



CATPRN

Canadian Agricultural Trade Policy Research Network

Rice Market Liberalization and Household Welfare in Sri Lanka: A General Equilibrium Analysis

CATPRN Working Paper 2006-1

December 2006

Jeevika Weerahewa
Assistant Professor
Department of Food, Agricultural and Resource Economics
University of Guelph
Guelph, Ontario

<http://www.catrade.org>

Funding for this project was provided by the Canadian Agricultural Trade Policy Research Network (CATPRN). The CATPRN is funded by Agriculture and Agri-Food Canada but the views expressed in this paper are those of the authors and should not be attributed to the funding agency.

Rice Market Liberalization and Household Welfare in Sri Lanka: A General Equilibrium Analysis

Abstract

Current trade policy pursued by the Sri Lankan government on rice can best be described as ad-hoc as it is characterized by protecting farmers during glut seasons and consumers during deficit seasons. This study examines the economy-wide impacts of various policy packages on rice and related markets, which consist of liberal as well as protectionist elements. A general equilibrium model developed for the Sri Lankan economy using the input-output table for 2000 was used for the analysis. The model consists of 5 sectors, 2 factors of production and households in 8 representative provinces. The key results of the analysis indicate that removal of the import tariff on rice along with removals of the import tariff on fertilizer and/or subsidy payments on other agricultural sectors could improve economic efficiency and household welfare across provinces. Contrary to the general belief that protectionism is pro-poor, an import ban on rice reduces household income and welfare even in agricultural provinces, including Uva and Sabaragamuwa. Further analysis indicates that broad-brush approaches may not yield expected outcomes, as the policy packages generate second best outcomes due to existence of other distortions in the economy. The key channel of transmission of trade shock to households appears to be through government transfer payments that are influenced by changes in government expenditures on subsidy payments.

Key words: General Equilibrium, Liberalization, Rice and paddy, Sri Lanka

Introduction

Rice is the staple food in Sri Lanka and paddy cultivation is part and parcel of the social fabric of the country¹. Complete liberalization of the rice market was therefore never considered a high priority area on the Sri Lankan policy agenda. At present, rice is on the negative list in regional trade agreements and the tariff is well within the bound rates of the World Trade Organization (WTO). However, with growing global trade liberalization trends and incentives provided by development financing organizations for trade liberalization in developing countries, the protection of the rice sector, not only in Sri Lanka, but also the rest of the world, will be increasingly difficult. Sri Lankan policy makers are concerned about the distributional implications of such a move as the implicit objective of its protectionist policies is to safeguard the poor.

Previous estimates of protection coefficients and the degree of competitiveness imply that the impacts of liberalization would be considerable at least on certain regions of the country. The NRP and ERP for rice in Sri Lanka were estimated to be 25.1% and 25.8% respectively for 2000 (Epparachchi et al., 2002). The estimates on competitiveness indicate that they vary across regions. According to Abeyrathne et al (1990) paddy under irrigated conditions is an efficient user of domestic resources and the average Domestic Resource Cost (DRC) ratio was 0.88 when irrigation costs were included as rehabilitation costs². Shilpi (1995) concluded that at the current factor prices and current pattern of resource use, paddy sector was not competitive. Rafeek and Samarasinghe (2000) also indicate a lack of competitiveness at the national aggregate level, yet suggest that the Dry Zone was suitable for paddy cultivation (Rafeek and Samarasinghe (2002). According to Kikuchi et al (2000), although competitiveness had been declining over the years, Sri Lanka still was competitive in growing paddy in major irrigation schemes. Weerasinghe et al (2003) and Thibbotuwawa and Weerasinghe (2004) show that in growing paddy in larger holdings was efficient.

The net impacts of rice-trade liberalization are determined not only by the efficiency of production as indicated above but also by the gains to consumers that are associated with a drop in rice prices. The size of these gains and losses are primarily determined by the share of expenditure on rice and share of income from paddy respectively. Weerasinghe (2004), who incorporated this aspect in assessing the impacts of rice trade liberalization, reveals that on average, there will be net gains from unilateral rice-trade liberalization for all the provinces, for all income groups and for all sectors considered in her study. The very poor people (among the income groups), the estate sector (among the sectors) and the Northwestern province (among the provinces) will have the highest welfare gains and hence rice-trade liberalization could be considered pro-poor even though paddy farmers in certain provinces such as Uva and Sabarasingmuwa are worse off.

The objective of the present study is to examine the economy-wide impacts of liberalization of the Sri Lankan paddy and rice markets paying special emphasis to household welfare at the provincial level. The impacts of liberalizing import tariffs on rice, import tariffs

¹ Rice is the final product obtained from milling paddy, which comes with a husk.

² The DRC is defined as the shadow value of non-tradable (domestic) factor inputs used in an activity per unit of tradable value added. A DRC ratio of less than one indicates that domestic resources are used efficiently.

on fertilizer and eliminating the subsidy on other agricultural commodities are evaluated using a general equilibrium model. The impacts of imposing restrictions on rice imports are also investigated to evaluate the cost of implementing such a policy on national and provincial economies. The model accommodates various channels of transmission of trade shocks to households across different provinces in Sri Lanka such as output prices, factor prices and employment, and government transfers.

The paper is organized as follows. The next section explores the significance of rice in the Sri Lankan economy. Section 3 provides a conceptual framework for the analysis and section 4 provides the analytical structure used in this study. Section 5 presents the results of various types of policy experiments and the paper ends with some conclusions.

Rice and the Economy of Sri Lanka

Past Policies

Prior to 1977, the overall economic policy of the country was import substitution. There were slight variations on the degree of openness to foreign trade with changes in political regimes. Within this general policy framework, the policies specific to the paddy sector included provision of a guaranteed price for paddy, provision of subsidies on inputs (land, fertilizer, seed, credit, irrigation, research and extension), and provision of marketing services by the state sector. During this period, the main focus was on self-sufficiency in rice. One of the important steps towards this end was settlement of people in the dry zone with irrigation facilities. Land entitlements, without permission to sell were granted in these schemes. As a result, land consolidation became illegal. Certain groups of people, who were not farmers earlier, became farmers due to land ownership under the settlement schemes. Of the investments in the agricultural sector, irrigation occupied the highest place. Paddy farmers were also provided with concessionary credit for a long period of time. Defaulted credit was written off from time to time. The production and distribution of seed was mainly done by the Department of Agriculture, thus providing a hidden subsidy. Government institutions were responsible for importation of rice and imports were controlled through import tariffs and import licensing. The marketing of paddy was the responsibility of the Paddy Marketing Board (PMB) along with the Co-operative Wholesale Establishment (CWE). A guaranteed price scheme (GPS) was implemented to avoid undesirable price drops. A free rice ration was given to every citizen of the country.

Figure 1 shows the trends in rice area, yield per hectare, total production and imports over the past 4 decades. They clearly show that protectionist policies helped to achieve higher production levels through improvements in land productivity and expansion of area under cultivation, reducing reliance on importation of rice.

