	WT2
Rice farmers	**16.30**	**16.70**	**14.95**	**13.95**	**16.66**	**14.63**	**14.31**
Urban	7.62	7.62	6.67	6.67	7.62	6.67	6.67
Rural	16.84	17.26	15.45	14.39	17.21	15.11	14.77
Estate	3.57	3.57	3.57	3.57	3.57	3.57	3.57
Total sample	**15.11**	**15.37**	**13.75**	**15.03**	**15.15**	**13.47**	**13.07**
Urban	8.73	8.83	7.91	8.81	8.73	7.76	7.56
Rural	16.54	16.81	15.05	16.30	16.61	14.76	14.30
Estate	22.35	23.00	20.45	23.00	22.35	20.01	19.47

Source: Author's calculations

Note: WOT- without transfer, WT1-trasfer to households below the poverty line, WT2-transfer only to all paddy producers

As presented in Figure 7.2, average poverty ratios decrease slightly for all consumers including paddy producers, in all cases except simulation 2 without transfer scenario. This confirms the importance of fertilizer subsidy in the rice sector in the country than the impact of trade policy. However, when consider the total sample the largest poverty reduction is observed for the estate sector consumers with their poverty ratios are reduced from 23% to 19.5% in the long run by giving transfer payment to all paddy households even though both distortions are eliminated. Therefore, it is observed that consumers belong to estate sector are strongly vulnerable to increase in rice prices. In addition, in the short run consumers in the rural sector get the substantial poverty reduction if both interventions are removed with transfer payments given to paddy households below the poverty line. Further, the results revealed that the long run poverty ratios are relatively smaller than the poverty ratios in the short run though the difference is small as a result of relatively inelastic demand and supply of rice. The policy changes without transfers would adversely affects farmers in general, particularly in the regions where large contribution is made to the national economy while households of net rice consumers are benefited. In addition, the largest poverty reduction with the removal of both distortions can be seen in the Jaffna, Kilinochchi, Badulla, Mulative and Trincomalle district in the long run with the transfer payment is made to the paddy farmers only (Appendix table 7.8).

Figure 7.2: Changes in Poverty Head Count Index for All Households in Sri Lanka by Sector (Long run)



Source: Author's calculations

Note: WOT- without transfer, WT1-trasfer to households below the poverty line, WT2-transfer only to all paddy producers

Poverty Gap Index

As indicate in the Table 7.17, national poverty gap index is declined except in the without transfer scenario in simulation 2. The highest poverty reduction can be seen in the rural sector which declined from 4.03 to 3.11 in the simulation 3 with transfer given to paddy households. The overall poverty gap is declined from 5.38 to 4.32 if transfer payments are given to the households below the poverty line when both interventions are removed. This further reduced to 4.12 if payments given only to paddy household in the long run. In all the simulations, poverty gap index values are relatively small in the long run compared to the short run when elasticities are incorporated.

Table 7.17: Impact of Different Simulations on Poverty Gap Index by Sector (Long run)

Sector	Simulation 1	Simulation 2			Simulation 3		
		PGWOT	PGWT1	PGWT2	PGWOT	PGWT1	PGWT2
Urban	0.67	0.70	0.58	0.70	0.67	0.55	0.53
Rural	3.88	4.06	3.39	3.90	3.91	3.26	3.11
Estate	0.62	0.66	0.55	0.66	0.62	0.51	0.48
Sri Lanka	**5.17**	**5.42**	**4.52**	**5.25**	**5.20**	**4.32**	**4.12**

Source: Author's calculations

Note: PGWOT-poverty gap without transfer
PGWT1-poverty gap with transfer payments to households below poverty line
PGW2-poverty gap with transfer payments only to all paddy households

7.5 Conclusions and Policy Implications

This chapter examines impacts of liberalization of price and trade policy interventions in rice sector in terms of income and poverty. The analysis of general characteristics of paddy farmers' show that, out of total sample 12% of households engage in paddy cultivation in 2012 and they obtain 15% of their income from rice cultivation. The majority of paddy farmers in the country are rural small scale poor households. In addition, the importance of rice in household income is highest in Northern (28%), Eastern (22%) and North Central (20%) provinces where the highest contribution of national production comes while it lowest in the Western Province (3%).

