Regional Food Chain System for Sustainable Purveyance, Agricultural Production and Local Resources Utilization in Sri Lanka

スリランカにおける持続的な食料調達、農業生産と地域資源を活用できる食物連鎖システム

Regional Food Chain System for Sustainable Purveyance, Agricultural Production and Local Resources Utilization in Sri Lanka

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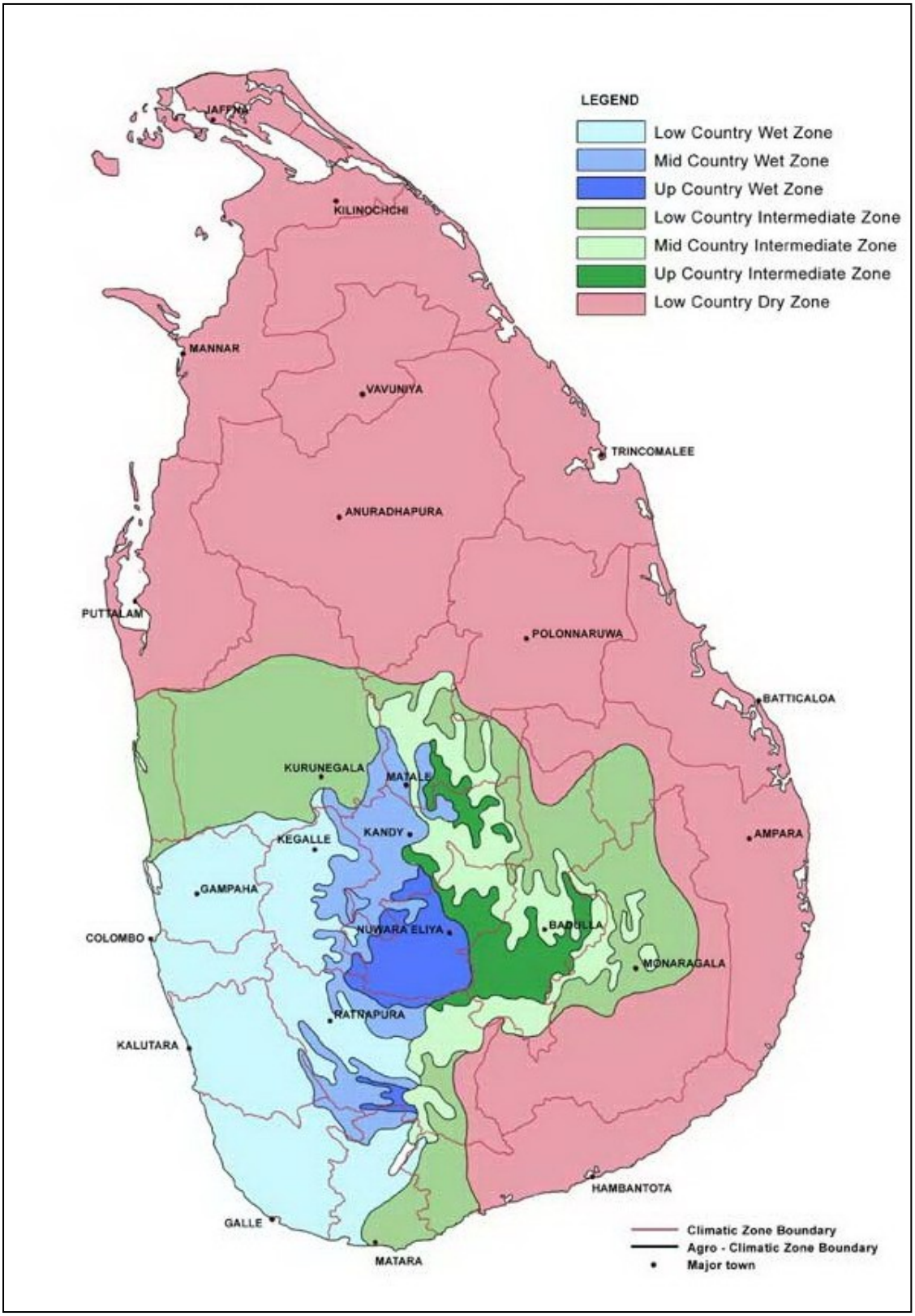

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Abbreviations and Acronyms

ADB	Asian Development Bank
AER	Agro Ecological Region
AOA	Agreement on Agriculture
BOP	Balance of Payment
CBSL	Central Bank of Sri Lanka
CCPI	Colombo Consumer Price Index
CIF	Cost, Insurance and Freight
CPCS	Coconut Producer Cooperative Society
CPI	Consumer Price Index
DCS	Department of Census and Statistics
DS	Divisional Secretariat
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
GATT	General Agreement on Tariff and Trade
GDP	Gross Domestic Product
GN	Grama Niladari Division
GPCs	Group Processing Centers
HCI	Poverty Head Count Index
IMF	International Monetary Fund
LDCs	Least Developing Countries
LISC	Local Independent Supply Chain
MNCs	Multi National Companies

RCSs	Resources Circulation Systems
RDCS	Resources Dual Circulation System
RFCS	Regional Food Chain System
RRCS	Rural Resources Circulation System
SAP	Structural Adjustment Program
SLSC	Sri Lanka Sugar Cooperation
SLSRI	Sri Lanka Sugar Research Institute
TCSLC	Traditional Circulation System of Local Coconut
TNCs	Transnational Companies
UWIS	Udawalawa Irrigation System
VIF	Variance Inflation Factor
WB	World Bank
WC	Washington Consensus
WTO	World Trade Organization

Scientific Communications

RPIR Prasanna & Yoshiharu Shiratake (2013), The significance of the Rural Resources Circulation System Initiated by the Sugar Sector under Economic Liberalization in Sri Lanka: An Empirical Study of the Sewanagala Sugar Processing Industry, *Journal of Distributive Studies*, Edited by the Japan Society for Distributive Sciences, Vol. 33, In press.

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要約

1980年代以降、さらなる国際競争は多くの発展途上国の農業を存亡の危機にさらしています。経済学者は、一般に、国際競争の影響を打ち消すために財政政策や金融政策を提案していますが、実証的根拠に基づく解決策に焦点を合わせていない。本研究は、スリランカで持続的な食料調達、農業生産と地域資源使用のための食物連鎖システム（FCSs）を対象に分析します。そして、その実証的分析を通して、スリランカにおける国際競争の影響を払拭する最高の解決策を示します。本研究は、特に、FCSsへの接近法として資源循環システム（RCSs）に着目しました。分析視点は次の3点です。第1に、風土の異なる各地域にある典型的なRCSsの特徴づけ、第2に、経済の自由化による経済的、社会的、環境的な悪影響の払拭に果たすRCSsの機能分析、第3に、RCSsの展開条件の確定です。本研究は、帰納的な研究方法を用いて、典型的な5事例を対象に実証的な研究を行った。

最初の事例研究は、砂糖部門によって始動されたRCSであるが、そのRCSにおける農家と加工業者間の地域資源の効果的循環の重要性を次の点で示した。①農村貧困の緩和、②地域住民に対する雇用機会の創出、③地域住民の生活条件の改善、④国際的競争とリンクせずに加工部門の経済力の強化等の側面で示した。その分析は、砂糖や関連商品の製造において、地域資源への強い依存が、海外産輸入原料への最小依存につながった事を示した。地場産主要原料に基づく加工部門は、より大きな付加価値生産段階へと生産システムを多角化しました。そのRCSはそのシステム内で、加工業にとっての電力エネルギーや農民とっての肥料を確保しており、輸入原材料への依存を最小にしました。本研究は、そのRCSの下でのサトウキビ栽培の経営費や所得の面での比較優位性を証明しました。

第2の事例研究は、酪農部門における資源二重循環システム（RDCS）である。これは、国際競争下で、酪農家の生産性向上と経営強化によって、地元の酪農部門を活性化させる戦略を提示しました。本研究は、スリランカにおける独立自営小規模酪農家、酪農と作物の複合経営、酪農市場を研究対象とし、その分析により、そのRCSが有する①農家レベルで複合化した資源管理技術の効率性、②酪農所得と生産性の改善、周年就業機会の提供、家族労働力の効果的利用による小規模酪農家への貢献性、③より良い原料乳価格が獲得できる競争的サプライチェーン・システム適用の有効性、④有機肥料使用とバイオガス生産による環境配慮への積極性などの諸点を明らかにしました。

第3および第4番目の実証的研究は、地場産ココナッツの伝統的な循環システムである。両研究は、地域経済のベースとなるココナッツに対する国際競争の影響を払拭する上で、そのシステムの3つの重要な特徴を示しました。それは、①地域の主要な作物にベースをおく多様な産業システムであること、②その主作物が地域自然への順応性が高いこと、③そのシステムのすべての小規模農家にとって重要な経済的機会を与えていることである。本分析はまた、安定した地域経済の3つの主要条件を示している。地域経済における家庭内製造業の中規模や大規模な加工産業への成長、その地域で主要な原料をベースにした価値付加システム、そして、地元労働市場に対するココナッツ加工産業の貢献である。両研究は、地元の農民にとって寡占市場構造であることを特定しました。しかし、全体的に農民の経済状態は弱くはならなかった。なぜなら、農民はそのシステムによって労働報酬を得る機会を得られるし、ココナッツ生産地で多様な農業ができるからである。

第5の実証的研究は、農業協同組合と小規模農家間の相互作用システムである。スリランカにおいて、不利な条件にある小規模農家を経済の自由化から保護する為に、協同組合の生産と販売の両事業で、農民の努力と地域資源を結合させることの重要性を示しました。協同組合によるマーケティングの構造と機能の分析は、主要な付加価値製品の品質改善、市場搾取問題の削除、市場参入の改善によって、小規模農家のマーケティング状態の改善に貢献しました。

これらの研究結果は、本分野の既存知識に付加する新しい知見である。従って、本研究は国際競争環境の中で、スリランカにおける持続的な食料調達、農業生産、地域資源活用の方法としてFCSs関連のRCSsを提示した。

Abstract

Since the 1980s, increased global competition has made agriculture in many developing countries at risk. Economists generally suggest fiscal and monetary policies to counteract the influence of global competition, but no focus on empirical evidence-based solutions is provided. This thesis analyses regional food chain systems (RFCSs) for sustainable purveyance, agricultural production and regional resources utilization in Sri Lanka. It indicates the best solutions in counteracting influence of global competition in the context of Sri Lanka from an empirical perspective. The study specifically pays attention to resources circulation systems (RCSs) approach in FCSs. The study: 1) characterizes typical RCSs presented in different agro-ecological zones; 2) analyses the impact of RCSs to counteract economic, social and environmental concerns of economic liberalization; and 3) identifies the development conditions of RCSs. The study examined five typical empirical studies employing the inductive research approach.

The first case study—RCS initiated by the sugar sector—proved the importance of effective circulation of the local resources among farming and processing sectors in alleviating poverty in farming areas, improving labor market opportunities for local people, improving living conditions of local people and strengthening economic status of the processing sector without linking with international competition. Results indicated that total dependency upon local resources had led to minimal dependency on imported foreign materials in terms of production of sugar and related products. The processing sector has diversified the production system with more value-added steps based on main material. It has minimized the need for imported materials such as energy for the processing sector and fertilizer for the farmers. The study also proved the comparative advantage of sugarcane farming (cost and income) under RCS approach.

The second case study—dairy sector resources dual circulation system (RDCS)—provided strategies to revitalize the local dairy sector by enhancing the productivity and economic success of dairy farmers in global competition. The study describes independent smallholder dairy farms, integrated dairy-crop farming and independent dairy markets in Sri Lanka. The results indicated; 1) the efficiency in farm-level integrated resource management techniques; 2) the contribution to smallholder dairy farmers in terms of improving milk income and productivity, providing year round working opportunities, and utilizing family labor effectively; 3) the provision of a competitive supply chain system with better raw milk prices, and 4) positive responsiveness to the environment in terms of organic manure usage and biogas

production.

The third and fourth empirical studies the traditional circulation system of local coconut. Both studies indicated three important characteristics of the system in counteracting influences of global competition on the coconut based regional economy. They are: a diversified industrial system based on the main regional crop; adaptability of main crop to the natural features of the region; and important economic opportunities for all smallholder farmers in the system. The results also indicate three main conditions of the stable regional economy: growth of home manufacturing to medium and large scale processing industries in the regional economy; superior main material base value-adding system in the region; and the contribution made by the coconut processing industries to the local labor market. Specifically, both studies identified the oligopolistic market structure to the local farmers. However, the overall economic condition of the farmers' has not weakened because of labor income opportunities offered by the system and agricultural diversification practices in coconut-growing lands.

The fifth empirical study—interaction system between agriculture cooperatives and smallholder farmers— demonstrated the importance of combining farmers' efforts and resources within the form of cooperation in both areas of production and marketing in order to protect disadvantaged smallholder farmers from economic liberalization in Sri Lanka. The analysis of marketing structure and its functions indicated its contribution to improve the marketing condition of the smallholder farmers by improving the quality of main value-added products, eliminating market exploitation problem and improving market access.

These findings are novel in regard to the existing body of knowledge in the field. Thus, the study shows RFCSs associated RCSs as a method for sustainable purveyance, agricultural production and regional resources use in Sri Lanka in the context of global competition.

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Chapter 1 : Introduction

1.1 Background and Thesis Objectives

Since the late 1970s, the economic liberalization has been the mainstream policy advice in development circles of the developing countries. This policy aimed to achieve the long-term objective to relocate resources to key sectors, agriculture and manufacture in particular, to make them more productive and export oriented while eliminating policy distortions that constraints productive investment and technological change in key sectors including agriculture (Kahn, 1987; Lal & Rajapathirana, 1987; Barbier, 2008). It argues that greater economic integration between countries on the basis of comparative advantage would generate more equitable distribution of income between all the people of the world (Wade, 2004). The statist development approaches[1], which were followed since the early post independent period until the early 1970s by the developing countries, have been mainly replaced by the policies of economic liberalization (Babai, 1988; Smith, 1991). The critical factors influenced the principles of economic liberalization in the world since the late 1970s were the oil crisis in 1973-1974 and world recession from 1974-1975 (Balassa, 1982; Nelson, 1990), and the chronic economic crisis through out the 1980s associated with the third world debt crisis, reforms in the East European transitional countries with the

[1] Most of Asian, Sub-Saharan African and Latin American countries had adopted state centered and interventionist development approaches particularly from early independence to until late 1970s. The policies had aimed to reduce foreign ownerships, enhance economic self-reliance, redistributive income, develop infrastructure, and promote overall living standard of people (Cowan, 1990; Martin, 1993).