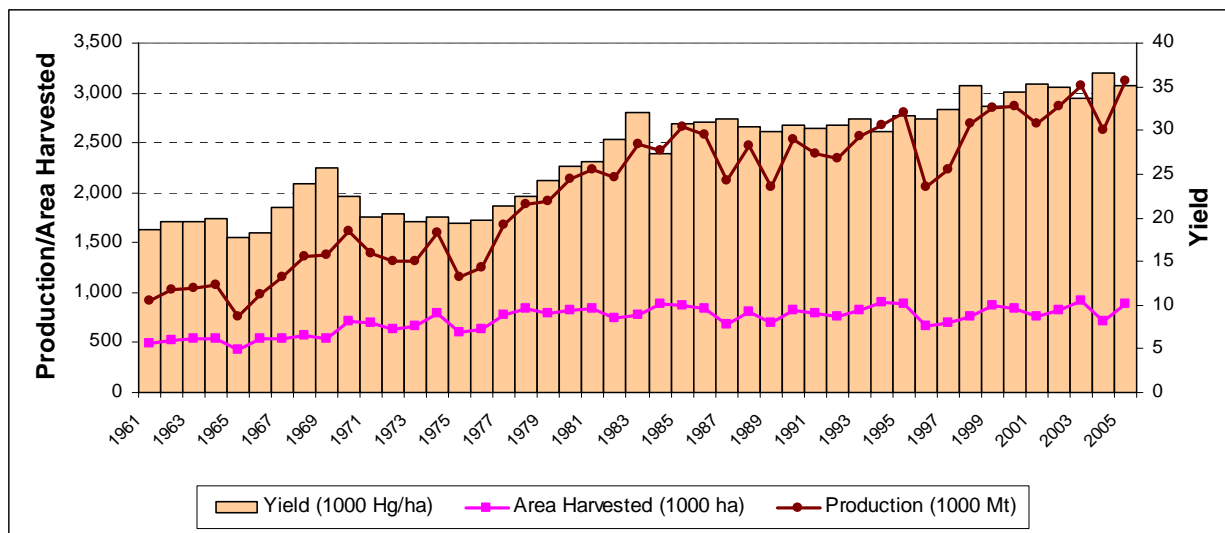


Figure 1: Trends in Area Under Paddy, Average Land Productivity and Total Production of Paddy

After 1977, with the implementation of more open economic policies, some of the protectionist measures were liberalized. The fertilizer subsidy was eliminated in 1989 and reinstated in 1994 and since then it has become a stop-and-go policy. It was originally applied to urea, sulphate of ammonia, murate of potash and triple super phosphate. In 1997, the fertilizer subsidy was revised to apply only to urea. The subsidy was provided to fertilizer manufacturers and the importation of fertilizer was subjected to a tariff. The government monopoly of certified seed paddy production was abolished and the private sector was allowed to produce seed paddy. Paddy marketing was liberalized and the private sector started to play a major role in purchasing and milling paddy. Imports of agricultural inputs and equipment, such as fertilizer and tractors were liberalized in 1997.

Along with these reforms, private traders were allowed to import rice although trade was subjected to some barriers. According to Epparachchi *et al.* (2002) total tax incidence, which indicates the gap between the world market price and the local price, during 1995-2002 ranged from 7.63% to 65.7%. The tariff on rice imports of 35% in 1999 was raised to 49% by imposing an additional surcharge in 2001. From January 2002 this was changed to a specific duty of Rs.7.00 per kilogram which is approximately 30%. Licensing scheme was also introduced and withdrawn from time to time, shifting the government's focus between consumer and producer welfare. At present, protectionist policies are in the forms of (i) import tariffs, (ii) an announced price for paddy³, (iii) a fertilizer subsidy (along with a tariff on imports), and (iv) hidden subsidies on seeds, irrigation water and research and extension. Thus, the paddy sector still enjoys some level of protectionism even after nearly thirty years of open market economic policies.

The trends in key economic variables during the post liberalization era are also shown in Figure 1. Land productivity has come to a plateau and the area under cultivation has been

³ Government purchases represented only 3% of total paddy sales under the announced price and it operates as a floor price.

growing more slowly since the 1980s resulting in small increases in total production. On one hand, these trends can be interpreted as a consequence of paddy and rice market liberalization (which was mainly limited to marketing of paddy and distribution of rice) and expansion of non-agricultural sectors due to open economic policies. On the other hand, this could be interpreted as a situation where protectionist policies (such as import tariffs on rice) no longer stimulate paddy production. Whilst the latter view makes more economic sense, Sri Lankan policy makers are of the view that protectionist policies safeguard the poor and hence are biased towards producer welfare. However, they lower the import tariffs on rice from time to time to protect the urban poor and landless laborers in rural areas. Moreover, there is tremendous political pressure on policy makers as paddy farmers in rural areas constitute the major portion of votes and changes in paddy and rice policy could easily topple the government in political power.

Input-Output Relationships in the Sri Lankan economy

While it is difficult to quantify the political significance of paddy and rice in the economy, the economic significance of such markets can easily be illustrated using an input-output table. Table 1 is an extract of the input-output table of Sri Lanka for the year 2000 (Amarasinghe and Bandara, 2005). The economy is divided into 5 sectors, namely, paddy, agriculture (excluding paddy), rice, manufacturing (excluding rice) and services. The rows show the values paid to each of the sectors by the sectors indicated in the column headings. Table 2 presents the same information in share form. It is clear that the value of labor is the highest cost share in paddy production (42%) whereas paddy is the biggest cost share (86%) in rice production. Fertilizer has a large cost share (10%) in paddy cultivation, which is reflected in the imported intermediate inputs in paddy cultivation⁴. A subsidy payment on fertilizer is not shown in this table; rather an import tariff, which comprises 0.32% of the cost, is recorded. The manufacturing sector depends heavily on imported inputs (42%), which are dominated by textile importation for garment production. The agricultural and manufacturing sectors are subsidized by the government (average ad-valorem subsidy rates are 0.54% and 0.35% respectively) through taxes imposed on the services sector (9.91%). The manufacturing sector pays a significant portion of duties (2.54%) for its intermediate inputs.

Table 3 shows the importance of trade for the Sri Lankan economy. The manufacturing sector is highly trade dependent occupying 80% of total exports and 68% of total imports. Out of its total production 57% is exported and 30% is imported for final consumption. In contrast, paddy is a non-tradable commodity and a small proportion of rice is imported to the country. Only 0.09% of total imports are rice and it is equivalent to 0.84% of total production of rice in 2000. Rice has not been an exportable commodity in Sri Lanka and trade in paddy is not permitted.

⁴ Phosphorous is the only fertilizer produced in Sri Lanka. All other fertilizers are imported.

Table 1: Input-Output table of Sri Lanka for the year 2000 (values are in Rupees Million*)

Sector		Paddy	Agriculture	Rice	Manufacturing	Services
Intermediate inputs (local)	Paddy	1,226	0	29,349	0	0
	Agriculture	200	7,297	5	52,436	5,249
	Rice	0	0	1	1,991	1,763
	Manufacturing	48	27,991	55	27,607	92,666
	Services	2,174	8,975	431	91,277	274,253
Intermediate inputs (imported)	Imports of Goods	3,757	5,296	1,050	302,002	4,744
	Import of Services	0	0	0	0	0
Value added	Rent	14,057	99,452	2,965	180,171	325,998
	Wages/Salaries	15,636	72,752	263	50,035	355,128
Government payments	Import duty	118	132	86	18,301	5,047
	Other taxes	0	-1,183	0	-2,524	117,188
Value of output		37,216	220,704	34,205	721,290	1,182,158

*Exchange rate in 2000 is 75.77 Sri Lankan rupees per US\$ (Central Bank of Sri Lanka, 2004).