The simulation results show that the welfare of paddy farmers' has declined if the current levels of price and trade interventions are removed. Especially the fertilizer subsidy has considerable impact on paddy farmers'

welfare than the import trade protection policy. In contrast, all consumers who are non rice farmers would favorably gain from the price and trade policy liberalization. Moreover, the analysis gives an impression that in general, the majority of paddy producers in the rural sector are adversely affected if the interventions are removed, hence the policy should be implemented very vigilantly. However, poor paddy producers who cultivate smaller farms are benefited when both distortions eliminate while large scale farmers are negatively affected because they receive larger income losses especially due to removal of fertilizer subsidy. Nevertheless, the impacts change significantly with the transfer payments granted to households. As example, if transfer payment is given to all poor households who below the poverty line, their welfare increases drastically compared the simulations without transfer cases. If the transfer payments are given only to all paddy households, poor farmers' welfare increases by 3.4% while non poor farmers also receive moderate benefits. Besides, larger proportions of consumers and poor small farm households favorably affect due to removal of distortions. Moreover, results of simulations with transfer payments result in highest poverty reduction for the estate sector consumers and rural sector producers. Therefore, overall this study suggest that the exclusion of current level of incentives given to rice sector will favorably affect to the majority of consumers thought it hurt to some rice producers.

Since removal of current incentives in rice sector cause decrease in producer price of rice which would have negative consequences on paddy farmers' net income as well as spread the poverty among the farmers, liberalization policies should carefully be implemented. In addition, drop in producer price of rice will lead inefficient high cost farmers who cannot survive to leave the rice farming. As majority of rice producers in the country are small scale poor farmers it will have undesirable impacts on their welfare as well as on the national economy. Therefore, it needs to make policy measures such as reduce cost of production and increase yield in order to increase the efficiency of small scale farming, while encourage poor inefficient farmers to easily switch from rice to high value commercial crops. It also necessary to absorb the unemployed laborers who leave their jobs because they cannot survive as incentives removed in the rice sector. So, creating new job opportunities in the fast growing service and industrial sectors are necessary. Meanwhile, it needs to provide the good quality training for them before they join to the new sectors because most of them are rural unskilled workers who do not have proper knowledge. Besides, it is necessary to set up new technologies to produce high quality specific rice varieties and use organic fertilizer in rice cultivation because such varieties have high demand at present. Meantime, in order to encourage

diversification in food sector it is required to amend the legal structure of the paddy lands which is not allowed to convert the paddy lands to non paddy lands.

Results further shows that incorporating high elasticities for supply and demand will enhance the welfare of households. Therefore, it is important to increase the demand and supply elasticities of rice. If there are more close substitutes with rice it is easy to switch between products that will enhance the elasticity of demand. In addition, cost of switching between products should be minimized. Therefore, cultivate more organic rice and traditional rice varieties which have high demand are important. In addition, in Sri Lanka still we do not produce large number of value added products using rice. Consequently, growing specific rice varieties and increasing the number of value added products in rice will help to enhance farmer income and reduce poverty. Further, availability of substitutes lead factors of production can more easily be transferred between crops. Supply is inelastic with high production cost. Therefore, reducing the production cost is benefited and it also increase the supply elasticity. In addition, if productions can quickly response to the price changes, such crop can be easily adjusted to the market supply. Hence using new technology and investing in rice research to produce short term varieties will lead to obtain higher income and increase welfare of the farmers. As suggest from the results, removal of incentives may increase the poverty among the rural paddy producers. Hence, the use of targeted transfer payments will reduce the income disparity between rich and poor as well as that would easy to reimburse the income loss of the rice producers. Therefore, implementing such policies would give favorable impacts on paddy households.

Although, this study assumed full price transmission from border to local markets, extent of price transmission can vary widely and poor infrastructures as well as high transaction cost unfavorably influence rural consumers. In addition, simulations do not consider the effects of low farm gate prices due to removal of interventions on the demand for labour and wage rates which would affect households' net income. Since rice farming is still labour intensive in Sri Lanka, reduction of farm gate rice price would adversely affect the labour wages. This would further increase the poverty among paddy farmers while their welfare negatively affect. However, in Sri Lanka family labour accounts more than 50% in most districts, so the effect of rice prices on income via wage rates is consider to be smaller in the model. In the model wage rate as exogenous because wage rate considered to be determined by the supply and demand in nonfarm sector. However, if wage rate is included in the model the adverse impact will get worse than the current results.

Appendices to Chapter 7

Appendix 7.1: Share of Net Rice Income and Consumption of Paddy Farming Households by Province

Province	No.	BS of Net Paddy Income	BS of Rice Expenditure	(BS of Net Income) – (BS of Expenditure)
Western	199	2.90	7.02	-4.12
Central	219	8.91	12.64	-3.73
Southern	348	11.85	9.04	2.81
Northern	228	28.43	11.66	16.77
Eastern	234	22.12	11.28	10.84
North Western	325	11.23	10.07	1.16
North Central	553	20.15	11.06	9.09
Uva	301	15.37	13.77	1.61
Sabaragamuwa	102	5.51	8.95	-3.43

Source: Author's calculations from HIES 2012/13, Department of Census and Statistics
Note: 'BS' is budget share