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collapse of the communist bloc at the end of the 1980s and the successive experience of East Asian countries since 1960s amongst other factors. One of the most common features of economic liberalization is its concern with the continuity of economic growth and accumulation based on market competition in line with minimizing the interventionist's role of the state (Nonneman, 1996).

Even though the economic liberalization policy is centered on the principles of stabilization, efficiency, productivity and competitiveness through allocation of scarce resources among productive sectors within and between countries with dismantling border barriers, the failure of the policies were viewed in the light of analysis of developing country and economic crisis reported in East Asian region particularly in the late 1990s and East European countries in 1990s, and recent economic and financial crisis in the world (Wade, 1990; Clague & Rausser, 1992; World Bank, 1993; World Bank, 1994). Specifically, the effects of economic liberalization are rather mixed, but mostly regressed to the developing countries particularly in the region of Sub-Saharan Africa and Latin America and stagnated to South Asian region in terms of extreme poverty and hunger, and economic and social inequality within and between countries, food security, environmental sustainability, natural resource depletion, local agriculture, and local labor markets, etc (Haque, 1999; Oxfam, 2002; Wade, 2004).

Under the aforementioned policy changes, there is today, a contentious discussion in economic literature on the sustainability of agriculture, local

industry and environment in developing countries due to the adverse impact of economic liberalization in the recent past. According to Polaski (2006), the benefits of opened and expanded market opportunities by liberalization policies have concentrated on a few middle income countries such as Brazil, Argentina and Thailand while the least developing countries (LDCs) are set to lose. The economists argue that the developing countries could not benefit from the liberalization of agriculture due to low aggregate supply elasticities associated with poorly functioning markets, poor infrastructure facilities, limited institutional and management capacity including access to credit and technology, insufficient social capital, poor domestic agricultural policies and other social and political conditions (Koning & Pinstrup-Andersen, 2007; Dunham & Kelegama, 1997; Wade, 1990; Clague & Rausser, 1992; Collier & Gunning, 1999).

According to Oxfam (2002), the International Monetary Fund (IMF) and the World Bank (WB) have constantly pressurized the developing countries to open their markets at accelerated speed since the late 1970s. This often has damaging consequences on poor communities in the developing countries because advocated economic structural adjustment programs (SAP), which focused on removing distortions in product and factor markets, to the developing countries have not sufficiently addressed the aforementioned constraints of the supply side. Meanwhile, the liberalization policies have facilitated the powerful transnational companies (TNCs) in dominating the global agricultural trade and promoting the global or industrial agriculture or

large scale cooperate agriculture. This domination has created a severe negative impact on small and independent farmers, processors and distributors in the agricultural commodity supply chain in developing countries. At present, a significant share of agricultural trade in the international market is handled by the TNCs. Moreover, a considerable part of world agriculture is directly or indirectly handled by the TNCs in terms of cultivation, processing and distribution.[2] However, the GATT/WTO rules do not adequately address the increasing power of the TNCs (Shafeddin, 2008).

Specifically, the current policy debate on economic liberalization in regard to agriculture heightened with establishment of the World Trade Organization (WTO) since 1995. This is because of the reported endogenous stagnation or decline in domestic agriculture where the countries that economic liberalization policies were assumed. Moreover, even though GATT/WTO's Agreement on Agriculture (AOA) suggests elimination of market distortions by removing agricultural subsidies, protectionism has actually risen or remained unchanged due to indirect or supplementary measures since the establishment of the WTO, particularly in the developed countries. For instance, producer support in agriculture in OECD (Organization for Economic Co-operation and Development) countries was about USD 230 billion in 2000-2002, which is almost 46% of production value. Of them, 63% came through higher prices associated with border protection and 37% from direct subsidies (Aksoy & Beghin, 2004).

[2] According to trade liberalization statistics of the WTO, Top 500 multinational corporations (MNCs), which are largely located in developed countries, account for 70% of global trade and about 85% of global agricultural trade.

Thus, economists argue that increasing agricultural subsidy represents dumping on a global agricultural trade. For example, it was reported the food export from developing countries declined from 50% of world total exports in the 1960s to 7% by 2000 (FAO, 2005). These protectionism policies adversely affect the small farmers in developing countries since they limit their opportunities to produce more of the products in which they have comparative advantage. Some argue that the impact of economic liberalization would only slow down the rate of increase of extreme poverty in the LDCs, as a majority of the poor in rural areas are engaged in subsistence farming with traditional crops. Some argue that the empirical basis of the arguments of economic liberalization or neo-liberalism in terms of reducing poverty and inequality (Wade, 2004). Despite these facts, since 2001economic liberalization has been at the top of the agenda of Doha development.

There is a substantial body of literature that emphasize a fundamentally important role of agriculture in economic growth and development prospects including poverty alleviation and environmental services of most of the developing countries in the world where a significant portion of population is still dependent on agriculture and agriculture related industries (Herschmen, 1958; Jorgenson, 1961; Kuznets, 1969). Indeed, agriculture is an important driver of pro-poor growth in developing countries (Koning & Pinstrup-Andersen, 2007). Economists argue that well-managed agricultural liberalization policies including agricultural trade and subsidies have the potential to lifts millions of people out of poverty. According to Anderson and Martin (2005), the poorest

people in developing countries will gain from global trade liberalization, specifically liberalizing trade in merchandise and agriculture. Though the policies aimed at liberalizing the agriculture by advocating a series of packages of economic reforms such as the SAP to developing countries, materialized out comes of the policies are not so expansive (Koning & Pinstrup-Andersen, 2007). Particularly economic liberalization in the developing countries allows predatory or subsidize imports to the markets of those countries (Moore, 2000). As a result, still there could be persistent poverty in the developing countries in Asia, Sub-Saharan Africa and Latin America. According recent estimates of the World Bank (2010), 21% (1.22 billion people) of people in the developing world lived at or below the extreme poverty line of 1.25 dollar a day. It remained 43% in 1990 and 52% in 1981. Almost 800 million people in the developing countries suffer from chronic hunger. In terms of average poverty line in developing countries, 2.4 billion people lived on less than 2 dollar a day in 2010. That is a marginal decline from 2.59 billion in 1981. These new findings on poverty in developing countries provide rather bland image of the impact of economic liberalization policies advocated to the developing countries since the late 1970s.

On the other hand, the recent global food and financial crisis in the world resulted in shifting view of policy makers towards the need for safeguarding small-scale local agriculture and related industries (Food and Agricultural Organization, 2008). These crises have pushed an additional 115 million of total world population into hunger. The report basically questioned the philosophy behind large scale cooperate agriculture which is called global or industrial

agriculture, and food production and northern bio-fuels policies. It is evident that there is always trade-offs between global or industrial agriculture and environment, economic and social outcomes. Therefore, at present, economists are with divergent opinions on whether economic liberalization would be beneficial to the developing countries where agriculture plays a dominant role in the economies. Economists also argued that rural structures and economic context are very different between developed and developing countries although multilateral institutions proposed similar economic policies or a level playing-field in both developed and developing countries. This global economic policy debate in economic literature also emphasizes the need to find empirical evidence-based appropriate sustainable solutions to the current challenges facing agriculture—a dominant sector of the economies in the developing countries—under the framework of economic liberalization. It also emphasizes the need to find long term counteracting strategies or solutions for social, economic and environmental influence of global economic competition. This is why the Food and Agricultural Organization (2004) emphasized in their book, "Smallholders, Globalization and Policy Analysis", the challenge of presenting policy options to improve local agriculture, particularly the smallholding sector and minimize negetive quancequances of economic liberalization. Similarly, the World Bank (2010) emphasised that there is a risk in the bulk of present-day research in development economics that appears to be too narrowly focused and/or of too little generalizability to help much in the fight against poverty and to facilitate structural change and sustained growth, particularly in developing countries.

In the consideration of Sri Lanka, the economic liberalization has been the mainstream policy line in the development circle since 1977.[3] Specifically, Sri Lanka is more open to agricultural trade relative to other Asian countries. The policy has strongly influenced the behavioral aspect of the people and institutional setting and culture of the economy of the country (Rajapatirana, 1988; Lakshman, 1989; Kelegama, 1993; Dunham & Kelegama, 1997; Lakshman, 2012). Consequently, like many developing countries, the study of the impact of economic liberalization on the economy of Sri Lanka has attracted the attention of theoretical and empirical research since the 1980s to date (Lakshman, 1989; Dias, 1991; Athukorala & Rajapathirana, 1993; Kelegama, 1993; Hettige, 1995; Weiss & Jayanthakumaran, 1995; Dunham & Kelegama, 1997; Dunham & Jayasuriya, 2000; Rafeek & Samaratunga, 2000; Thenuwara, 2003; Weerahewa, 2004; Abeyarathna, 2009; Lakshman, 2012). Specifically, analysis of the impact of economic liberalization on the livelihood of local people, poverty and inequality, environmental sustainability, food security and local labor markets have been received growing attention in economic literature.

[3] Reforms measures have included the loosening of protectionist measures to provide to import competing sectors, exchange rate adjustments, fiscal and monetary reforms, liberalization of domestic factor and domestic markets and privatization of some government business enterprises (Gunawardena & Somarathna, 2001). The first round of reform measures covered most aspects of economic policy, including trade policy. A significant "second wave" of liberalization reforms took place in 1990. As a result, by 1994, when the WTO Agreement was signed, the economic environment was already fairly liberal, with the private sector identified as the main "engine of growth" (Food and Agriculture Organization, 2000).

Like many developing countries, Sri Lanka also has rather mixed evidence on the impact of the economic liberalization since 1977, specifically in regard to local agriculture, related industries, and environment during the last few decades (Lakshman, 1989; Dunham & Kelegama, 1997).[4] Some economists question timing of economic liberalization which was too drastically and too quickly (Herath, 2007). As many countries in Asia, an endogenous stagnation of main crops and livestock production was reflected due to the effects of economic liberalization in the country during the last few decades. Agricultural growth rate has remained approximately at an annual average rate of 2%, which is very low in comparison to the expectations of the government, since economic liberalization occurred. This has led to a rapid increase of import of agricultural products in line with the increase of population, urbanization and people income. Most of those imported products are predatory or substitutes to agricultural products produced domestically. These imported cheap agricultural products, which are mainly produced under low cost and large-scale farming conditions, using capital intensive advanced technologies, and benefiting direct and indirect agricultural subsidies[5], have dominated the domestic market during the last three decades making a huge influence on

[4] The local agriculture and related industries are associated with sustainable agriculture and it is not only limited to geographical distance, but also refers the environmentally and socially sustainable way the food is grown, processed and distributed.

[5] The subsidies given by developed countries largely centered on large scale farmers. According to the WTO (2003), USA gives 89% of its agricultural subsidies to large-scale farmers and it is 75%, 70% and 67% in terms of Canada, EU and Japan, respectively. Moreover, the European Union spent 44% of their expenditure on agriculture (Edwards, 2007). In USA, approximately 25,000 cotton farmers receive US dollar 2.5 billion worth of subsidy (World Resources, 2005).

local agriculture and related industries in Sri Lanka (see Table 1-1). Moreover, it is argued that the expectations of economic liberalization, particularly openness, did not materialize as there was no adequate resource shift to export agriculture and food imports grew faster (Herath, 2007). These developments have had negative fallouts on rural poverty, local labor markets, livelihoods of local people, local environment, etc.

This local agriculture and related industry are highly significant to economies of local people in terms of livelihood activities, income, food security, labor markets, etc. Specifically, there are thousands of small-scale farmers, processors and distributed in the local economy. A significant number of livelihoods and environments are still sustained by a diversity of the local agriculture and related industries in the country. For instance, 70% of Sri Lanka`s population lives in rural areas and approximately 60% of population is engaged in agriculture and related industries. Majority of these farmers are small-scale producers. A large number of agriculture related industries are traditionally located in the local economy at small size level. Moreover, the local agriculture and the related industries provide a significant number of additional or indirect livelihood and employment opportunities to the country`s population. Thus, livelihoods and incomes of a large number of rural and urban dwellers of the country are dependent on local agriculture and related industries.

By taking into account these facts, some economists suggest that agriculture economies that play a dominant role should be promoted through appropriate

policy actions and/or protecting the local agriculture and related industries by counteracting the unfair competition from other countries against local agriculture and related industries (Amaratunga, et al., 2001; Herath, 2007; Lakshman, 2012). Similar to the other developing countries, theoretical and empirical studies provide rather mixed results in regard to effects of economic liberalization policies on local agriculture, related industries, environment and resources in Sri Lanka. Many studies on impact of economic liberalization on local agriculture and related industries are in the aggregate level, not disaggregate or empirical level. Particularly, the implications of these studies center mostly on the fiscal and monetary policies of the government.

Even though the economic literature has extensively discussed the effects of economic liberalization on local agriculture and related industries in Sri Lanka from theoretical and empirical points of view, the identification of appropriate empirical evidence-based sustainable solutions to address present challenges facing the local agriculture, agriculture related industries, environment and natural resources without violation of principles of economic liberalization is highly contentious. Specifically, the empirical investigations with regard to Regional Food Chain Systems (RFCSs) for sustainable purveyance agricultural production and regional resources use in Sri Lanka have not been carried out as yet. The RFCSs is generally defined as "***regionalized systems which effectively utilize and circulate the local resources at farm-, local-, and regional economy levels, generating economic and social benefits and enviornmental services to local people, processors, distributors and consumers by preserving the local***

environment and resources in a sustainable way".[6] However, until now, there are no studies that attempt to analyze the RFCSs with the intention of indicating the best solutions for mitigation and adaptation of influence of global competition. The focus of economic policies have always being determined along with fiscal and monatory policies in terms of counteracting unfair competition in agriculture coming from other countries. This indicates that counteracting economic policies for economic, social, and envioronmental influence of global competition have not been determined along with empirical evidence-based solutions as yet. This also indicates that a gap exists in the theoretical and empirical literature in terms of Sri Lanka and other developing countries in identifying an alternative empirical evidence-based economic model which leads to a new theoretical development in the economics with the aim of maintaining the sustainable purveyance agricultural production and regional resources use without violation of the principles of economic liberalization.