Source: Calculated using Input-Output Table (Amarasinghe and Bandara, 2005)

Table 2: Cost Shares of Different Sectors

Sector		Paddy	Agriculture	Rice	Manufacturing	Services
Intermediate inputs (local)	Paddy	3.29	0.00	85.80	0.00	0.00
	Agriculture	0.54	3.31	0.01	7.27	0.44
	Rice	0.00	0.00	0.00	0.28	0.15
	Manufacturing	0.13	12.68	0.16	3.83	7.84
	Services	5.84	4.07	1.26	12.65	23.20
Intermediate inputs (imported)	Imports of Goods	10.10	2.40	3.07	41.87	0.40
	Import of Services	0.00	0.00	0.00	0.00	0.00
Value added	Rent	37.77	45.06	8.67	24.98	27.58
	Wages/Salaries	42.01	32.96	0.77	6.94	30.04
Government payments	Import duty	0.32	0.06	0.25	2.54	0.43
	Other taxes	0.00	-0.54	0.00	-0.35	9.91
Value of output		100.00	100.00	100.00	100.00	100.00

Source: Calculated using Input-Output Table (Amarasinghe and Bandara, 2005)

Table 3: Importance of Trade for the Sri Lankan Economy

	Production (Rs. million)#	Exports (Rs. Million)#	Imports (Rs. Million)#	Export share (%)	Import share (%)	Export penetration* (%)	Import penetration** (%)
Paddy	35,990	0	0	0.00	0.00	0.00	0.00
Agriculture	213,415	18,813	27,087	3.82	8.83	8.82	12.26
Rice	34,204	0	288	0.00	0.09	0.00	0.83
Manufacturing	693,689	396,303	210,013	80.50	68.47	57.13	23.24
Services	907,783	77,185	69,332	15.68	22.60	8.50	7.10
Total	1,885,081	492,301	306,720	100.00	100.00	74.45	13.99

*Exports as a % of total production and ** Imports as a % total supply (production and imports).

Exchange rate in 2000 is 75.77 Sri Lankan rupees per US\$ (Central Bank of Sri Lanka, 2004).

Source: Calculated using Input-Output Table (Amarasinghe and Bandara, 2005)

Provincial Differences in Rice Consumption, Production and Poverty

There are differences between the rich and the poor as far as income earned from paddy farming and expenditure incurred to purchase rice are concerned. The average monthly consumption of rice in Sri Lanka is 35.3 kg/household/month and the consumption levels range from 18.6 (the first decile) to 37 (the tenth decile). The resulting average expenditure on rice of the lowest and highest income deciles are 517 and 1219 Rs./household/month respectively with a national average of 1052 (Department of Census and Statistics, 2002).

According to consumer finance surveys conducted by the Central Bank of Sri Lanka, expenditure on rice as a percentage of total food expenditure has been declining over time (28.3% and 20.4% in 1981/82 and 1996/97, respectively). Furthermore, there are sizable differences among the provinces. As shown in Table 4, the food expenditure share and the share of rice within this category in 2003/04 are the lowest in the Western province.

Table 4: Consumer Expenditure Shares, %

	Rice	Other food	Clothing	Services
Western	4.1	26.5	7.5	61.9
Central	8.3	35.1	10.2	46.6
Southern	7.1	34.5	7.6	50.8
Northern	5.8	40.6	6.7	46.9
Eastern	7	40.1	10.6	42.3
North Western	7.3	30.4	7.9	54.4
North Central	8	35.7	9	47.3
Uva	8	38.5	8.9	44.4
Sabaragamuwa	10.4	35.2	9.2	45.2
All Island	6.3	31.6	8.3	53.8

Source: Consumer Finance Survey, Central Bank of Sri Lanka (2003/04).

The differences between the rich and the poor in terms of income from farming, especially from paddy, should be considerable. However, such information is not available at the national level and Table 5 shows the contribution of wage income versus other sources of income by provinces.

Table 5: Contribution to Total Income by Different Sources (in percentages)

Province	Total monetary income	Wages	Non agricultural activities	Agricultural activities	<i>Samurdhi</i>	Other cash	Non monetary
Western	80.7	45.4	19.1	2.6	0.5	13.1	19.3
Central	82.4	42.8	17.0	7.1	1.4	14.2	17.6
Southern	79.0	36.5	15.5	14.3	1.6	11.2	21.0
North Western	82.2	39.4	16.9	12.1	1.9	12.0	17.8
North Central	82.8	33.4	17.8	17.2	1.5	12.9	17.2
Uva	81.0	33.9	14.5	15.7	1.6	15.2	19.0
Sabaragamuwa	81.8	46.3	14.1	10.3	8.9	3.1	8.2
Sri Lanka	81.1	42.0	17.4	7.8	1.1	12.7	18.9

Source: HEIS, 2002

The rice/paddy sector and poverty in Sri Lanka are closely associated. The incidence of poverty (head count ratio) at the national level was reported at 22.7% (HEIS, 2002). In the rural sector, where paddy farming is mostly carried out, 24.7% of the households are poor in contrast to 7.9% in the urban sector. Table 6 presents the status of poverty in 1995/96 using Foster, Geer and Thorbecke (FGT)–indicators, i.e. incidence, depth and severity, which indicate that higher incidences of poverty is recorded in provinces with larger rural populations such as Uva, Northwestern and Sabaragamuwa.

Table 6. Provincial Differences in Poverty in 1995/96 (poverty line Rs 791.67 per person per month)

Province	% of agricultural households*	Incidence		Depth		Severity	
		Index	Contribution	Index	Contribution	Index	Contribution
Western	15.6	14	17	3	15	1	14
Central	45.3	28	17	6	18	2	19
Southern	42.4	26	16	6	16	2	16
Northwestern	48.0	34	18	7	17	2	16
Northcentral	82.6	31	8	6	7	2	7
Uva	75.9	37	11	9	13	3	15
Sabaragamuwa	51.1	32	14	7	14	2	14

Source: Gunawardena 2000 and World Bank (2003).

According to Gunawardena (2000), the poor are more likely to be wage earners or receivers of agricultural income, are less likely to receive income from non-farm self employment, less likely to receive pensions and foreign remittances, and are more likely to

receive transfer payments (*Janasaviya* and *Samurdhi* programs⁵). Most of the paddy farmers in Sri Lanka fall into the categories described above. Table 7 clearly indicates that poverty indices are high among those who are involved in either wage or agricultural activities and table 6 shows that those who derive income from agricultural activities are concentrated in the North Central and Uva provinces. In addition, only 22% of the population own paddy land and there appears to be an inverse association between poverty and the size of paddy land holdings; smaller paddy farmers being the poorer farmers (Gunawardena, 2000).

Table 7. Poverty by Source of Household Income

Household type	Incidences of poverty* (%)	Gini**	Average consumption expenditure# (Rs/month)
Wage income only	23.86	0.334	1,436.77
Agricultural self employment only	26.73	0.282	1,221.19
Non-agricultural self employment income only	13.56	0.346	1,715.99
Agricultural and non-agricultural self employment income only	22.17	0.310	1,380.53
Wage and self employment income	28.09	0.316	1,289.85
No earned income	18.58	0.359	1,794.28

Note: * based on the reference poverty line of Rs 791.67 per person per month.

**Gini coefficient is based on Lorenz curve and is commonly used measure of inequity. The value of Gini coefficient ranges between 0 and 1. A zero value shows a completely equal distribution (Lorenz curve is located on 45 degree line so that the area between 45 line and Lorenz curve is zero). The greater the value of Gini, the greater the degree of inequity in distribution.

#Exchange rate in 1995 was 51.25 Sri Lankan rupees per US\$ (Central Bank of Sri Lanka, 2004).

Source: Gunawardena 2000.

Linking Trade Reforms and Household Welfare

There is ample literature assessing the linkage between trade liberalization and poverty. Most of the studies⁶ identify at least a few of the key linkages highlighted by Winters (2000).

The first linkage is through the price and availability of goods. If trade liberalization, through lowering of tariffs, reduces the price of imported goods, which occupy a major component in the basket of poor consumers, it will be pro-poor. Or, if trade liberalization, through reductions of export taxes, increases the farm gate price of goods that are produced by the poor, it will be pro-poor.