Appendix7.2: Budget Share of Net Rice Income and Consumption of Paddy Farming Households by District

District	No.	BS of Net Paddy Income	BS of Rice Expenditure	(BS of Net Income) – (BS of Expenditure)
Colombo	28	4.50	6.92	-2.43
Gampaha	73	2.84	6.36	-3.52
Kalutara	98	2.48	7.54	-5.06
Kandy	66	6.75	13.30	-6.55
Matale	119	10.98	10.45	0.53
N'Eliya	34	5.86	19.03	-13.17
Galle	91	4.51	10.86	-6.35
Matara	114	5.57	9.04	-3.47
H'tota	143	21.53	7.89	13.64
Jaffna	17	10.04	19.91	-9.87
Mannar	55	15.41	10.11	5.29
Vavuniya	62	17.63	8.84	8.80
Mulativu	61	58.75	15.62	43.13
Kilinochchi	33	23.85	8.00	15.85
Batticaloa	43	17.54	12.02	5.53
Amapara	94	22.70	11.68	11.01
Trincomalee	97	23.60	10.57	13.03
Kurunegala	274	10.75	10.13	0.62
Puttalam	51	13.83	9.77	4.06
Anuradhapura	339	18.60	10.69	7.91

Polonnaruwa	214	22.61	11.64	10.97
Badulla	129	18.96	14.85	4.11
Moneragala	172	12.68	12.95	-0.27
Rathnapura	67	6.82	8.08	-1.26
Kegalle	35	3.01	10.60	-7.59

Source: Author's calculations from HIES 2012/13, Department of Census and Statistics

Note: 'BS' is budget share

Appendix 7.3: Baseline Poverty Ratios by Districts

District	HH below Poverty line	Total	Poverty Ratio (%)
Colombo	73	2,156	3.39
Gampaha	121	1,940	6.24
Kalutara	92	1,229	7.49
Kandy	153	973	15.72
Matale	129	593	21.75
N'Eliya	140	785	17.83
Galle	177	1,293	13.69
Matara	159	1,141	13.94
H'tota	83	730	11.37
Jaffna	171	634	26.97
Mannar	65	285	22.81
Vavuniya	38	280	13.57
Mulativu	100	264	37.88
Kilinochchi	107	325	32.92
Batticaloa	227	696	32.61
Amapara	180	739	24.36
Trincomalee	98	501	19.56
Kurunegala	177	1,146	15.45
Puttalam	99	649	15.25
Anuradhapura	95	743	12.79
Polonnaruwa	82	524	15.65
Badulla	151	715	21.12
Moneragala	185	575	32.17
Rathnapura	123	821	14.98
Kegalle	101	666	15.17

Source: Author's calculations from HIES 2012/13, Department of Census and Statistics

Appendix 7.4: Impact of Removal of Border Protection by Districts

District		Welfare Change			
		Short run		Long run	
		Paddy Producers	Total Households	Paddy Producers	Total Households
District	Colombo	2.01	1.64	2.39	1.91
	Gampaha	1.98	2.19	2.34	2.55
	Kalutara	2.41	2.39	2.83	2.79
	Kandy	3.92	3.34	4.67	3.89
	Matale	2.69	3.45	3.27	4.04
	N'Eliya	6.24	3.64	7.32	4.24
	Galle	3.43	2.81	4.04	3.27
	Matara	2.57	2.77	3.07	3.23
	H'tota	0.63	2.60	1.01	3.08
	Jaffna	5.90	3.31	7.02	3.85
	Mannar	1.40	3.13	2.02	3.70
	Vavuniya	0.99	1.68	1.47	2.02
	Mulativu	0.01	2.79	0.86	3.42
	Kilinochchi	0.42	4.66	0.81	5.47
	Batticaloa	2.50	5.30	3.14	6.17
	Amapara	1.71	4.40	2.32	5.17
	Trincomalee	1.18	3.04	1.72	3.60
	Kurunegala	2.58	3.27	3.13	3.84
	Puttalam	2.10	3.00	2.63	3.50
	Anuradhapura	1.88	2.27	2.44	2.75
	Polonnaruwa	1.39	2.92	1.98	3.55
	Badulla	3.75	4.31	4.57	5.05
	Moneragala	3.29	4.70	4.00	5.54
	Rathnapura	2.21	3.94	2.74	4.59
	Kegalle	3.44	3.36	4.04	3.90