Table 1-1 Trends of import of major food items: value in USD, 000

Item	Average Annual Import					% change (1980-90) – (2000-10)
	1960-70	1970-80	1980-90	1990-00	2000-10	
Sugar	18,995	35,471	83,577	121,176	155,994	87
Milk	13,461	12,925	33,392	73,262	153,645	360
Palm oil	98	237	2,966	22,070	103,269	3,382
Wheat	27,824	100,463	100,353	129,252	197,820	97
Pulses	10,231	5,052	14,478	38,343	67,986	370
Beverages tobacco	1,504	1,234	6,503	36,405	59,797	820

Source: Food and Agriculture Organization of the United Nations

[6] For more details food chain systems, see Gail W. Feenstra, (1997)

Therefore, this PhD thesis examines the RFCSs' associated Resources Circulation Systems (RCS) in order to find empirical evidence-based alternative solutions to present challenges facing local agriculture, related industries, environment and resources in the developing countries due to economic liberalization policies in the Sri Lankan context. It could suggest the appropriate empirical lessons in favor of agricultural development in Sri Lanka as well as the developing countries without violation of the established principles of liberal economic behavior.

Shortcomings in the field were identified after reviewing the large number of existing theoretical and empirical studies in the field of RFCSs in Sri Lanka and other developing countries in the context of the policy framework of economic liberalization.

First, there are no empirical investigations which attempt to study the RFCSs' associated RCSs in order to investigate alternative empirical model relevance for treatment of problems that emerged due to economic liberalization in developing countries. No studies have focused on examining the relevance of local and regional resources circulation systems to increase the income of local people, contribution to local labor markets and environments and conservation of local resources. Specifically, declining livelihood activities of local people, loss of local labor markets, depletion of natural resources and degradation of environment are the most alarming concerns of economic liberalization in

developing countries, particularly the countries in the South Asia, Sub-Saharan Africa and Latin America regions. Specifically, the characterization of RCSs and analysis of economic, social and environmental functions of the RCSs are of paramount important because it would better the understanding of policy makers on how local resources can be effectively utilized, deriving economic, social and environmental benefits to the local areas without violating the established principles of liberal economic behavior.

Second, there are no empirical investigations into the RFCSs' associated regional specialized crop-based traditional circulation system (material utilization system) which support the stable regional economy of developing countries in the context of economic liberalization. Specifically, no studies have analyzed the significant content of specialized crop-based regional economy, although it is very important to determine agricultural liberalization for selective commodity sectors at the economic policy making level. So far, such policies based on empirical analysis in developing countries have not been recommended. Such empirical studies will definitely help to derive the strategies for stabilization of agriculture-based regional economies in the context of economic liberalization.

Third, there are no sufficient studies which attempt to analyze the importance of the activation of interactions system between agricultural cooperation and smallholder farmers in the RFCSs to address present challenges facing smallholder farmers in Sri Lanka due to global competition. The existing state of

knowledge in the field of agricultural cooperatives also provides rather mixed evidence on their role to develop smallholder farmers in Sri Lanka. Specifically, no sufficient evaluation on the smallholder farmers' combined efforts and resources within forms of cooperation in both areas of production and marketing. Some studies argue that the cooperative movements have failed to face the challenges of economic liberalization introduced in 1977. There are some studies in developing countries that analyze how smallholder farmers link with markets through agricultural cooperation but no such studies have been done on Sri Lanka.

Fourth, it is evident that adopted both fiscal and monetary economic measures to address the challenges coming from global competition are largely based on macroeconomic or aggregate aspects of economies and not along empirical evidence-based solutions. Thus, it is of paramount importance to suggest empirical evidence-based solutions to the countries where economic liberalization policies were assumed, since then process of economic policy determination would acknowledge the heterogeneity of local and regional context of economies of developing countries.

By taking into account these shortcomings in the field, this PhD thesis inquires RFCSs to identify the best empirical solutions that can be suggested by researchers / policy makers / multilateral institutions in understanding alternative economic model to suggest developing countries to maintain the sustainable purveyance agricultural production and regional resources use without violation

of the framework of economic liberalization. The study identified and examined five typical empirical studies employing inductive research approach since it allows for broader generalization of solutions and theories moving from specific observations on empirical grounds. In relation to this, the study: 1) characterizes typical RCSs be presented in different agro-ecological zones; 2) analyses impact of RCSs to counteract economic, social, environmental and resources concerns of global competition in agriculture; and 3) identifies the development conditions of RCSs.

This thesis first focuses on allowing the study of the best empirical cases of local/regional resources circulation systems in the local agriculture-based economy that addresses the effective utilization of local resources and sustainability of local and regional environment, alleviation of poverty in the local economy, improve the livelihoods of local people and secure the food security of local people etc., within the scenario of 'with' and 'without' international competition.

Second, it allows for the study of the best empirical case of single crop based traditional circulation system (regional single crop-based material utilization system) that supports strong policy implications for selective liberalization of agriculture in the developing countries in the era of economic globalization.

Third, it allows for the study of the best empirical case of agricultural cooperation in the smallholder agriculture processing sector that finds strong

evidence which supports the view that the activation of agricultural cooperation can protect disadvantaged smallholder farmers from economic liberalization in Sri Lanka. This section of the thesis joins the growing literature that has explored and investigated the role of farmer organizations in developing countries.

Accordingly, the thesis has four major sections (see Figure 1-1). They are: 1) local/regional resources circulation systems; 2) a single crop based traditional circulation system (regional single crop-based material utilization system); and 3) agricultural cooperation under open competition initiated by the RFCSs.

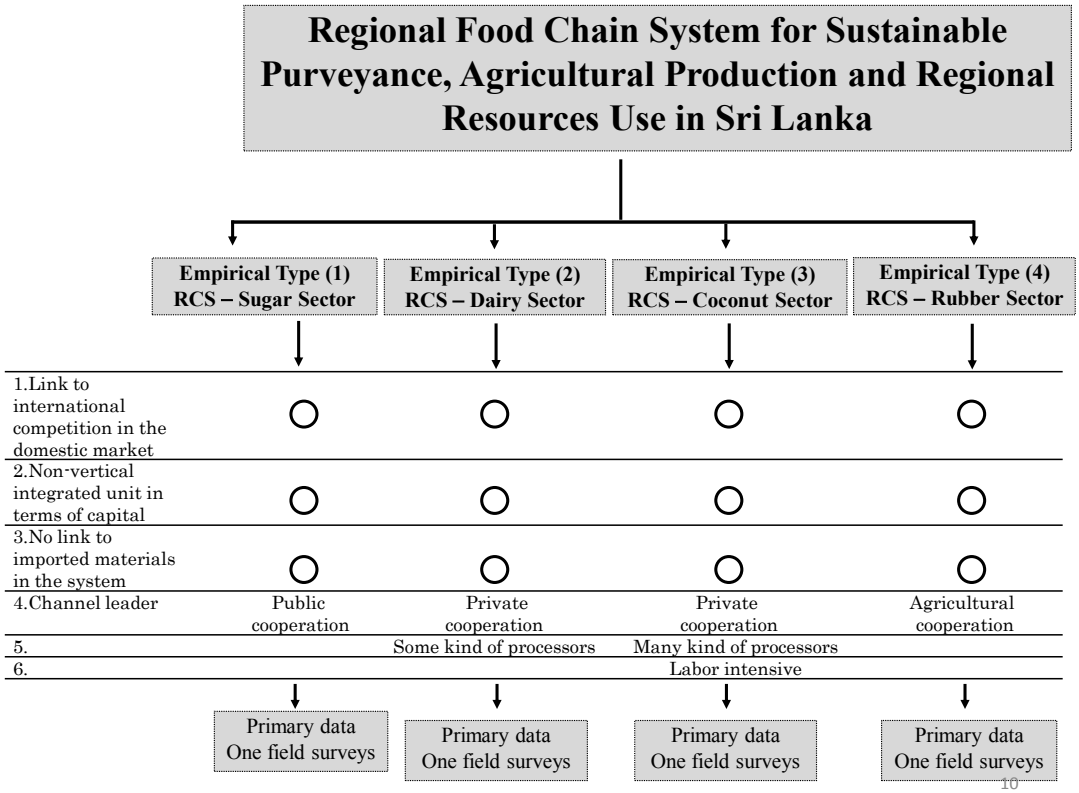

Figure 1-1 Summery of the four main sections of the thesis

1.2 Methodology of the Study

The fundamental purpose of social research is to provide new knowledge about the social world, to answer puzzles about what the social world is like and how it works, and to find ways to solve problems and bring about change (Blaikie, 2000).

As all research is based on some underlying philosophical assumption, this section first describes the research philosophy of the study. The philosophical idea that is applied in the choice of research approach in this study is the interpretivism.[7] Thus, the inductive research approach was employed in this study.[8] The reason is that, first, inductive research approach allows for broader generalizations and theories moving from specific observations. Second, the inductive research approach allows for understanding of research focus in depth. The adoption of inductive research approach is justifiable as the objective of this thesis is to develop an empirical model, which leads to new theoretical development that can be applied to find ways to maintaining the sustainability of the food, agriculture and resources in the economies of both developed and developing countries within the framework of economic liberalization, which is evident from raw data.[9] Next, research strategy

[7] For more details, see Blaikie, (2000) and Neuman, (2003).

[8] Inductive approach start with data collection, followed by data analysis, and then the development of generalizations that, with further testing, can become law like propositions to be used to explain aspects of social life (Blaikie, 2000).

[9] The primary purpose of the inductive approach is to allow research findings to emerge from the frequent, dominant or significant themes inherent in raw data, without the restraints imposed by structured methodologies (Thomas, 2003).

undertaken by the thesis is the empirical study or field survey method. In this connection, five empirical cases were formed as depicted in Figure 1-1. Figure 1-2 summaries key elements of the research design.

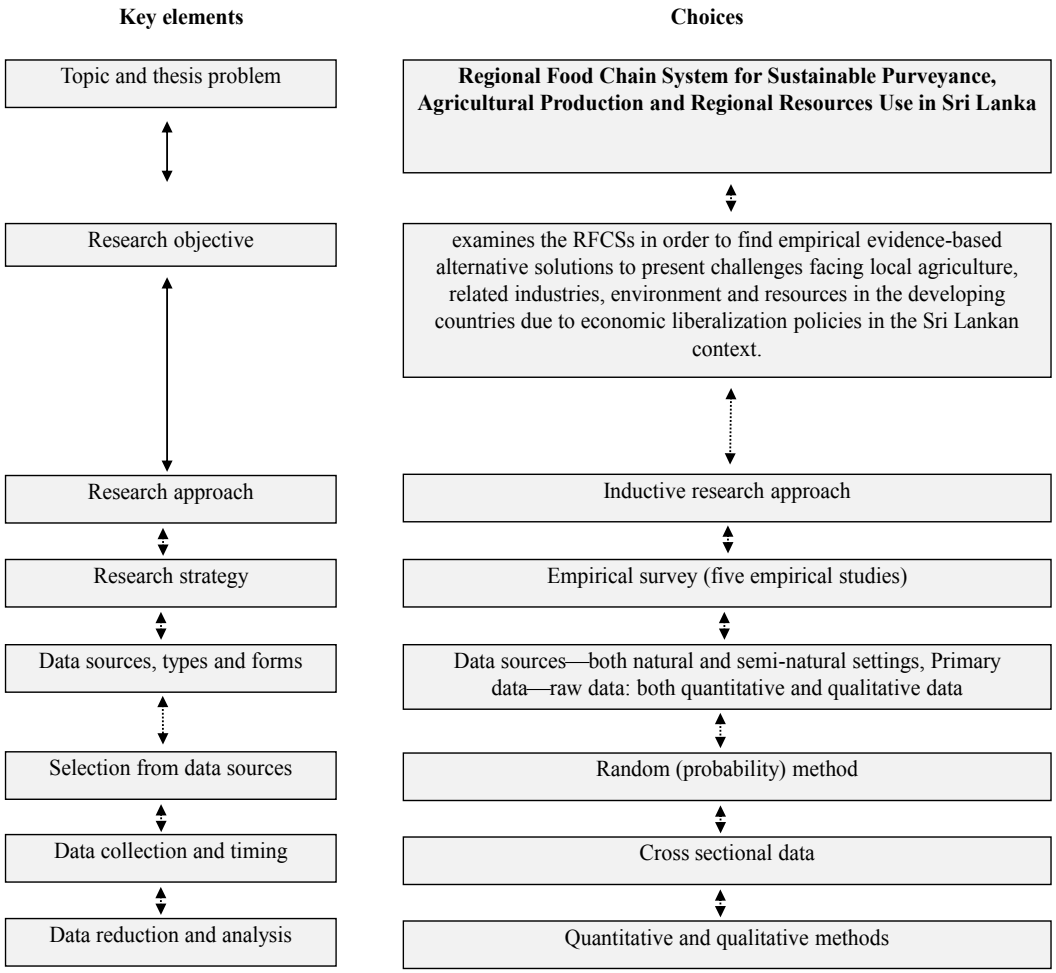

Figure 1-2 Key elements of research design and choices

Therefore, the study is totally dependent on the empirical evidence at the micro level or farmer level. As depicted in Figure 1-2, the selected empirical cases in the local agriculture and related industry are sugar, dairy, coconut and rubber sectors. Selection of these empirical cases was based on the relative influence of the economic liberalization on each sector in the Sri Lankan economy. The

influence of economic liberalization on each sector was primarily evaluated by taking into account import trends of homogeneous or substitute products of each sector. According to FAO (2012), the main agricultural products in the Sri Lankan import basket are the competitive products, either form of homogeneous or substituted, to products produced by the local agriculture and the related industry (see Table 1-2). For instance, sugar refined, milk whole dried, palm oil (substitute product to main product of the local coconut sector—coconut oil), rubber natural dry represented first, third, sixth and sixteenth rank in the country`s top 20 category of agricultural products import basket in 2010, respectively (Food and Agricultural Organization, 2010). Moreover, these four products account for approximately 50% of the total import cost of agricultural products (food and beverage) in the country (Central Bank of Sri Lanka (CBSL), 1960-2012). In addition, each sector contribution to the country`s agricultural GDP, employment and livelihoods of local people were taken into account in selecting the empirical cases. Import trends of homogeneous and substitute products to selected items produced local agriculture and related industry and their burden on country`s balance of payment (BOP) during the post economic liberalization period were also taken into consideration. The selection criterions of each empirical case for the study are descriptively explained in Chapter 3, 4, 5, 6 and 7 of the thesis.