The second linkage is through factor prices, income and employment. If trade liberalization increases the prices of factors that are endowed by the poor (such as unskilled

⁵ Poverty alleviation schemes launched by successive Sri Lankan governments.

⁶ For overview papers on the linkage see Wood (1995) and Slaughter (1999).

labor) and/or expand the sectors where poor workers provide their factors of production (such as agriculture and manufacturing), it will be pro-poor.

The third linkage is through government transfers influenced by changes in revenues from trade taxes. If poor is heavily dependent on government transfers which are funded through trade taxes, the reduction in government revenue due to trade liberalization will have adverse impacts on the poor, if trade taxes are not replaced by domestic taxes.

The fourth, fifth and sixth linkages proposed by Winters (2000) include the incentives for investment and innovation, external shocks, changes in terms of trade and short-run risk and adjustment costs. The relative role of each of the above factors depends on the context under consideration. A model to address the poverty implications of trade should ideally accommodate all of the above linkages. The following general equilibrium model, designed to assess the impacts of trade liberalization on household welfare in Sri Lanka, explicitly accommodates the first three linkages.

The Structure of the Model

A general equilibrium model is developed to reflect the key features of paddy and rice markets described in section 2 and the channels of transmission depicted above. It consists of five aggregated sectors, namely, paddy, rice, agriculture (excluding paddy), manufacturing (excluding rice) and services; two primary factors: labor and capital; and eight types of representative households representing each of the eight provinces. It was assumed that markets are perfectly competitive and in equilibrium all factors and product markets clear. The following sections describe the components of the model.

Production

Production in each sector is carried out in two stages. In the first stage, intermediate inputs are combined with a value added composite in constant proportions. There are 6 categories of intermediate inputs in each sector: paddy, agriculture, rice, manufacturing, services, and imported intermediate inputs, the latter is considered a composite of all intermediate goods. The elasticity of substitution between value added and intermediate inputs is considered to be unitary. Labor and capital are used in fixed proportions. All of the inputs are considered to be mobile. Producers maximize profits and at the equilibrium the zero profit condition holds.

Trade

An Armington assumption is imposed and products produced locally are considered imperfectly substitutable for the imported product (Armington, 1969). The Armington elasticity is set at 15. There are import supply functions and export demand functions for all the sectors and they are considered to be perfectly elastic, assuming Sri Lanka is a small open economy. The importation of products for intermediate use and final consumption is subjected to an import

tariff. Paddy is treated as a non-tradable commodity and rice is treated as non-exportable⁷. The baseline equilibrium is characterized by a trade deficit, which is financed by a foreign exchange endowment.

Consumption

Eight representative households are included in the model representing each province of the economy. Consumers maximize utility (derived from consuming goods produced by the 5 sectors) subject to budget constraints. They receive income from wages and salaries, capital rent and government transfers. Consumers endow a certain amount of foreign exchange that is used to finance the trade deficit. The consumption ratio of imported items and domestic products, that are substitutable by assumption, is constant across households. Only private households are included in the model assuming government consumption is also equally allocated among private households. No private savings are included.

Government

The government is treated as an implicit agent that collects tax revenue and distributes it among different households and among production sectors as subsidy payments. The model does not specify the savings and investment decisions of the government.

Welfare

A composite consumption basket for each representative household is defined which enables the assessment of equivalent variation (EV) of representative households due to various policy changes.

The model is written in the MPSGE language (Mathematical Programming System for General Equilibrium) and in the GAMS (General Algebraic Modeling System)⁸.

Policy Experiments

A series of hypothetical policy experiments were conducted to assess the impacts of various combinations of policies that affect the rice market.

Unilateral liberalization scenarios:

- (i) Simulation 1 (Rice tariff): Removal of import tariff on rice.
- (ii) Simulation 2 (vat): Removal of subsidy on agriculture
- (iii) Simulation 3 (Rtariff_vat): Removal of import tariff on rice and subsidy on agriculture.
- (iv) Simulation 4 (Rtariff_fert): Removal of import tariff on rice and import tariff on fertilizer.

⁷ Rice exports from Sri Lanka have not been reported so far and the quality of Sri Lankan rice is considered to be lower than the rice traded in the world market.

⁸ See <http://www.gams.com/solvers/mpsge/> for detailed descriptions on MPSGE.

- (v) Simulation 5 (All3): Removal of import tariff on rice and fertilizer, and the subsidy to agriculture.

Global liberalization scenarios⁹

- (vi) Simulation 6 (HighWP): 10 percent increase in world market price of rice.
- (vii) Simulation 7 (Hwp_tariff): 10 percent increase in world market price of rice and 100 percent removal of import tariff on rice.

Protectionist scenarios

- (viii) Simulation 8 (SelfSuf): No trade in rice and paddy (rice self sufficiency).
- (ix) Simulation 9 (SS_vat): No trade in rice and paddy and 100 percent removal of subsidy on agriculture

The general equilibrium model presented in the above section treats tariff rates, subsidy rates and world market prices as exogenous variables and solves for domestic prices, local production, imports, exports, income levels, government revenue and welfare. It implies the following channels of transmission. A removal of an import tariff (or a reduction in import prices) of a given good will lower the price of imports, increase the volume of imports and decrease domestic production. It influences the allocation of resources and therefore production in certain other sectors and their exports will increase¹⁰. Factor prices will change—the prices of factors that are heavily used in expanding sectors will tend to rise and vice versa. The changes in factor prices and government revenue will determine the equilibrium household income levels. Households, which derive more income from the factors whose prices have increased, will receive higher incomes and vice versa. The reduction in government revenue due to the lowering of tariffs reduces government transfer payments to the households, which also influence household income. The impacts on welfare depend not only on income levels but also on price levels. The prices faced by different households are dependent on their respective expenditure shares. An improvement in welfare will be observed even with a reduction in income, if prices fall sufficiently.

The production technology in Sri Lanka is such that the cost of capital exceeds the cost for labor in the rice sector (capital intensive) and the cost of labor exceeds the cost of capital in the paddy sector (labor intensive) indicating that rice tariff liberalization can have mixed impacts on wage rates and capital rental rates (Tables 1 and 2). The composition of income is such that households in Western, Central and Sabaragamuwa obtain more than 40% of their income from labor and the major rice growing province, North Central, and the major agricultural province, Uva, obtain a higher share of income from capital. The capital rents in such provinces consist mainly of returns to land. Sabaragamuwa gets a sizable share of its income (9%) from government transfers so a reduction in government payments will have adverse impacts on Sabaragamuwa. On the consumption side, Western province shows the lowest share of rice (4%) and Sabaragamuwa shows the highest share of rice (10%) indicating that Sabaragamuwa will get the advantage of lower rice prices due to rice trade liberalization when compared with Western province.

⁹ Razzaque and Raihan (2006). suggest an increase in world price facing Sri Lanka for rice due to global rice liberalization.

¹⁰ If production in the agricultural sector expands, it attracts more subsidy payments from the government, creating another source of inefficiency making the tariff liberalization as a second best policy.

The model was subjected to composite policy shocks comprising changes in import tariff rates and domestic support and restriction of imports. The following sections discuss the counterfactual equilibrium solutions.

Unilateral Liberalization of Rice

Simulation 1 is liberalization of the import tariff on rice and selected results are reported in Tables 8-11. Appendix Table A.5 shows the detailed results of all simulations, the 3rd column shows the baseline equilibrium levels¹¹ and 4th-12th columns show the changes from the baseline in simulations 1-9 respectively.

The import price of rice facing Sri Lankan consumers is lower due to rice tariff liberalization hence a significant rise in imports of rice is observed¹². Hence, a simultaneous decrease in paddy and rice production levels can be observed (Table 8). The changes in intermediate input usage remain the same as respective production levels because a constant proportion of intermediate inputs are used in production (Leontief production technology). The decline in the production of rice and paddy releases resources to agriculture increasing the production and exports in the latter sector.