Source: Author's calculations

Appendix 7.5: Impacts of Removing Border Protection by Province

Province	Welfare Change			
	Short run		Long run	
	Paddy Producers	Total Households	Paddy Producers	Total Households
Western	2.19	2.02	2.59	2.35
Central	3.61	3.47	4.32	4.05
Southern	1.99	2.75	2.48	3.21
Northern	1.11	3.19	1.70	3.76
Eastern	1.64	4.37	2.22	5.12
North Western	2.50	3.17	3.05	3.72
North Central	1.69	2.54	2.26	3.08
Uva	3.49	4.49	4.25	5.27
Sabaragamuwa	2.63	3.68	3.13	4.28

Source: Author's calculations

Appendix 7.6: Impacts of Removing Border Protection and Fertilizer Subsidy by Sector and Districts

District	Welfare Change			
	Short run		Long run	
	Paddy Producers	Total Households	Paddy Producers	Total Households
Colombo	0.95	1.63	1.34	1.89
Gampaha	1.35	2.17	1.71	2.53
Kalutara	1.63	2.34	2.06	2.72
Kandy	1.45	3.18	2.20	3.73
Matale	0.78	3.07	1.36	3.66
N'Eliya	5.29	3.60	6.38	4.20
Galle	2.51	2.75	3.13	3.21
Matara	0.64	2.58	1.15	3.04
H'tota	-4.26	1.65	-3.89	2.13
Jaffna	2.40	3.22	3.51	3.76
Mannar	-6.58	1.64	-6.02	2.20
Vavuniya	-5.75	0.22	-5.25	0.55
Mulativu	-10.68	0.36	-9.84	0.98
Kilinochchi	-5.16	4.10	-4.77	4.90
Batticaloa	-1.57	5.05	-0.93	5.92
Amapara	-4.58	3.61	-3.98	4.37
Trincomalee	-5.62	1.72	-5.09	2.28
Kurunegala	0.54	2.79	1.10	3.35
Puttalam	-0.91	2.76	-0.38	3.27
Anuradhapura	-2.69	0.19	-2.13	0.66

Polonnaruwa	-7.15	-0.54	-6.56	0.06
Badulla	2.11	4.01	2.94	4.75
Moneragala	0.14	3.77	0.85	4.60
Rathnapura	0.97	3.84	1.42	4.48
Kegalle	2.52	3.31	3.12	3.86

Source: Author's calculations

Appendix 7.7: Impacts of Removing Fertilizer Subsidy by Province

Province	Change in Welfare	
	Paddy Farmers	Total Households
Western	-0.80	-0.03
Central	-2.04	-0.19
Southern	-3.07	-0.34
Northern	-8.13	-1.03
Eastern	-6.44	-0.78
North Western	-2.31	-0.42
North Central	-6.45	-2.82
Uva	-2.64	-0.62
Sabaragamuwa	-1.29	-0.09

Source: Author's calculations

Appendix 7.8: Impact of Removing Border Protection and Fertilizer Subsidy on Poverty Level by District

District	Baseline Poverty Ratio	Short run		Long run	
		Poverty Ratio with Transfer to HH below Poverty	Poverty Ratio with Transfer to Paddy HH only	Poverty Ratio with Transfer to HH below Poverty	Poverty Ratio with Transfer to Paddy HH only
Colombo	3.39	3.01	3.34	3.01	2.92
Gampaha	6.24	4.95	6.13	4.95	4.85
Kalutara	7.49	6.51	7.08	6.51	6.35
Kandy	15.72	13.57	15.01	13.57	13.46
Matale	21.75	20.24	21.42	20.24	20.07
N'Eliya	17.83	15.54	17.45	15.54	14.78
Galle	13.69	12.14	13.46	12.14	11.91
Matara	13.94	11.66	13.58	11.57	11.13
H'tota	11.37	9.45	11.10	9.45	8.90
Jaffna	26.97	23.34	26.34	23.34	22.87
Mannar	22.81	18.95	21.40	18.95	18.60
Vavuniya	13.57	11.79	13.21	11.79	11.43
Mulativu	37.88	34.85	37.88	34.85	34.09

Kilinochchi	32.92	30.46	32.92	30.46	28.92
Batticaloa	32.61	30.03	32.04	30.03	29.31
Amapara	24.36	21.65	23.82	21.65	21.11
Trincomalee	19.56	16.57	18.76	16.37	15.77
Kurunegala	15.45	14.05	15.18	13.96	13.53
Puttalam	15.25	13.56	14.79	13.56	12.79
Anuradhapura	12.79	10.50	11.44	10.50	10.23
Polonnaruwa	15.65	15.08	15.27	14.89	14.50
Badulla	21.12	18.32	19.86	18.32	17.20
Moneragala	32.17	29.91	30.96	29.91	29.22
Rathnapura	14.98	13.03	14.74	13.03	12.67
Kegalle	15.17	12.91	15.17	12.91	12.46

Source: Author's calculations

CHAPTER 8

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

8.1 Introduction

Finally, this Chapter presents the study findings along with key policy recommendations for the country that emerge from the study results.