The thesis applied a field survey method in each empirical study as a main data collection method. The field surveys were carried out in three geographical regions; i.e. the dry zone, intermediate zone and wet zone during the period

2008 to 2012. According to Dane (1990), the field survey method involves obtaining information directly from a group of individuals. It is also advantageous because field survey methods allow the researcher to collect a diversity of information on facts such as behaviors and attitudes and opinions (Dane, 1990; Blaikie, 2000; Neuman, 2003). Each selected agricultural product by the study has high potential in each region, for instance—sugarcane cultivation in dry zone region, coconut farming and dairy farming in the intermediate zone—coconut triangle in particular and rubber cultivation in wet zone. Moreover, the selected districts for each empirical study record the highest production and number of extent/animals in the country. The survey area selection criteria of each empirical study are also descriptively discussed in thesis Chapter 3, 4, 5, 6 and 7.

Table 1-2 Basic characteristics of selected agricultural products for empirical studies (2012)

Commodity	Import rank of related products	Main agro-climatic zone	Contribution to the agricultural GDP	Importance of household dietary intake (calorie)
Sugar sector	1	Dry zone	8%	10.5% (3)
Dairy Sector	3	Intermediate zone	6.5%	2.1% (8)
Coconut sector	6	Intermediate zone	10.7%	20% (2)
Rubber sector	16	Wet zone	9.8%	-

Source: Department of census and statistics, Sri Lanka, Food and Agricultural Organization of the United Nations, Central Bank of Sri Lanka.

Note: Parentheses are ranks according to their contribution to household dietary intake.

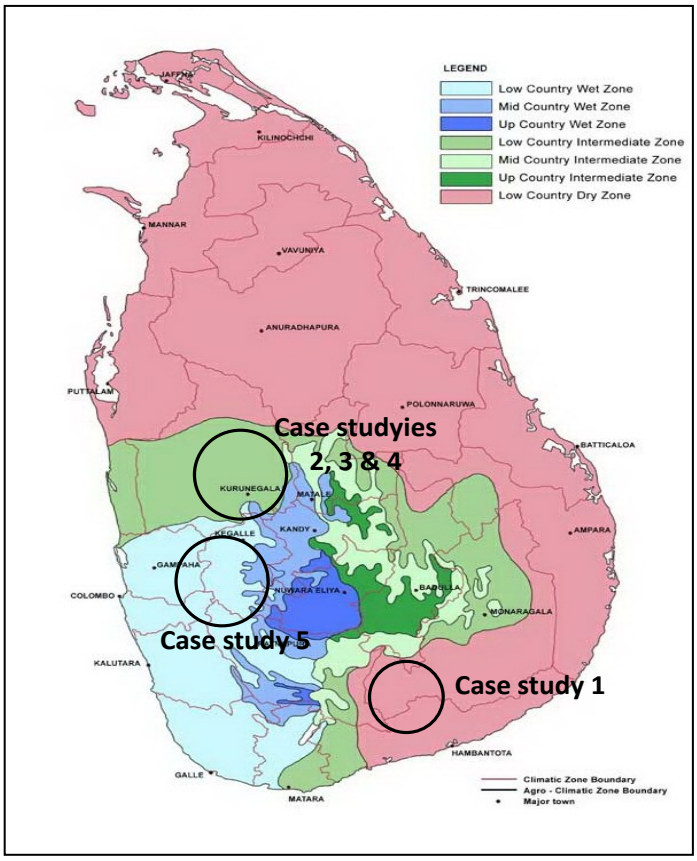

Figure 1-3 Agro-climatic zones and selected survey areas for each empirical study

Source: Department of Agriculture

1.3 Expected Contribution of the Thesis

This thesis finds the best empirical solutions that can address the main puzzles in regard to safeguarding or strengthening local agriculture, related industry and environment without violation of the framework of economic liberalization in the context of Sri Lanka. The solutions can be generalized to the developing countries where local agriculture, related industry and environment are facing the challenges due to the implementation of economic liberalization policies advocated by the multilateral institutions since the late 1970s. The empirical models, derived in the study are based on raw data collected by applying the

inductive research approach will contribute to a new theoretical framework that can be applied to the developing countries. The study will provide policy makers with empirical evidence of existing solutions to correct local agriculture and related industries in developing countries, where the economic liberalization policies have unfavorably affected or expected to implement. Moreover, the study will provide new policy evidence to multilateral institutions on how local agriculture and the related industry can be safeguarded or strengthened while implementing economic liberalization policies in developing countries. Therefore, this thesis will fill the empirical gap in the state of knowledge in the field providing a basis for new theoretical development in agricultural economics.

Each empirical case in PhD thesis, first, provides an in-depth investigation of existing problems associated with economic liberalization policies with sufficient inquiry on previous studies. The understanding of way of safeguarding and strengthening the economic conditions of local small-scale and independent farmers, processors and distributors in particular, in Sri Lanka is important due to revealed economic impact of the policy framework of economic liberalization on agriculture, related industries and environment.

1.4 Structure of the Thesis

This PhD thesis will provide the best empirical solutions to safeguard or strengthen the local agriculture and related industry by maintaining the local and regional environment in the developing countries within the policy framework of

economic liberalization in the context of Sri Lanka. For that purposes, this thesis is organized into eight chapters as shown in Figure 1-3. Building a foundation for the study, this chapter has presented a detailed concise overview why this research is currently of interest to economists and policy makers. It has briefly laid out the ground work of what has been done in the area by citing past studies and why the research is important in terms of theoretical, social and practical concerns. The chapter explains the focus and objectives of the thesis while explaining the research methodology and expected outcome of the research.

The second chapter devotes to fully develop concisely explained thesis background in chapter one by taking into account the theoretical and empirical concerns of the economic liberalization. First, the chapter presents the theoretical development towards economic liberalization. The second, chapter comprehends the country experience on the economic liberalization by taking into account the typical agricultural commodity sectors of some selected countries in Asia, Sub-Saharan Africa and Latin America. Finally, the chapter reviews the agricultural policies of Sri Lanka, concerning two policy phase—pre- and post-economic liberalization period in Sri Lanka.

Findings of the study are provided in five chapters. Third chapter analyses the rural resources circulation system (RRCS) initiated by local food industry by giving special emphasis to the sugar sector in dry zone in Sri Lanka. This chapter analyzes the economic effects of the RRCS with regard to the local small-scale

farmers and processor while identifying the development conditions of the system. The forth chapter assess the dairy sector resources dual circulation system (RDCS) under market liberalization in Sri Lanka. It also comprehensively presents the importance of the RDCS with regard to the local resources, marketing, income in terms of safeguarding of dairy farming and related industry under milk and milk product market liberalization. The fifth chapter examines the roles and development conditions of traditional circulation system of local coconut (TCSLC) to understand an appropriate empirical method for supporting strong economic policy implications to selective liberalization in agriculture in Sri Lanka as well as other countries where economic liberalization policies were assumed or to be assumed. Chapter six examines the base and conditions of the stable regional economy under economic liberalization by giving special emphasis to the diversified local coconut industry in the Kurunegala district that belongs to the coconut triangle. Both, fifth and sixth chapters broadly identify the existing constraints to the traditional circulation system of local coconut and diversified industrial system of the regional economy. Chapter seven presents the role of agricultural cooperation in strengthening the marketing and production conditions of smallholder farmers in Sri Lanka by paying special attention to smallholder rubber sector. In this connection, the focus of the empirical study lays down on the interaction system between smallholder farmers and agricultural corporations.

The final chapter provides a brief summary of the thesis with a discussion of the results of five case studies. Particular attention is paid to highlight key findings

and policy implications. The chapter will also provide brief information on remaining future research areas in the field.

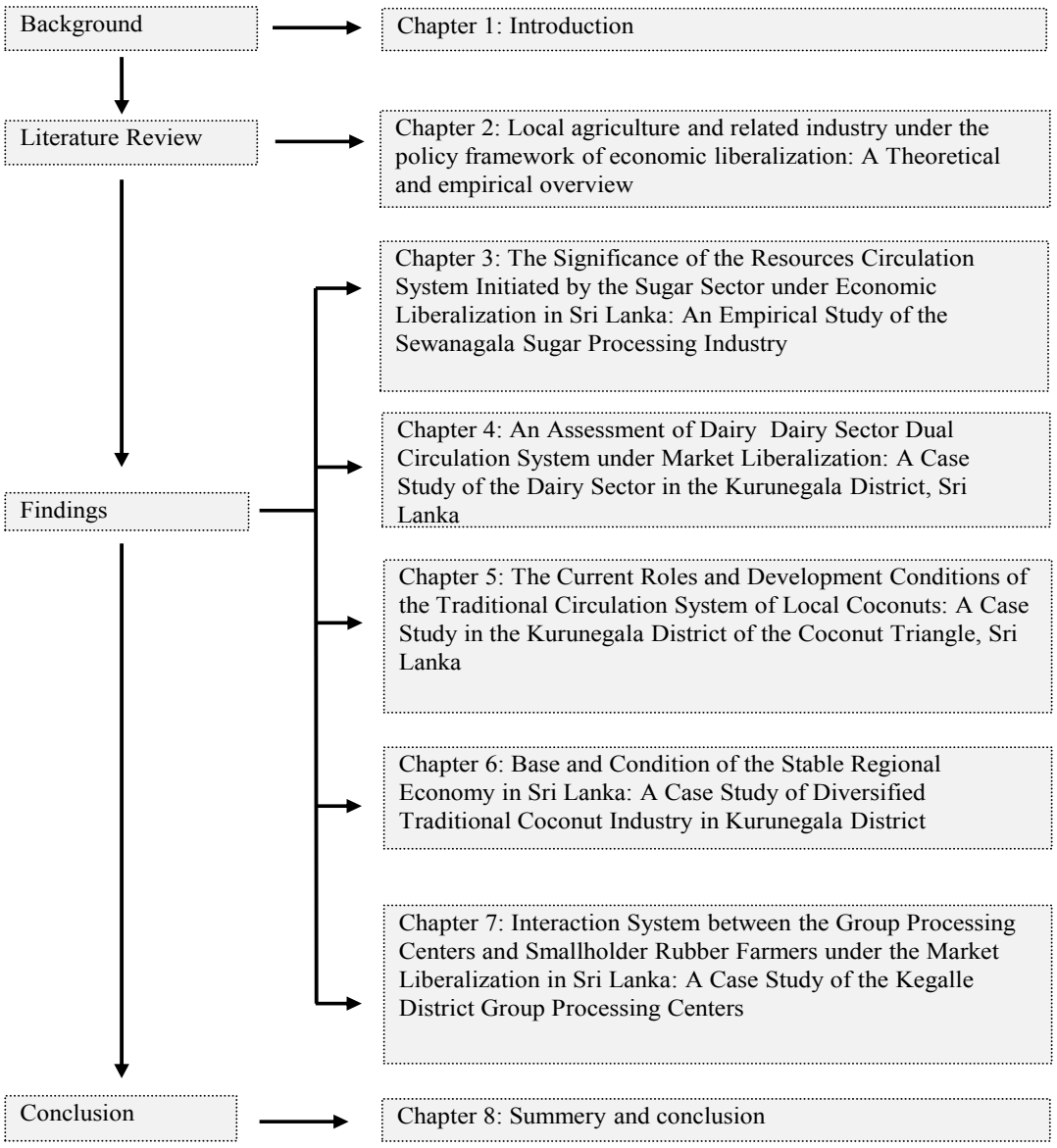

Figure 1-4 Chapter outline of the thesis

Chapter 2 : Local Agriculture and Related Industries in Developing Countries under the Policy Framework of Economic Liberalization: A Theoretical and Empirical Overview

2.1 A Review of Development Thinking towards Economic Liberalization

The economic liberalization policy has been a mainstream policy line of most of the developing countries since the late 1970s. This policy framework includes a reduction in the direct involvement of the state in the economic activity, a reduction of state control of economic process and activity (price, production and directions, etc.) and liberalizing foreign trade (Nonneman, 1996). The commonly accepted principles of economic liberalization derive from neoclassical economics—beginning from Adam Smith and later Bela Balassa. The neoclassical economics assumed that market mechanism is the best way of creating short-term allocative efficiency rather than state mechanism. Going beyond the neoclassical economics, neoliberal economics conceived since 1980s based on twofold argument: 1) ultimate aims of the development—reduce poverty and improve welfare and 2) in order to achieve economic growth it is important to rely on free market forces rather than state intervention (Krueger, 1974; Bauer, 1981).

Development thinking towards economic liberalization can be evaluated by taking into account the theoretical developments and policy practices in developing countries after World War II or after the independence of

developing countries in the 1940s. The emergence of Keynesianism weakened the ideology of the free market concepts and promoted the interventionist policies (Banuri, 1991). Specifically, Keynes book— the General Theory of Employment, Interest and Money—caused weakening of the free market concepts from the 1930s to the 1970s in particular. The Keynes theory basically emphasized that the aggregate demand created by households, businesses and the government is the most important driving force in an economy. The theory basically emphasizes government intervention in the economy through public policies that lead to achieve full employment and price stability. During this period, there was an increasing legitimacy of social welfare institutions and labor unions as well as the need for regulating the financial institutions. Specifically, the suppression of consumption was identified as the basis of high rate capital accumulation (by increasing saving rate) and economic growth in the capitalist market structure. In terms of newly independent developing countries, market mechanism was insufficient in capital accumulation and the economic growth process because these economies were extremely subsistence economies and hence poor and thus it was difficult to mobilize sufficient savings required for investment in the productive sectors (Hayami, 2001). That suggested state intervention in the economic activities in order to sufficiently accumulate capital and investment in the productive sectors in order to achieve a high rate of economic growth.