Table 8: Percentage Changes in Production Levels Under Selected Scenarios

	Simulation 1 (Rice tariff)	Simulation 5 (All3)	Simulation 6 (HighWP)	Simulation 7 (Hwp_tariff)	Simulation 8 (SelfSuf)	Simulation 9 (SS_vat)
Paddy	-1.70	3.60	-0.60	-0.90	-0.60	0.70
Agriculture	47.70	-14.00	43.20	44.40	43.20	-13.30
Rice	-1.90	3.50	-0.70	-1.00	-0.70	0.80
Manufacturing	-3.10	0.90	-2.80	-2.90	-2.80	0.70
Services	-9.30	2.60	-8.40	-8.60	-8.40	2.60

The impacts on government revenue are negative as the government loses rice tariff revenue and has to spend more for subsidies in the expanded agricultural sector (Table 9). A simultaneous increase in the capital rental rate and wage rates is recorded, due to an increase in exchange rates¹³ however; the net impact on income levels has been negative due to reduction in government transfers. The resulting impact on welfare at the national level has been negative due to the drop in income levels (Table 9).

¹¹ Except for income and government revenue, the levels of all the other variables in the baseline were set to equal to one.

¹² It should be noted that the baseline import level is rather small and the resulting absolute volume change is also small, despite the significant change in relative terms.

¹³ The exchange rate is endogenous in the model.

Table 9: Percentage Changes in Aggregate Income, Prices and Welfare Under Selected Scenarios

	Simulation 1 (Rice tariff)	Simulation 5 (All3)	Simulation 6 (HighWP)	Simulation 7 (Hwp_tariff)	Simulation 8 (SelfSuf)	Simulation 9 (SS_vat)
Government Revenue	-3.98	2.42	-3.08	-3.35	-3.13	3.23
Total income	-0.08	0.03	-0.06	-0.07	-0.06	0.04
Price Index	-0.05	-0.09	0.00	0.00	0.00	0.00
National Welfare	-0.09	0.11	-0.15	-0.14	-0.16	0.04

The impacts on income, price levels and status of welfare in the representative households indicate that the import tariff liberalization on rice reduces the composite price faced by some of the representative households (those who have relatively higher expenditure ratios on rice such as Central, North Central, Uva and Sabaragamuwa) and decrease the income earned by all the representative households (Table 10). The resulting impacts on welfare are negative for all types of households. The Western province is the numeraire province, hence its income is unaffected due to the policy shock¹⁴. Its welfare is also unaffected as prices are unaffected (Table 11).

Table 10: Percentage Changes in Income in Individual Provinces Under Selected Scenarios

	Simulation 1 (Rice tariff)	Simulation 5 (All3)	Simulation 6 (HighWP)	Simulation 7 (Hwp_tariff)	Simulation 8 (SelfSuf)	Simulation 9 (SS_vat)
Western	0.00	0.00	0.00	0.00	0.00	0.00
Central	-0.19	0.07	-0.15	-0.16	-0.15	0.11
Southern	-0.14	0.03	-0.11	-0.11	-0.11	0.06
Northeastern	-0.12	0.04	-0.09	-0.10	-0.09	0.06
Northwestern	-0.16	0.06	-0.12	-0.14	-0.12	0.09
Northcentral	-0.15	0.02	-0.12	-0.13	-0.12	0.05
Uva	-0.19	0.03	-0.14	-0.16	-0.15	0.07
Sabaragamuwa	-0.16	0.10	-0.12	-0.14	-0.13	0.12

Table 11: Percentage Changes in Welfare in Individual Provinces Under Selected Scenarios

	Simulation 1 (Rice tariff)	Simulation 5 (All3)	Simulation 6 (HighWP)	Simulation 7 (Hwp_tariff)	Simulation 8 (SelfSuf)	Simulation 9 (SS_vat)
Western	0.00	0.00	0.00	0.00	0.00	0.00
Central	-0.10	0.20	-0.20	-0.20	-0.20	0.10
Southern	-0.10	0.10	-0.10	-0.10	-0.20	0.00
Northeastern	-0.10	0.10	-0.10	-0.10	-0.10	0.00
Northwestern	-0.10	0.10	-0.20	-0.20	-0.20	0.10
Northcentral	-0.10	0.10	-0.20	-0.10	-0.20	0.00
Uva	-0.10	0.10	-0.20	-0.20	-0.20	0.00
Sabaragamuwa	-0.10	0.20	-0.20	-0.20	-0.20	0.10

¹⁴ Nominal income is not a meaningful indicator in this model. The changes in welfare are given in real terms and is a meaningful indicator.

One of the interesting results of this simulation is the indirect impact of expansion of agricultural production due to the shrinking paddy and rice sectors, which have dominated the welfare results¹⁵. It now attracts more subsidy payments reducing the revenue of the government. This leads to decreases in income levels of households in all provinces, which subsequently lead to welfare decreases. Further simulations performed to assess the impacts of simultaneous liberalization of the rice import tariff and agricultural subsidy payments indicate that welfare improvements will take place in all the provinces, if there are no subsidy payments.

Simulation 2 is the complete liberalization of subsidies on agriculture with original protection to rice through import tariffs. Simulation 3 is the combined removals for subsidy in agriculture and tariff on rice. A comparison of results among simulations 1, 2 and 3 show that efficiency gains due to subsidy removal can be improved by also liberalizing rice tariffs as average household welfare is the highest in simulation 3. In both simulations 2 and 3, incomes increase and all provinces gain. They are associated with lower agricultural output and hence there is a release of government revenue that was earlier used for subsidy payments (Appendix A.5).

Simulation 4 is liberalization of import tariffs on both rice and fertilizer. This leads to reductions in government revenue as the government loses tariff revenue from rice and fertilizer. The resulting impact on income levels at the provincial level is negative. Domestic and import prices of rice decline and composite prices also decline. The decrease in import prices of intermediate inputs used in paddy leads to an increase in paddy and rice production. Consequently, a decrease in agricultural production is observed, saving some expenditure on subsidy payments to agriculture. The resulting impacts on household welfare are positive across provinces as the effect of lower incomes is offset by lower prices (Appendix A.5).

Simulation 5 is the liberalization of import tariffs on rice and fertilizer and the subsidy to agriculture. The import price of rice decreases and imports of rice increase. The elimination of support to the agricultural sectors saves government expenditure. There is a decrease in the capital rental rate and increase in wage rates. The resulting impact on income levels is positive for all the provinces. Consequently, the impacts on welfare are positive for all provinces except for the Western province, which is the numeraire (Appendix A.5).

Global Liberalization Scenarios

Simulation 6 is a 10 percent increase in the world market price of rice. An increase in the price of rice in the world market increases the cost of importation of rice, reduces imports of rice, and reduces production of paddy and rice (Table 8). The reduction in rice imports reduces tariff revenue and increases in agricultural production increases the subsidy payments. Overall, there will be reductions in total income, efficiency in the economy and household welfare at the provincial level (Tables 9-11).

Simulation 7 shows higher world prices along with a removal of import tariffs on rice. The results are similar to those of simulation 6, except that importation of rice still will be

¹⁵ Note that the size of agricultural sector is much larger than the sizes of paddy and rice sectors and hence the magnitude of the subsidy payment is quite high.

cheaper so imports will increase. Overall impacts on the economy at national and provincial level however are negative (Tables 10 and 11).