8.2 Summary and Conclusions

Food crop sector in Sri Lanka has been dominated in the agricultural GDP for long period of time where as it accounts three quarter of the agricultural budget. Among the food crops, rice has prioritized as the major import competing food crop and it provides significance role in terms of agriculture GDP, employment generation and staple food of the country. Moreover, as a symbolic affiliation of the Sri Lankans it gave credence to the priority received in political agenda of the country. Therefore, every successive government makes various attempts to protect the food crops sector where main concern given to rice sector. Despite several attempts given, overall food production has almost stagnated and poverty level in the country is relatively high in the rural areas of the country where the majority of rice farmers reside. Meantime, government interventions on food crop sector create distortions to the society in terms of resource allocation and welfare of the country. Therefore, the overall objective of this study is to undertake finer analysis of the price and trade policy distortions in food crop sector in Sri Lanka and investigate its impacts on household income and poverty in the recent period. The specific objectives are: to evaluate the recent trends in paddy production, input use and profitability in rice sector, evaluate the effects of fertilizer subsidy adjustments in rice sector, to estimate input demand and output supply elasticities of rice, to examine the import trade policy, the extent of protection in food crop sector in terms of NRP and ERP, to determine who get the benefits from the current incentive structure and what are the implications on removal of price and trade policy interventions on income and poverty of households in the country.

Following the introduction, Chapter 2 is focused on evolution of food crop sector policies with special consideration to the rice policies and examines the political economy of the food crop sector policy incentives in the country. Food crop sector in Sri Lanka has been protected for long period of time by successive governments through provision of various input and output subsidies, import tariffs and other trade barriers, distribution and

marketing policies, infrastructure and other investments. Therefore, in this chapter discusses: land settlement policy, food subsidies, seed policy, marketing and distribution, fertilizer subsidy, irrigation, research and extension and import trade policy to provide necessary background information. Marketing in rice is mainly performed by the private sector while state involvement in paddy purchasing and distribution has been minimal in recent years. However, fertilizer subsidy and import tariffs and other para-tariffs on rice have been playing an important role in the rice sector. In the beginning of 1980s government policy shifted towards more liberal policy attempts by allowing trade liberalization and privatization. Meanwhile, the government continues to provide fertilizer subsidy (except 1990-94 period) despite several policy changes made time to time under different regimes. However, this chapter suggest that the country's agricultural policy is relatively distorted under the protection policies applied by SLFP governments because they committed to sociologist ideology and designs their economies more to enhance the producer welfare. In contrast, under the UNP governments' agriculture sector is less distorted because of their open economic policies. Nevertheless, the highlights of the food policy indicate that the absence of long term policy agenda could badly affect the food crop sector development in the country. In addition, policy implementation in the country is also very weak. Moreover, weaknesses in the distribution and marketing system, intermediation, less private sector participation, low predictability and transparency of public expenditure investments, corruptions and misallocations take place in the fertilizer subsidy distribution programme, improper management of irrigation canals and infrastructure, weak link between research and extension service, administration weaknesses, political interference and weaknesses in planning, monitoring and policy implementation in the government sector would further lessen the development in the food crop sector.

The third chapter examines the long term trends in paddy production, input use, cost of production and profitability of paddy. Information suggest that greater emphasis on developing paddy production in the country by successive governments resulted increasing of rice yield from 1.6 mt/ha in 1960 to 4.4 mt/ha in 2015. Meantime, rice imports have drastically dropped though it has fluctuated over the years from 15% (in 2014) to 6% (in 2015) of the total requirement. In addition, inputs used in rice sector have markedly increased whereas fertilizer usage for paddy has tripled between the periods of 1961-2015 due to its relatively low price as a result of subsidy. Moreover, this chapter highlights that, net return from paddy farming is continued to decrease for years due to increase cost of production at a higher rate than increase in paddy price. Hence, the majority of farmers consider rice cultivation is unprofitable industry in the sense that an income derived from paddy is being decreased for years. Therefore, this

chapter suggests the importance of reducing the cost of production in paddy farming and increasing income diversification in order to increase the benefits obtained from rice cultivation.