However, it was later widely identified that structural barriers of state intervention in economic activities which constraints capital accumulation process and

thereby hinder the economic growth of most of developing countries lead these economies into crisis or severe macro-economics imbalance. The main reasons were that the state or public sector was too big, too pervasive and too inefficient. Failure or inefficiency of most of the state owned enterprises was reported due to the lack of skilled labor or sponge employers, political interests of the state, social functions, etc. During the 1960s and 1970s, state sector in the developing countries expanded considerably—for example, the number of state owned enterprises increased in Brazil from about 150 to 600, Mexico from 150 to 400 and Tanzania from 50 to 600 (Nonneman, 1996). The country experiences showed the failure of state intervention in making viable economy, generating revenue, using resources efficiently, making social equity and structural change in the economy and society. Specifically, the oil crisis from 1973-1974, world recession from 1974-1975 and chronic economic crisis throughout the 1980s associated with the third world debt crisis severely marked failure of state interventionists' policies in the development circle of developing countries (Balassa, 1982; Nelson, 1990; Banuri, 1991). This made series of questions about the Keynesian consensus in terms of stabilization policies, labor unions, social welfare institutions and regulation of industrial and financial markets. Moreover, the some of economic appeals of centrally planned system began question due to a series of economic and social difficulties of those economies. This revived neoclassical economic thinking with growing attention to principles of economic liberalization.

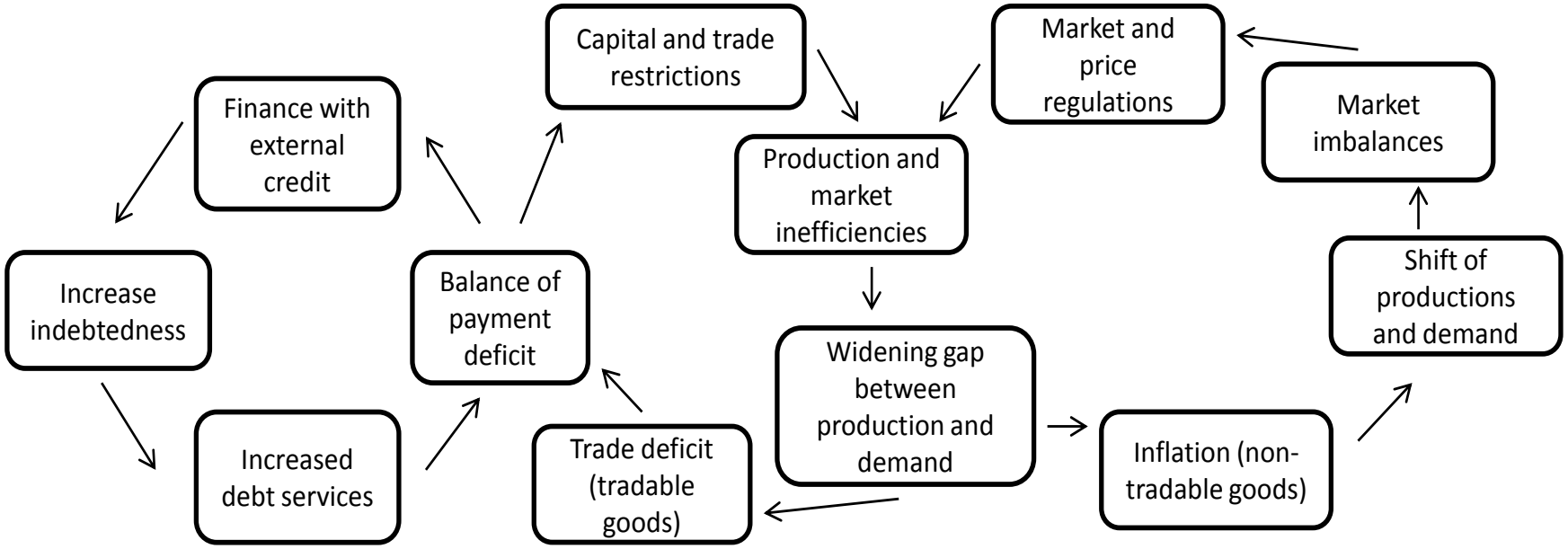

Figure 2-1 Flow of structural imbalances in the economies of developing countries in the 1970s

Source: FAO, 1999

A counter measures to those economic crises was neoliberal economic thinking. Specifically, since the 1980s, the focus shifted to macroeconomic problems—fiscal imbalances and misguided monetary policies (Stiglitz, 2002). According to Nonneman (1996), there are three basic arguments in proposing the economic liberalization policies to developing countries. They are:

Policies would allow input of new resources from foreign investment and domestic liquidity.

Policies will allow economic dynamics to emerge due to more accurate signals and responsive and flexible reaction. This would help more wealth, production, and generally contribute to long term viability of the economy.

Opening up of economies to the international competition would sharpen the competitive skills and lead to reinforcing the entire process and promote economic growth.

Moreover, the neoliberal policy prescription emphasizes the following:[10]

The public sector should get involved in proper macroeconomic management of the economy—for example, reduce budget deficit, keep interest rate low, provide basic infrastructure facilities and establish legal framework which are required to safeguard private property and work the market efficiently.

There should not hinder the market in terms of direction, subsidies, protection, etc.

The private sector should be the engine of the economic growth.

[10] For more details, see Nonneman, (1996)

Foreign trade should be liberalized and export oriented. This argument is mainly based on the theory of comparative advantages.

According to Krueger (1986) and Balassa (1986), these changes in the economies—particularly in developing countries—will facilitate efficient and effective search of economic and social goals. It is evident that these arguments are largely influenced by the successful experience of East Asian countries and poor performance of other developing countries. Following these theoretical developments in economic literature, the WB and IMF, the two Breton Woods institutions, proposed a range of policy reforms under so called "Structural Adjustment Programs (SAP)" for developing countries in order to break the cycle of underemployment, debt crisis and economic crisis since the early 1980s. [11] The WB and the IMF carried out their specific policy reforms—macroeconomics policy reforms, institutional reforms, capacity building, and governance—in the developing countries through their lending and projects.

[11] The WB first applied the term structural adjustment to describe its program of policy-based lending which began in the early 1980s. The objectives of the SAP were to solve the problem of macroeconomic imbalances and stimulate the economic growth in developing countries. It involves in improving the structure of the production by allocating resources by taking into account the opportunity cost and maximizing the resource allocation efficiency. Moreover, the SAP concerns the both operational and economic efficiency. Operational efficiency is increased when unit cost of production are minimized through efficient management and the adoption of the appropriate technology. Both allocation efficiency and operational efficiency represent in the economic efficiency (Crawford, 1997).

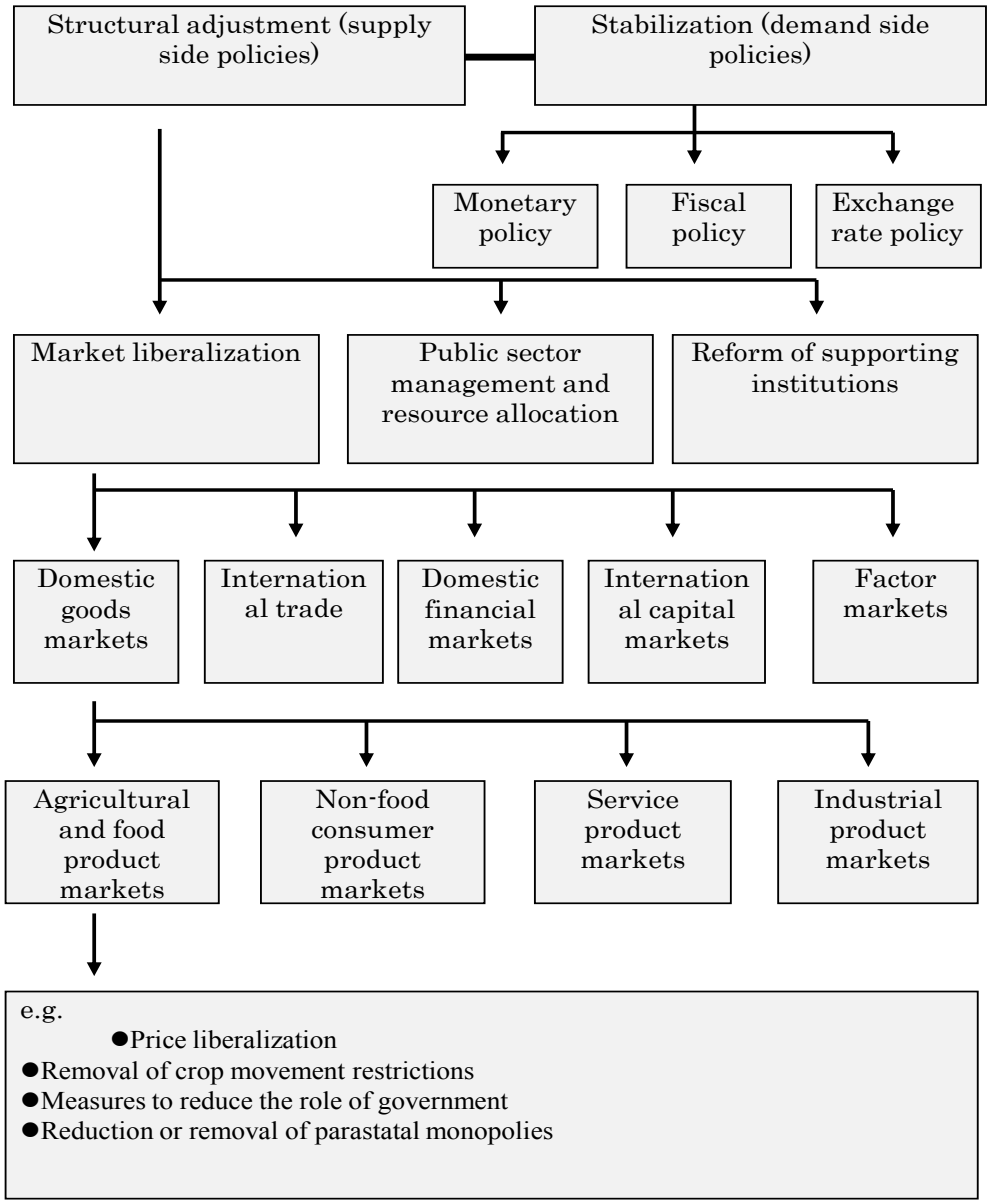

Figure 2-2 The nature of stabilization and structural adjustment program

Source: Spooner & Smith (1989)

However, the effects of lending and projects are rather mixed. Some claim that these institutions did not take into account the specific conditions of countries—rural structure and economic conditions—where policy reforms were undertook. However, these claims were somewhat addressed in a more

balanced way in the 1990s under the "Washington Consensus (WC)".[12]

From the early 1980s up to date, there are many macroeconomic assessments which were carried out to document the relationship between neoliberal economic reforms and economic growth. According to the IMF study (1990), there was no clear or significant relationship between IMF implemented programs under the SAP and economic growth of developing countries. In contrast, the World Bank study evaluated the growth, savings and export

[12] The Washington Consensus was made up by American economist John Williamson in 1989. It describes ten specific policy prescriptions in order to cater the debt and economic crisis in the developing countries. The prescriptions covers macroeconomic stabilization, economic opening with respect to trade and investment and expansion of market forces within the domestic economy. These policy prescriptions were largely supported by the international organizations such as the World Bank, the IMF, the USA and the EU.

The specific policy recommendations of Washington Consensus are as follows:

1. Low government borrowing. Avoidance of large fiscal deficits relative to GDP;
2. Redirection of public spending from subsidies ("especially indiscriminate subsidies") toward broad-based provision of key pro-growth, pro-poor services like primary education, primary health care and infrastructure investment;
3. Tax reform, broadening the tax base and adopting moderate marginal tax rates;
4. Interest rates that are market determined and positive (but moderate) in real terms;
5. Competitive exchange rates;
6. Trade liberalization: liberalization of imports, with particular emphasis on elimination of quantitative restrictions (licensing, etc.); any trade protection to be provided by low and relatively uniform tariffs;
7. Liberalization of inward foreign direct investment;
8. Privatization of state enterprises;
9. Deregulation: abolition of regulations that impede market entry or restrict competition, except for those justified on safety, environmental and consumer protection grounds, and prudential oversight of financial institutions;
10. Legal security for property rights.

performance of 78 countries by categorizing them into early adjusters, late adjusters and non-adjusters. The study concludes that a country would expect to have GDP growth of an average 8 percent, and faster saving and export performance, but lower investment. However, the study emphasizes the difficulties in isolating effects of trade policies and establishing causality, so that debate on policy reforms is not fully resolved (Nonneman, 1996). There are numerous studies that explain the poor record of reform. According to Stiglitz (1998), there is a need to go beyond the WC in order to achieve broader objective of the development. The author argued that the WC focused on privatization and trade liberalization as an end rather than the means to more sustainable, equitable and democratic growth. Thus, the existing policy critics against the economic liberalization in the developing countries emphasize the need for new consensus towards thinking of economic liberalization.

2.2 Selected Country Experience of Economic Liberalization - Empirical Evidence from Developing Countries

The development philosophy of two Bretton Woods institutions—the World Bank and the International Monetary Fund (IMF) and the World Trade Organization (WTO) with regard to developing countries has again become questionable due to the recently emerged food and finance crises. These have pushed an additional 115 million people in developing countries into hunger indicating the importance of restructuring the neo-liberal development path advocated by multilateral institutions in these countries. Long-term effects of advocated economic liberalization policies in terms of investment and technological

change in agriculture of developing countries were questioned.