Protectionist Scenarios

Simulation 8 is a rice import ban which leads to zero imports of rice and no tariff revenue from rice importation. The loss in tariff revenue causes a reduction in household incomes which finally reduces the local demand for rice and hence reduces the local production of rice and paddy (Table 8). This leads to increases in agricultural production and exports, which has a negative effect on incomes as government incurs an expenditure on subsidy payments (Table 9). The impacts on welfare are negative at the national and provincial levels (Tables 10 and 11).

Simulation 9 was conducted to assess the impact of a rice import ban in the absence of subsidies on agricultural sectors illustrating the removal of indirect tax on paddy production. The results show an increase in paddy and rice production levels and a decrease in production of agriculture. Rice import bans under this scenario increase government revenue (through savings of government expenditure on subsidy payments), decrease the capital rental rate (due to reduction in agricultural production) and increase wage rates. The resulting impact on income levels is positive (Tables 9 and 10). The domestic price of agriculture increases yet there are no noticeable impacts on composite prices. The impacts on welfare are positive as losses due to trade restrictions are over-weighted by the gains due to the removal of the subsidy payments (Table 11).

Summary, Conclusions and Implications

Sri Lanka has a rich experience in implementing a variety of policies on its paddy and rice sectors, which were aimed to achieve household food security. The paddy industry benefited significantly due to protectionist policies implemented in the post independence era, which is evident by significant increases in productivity, extent cultivated and total production until late 1970s. At the on set of open economic policies, the country was about 90% self-sufficient in rice. The open economic policies for the paddy and rice sectors in the post-liberalization period have been mainly limited to marketing and distribution while the trade policy has been rather ad-hoc protecting the producers during glut seasons and protecting consumers during the deficit seasons. The growing populations in the non-farm sector made the protectionist policies rather costly to the country in this era. However, the policy makers have been reluctant to move away from the protectionism due to equity and related political reasons.

This study investigated household welfare impacts of alternative liberal and protectionist policies related to the rice sector using a general equilibrium model. The key results of the study show that liberal policies would increase economic efficiency and household welfare across provinces. The results also show that import bans on rice and global liberalization of rice that increases the import price not only reduce overall efficiency of the economy, but also reduce household welfare even in some of the poorer agricultural provinces such as North Central and Uva.

The above results indicate that liberalization of paddy and rice markets is not a zero sum game as once perceived. In broad terms, it could improve economic efficiency without having bad distributional outcomes, at least at the provincial level. These results imply that continuation of protectionist policies is neither necessary nor efficient in the present era though they had been very successful in expanding paddy and rice sectors during the post independence era. Liberalization would allow paddy farmers to be more competitive and possibly result in an environment where paddy farming is characterized by larger holdings managed by entrepreneurial farmers. It might also lead to land consolidation, vertical integration, value addition and product diversity and consequently a movement away from semi-subsistence state to a commercial enterprise.

However, it should be noted that different liberalization packages generated mixed outcomes for efficiency and household welfare due to their second best nature. In this regard, a few channels of transmission can be identified. The first and the most important channel is government revenue/expenditure. Prior to the experiments, the economy was characterized by a subsidy payment for the agriculture sector which occupied a major portion of government expenditure. The removal of the subsidy on agriculture always improves efficiency both at national and provincial levels due to reductions in government expenditure. Consequently, the removal of the rice tariff without liberalizing agricultural market is welfare reducing both at the national and provincial levels due to its indirect impacts on expanding agricultural production. In contrast, the removal of the rice tariff together with the fertilizer tariff was welfare improving as it did not significantly change the level of production in agriculture. Higher world market prices and import bans for rice were also associated with increased agricultural production and hence welfare reducing.

The second channel is through output prices. Liberalization scenarios, except for the agriculture subsidy removal, lead to lower output prices that helped to improve household welfare. For example, a removal of the import tariff lowers the import price of rice that would benefit a province like Sabaragamuwa, which spends a higher proportion on rice.

The third channel is through factor prices. Different policy packages have different impacts on factor prices depending on which sectors are contracted or expanded. For example, a removal of the subsidy on agriculture contracts the agricultural sector and hence reduces capital rental rates. It has adverse impacts on households in the North Central and Uva provinces, which derive a higher portion of household income from capital rents.

The different elements in policy packages influence different channels of transmission in various degrees and hence broad-brush approaches may not yield expected results in the Sri Lankan context. It is clearly evident that the heterogeneity in preferences and composition of income sources of the households, intra-industry relationships inherent in the economy, and underlying policy framework determine the outcome of a policy package. Therefore, incorporation of basic characteristics of the economy in economic models, which show the strength of various transmission channels, is of immense importance in policy analysis.

Future research in this area should use a more dis-aggregated model to better depict the characteristics of the Sri Lankan economy. In this study, the analysis was performed at a

provincial level and the aggregate nature of a single province may have masked some of the deprived groups of households within a province such as paddy smallholdings. The short-term implications of liberalization policies, though not apparent in this study, could certainly be adverse on such small paddy farmers who are locked in paddy farming due to restrictive land tenurial arrangements. Hence, further dis-aggregation of households to include different types of farmers is recommended. The factor specific nature of paddy lands in certain regions of the country also needs to be accommodated. Dis-aggregation of agricultural sector into various sub-sectors along with a characterization of the policies is also needed in order to identify where the subsidies and sources of related inefficiencies are. Furthermore, the model assumes perfectly competitive behavior in all markets that may have biased the results if market power is present. There is evidence to suspect an existence of oligopsony power among certain paddy buyers and hence extension of the model to include imperfect behavior will also be required.

References

- Amarasinghe, D. and Bandara, Jayathilake (2005). Input – Output Table for the Year 2000 – Sri Lanka, Institute of Policy Studies, Colombo, Sri Lanka.
- Armington, Paul S. (1969). A Theory of Demand for Products Distinguished by Place of Production. IMF Staff Papers, 16(1): 159-176.
- Abeyratne, F., E. Neville, W.G. Somaratne and P. Wickramaarachchi (1990), Efficiency of Rice Production and Issues Relating to Protection, Sri Lanka Journal of Agricultural Economics, 1: 16-25.
- Central Bank of Sri Lanka, Annual Reports, Colombo, Sri Lanka. Various years.
- CFS, Consumer Finance Survey, Central Bank of Sri Lanka. Various years.
- Gunawardena, D. (2000). Consumption Poverty in Sri Lanka. Mimeo.
- Epaarachchi, Roshen, Sanath Jayanetti and Ananda Weliwita (2002) Policies and their Implications for the Domestic Agricultural Sector of Sri Lanka: 1995 – 2000. Institute of Policy Studies, Agricultural Policy Series Publication.
- HEIS, Household Expenditure and Income Survey, Department of Census and Statistics, 2002.
- Kikuchi, M., R. Barker, M. Samad and P. Weligamage. (2000), Comparative Advantage of Rice Production in an Ex-rice Importing Country: the Case of Sri Lanka. Research paper presented at iii Conference of Asian Society of Agricultural Economists. 18th -20th October 2000, Jaipur, India.
- Rafeek, M.I.M. and P.A. Samaraturunge (2000), An Analysis of Competitiveness of the Rice Sector in Sri Lanka, Socio Economic and Planning Center, Department of Agriculture, Peradeniya.