Chapter 4 of the thesis is focused on simulation analysis to evaluate the fertilizer subsidy reforms in rice sector to understand its impact on national rice production, demand/supply of inputs, farm profit and government budget. In addition, cost effectiveness of the fertilizer subsidy is evaluated in terms of transfer inefficiency. Since the newly elected government in Sri Lanka in end of 2015 suggested direct cash transfer system to replace the long time lasted fertilizer subsidy, this chapter also attempts to evaluate the effects of the subsidy adjustment. To obtain the results, demand supply equilibrium model with input markets is employed and the production technology is assumed to be two stage CES with bio chemical process (seed, chemical, land) and machinery process (machinery and labour). The results indicate, complete fertilizer subsidy reduction would reduce rice production by around 4%, while a 36% decline in the fertilizer demand for paddy cultivation. Although, the subsidy cut reduces the enormous government burden, farmers are unfavorably affected by 40% reduction of farm profit. Moreover, fertilizer subsidy (before 2016) would cause government to spend SLRs. 1.38-1.91 to increase farm profit by one rupee. In addition, reduction of labor use in rice sector due to elimination of fertilizer subsidy will lead inefficient farmers to leave rice farming in the future. Meanwhile, a 3% decline of paddy production and a 14.5% increase in the rice price is expected by the proposed cash transfer policy. Apart from that the elimination of subsidy is likely to create substantial political concern especially among rural groups in the society.

In the fifth chapter attempts to estimate the output supply and input demand parameters of rice with special reference to the fertilizer subsidy using the restricted normalized translog profit function for the four major paddy producing districts in Sri Lanka (namely: Anuradhapura, Hambantota, Kurunegala and Polonnaruwa). The results suggest that the changes in market prices of inputs and output significantly affect the farmers' profit, rice supply and the use of resources in paddy cultivation. In addition, the supply elasticity of rice with respect to its own price is 0.5 and the supply elasticity of output with respect to fertilizer price is -0.05 on an average. Further, results reveal that although the country's fertilizer demand is inelastic, it has considerable effect on national rice production. Therefore, fertilizer subsidy is one of the main factors to increase fertilizer demand and paddy supply in the country. However, the results further disclose that paddy output in the country is more responsive to the increasing output price than change in fertilizer price hence applying competitive and attractive output price policy is essential for the

higher rice production in the country. In addition, the low elasticity of substitution between labour and fertilizer and other inputs indicates that there is a complementary relationship among these inputs hence their combined application increases paddy production synergistically.

Chapter 6 of the study is focused on measuring the level of protection of the major food commodity imports in terms of TPR, NRP and ERP and analyzes the recent structure of import trade regime in Sri Lanka. The study found that there are frequent changes in import tariffs and other para-tariff measurers (such as SRL, PAL, VAT, Cess, RIDL etc.) especially for import competing agricultural commodities which make difficulties in measuring the protectiveness. In addition, calculation of tariffs is highly complex because tariff formula is based on several tariff bases. As reveals from results the average total protection rate for agriculture tariff lines exceed (31%) the average protection of industrial tariff lines (24%) during the period of 2007-2015. Despite the larger portion of protection in agricultural tariff lines due to CD, it is also noted that 15% of agricultural tariff lines have been subjected to SCL. Study also suggests that more than half of the agricultural tariff lines are exceed 50% of TPR in recent period which would cause uncertainty in tariff calculation and create harmful impacts on the domestic economy. The level of protection varies across commodities as well for the same commodity it varies monthly. Therefore, the structure of import tariff changes is hard to predict. Specially, the ad-hoc tariff changes in major import competing food crops of rice, potato, chilli and big onion would result in uncertainty in the market and generate adverse impact on society. In terms of ERP, potato farmers have the highest protection while production of chilli has relatively small protection. Results also reveal that protection rates of rice have gradually been reducing although it is being fluctuated over the years. However, fertilizer subsidy is the main driver of the ERP for rice. Overall, results suggest that all the selected commodities are positively protected during the study period hence farm income would negative affected if the interventions are removed. In contrast, the removal of such intervention in terms of tariffs and other taxes as well as fertilizer subsidy would be beneficial on majority of consumers in the country. Therefore, study suggests that distortions in rice and other food crops lead to increase the farmers' income at the expense to the consumers.

The chapter 7 examines the link between price and trade policy interventions in rice sector with households' income and poverty in Sri Lanka. In order to meet the objectives, three policy simulation scenarios (namely: simulation 1-removal of border protection only, simulation 2-removal of fertilizer subsidy only and

simulation 3-removal of both) are conducted based on budget share of rice income and expenditure on rice consumption in 2012/13 and import tariffs applied in 2012. In addition, simulation 2 and 3 are further analyzed with transfer payments given to (i) all households below poverty line, and (ii) all paddy producers only, to minimize the negative effect on households as a result of price and trade policy liberalization. The long run impacts on households' income and poverty are analyzed incorporating the demand and supply elasticity of rice.