Since the late 1970s, the structure of agricultural systems in developing countries, small-scale and independent agricultural systems in particular, was identified as the main hindering factor of capitalistic development by the multilateral institutions. Thus, the Bretton Woods institutions have recommended a series of economic liberalization policies to developing countries in line with advocating SAP with the aim of eliminating supply and demand constraints and making key sectors of the economies more productive. Thus, the developing countries had to liberalize production and trade in agriculture, remove or reduce subsidies paid on input and output of farm products and dismantle their marketing boards (Shafeddin, 2008). Specifically, the recommended policies were very favorable to industrial agriculture and promoted tradable agriculture by neglecting the existing local agricultural systems and related industries. This has made space in the domestic markets of most of the developing countries to engage in predatory and substitute imported food and food products. These changes in agriculture have exposed their agricultural production to unfair competitive pressure in domestic and international markets.

In this connection, one of the main areas of focus in literature is the agriculture smallholder. The reason is that the smallholders dominate a large tract of agricultural land in developing countries and account significantly for rural employment and food production. Specifically, more than two-thirds of the poor in the rural areas are smallholder farmers (Food and Agricultural

Organization, 2004). Thus, any changes due to agricultural policy recommendations in developing countries affect smallholder farmer production, their consumption and labor supply. The studies have showed that economic reforms with regard to agriculture in developing countries have resulted in switching the cropping patterns to a more tradable food crop in order to increase income. The empirical evidence of agriculture and related industry in developing countries under economic liberalization policies are strikingly dissimilar and inconclusive. Most of macro or empirical level studies confirm the positive effects of economic liberalization and micro level studies shows rather mixed results. This section is mainly focused on reviewing the empirical experience of countries in the regions of Asia, Sub Saharan Africa and Latin America because the purpose of this thesis is to show appropriate empirical evidence-based solutions for challenges faced by the local agriculture and related industries under the economic liberalization in developing countries (see Table 2-1, 2-2 and 2-3).

In case of Asian region, rice sector issue in the Philippines is one of the best cases which show policy effects. The Philippines was net rice exporter till the mid 1990s. Policy shift towards export oriented non-food cultivation occurred in 1990s under the SAP proposed by the multilateral institutions. Following the accession of the country to the WTO trade regime, domestic prices of rice increased significantly compared to other East Asian countries such as Thailand and Indonesia. For example, the Philippines nominal wholesale price of rice was 91% higher than the world market price of rice. Although all quantitative import restrictions were

not lifted in terms of rice with the intention to safeguard the small farmers from competitive imports, the Philippines government has failed to provide the required public support services to increase the productivity due to their obligations to the SAP advocated by multilateral institutions (Balisacan & Ravago, 2003; Bello, 2003). As a result, the Philippines is a country which has highly favorable agro-climatic condition for rice cultivation has became the net rice importer, and thereby making the livelihood of millions of small scale farmers vulnerable.

In terms of Indonesia, several crops provide evidence on the adverse fall out of economic liberalization. For example, Indonesia liberalized the rice import market in the 1990s while introducing various market related reforms. As a result, the private sector today provides 90% of the national need for rice via imports. According to Andri & Shiratake (2007), most of the rice farmers have major problem with the marketing aspect, especially low and fluctuating prices. Thus, farmers further expect the good policies from the government on their rice farming and income. The authors have revealed food policy programs, which are closely related to farmers and consumer wealth, and still needs to be directly conducted by the government during the liberalization process. The similar scenario could be seen in terms of the soybean sector in Indonesia. The economic liberalization policies has affected the reduction of the cultivated area of soybean from 1.7 million ha in 1992 to 0.457 million ha in 2007 (Shafeddin, 2008). It is evident that the price of imported US soybean is 22% lower than the production cost of soybean in Indonesia. Moreover, the dairy sector in Indonesia

also gives evidence on domination of multinational companies (MNCs) in production, processing and distributive channels (Andri & Shiratake, 2006). Tumbuwan & Shiratake (2010) also reveals existing threat of globalization to sustainability of old *Pasars* that undertake important marketing functions in terms of local people in Indonesia.

The recent study conducted by Hoque & Shiratake (2011) revealed the impact of imported milk powder on the dairy sector of Bangladesh due to the newly adopted import policy by the government in 2008 under the WTO regulations. Under the policy, the tariff level on imported milk powder was reduced from 75% to 36% in 2007-2008 and it has caused a sharp drop in market price of imported milk powder from 455 Taka to 198 Taka per kg while resulting in the rapid increase of the quantity of imported milk powder in the market from 30,000 tons to 640,000 tons. Therefore, cheap imported milk powder is currently dominating the domestic market and sevierely affecting the domestic dairy sector in Bangladesh. The authors have found the changes of raw milk market structure due to the availability of cheap imported milk powder. Specifically, sweet shops, which were the biggest user of local raw milk, have changed to using imported milk powder for products and most of the dairy processing companies, except dairy cooperative—Milk Vita, have decreased raw milk collection from the local farmers by using cheap imported powder milk to produce liquid milk and milk related products. The study also suggests several import market related measures such as imposition of import quota and increase of tariff levels on imported powder milk and farmer incentive or supportive measures such as

subsidies in order to protect vulnerable farmers.

Madagascar, a country located in the Sub-Saharan African Region, provides typical empirical evidence to the region on the effect of economic liberalization on agriculture and the rice sector in particular. The rice sector in Madagascar has been progressively liberalized since 1983, followings the reforms guided by the IMF and World Bank. The objective of these reforms in agricultural sector were to stimulate and promote the private sector participation, encourage the commercialization of the subsistence sub-sector, increase rice farm gate price, and ultimately raise household incomes and improve the availability and access to food (Ralandison & Shiratake, 2007; Ralandison & Shiratake, 2008a; Ralandison & Shiratake, 2008b). However, the failure of the policies was confirmed due to the low farm gate price offered to the farmers and high consumer prices. According to Ralandison and Shiratake (2007), the gap between farm gate price and consumer price of rice has been widened over the years. Based on empirical investigation, they found that small individual farmers find it difficult to compete with the large traders and suggests that farmers' cooperative movements would be one of the alternatives for enhancing farmers` income.

Ghana, also a country located in the Sub-Saharan African Region provides good evidence on how agricultural subsidies in developed countries affect the agriculture of developing countries. According to Khor (2008) and Bassey (2008), Ghana's rice sector is one of the typical cases that show the long term effects of

policies of economic liberalization. Agriculture liberalization in Ghana occurred in the 1980s like other countries in the region. Ghana was self-sufficient in rice in the 1970s. Specifically, the policy changes encouraged imported the rice from foreign countries. The price of exported rice was relatively low in production cost of rice in Ghana, thus self-sufficiency ratio of rice has decreased significantly during the last two decades. Specifically, it is reported that the price of American rice is 34% below production cost of Ghana's rice. This has led import quantity of American rice to 111,000 tons in 2003, which accounts for 27% of the total import of Ghana's rice. Thus, it is clear that economic liberalization policies put the large number of small-scale farmers at risk, while increasing food dependency on import market. In addition to rice sector, Ghana provides another two examples on tomato and chicken productions. According to Khor (2008) and Bassey (2008), privatized and liberalized tomato sector of Ghana has resulted in the increased import of tomato from the EU, the region which provides large subsidies on tomato production. For instance, import of tomato from the EU has increased from 3,200 tons in 1994 to 24,077 tons in 2002. According to Bassey (2008), EU subsidizes 254 Euro per ton of chicken. Thus, market liberalization in Ghana has resulted in an increase of import of poultry products from 5% to 89% of domestic requirement during the period of 1992 to 2001. Similar result is reported in Senegal in terms of poultry production. It is reported that 70% of poultry production has been wiped out due to the liberalization of poultry market. These adverse impacts of economic liberalization has put livelihood of millions people of these countries at risk.

Tanzania also provides a typical case on how economic liberalization policies affect the stable food of developing countries. In Tanzania, maize is the stable food which accounts for 22% of GDP. Similar to other counties in Sub-Saharan African region, Tanzania also implemented economic liberalization policies as advocated by the multilateral institutions in the 1980s. According to Skastein (2005), growth performance of both maize and paddy production and labor productivity have shown the negative trend after implementation of the economic liberalization policies. For example, the per capita growth of maize and paddy production has declined at an annual average rate of 2.35% and 1.80% during the period of 1985 to 1998, respectively. In the meantime, labor productivity in the maize and paddy sector has declined at an annual average rate of 1.94% and 1.39%, respectively.

Haiti, a country located in Latin American region also provides a typical example on adverse effects of economic liberalization in terms of the rice sector. Haiti was self-sufficient in rice in the 1980s. The IMF imposed trade liberalization policies in Haiti in the 1990s. According to Carlsen (2008), import duty on rice was reduced from 35% to 3% by espousing trade liberalization policies. As a result, domestic rice production declined drastically and in 2008, 82% of country's rice requirement was met through imports. Mexico also provides a typical case in terms of corn production due to the elimination of government control on imports and marketing. This policy changes has resulted to a domination of domestic market by few TNCs, the Cargil and Minsa in particular.

Table 2-1 Country experience of economic liberalization: Asian region

Author	Country coverage	Affected area	Cause	Effects or main findings
Bello and Baviera (2009)	Philippines	Rice	Policy shift towards export oriented non-food cultivation	The Philippines has become net importer in terms of rice
Hoque and Shiratake (2011)	Bangladesh	Dairy products	Import market liberalization of milk and milk products. Reduced tariff level on imported powder milk from 75% to 36% in 2008 under the WTO regulations.	Market prices of imported powder milk dropped 455 Taka to 198 Taka per kg while resulting to rapid increase in quantity of it in market from 30,000 tons to 640,000 tons.
Tumbuan and Shiratake (2010)	Indonesia	Traditional old pasars	Economic liberalization policy	The study suggests that Old Pasar should be preserved in order to sustain the living of thousands of people and to upkeep the local economy.
Jhamtani (2008)	Indonesia	Rice	Liberalization of rice import market	Private sector distribute 90% of national need supplied mainly by imported rice.
Jhamtani (2008)	Indonesia	Soybean	Liberalization of Soybean market	Reduced the cultivated area of Soybean from 1.7 million ha in 1992 to 0.457 million ha in 2007. Price of imported US soybean was 22% lower than production cost of soybean in Indonesia.
Ghosh (2008), Jianjun Wen (2008)	China	Soybean	Reduction of import duty up to 3% with the WTO membership.	Price of imported soybean was below cost of soybean production in China. Although China was self-sufficient in rice in 1990s, before entering into the WTO, it reduced to 40% by 2008.

Table 2-2 Country Experience of Economic Liberalization: African Region

Author(s)	Country coverage	Affected crop	Cause	Main findings
Ralandison & Shiratake [2008], Ralandison & Shiratake, [2007]	Madagascar	Rice	Trade liberalization in Agriculture	Liberalization and deregulation of rice market was started in 1983 and the participation to the WTO since 1995 have resulted in a serious of food market problem in Madagascar.
Khor (2008), Bassey (2008)	Ghana	Rice	Agricultural liberalization in Ghana in 1980s. Agricultural subsidies in developed countries, USA in particular.	Ghana was self-sufficient in rice in 1970s. However, by 2003, Ghana import 79% of national requirement of rice. American rice, which is exported price is 34% below production cost, amounted 111,000 tons in 2003. It is 27% of total imports.
Khor (2008), Bassey (2008)	Ghana	Tomato	Privatized and liberalized tomato production in the country. EU subsidies on tomato production.	Import of tomato increased from EU from 3,200 tons in 1994 to 24,077 tons in 2002.
Bassey (2008)	Ghana	Chicken	Market liberalization in Ghana. EU subsidies on Chicken (254 Euro per ton of chicken).	Import of poultry products increased from 5% to 89% of domestic requirement during the period of 1992 to 2001.
Bassey (2008)	Cameron	Poultry	Reduction of import tariff by 25%	Increased the import of poultry products by six fold.
Bassey (2008)	Senegal	Poultry	Import market liberalization	70% of poultry production is wiped out.
Bassey (2008)	Mozambique	Vegetable oil	Import market liberalization	Production of vegetable oils dropped from 21,000 tons in 1981 to 3,500 tons in 2002.
Skastein (2005)	Tanzania	Maize & paddy	Economic liberalization	Per capita maize and paddy production and labor productivity have declined after economic liberalization.

Table 2-3 Country Experience of Economic Liberalization: Latin American Region

Author	Country coverage	Affected crop	Cause	Main findings
Carlsen (2008)	Haiti	Rice	Trade liberalization policies imposed by IMF in 1990s.	Haiti was self-sufficient in rice in 1980s. In 1990s, import duty on rice reduced 35% to 3%. As a result, domestic rice production declined drastically and in 2008, 82% of national requirement of rice was met through imports.
Caelsen (2008)	Mexico	Corn	Eliminated government control on imports and marketing	Domestic market of corn was dominated by few TNCs, especially the Cargil and Minsa.

2.3 Agricultural Policies in Sri Lanka since Independence in 1948

Since regaining political independence in 1948, the Sri Lankan government paid special attention to develop the agricultural sector in order to achieve certain socioeconomic goals. Different political regimes have adopted different types of development policies in regard to agriculture since 1948. Until 1977, both mixed and central planning of economic sectors becomes dominant. Specifically, a continuation of colonial economic policy could be seen from 1948 to the late 1950s. From the late 1950s to 1977, there was an import substitution policy with some export promotions. During this period, there was a heavy state intervention in economic activities. According to applied economic policy prescriptions in the economy, there is a clear turning point of economic policies from 1977 due to the economic liberalization policy. Thus, agricultural development policy in Sri Lanka can mainly be discussed under two policy phases: policies in the pre-liberalization period and policies in the post liberalization period. However, those contradictive policy prescriptions had their advantages and disadvantages in respect to the agricultural sector development in Sri Lanka.

2.3.1 Policies in the Pre-liberalization Period

The main focus of agricultural policies was to make the country self-sufficient in food. To achieve the objectives of the agricultural policies, the Sri Lankan government took several measures in regard to agriculture since the 1940s. They are land settlements in the 1940s, high land colonization in the 1950s, village expansion and youth settlement in the 1950s, tenancy reforms in the paddy land

in the 1950s, accelerated Mahaweli development program in the 1970s and land reforms in the 1970s (Sanderathna, 2005). Moreover, the government established a heavy interference programs and these programs were more tightened during the period 1970-77. The role of the government in the agricultural sector was viewed through programs of price-subsidized of agricultural commodities, import control of specific food commodities, government investment in the agricultural sector development—infrastructure development and institutional setting in particular, research and extension activities and governmental marketing of strategic commodities such as rice during the period of 1948-77.