- Rafeek, M.I.M. and P.A. Samaratunge (2002), Trade Liberalization and Its Impact on the Rice Sector of Sri Lanka, *Sri Lankan Journal of Agricultural Economics*, vol. 3 no. 1 pp 143-154.
- Razzaque, M.A. and Selim Raihan (2006). Global Liberalization of Rice Market: A GTAP Analysis. Unpublished document.
- Shilpi, F. (1996), Policy Incentives, Diversification and Comparative Advantage of Non Plantation Crops in Sri Lanka, Working paper No.2, prepared for World Bank report, Sri Lanka: Non plantation crop sector policy alternatives.
- Slaughter, Matthew J (1999), Globalization and Wages: A Tale of Two Perspectives” *World Economy*, 22(5):609-630.
- Thibbotuwawa, R.M.M.I. and J. Weerahewa. (2004). Policy options for Sustainable Paddy Farming: Scope for Land Consolidation in Sri Lanka. Proceedings of the Annual Research Sessions, University of Peradeniya.
- Weerahewa J., H.M. Gunatilake and H. Pitigala (2003). Future of Paddy Farming in Sri Lanka: Comparative Advantage, Scale and Rural Poverty. *Sri Lanka Economic Journal*, 3(2): 104-144.
- Weerahewa, Jeevika (2004) Impacts of Trade Liberalization and Market Reforms on the Paddy/Rice Sector in Sri Lanka. MTID Discussion Paper, No. 70, Markets, Trade and Institutions Division, International Food Policy Research Institute, Washington D.C.
- Winters, L. Alan. 2000. “Trade, Trade Policy and Poverty: What are the Links?” Centre for Economic Policy Research Paper. No. 2382.
- World Bank, (2003) Sri Lanka Promoting Agricultural and Rural Non-farm Sector Growth, Main Report, Volume 1, Rural Development Unit, South Asia Region, The World Bank.

Appendix 1: The construction of the SAM

The following steps show how the Social Accounting Matrix (SAM) was constructed.

Step 1: The input-output table depicted in table 2 is taken as the starting point in creating the social accounting matrix (SAM) which shows the input-output relationships of the economy.

Step 2: Imports for final consumption and exports figures depicted in table 4 are added to the input-output table. The amount available for final consumption by the economy is obtained by subtracting exports and adding imports to the total production level net of intermediate demand.

Step 3: The difference between the value of imports and the value of exports, i.e., trade deficit, is considered to be financed by foreign exchange owned by the final consumers.

Step 4: The income sources of final consumers consist of capital rents, wages and salaries, government transfers (funded by tax and tariff revenues net of subsidy payments) and foreign exchange endowments.

Step 5: Households were classified into 8 groups showing the province of residence; i.e., Western, Southern, Central, North Western, North Eastern (a combined province for the Northern and Eastern), North Central, Uva and Sabaragamuwa. The average household income and average household size, obtained from the Consumer Finance Survey (CFS) Report 2003/04 published by the Central Bank, along with population estimates obtained from the Department of Census and Statistics are used to calculate the proportion of income allocated to each province. The average income level of the Northern and Eastern provinces is considered as the income level of the North-East province. Total household income calculated in step 4 was divided among the 8 provinces using proportions obtained from the above.

Step 6: Consumer expenditure shares, obtained from CFS (2003/04), were used along with household income levels calculated in step 5, to allocate the income among the goods and services produced by the five sectors, assuming that income level is equal to the expenditure level and ruling out the savings. The average consumption shares calculated according to step 3 are different from the average consumption shares of CFS. The average consumption shares of CFS were hence adjusted to reflect the consumption shares in the IO table. Consumption share of paddy was equally allocated among all the provinces. Consumption shares of agriculture, manufacturing and rice were proportionally adjusted. The consumption share of services was obtained as the residual so as to have zero savings.

Step 7: Sources of income, obtained from Household Expenditure and Income Survey (HEIS) in 2002 by the Department of Census and Statistics were used to allocate income from different sources, i.e., wages and salaries, capital rent and government transfers. Due to the absence of data for the North East, the average of all the provinces was considered as the North-East value. As in the case of consumer expenditure shares, the HEIS shares did not match the average income shares calculated according to the information in step 3. Therefore, the income shares were proportionally allocated treating IO shares as correct. The share of foreign exchange was obtained using the residual.

Step 8: Consumption expenditure and income levels calculated in steps 6 and 7 respectively did not sum up to exact total consumption levels and income levels obtained from the IO data. The small errors encountered were evenly allocated among the provinces in order to obtain a balanced SAM.

Appendix 2: Social Accounting Matrix

Table A.1: Classification of Industries

Paddy	Agriculture	Rice	Manufacturing	Services
Paddy	Tea Growing-High Elevation Tea Growing- Medium Elevation Tea Growing -Low, Elevation Rubber Growing Coconut and Toddy Vegetables Fruits Highland Crops Potatoes Minor Export Crops Tobacco Betel and Arecanuts Livestock Plantation Development Firewood Forestry Fisheries Miscellaneous Agriculture Products	Rice Milling	Mining and Quarrying Tea Processing Rubber Processing Coconut Processing Flour Milling Food, Beverages and Other Textiles, Footwear and leather products Garment Industry Wood and Wood Products Paper and Paper Products Chemicals and Fertilizer Petroleum Industry Plastic and Rubber Products Non Metallic & Other Mineral Products Basic Metal Products Fabricated Metal Products Other Manufacturing	Electricity, Gas and water Construction Wholesale and Retail Trade Hotels and Restaurants Tourist Shops and Travel Agents Transport Post and Communication Banking, Insurance and Real Estate Ownership of Dwellings Public Administration and Defence Other Personal Services

Source: Input-Output Table (Amarasinghe and Bandara, 2005)

Table A.2: Input-Output Relationships

	Paddy	Agriculture	Rice	Manufacturing	Services	Exports	Imports
Paddy	35,990	0	29,349	0	0	0	0
Agriculture	200	213,415	5	52,436	5,249	18,813	22,423
Rice	0	0	34,204	1,991	1,763	0	374
Manufacturing	48	27,991	55	693,689	92,666	396,303	234,164
Services	2,174	8,975	431	91,277	907,783	77,185	69,332
Capital Rent	14,057	98,269	2,965	177,647	443,186		
Wages	15,636	72,752	263	50,035	355,128		
Foreign Exchange Income						492,301	618,273
Intermediate imports	3,757	5,296	1,050	302,002	4,744		316,849
Import duties	118	132	86	18,301	5,047		24,870
Subsidies/Taxes	0	-1,183	0	-2,524	117,188		

Source: Calculated using Input-Output Table (Amarasinghe and Bandara, 2005)

Table A.3: Consumption of composite commodities

	Western	Central	Southern	North East	North Western	North Central	Uva	Sabaragamuwa
Paddy	3,066	215	664	716	796	401	286	493
Agriculture	58,294	6,958	17,604	21,750	18,521	11,677	9,385	13,758
Rice	8,502	1,855	3,664	3,611	4,351	2,744	2,169	3,925
Manufacturing	194,662	10,681	40,610	40,279	57,710	24,710	15,230	26,904
Services	383,765	25,755	77,790	84,979	86,916	45,327	33,448	59,088
Capital Rent								
Wages								
Foreign								
Exchange								
Income	648,292	45,466	140,336	151,337	168,296	84,862	60,521	104,171
Intermediate								
imports								
Import duties								

Source: Calculated using Input-Output Table (Amarasinghe and Bandara, 2005)

Table A.4: Income sources

	Western	Central	Southern	North East	North Western	North Central	Uva	Sabaragamuwa
Paddy								
Agriculture								
Rice								
Manufacturing								
Services								
Capital Rent	31,5376	25,644	80,417	82,376	91,029	52,260	37,825	51,192
Wages	25,7399	13,786	41,929	49,746	55,303	21,647	14,711	39,290
Foreign	66,583	3,219	11,392	12,662	13,127	6,641	4,387	7,960
Exchange								
Income	648,292	45,466	140,336	151,337	168,296	84,862	60,521	104,171
Intermediate								
imports								
Import duties	9,081	2,964	6,744	6,700	8,983	4,459	3,744	5,875
Subsidy	148	148	148	148	148	148	148	148

Source: Calculated using Input-Output Table (Amarasinghe and Bandara, 2005)