The results of chapter 7 indicate that changes in welfare and poverty among households vary widely between regions, farm size and income categories. The results suggest that removal of border protection in inputs and output tends to increase the welfare and reduce poverty of the majority of rice farmers and all the non rice farmers. In addition, paddy producers in rural sector who depend largely on rice consumption, will receive the largest welfare gain (2.9%) with the removal of border protection while considering for all consumers (including paddy famers), estate sector gain the most (5.1%). In the meantime, poor households gain the significantly large benefits while the marginal benefits are received by households in the upper income categories for simulation 1. For the large paddy holdings, their income loss is greater than the expenditure savings when the border protection is removed because their income share of rice is high. Hence, welfare decreases with the farm size increases. Meanwhile, the highest welfare drop (4.1%) for rice farmers is due to, removing fertilizer subsidy of 90% while continuing the border protection. Therefore, removal of fertilizer subsidy would have significant negative consequence on paddy farmers' welfare than removal of border protection. This suggests that the welfare loss of paddy households' should take in to consideration when the government makes changes in fertilizer subsidy policy. In addition, removal of both (border protection and fertilizer subsidy) interventions tend to reduce welfare in urban and rural rice producers, while, welfare increase for rice farmers in the estate sector because estate sector farmers are net rice consumers. However, it is revealed that the negative welfare effect of the paddy producers' will get mild in the long run if incorporated the larger producer and consumer elasticites. In contrast, drop of purchasing rice price due to removal of both interventions resulted in welfare gain for consumers belong to all the sectors in 2012 particularly larger portion of benefits grab by consumers belong to the low income groups. Moreover, long run results indicate that removal of both interventions tend to smaller welfare loss for poor farmers than non poor farmers. In other words, the current protectionist policies in rice give fewer benefits to the poor farmers. The analyses also suggest that policy changes without transfers would adversely affect farmers in general, particularly in the regions where large contribution is made to the national economy. As seen from the results, poor farmers'

welfare increases by 3.4% while non poor farmers too receive moderately high benefits, if the transfer payments grant only to the paddy producers. Considering the total sample, the largest poverty reduction is observed for the estate sector consumers with their poverty ratios reduced from 23% to 20% when both distortions are eliminated and transfer payments are given to all households below the poverty line. Therefore, results imply that consumers in the estate sector strongly affected when rice price increase. It is also revealed that the long run poverty ratios are lower than the poverty ratios in the short run though the difference is small as a result of relatively inelastic demand and supply of rice. Moreover, the overall poverty gap is declined from 5.38 to 4.32 and 4.12 with the transfer payments given to the households below the poverty line and payments given only to paddy households respectively when both interventions removed. The overall results suggest that, the majority of households who affected unfavorably due to the current distortions are the low income households. Therefore, removal of distortions will affect favorably for both consumers and poor paddy producers. Conversely, there will be some negative consequences such as marginal drop of paddy production in the country due to increasing input prices (specially fertilizer) and low producer price, and detrimental impact on rice income for paddy producers and consequently on rice self sufficiency. This situation would weaken the political power of the government also.

Finally, the next section provides several policy implications for the country based on the findings and conclusions of this study.

8.3 Policy Recommendations

(1) Promote public private partnership

As discussed in the study, public sector involvement in the food sector in terms of free irrigation, fertilizer and research is very high in Sri Lanka over the decades. This make tremendous budgetary burden to the government. Moreover, this would weaken the private sector involvement in the food and agriculture sector. Therefore, it needs to promote the public private partnership in the food sector in the country, which will enhance the competitiveness in the sector. Besides, facilitating the private sector participation would increases overall resources invested in the food crop sector and competition would increase the food productivity and resource allocation. In addition, due to increase in private sector investment, government can divert its resources to other sectors and programmes such as research, and infrastructure development etc. where private sector involvement is insufficient.

(2) Develop long term agriculture policy agenda for the country

This study explains how the food crop sector policies being evolved since independence and how the political economy affected to change the agricultural sector policies time to time. Therefore, absence of long term policy is one of the major hindrances to the food sector development. Meantime, proper monitoring and timely implementation of policies are important to increase the efficiency of the projects. Proper management of the irrigation schemes through farmer participation will reduce the government budget as well as farmers' attitudes to protect the scarce resources.

(3) Invest in agriculture research and extension

Improve food qualities, and produce pest and disease resistant varieties are very important aspects in food production sector. This is the area which public sector expenditure should be directed. Meantime, findings of the research are not conveyed to the farmers effectively due to weakness in the extension service. Therefore, government should invest in such weaker areas and introduce new technology to produce new food crop varieties. In addition, produce specific rice varieties which have high export demand and find methods to reduce the cost of production are important for the farmers to increase their income because currently paddy faming is unprofitable in most of the areas.