Moreover, during 1970-77, the government maintained protectionist policies including the agriculture due to severe deflation of foreign reserves (Herath, 2007). The primary objective was to achieve the food self-sufficiency in the country. In this respect, the government had provided the subsidized inputs such as fertilizer, pesticides, tractors, improved seed and planting materials and rural credits (Herath, 2007). During this period, attention was specifically paid to the import-substitution in the agriculture, by controlling the foreign exchange and imposing the quantitative restrictions on imports. Specifically, dual exchange rate system was adopted during this period to facilitate export and to curtail import. In this period, the government established several government-owned industrial enterprises in several locations of the country. Specifically, the potential of peasant agriculture was acknowledged by the Five Year Plan (1972-76) of the government. The provisions of agricultural marketing and

establishment of guaranteed price scheme were some of contributory measures taken by the government in regard to the agricultural sector development in Sri Lanka. Specifically, the new land reform policies implemented in 1972 and in 1975 were the main policy reforms that were undertaken by the government during this period. There are many studies which examined the impact of these land reform policies on poor and the land less farmers in the country. The impact of these policy measures with regard to agriculture could be seen in terms of the increase of production, arable land, food self-sufficiency ratio of specific commodities and changes of export and import of agricultural commodities. For instance, paddy production grew from 509,700 mt in 1960 to 1,035,000 mt in 1980; sugar production from 13,000 mt in 1970 to 26,290 mt in 1980 and milk production from 108 mt in 1960 to 283 mt in 1980 (Herath, 2007). In the meantime, it was evident that import substitute policies were not sufficient enough to reduce the food import bill of the country from 1970-77. However, there are no sufficient studies which attempted to study the impact of protectionism or import substitute economic policies on the agricultural sector in Sri Lanka.

2.3.2 Policies in the Post Liberalization Period

The economic reforms introduced in 1977 were sharp break from the previous economic regime. The new economic reforms moved the country from inward looking policies into more market oriented policies. In this respect, foreign exchange restrictions were significantly liberalized, price controls were removed and barriers to internal trade were eliminated. Fiscal policies were specifically used to support the market orientation while recognizing private sector as

engine of the economic growth. Specifically, purpose of taxation policy was shifted from resource mobilization which was previously done for public investment or for income distribution to resource allocation. These policies made a structural change in the economy in terms of agriculture, industry and services. Specifically, export led manufacturing sector showed better performance during the post liberalization period while relative contribution of agriculture to GDP declined dramatically. For instance, contribution of agriculture to GDP declined from 23.3% in 1990 to 11% in 2010.

Agricultural policies in the post economic liberalization period were mainly focused to promote diversification towards commercial agriculture. Specifically, primary focus of the agricultural policies was to change the character of agriculture—shift from subsistence agricultural sector to commercial agricultural sector with high value crops (Herath, 2007). Reduction of rigidities in the tariff system, devaluation of domestic currency to promote exports, reduction of agricultural subsidies—fertilizer subsidy in particular, promotion of crop diversification and export of non-plantation crops were observed from the agricultural policies during this period.

Moreover, in the later period of the 1990s, the aims of agricultural policies were to promote agricultural growth, ensure food security, and expand agricultural export and commercialization. In this respect, removal of institutional and policy barriers in the agricultural sector have been identified as prime areas. Specifically, the government reduced the interest rate of agricultural credit and

turnover tax on agricultural inputs, reduced the consumer subsidies on several imported food items including wheat and dairy related products, removed the government intervention in marketing were some of main reforms undertaken during this period. Tariff reforms were one of main fiscal policy reforms undertook to promote the investment activities in the agricultural sector. Specifically, Sri Lanka was one of the countries in the Asian region which represented the lowest tariff level on agricultural commodities by the mid 1990s. However, the policies have not been sufficient enough to induce the domestic agriculture including plantation agriculture. It was evident an endogenous stagnation of production of most agricultural crops during the period of post economic liberalization period (see Figure 2-2). Some economists argue that the Sri Lankan agricultural sector was not structurally developed in order to face the product competitiveness coming from imported agricultural products (Herath, 2007).

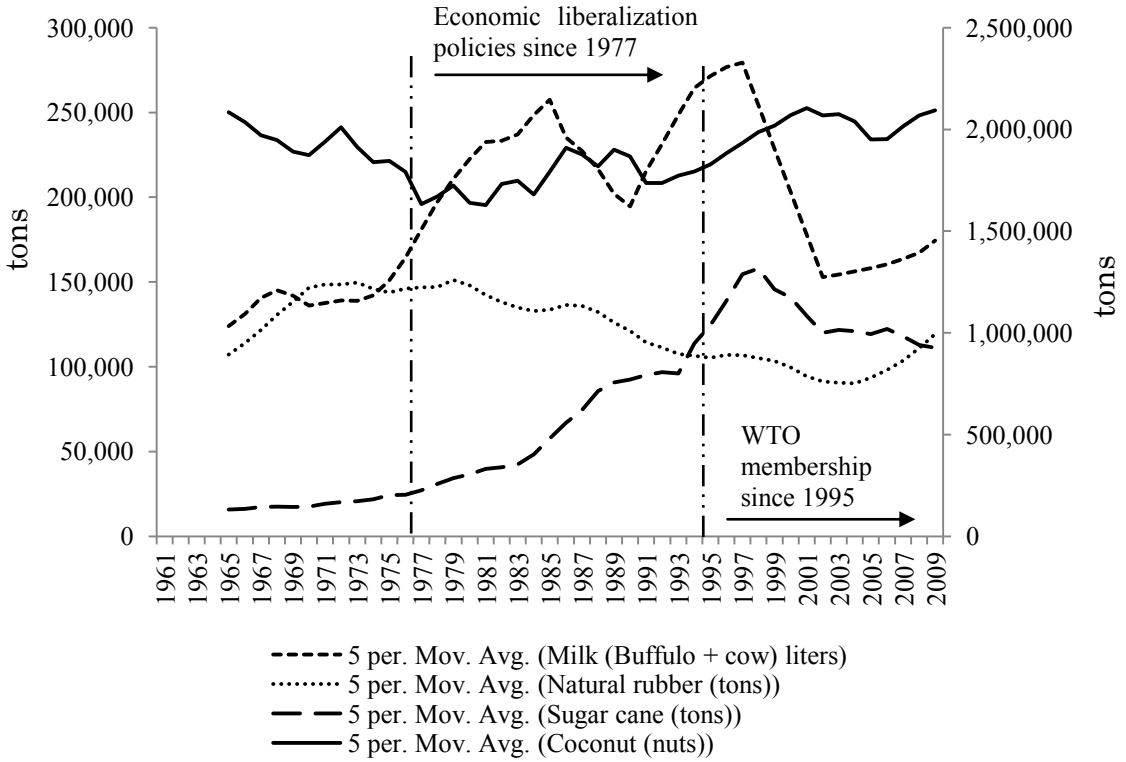

Figure 2-3 Trends of some selected main crop and livestock production in Sri Lanka: in Volume

Source: Food and Agriculture Organization of the United Nations

Chapter 3 : The Significance and Development Conditions of the Rural Resources Circulation System Initiated by the Sugar Sector under Economic Liberalization in Sri Lanka: An Empirical Study of the Sewanagala Sugar Processing Industry

3.1 Introduction

The sugar sector, which provides multiple raw materials for a diverse range of products, has played a dominant and multilayered role in the economy of Sri Lanka until 1995. Sugar is one of the main sources of calorie intake of the average diet in Sri Lanka. In 2010, the annual per capita consumption of sugar was 31.6 kg (Department of Census and Statistics , 2010). More than 15,000 farm households in the dry zone of Sri Lanka are directly involved in sugarcane farming. A considerable number of rural people produce sugarcane-related products for the cottage industry. In 2005, by-products of sugarcane processing produced 9.4 million liters of alcohol, which corresponds to 40% of the alcohol consumption of the country (Central Bank of Sri Lanka (CBSL), 1960-2012). The sugar sector development in Sri Lanka was initially started in 1957 with the establishment of the Sri Lanka Sugar Cooperation (SLSC), under the State Cooperation Act No. 47 of 1957. As a result, 4 large-scale, sugar-manufacturing companies were started as government ventures in Hingurana and Kantale in 1960 and 1961, respectively, and in Sewanagala and Pelwatta in 1986. This step contributed to the development of dry zone areas, saved foreign exchange and improved the country's trade balance, especially until 1995.

Since the early 1990s, this important sector has experienced major policy reforms under the Structural Adjustment Program (SAP) proposed by the World Bank (WB), the International Monetary Fund (IMF) and the World Trade Organization (WTO) (see Figure 3-1).[13] The key reforms were the abolition of the state monopoly in sugar manufacturing for the formation of joint venture enterprises in the first half of the 1990s and the acceleration of the sugar sector liberalization with WTO membership.[14] The economic liberalization allowed private traders to import sugar from international markets without any import quantity restrictions from the second half of the 1990s onwards. Subsequently, the sugar production of the country declined significantly, for instance by 56.7% from 71,416 tons in 1995 to 31,000 tons in 2010 (see Figure 3-1). The self-sufficiency ratio in sugar production has thus declined from 16.4% to 5.3% (Central Bank of Sri Lanka (CBSL), 1960-2012). During the same time, the area under sugarcane cultivation

[13] At the time of economic liberalization in 1977, the state sector of Sri Lanka played a dominant role in production, distribution and financing in the economy. The government had non-financial objectives with regard to the state owned enterprises. Amongst these objectives were redistributive justice, regional development – which meant that industries were set up in rural and remote areas, price regulation of essential products and employment creation. Since 1977, governments have implemented far reaching economic reforms under the structural adjustment program proposed by the World Bank, the IMF and the World Trade Organization. Reform packages have included the loosening of protectionist measures to provide to import competing sectors, exchange rate adjustments, fiscal and monetary reforms, liberalization of domestic factor and domestic markets and privatization of some government business enterprises.

[14] Until 1995, Sri Lankan government had controlled the domestic market sugar price by using tariff measures. Therefore, influence of imported sugar to the domestically produced sugar was minimized. However, with the acceleration of market liberalization process in 1995, the government intervention in controlling the sugar market price was abolished.

had declined by 52.5%, from 24,842 ha to 11,800 ha. This overall trend has put the livelihoods of almost half of the impoverished farmers in jeopardy. In 1997, 2 large-scale companies, Hingurana and Kantale, stopped their sugar production. These drastic changes in the sugar sector weakened the rural resources circulation system (RRCS) initiated by the sugar sector.[15] This RRCS was mostly characterized by the circulation of resources such as rural labor, material, supply of other services and production of value-added products. Owing to the heavy protection by the government, the system functioned well in sugarcane growing areas during the period from 1973 to 1995. Moreover, these drastic changes worsened the country`s trade balance. For instance, in 2010, sugar imports accounted for 7.5% (USD 363 million) of total trade deficit of the country. During the period from 1995 to 2010, the level of imported sugar increased by 68%, from 301,230 tons to 508,397 tons (FAO, 2010).[16] Thus, the examination of the economic effects of the RRCS and the identification of the conditions necessary to revitalize and strengthen the system are subjects of paramount importance to solve the problems facing the sector, particularly in Phase 3.

[15] The term "Rural Resources Circulation System (*RRCS*)" have not been used in the literature. In this study, we adopted our own definition for this term based on specific characteristics of sugar sector. The characteristics were identified during the field survey.

[16] In 2010, the import of sugar accounted for 28% of the country`s total food import bill (Central Bank of Sri Lanka (CBSL), 1960-2012), and it was the highest percentage recorded in a single item of imports of food and beverages. The import of food and beverage accounted for 9.9% of total import bill of the country (Central Bank of Sri Lanka (CBSL), 1960-2012).

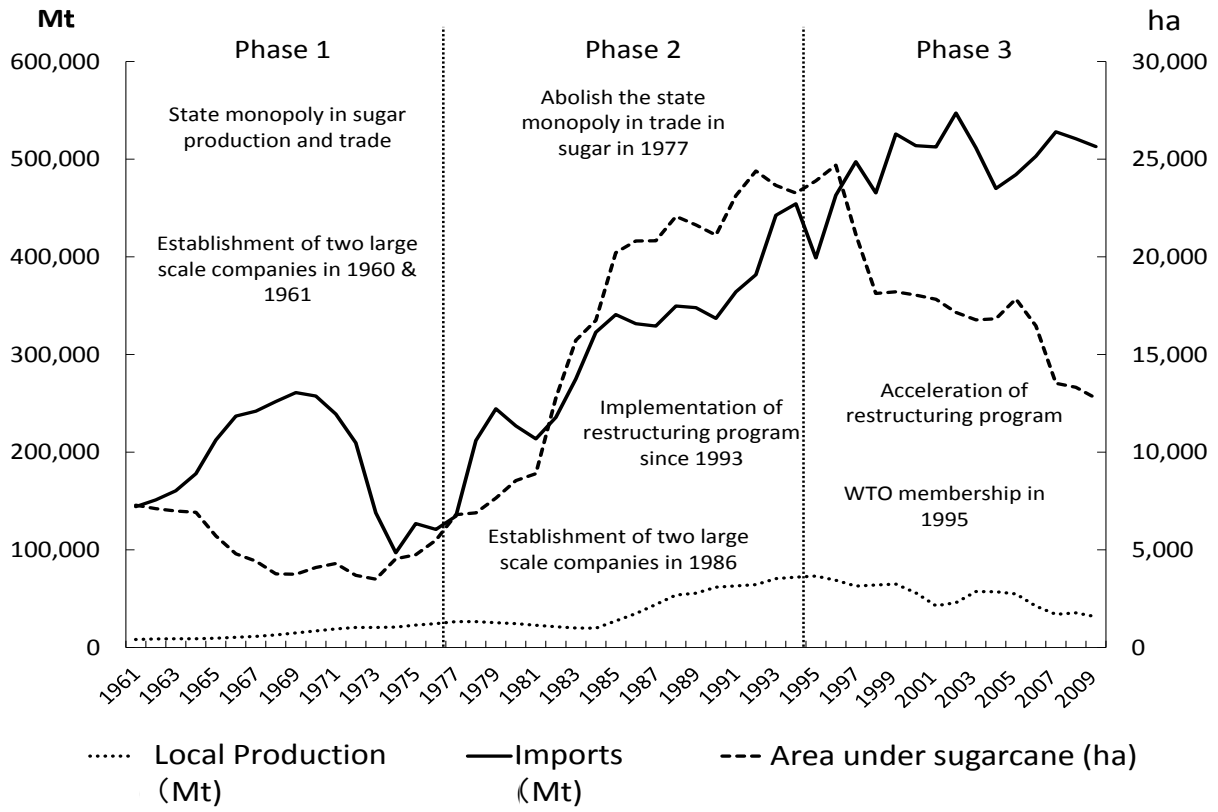

Figure 3-1Trends of annual sugar production, imports and area under sugarcane cultivation, 1961-2010