Table A.5: Results of the Analysis: The impacts of various policy reforms

		Base	Rice tariff	VAT	Rtariff_vat	Rtariff_fert	All3	HighWP	Hwp_tariff	SelfSuf	SS_vat
Activity	P	1.000	0.983	1.007	0.996	1.031	1.036	0.994	0.991	0.994	1.007
	A	1.000	1.477	0.867	0.861	0.906	0.860	1.432	1.444	1.432	0.867
	R	1.000	0.981	1.008	0.997	1.028	1.035	0.993	0.990	0.993	1.008
	M	1.000	0.969	1.007	1.008	1.007	1.009	0.972	0.971	0.972	1.007
	S	1.000	0.907	1.026	1.027	1.017	1.026	0.916	0.914	0.916	1.026
Import	P	.	.	.	.	.	.	.	.	.	.
	A	1.000	0.988	1.009	0.997	0.988	0.996	0.999	0.996	0.999	1.009
	R	1.000	50.493	1.009	51.006	50.508	50.937	0.239	12.200	.	.
	M	1.000	0.989	1.008	0.998	0.989	0.997	0.999	0.996	0.999	1.008
	S	1.000	0.989	1.008	0.998	0.989	0.997	0.999	0.996	0.999	1.008
Export	P	.	.	.	.	.	.	.	.	.	.
	A	1.000	6.586	.	.	.	.	5.983	6.141	5.979	.
	R	.	.	.	.	.	.	.	.	.	.
	M	1.000	0.938	1.013	1.018	1.020	1.020	0.940	0.940	0.940	1.013
	S	1.000	.	1.232	1.352	1.309	1.341	.	.	.	1.229
Intermediate Inputs	P	1.000	0.983	1.007	0.996	1.060	1.066	0.994	0.991	0.994	1.007
	A	1.000	1.477	0.867	0.861	0.906	0.860	1.432	1.444	1.432	0.867
	R	1.000	0.981	1.008	0.997	1.025	1.032	0.993	0.990	0.993	1.008
	M	1.000	0.969	1.007	1.008	1.007	1.009	0.972	0.971	0.972	1.007
	S	1.000	0.907	1.026	1.027	1.017	1.026	0.916	0.914	0.916	1.026
Welfare	WE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	CE	1.000	0.999	1.001	1.002	1.001	1.002	0.998	0.998	0.998	1.001
	SO	1.000	0.999	1.001	1.001	1.001	1.001	0.999	0.999	0.998	1.000
	NE	1.000	0.999	1.000	1.001	1.001	1.001	0.999	0.999	0.999	1.000
	NW	1.000	0.999	1.001	1.001	1.001	1.001	0.998	0.998	0.998	1.001
	NC	1.000	0.999	1.000	1.001	1.001	1.001	0.998	0.999	0.998	1.000
	UV	1.000	0.999	1.001	1.001	1.001	1.001	0.998	0.998	0.998	1.000
	SA	1.000	0.999	1.001	1.002	1.001	1.002	0.998	0.998	0.998	1.001

Table A.5: Results of the Analysis: The impacts of various policy reforms (ctd.)

		Base	Rice tariff	VAT	Rtariff_vat	Rtariff_fert	All3	HighWP	Hwp_tariff	SelfSuf	SS_vat
Domestic Price	P	1.000	1.001	1.000	1.000	0.997	0.997	1.000	1.000	1.000	1.000
	A	1.000	1.001	1.005	1.005	1.000	1.005	1.000	1.000	1.000	1.005
	R	1.000	1.001	1.000	1.000	0.997	0.997	1.000	1.000	1.000	1.000
	M	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	S	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Foreign exchange rate		1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Composite Price	WE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	CE	1.000	0.999	1.000	0.999	0.999	0.999	1.000	1.000	1.000	1.000
	SO	1.000	1.000	1.000	0.999	0.999	0.999	1.000	1.000	1.000	1.000
	NE	1.000	1.000	1.000	0.999	0.999	0.999	1.000	1.000	1.000	1.000
	NW	1.000	1.000	1.000	0.999	0.999	0.999	1.000	1.000	1.000	1.000
	NC	1.000	0.999	1.000	0.999	0.999	0.999	1.000	1.000	1.000	1.000
	UV	1.000	0.999	1.000	0.999	0.999	0.999	1.000	1.000	1.000	1.000
SA	1.000	0.999	1.000	0.999	0.999	0.999	1.000	1.000	1.000	1.000	
Factor Prices	PL	1.000	1.001	1.003	1.003	1.000	1.003	1.000	1.000	1.000	1.003
	PK	1.000	1.001	0.997	0.997	1.000	0.997	1.000	1.000	1.000	0.997
Intermediate Input Price	P	1.000	1.001	1.000	1.000	0.970	0.969	1.000	1.000	1.000	1.000
	A	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	R	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	M	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	S	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Import Price	A	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	R	1.000	0.770	1.000	0.769	0.769	0.769	1.100	0.847	n.a	n.a.
	M	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	S	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table A.5: Results of the Analysis: The impacts of various policy reforms (ctd.)

		Base	Rice tariff	VAT	Rtariff_vat	Rtariff_fert	All3	HighWP	Hwp_tariff	SelfSuf	SS_vat
Income	WE	648,290	648,290	648,290	648,290	648,290	648,290	648,290	648,290	648,290	648,290
	CE	45,466	45,378	45,521	45,505	45,459	45,499	45,398	45,392	45,397	45,517
	SO	140,340	140,150	140,430	140,390	140,320	140,380	140,190	140,180	140,190	140,420
	NE	151,340	151,160	151,440	151,410	151,320	151,400	151,200	151,190	151,200	151,430
	NW	168,300	168,030	168,460	168,420	168,270	168,400	168,090	168,070	168,090	168,450
	NC	84,862	84,735	84,908	84,885	84,852	84,877	84,764	84,755	84,762	84,902
	UV	60,521	60,409	60,568	60,548	60,512	60,541	60,434	60,427	60,433	60,563
	SA	104,170	104,000	104,310	104,280	104,160	104,270	104,040	104,020	104,030	104,300
Total income		1,403,289	1,402,152	1,403,926	1,403,729	1,403,182	1,403,658	1,402,406	1,402,324	1,402,392	1,403,872
% Change in income			-0.08	0.05	0.03	-0.01	0.03	-0.06	-0.07	-0.06	0.04
	WE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CE		-0.19	0.12	0.09	-0.02	0.07	-0.15	-0.16	-0.15	0.11
	SO		-0.14	0.06	0.04	-0.01	0.03	-0.11	-0.11	-0.11	0.06
	NE		-0.12	0.07	0.05	-0.01	0.04	-0.09	-0.10	-0.09	0.06
	NW		-0.16	0.10	0.07	-0.02	0.06	-0.12	-0.14	-0.12	0.09
	NC		-0.15	0.05	0.03	-0.01	0.02	-0.12	-0.13	-0.12	0.05
	UV		-0.18	0.08	0.05	-0.01	0.03	-0.14	-0.16	-0.14	0.07
SA		-0.16	0.13	0.11	-0.01	0.10	-0.12	-0.14	-0.13	0.12	
Govt Rev	----	47,371	45,484	48,981	48,651	47,206	48,519	45,910	45,782	45,890	48,900
% Change in GR			-3.98	3.40	2.70	-0.35	2.42	-3.08	-3.35	-3.13	3.23
National Welfare		1.0000	0.9991	1.0006	1.0011	1.0009	1.0011	0.9985	0.9986	0.9984	1.0004
Price Index		1.0000	0.9995	1.0000	0.9991	0.9991	0.9991	1.0000	1.0000	1.0000	1.0000