(4) Use organic fertilizer in rice and other crop cultivation and promote environmentally friendly farming

Annually the government spends huge budget on fertilizer imports to the country. Moreover, since there are several shortcomings of the fertilizer subsidy such as leakages, corruptions, concerns on human health and environmental problems, it is important to use organic fertilizer in crop cultivation. Meantime, one of the major concerns among the rice growing areas in Sri Lanka at present is emerging chronic kidney disease as believed due to use of low quality fertilizer. Therefore, policies towards promoting environmentally friendly farming specially encourage farmers to produce and use more organic fertilizers in their fields will probably be some positive approach. Moreover, invest in commercial production of organic fertilizer is also necessary.

(5) Adjustments to the fertilizer subsidy policy

As observed from the study fertilizer subsidy is the main driver of the ERP for rice. However, it costs more than 30 billion rupees annually and has created number of socio economic problems during the past few decades. Therefore, government should consider making adjustments to the fertilizer subsidy policy either to reduce the subsidy or complete elimination of the subsidy with direct transfer payments as proposed by the newly elected government. However, before making such drastic changes to the subsidy policy, policy makers should evaluate it carefully, examining the possible impacts on all the sectors which can be affected negatively.

(6) Rural livelihood diversification

Removal of incentives in the rice sector could reduce paddy farmers' income. Therefore, diversifying the food crop sector is necessary. In addition, diversification in the food crop sector causes reducing the negative welfare impacts on rice producers in the long run. Diversification of rural sector can take the form of shifting production to high value and export based crops. If there are more income opportunities in the rural areas then paddy farmers can easily switch to other high value commercial crops when the price of rice is low. Further, they can divert their factors of production such as labour and capital to produce other crops and increase their farm income.

(7) Enhance the efficiency of small farmers

Removal of fertilizer subsidy and trade protection for farmers could result in inefficient small scale farmers to leave the industry. Therefore, it is necessary to apply new technology to improve the yield and reduce production cost aiming to enhance the efficiency of small farms. In addition, improved technology should be used to produce specific rice varieties which have high quality and commercial value (ex. resistant to crop diseases, rich in nutrition value and good flavor) and export oriented rice varieties. Further, cultivation of specific rice varieties with high export and local demand will mitigate the low income problems faced by rice farmers due to removal of interventions.

(8) Absorb additional labours to other industries and provide training opportunities

As shown in the results of Chapter 4, some inefficient farmers lose their jobs due to removal of fertilizer subsidy. This could further leads to rise poverty in the rural sector. Therefore, it is important to absorb such

additional labours to other sectors. In the country there are certain industries such as construction and IT sectors that need skilled or semi skilled workers. There is a high demand for them with attractive salaries and other incentives. So, there should be a more systematic mechanism to give the necessary training for the youth and other labors who are deprived their jobs in the paddy sector and absorb them to the sectors where they are really needed. Such a prior planning would reduce the pressure on the farmers who lose their jobs in paddy sector with the removal of fertilizer subsidy.

(9) Targeted transfers to low income and paddy farming households

More efficient target has become increasingly important and implementation of targeted transfer payment would ease out the costs of price and trade liberalization to low income families. Further, it will reduce the income disparity between rich and poor and reduce the increase in poverty when remove the distortions. However, the effectiveness of newly proposed direct cash transfer policy in the rice sector is doubtful as there is no obligation to obtain the transfer payment. Therefore, government should consider introducing some obligation to increase the effectiveness of the proposed policy and select the appropriate households after careful examination, avoiding any political interference. This can be based on the farm size of paddy farming households and implementation of proper system to calculate the total income of the households. Then government can differentiate between who should receive and who should not receive the transfer payments with good transparency.

(10) Measures to increase demand and supply easticities

Since the results suggest that adverse welfare impacts could get mild in the long run, it required to improve the factors affecting the demand and supply elasticities of rice. Therefore, need to motivate the farmers to grow close substitutes of rice such as maize, manioc, jack fruit and other root crops. In addition, increase the number of value added products that can be produced using the rice as well as employ mechanisms to reduce the cost of production would increase the demand and supply elasticity of rice respectively.

(11) Consistent and simplified import tariffication policy

As observed from the Chapter 6, import tariffs in the country are subjected to unpredictable frequent changes. Also there is an inadequate transparency in import tariff process. Such ad-hoc changes in the import tariff policy are not conducive to the long term growth of the domestic food crop sector. Hence, a consistent tariff policy

will help to develop the domestic food sector. Meantime, it is necessary to simplify the existing taxes and tax bases to remove the complexity of the taxation procedure and to understand the taxable amount easily. A closer coordination between relevant ministries and departments is essential in this regard.

(12) Attractive output price policy

As suggested in the study, paddy price has a strong incentive to increase the rice production in the country. Therefore, the government should introduce attractive output price policy when fertilizer subsidy is removed. Meantime, to increase the competitiveness between the private and public sector marketing system it is necessary to introduce appropriate market price thus to increase farmers' income.

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