Source: Central Bank of Sri Lanka, Annual reports, various issues

The literature survey revealed that more researchers have written about technical aspects of sugarcane farming (Chandrasena, et al., 2005), socio-economic issues and macroeconomic aspects of the country's sugar sector (Keerthipala, 2002; Dharmawardene, et al., 2004; Dharmawardene, et al., 2004; Keerthipala, 2007; Kodituwakku, 2010). There are few studies that examine the profitability of sugarcane farming, sugarcane pricing system, and sugar sector issues and macroeconomic policies (Keerthipala & Thomson, 1998; Keerthipala & Dharmawardene, 2000; Keerthipala, 2007; Kodituwakku, 2010).[17] Even though there are no studies with regard to the RRCS initiated by the sugar sector in Sri Lanka, the literature survey found few studies which assess the resources circulation systems associated with dairy sector and coconut sector in the local areas of Sri Lanka. For instance, Prasanna and Shiratake (2012) assess the resources dual circulation system (RDCS) of dairy sector under the economic liberalization policies in Sri Lanka. This study supports the contention that the RDCS contributes to the sustainability of dairy farming due to the efficiency in farm-level integrated resource management techniques, the contribution to

[17] In terms of government policy with regard to sugar sector development, we identified several policies implemented since 1995 to until now. The government policy objective was to achieve 60% self-sufficiency in sugar (Keerthipala, 2007). The restructuring policy of the government with regard to formation of joint venture enterprises was continued. It was observed the add-hoc tariff measures on imported sugar. However, the policy has not been targeted at development of domestic sugar industry and the revenue from the tariff on imported sugar has not been used to support the sugar industry directly (Dharmawardene, et al., 2004). However, we could not see any significant policy of the government with regard to the development of sugar sector during 1995 to 2010. The most researchers reveal the add-hoc nature of the policies that are not favorable to development of sugar sector in Sri Lanka.

smallholder dairy farmers in terms of improving milk income and productivity, the provision of a competitive supply chain system with better raw milk prices, and positive responsiveness to environment in terms of organic manure usage and biogas production. The study further emphasizes that the characteristics of the RDCS are important for the development and strengthening of Sri Lanka`s dairy sector, which is currently facing challenges in the post-economic liberalization period that include issues of profitability, farm-level resource use, raw milk marketing and smallholder dairy farmer economic development. Moreover, Prasanna and Shiratake (2013) examines the traditional circulation system of local coconut (TCSLC) to identify an appropriate empirical method for supporting strong policy implications to revitalize the local coconut sector in the context of economic liberalization policies in Sri Lanka. The study emphasizes the importance of the TCSLC to developing the local coconut sector while indicating three characteristics of that system which support eliminating the influence of globalization on the TCSLC: a diversified industrial system based on one main regional crop, adaptability of that main crop (coconut) to the natural features of the region, and important economic opportunities for all smallholder farmers in the system. Amaratunga et al. (2001) study the agricultural diversification in the coconut triangle area of Sri Lanka as an alternative method in stimulating the agricultural sector growth through sustainable development. They examine dairy farming as a suitable agricultural diversification in the coconut land for poor farming communities. Moreover, Wei and Xu (2004) emphasize the importance of adoption of new technologies by the sugar industry in order to minimize the adverse environmental impact on society. They

state that organic fertilizer prepared using waste of processing have resulted in 17% higher sugarcane yield compared to usage of regular fertilizer. They also emphasize the multiple positive effects of production of by-products using waste of processing, including generation of more economic activity via job creation and thereby strengthening the local economy particularly in rural areas. In terms of present circumstances of Japanese agriculture, the Japanese central government also suggests the importance of establishing relation among agriculture, commerce and industry. Even if the suggestion emphasizes the resource circulation system, the idea is not so expansive due to lack of focus on some important aspects of the resources circulation systems such as energy production. However, in literature, there are no empirical studies that examined the RRCS initiated by the sugar sector in the rural areas of Sri Lanka. Therefore, the purpose of this study is to examine the significance and the development conditions of the RRCS initiated by the sugar sector in Sri Lanka. This study will examine the mechanism and characteristics of the RRCS, analyze the economic effects of the system and identify the current problems facing farmers and processors in the system.

3.2 Research Methodology

3.2.1 Reasons for selecting the study area

The empirical data for the study were drawn from the field survey conducted in the Sewanagala Divisional Secretariat (DS) division.[18] The reasons for selecting

[18] According to the administrative structure of Sri Lanka, a district is divided into a number of Divisional Secretary divisions (DS divisions), which are in turn subdivided into Grama Niladari Divisions (GN divisions).

the Sewanagala DS division were as follows. First, the area is located in the leading sugarcane production district, Monaragala District, and in the main irrigation system channel, the left bank of the Uda Walawa Irrigation System (UWIS), specified mainly for sugarcane cultivation in Sri Lanka (see Figure 3-2). In the UWIS, there are two main channels: the right bank main channel and the left bank main channel. The sugar development in the UWIS area was undertaken on the left bank in the early 1980s with financial assistance from the Asian Development Bank (ADB). The sugarcane cultivation was introduced by considering existing land and water resources in the UWIS. The basic objectives of the development were to increase the domestic sugar production and sugarcane related by-products and to upgrade the economic condition of farmers, mainly by settling the population of 2,600 encroachers in the area in an organized manner and providing direct and indirect employment opportunities for rural inhabitants (Asian Development Bank, 1995). The left bank of the UWIS is mainly located in the selected survey area. Second, the largest sugar processing company of Sri Lanka, Sewanagala Sugar Processing Industry, is located in the Sewanagala DS division. The farmers are familiar with the activities of this company since 1986 because of the long-term supply of raw material (sugarcane), labor and other related services. Sewanagala Sugar Processing Industry was established in 1986 as a government venture with a capacity of 1,430 tons crushed per day (Central Bank of Sri Lanka (CBSL), 1960-2012). Under the restructuring program of the sugar industry in Sri Lanka, the ownership and management structure of the company was changed in 2003.

Third, 42% of the population (approximately 4,000 farm households) in the Sewanagala DS division is engaged in sugarcane farming (Sri Lanka Sugarcane Research Institute (SLSRI), 2000-2010), and a significant number of people in the area are involved in sugar-sector related activities. By 2008, land planted with sugarcane amounted to approximately 4,000 ha in the survey area (Sri Lanka Sugarcane Research Institute (SLSRI), 2000-2010). Fourth, the Sevanagala DS division records the lowest rate of poverty incidence as measured by the Poverty Headcount Index (HCI = 19.3) among the DS divisions in the Monaragala district, although the district records the second highest rate of poverty incidence (HCI = 33.2) out of 25 districts in the country (Department of Census and Statistics , 2010).

3.2.2 Sampling and data collection in the field

The farmer settlements under the sugar development in the UWIS area are primarily concentrated in the Sewanagala DS division which consists of 14 Grama Niladari (GN) divisions. By taking into account the similar characteristic of initial conditions of settled farm households, the study selected a typical GN division named "Daluketiya" for the farmer survey.[19] In the selected GN division, there were 320 farm households. It is the highest number of farm households

[19] Under the sugar development program in the UWIS area, the population of encroachers in the area was primarily settled. When they were settled, they were supplying labor and implementing slash-and-burn cultivation. They were primarily the poor. Each farmer was given 2.5 acres for sugarcane cultivation and 0.5 acre for paddy cultivation by the government. Therefore, these farmers had similar characteristics in terms of socioeconomic and agricultural practices at the initial stage of program.

recorded by a single GN division in the Sewanagala DS division. The survey covered 96 farmers, including 80 sugarcane farmers and 16 non-sugarcane farmers scattered in the area. These 96 farmers were covered by the survey giving equal probabilities to all farmers in sampling. The reasons are the insufficient secondary information about the farmers at the village level and difficulties in accessing all farmers within a limited survey period due to the socioeconomic characteristics and nature of livelihood activities of the farmers in the area. Sampled farmers were interviewed by administering a semi-structured questionnaire. The characteristics of surveyed farmers revealed that almost all the sugarcane farmers have more than 20 years of experience in sugarcane farming, and 58% of farmers are primarily involved in agricultural activities. In addition, key informant interviews were held to gather data about the supply chain system, the farmer organizations and the operational activities of Sewanagala Sugar Processing Industry. For this purpose, all managers, technical officers and field officers of the company and a president of the sugarcane farmer organization were interviewed. The collected data were analyzed with the descriptive statistical method. The productivity, production costs and income viability of the system were analyzed by comparing to the national level published data.

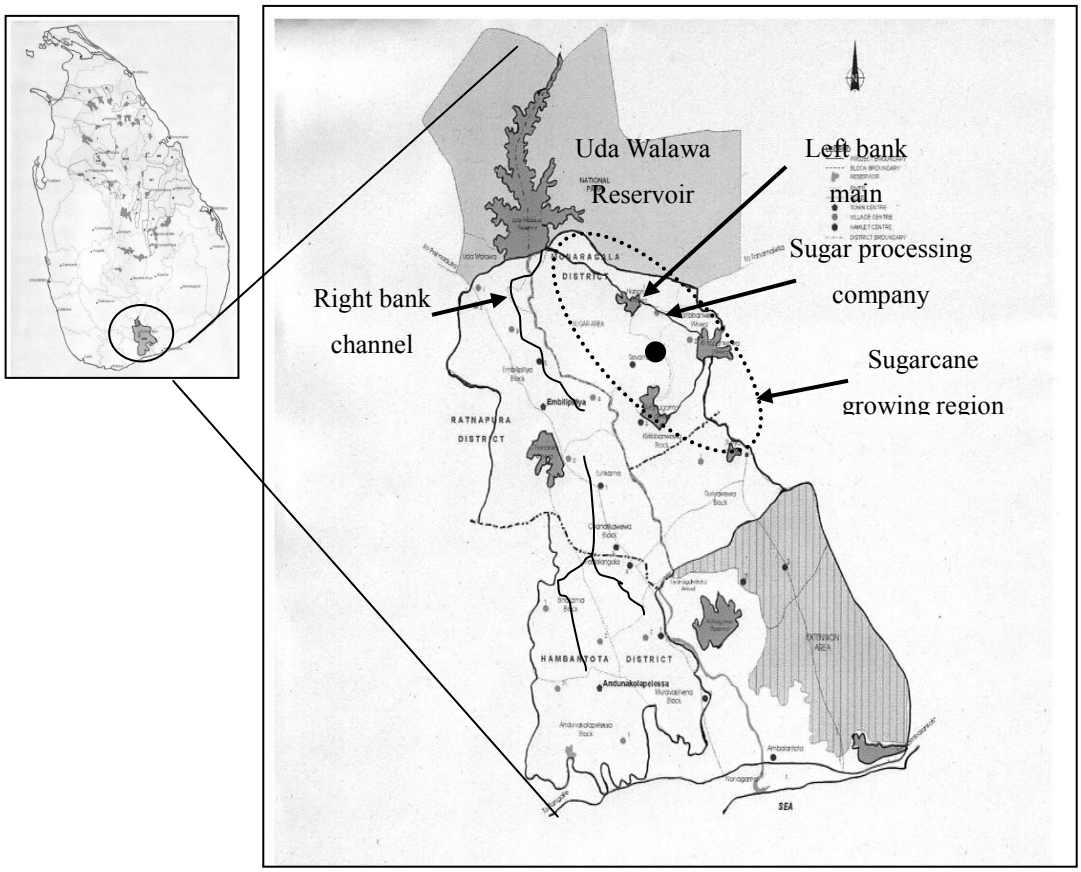

Figure 3-2 Map of the UWIS area and location of the sugar processing company and sugarcane growing region

Source: Field survey, 2008

3.3 Analysis and Results

3.3.1 Characteristics of the RRCS initiated by the sugar processing industry in the survey area

This section contains the results of analyzing the mechanism and characteristics of the RRCS initiated by the sugar sector in the survey area. Figure 3-3 illustrates how rural resources circulate among sugarcane farming and processing sectors. The sugar processing company includes the main processing sector, sub processing sector 1 and 2, water treatment plant, fertilizer plant and energy

plant. The key feature of the RRCS is that it depends solely on rural resources such as raw material (sugarcane, fertilizer, water and energy), land, and labor, among other factors, and it has no link to foreign material. Concerning land and water resources, the sugarcane fields and processing industry are located within the system, and thus, the water required for the sugarcane fields and processing sector is supplied by the left bank of the UWIS (see Figure 3-3, arrows (2)[1] & (2)[2]). Sugarcane, the basic raw material of the processing sector, is entirely supplied by the farmers based on an agreement between the farmers and the processing company.[20, 21] In this regard, the processing company is also legally bound to purchase the total sugarcane harvest of the farmers, while providing marketing intelligence and other information such as price and harvesting time, among others (see Figure 3-3, arrow (1)[1]). It is prohibited to cultivate other crops in the land distributed among the sugarcane farmers in the area. Farmer labor and other related services in the area, such as transportation facilities, are also

[20] Paragraphs 1 and 2 of the agreement between farmer and processor state: 1. land allocated to farmers to cultivate sugarcane cannot be used for other types of cultivation, and 2. farmers should provide the entire harvest to the company, which agrees to purchase the entire harvest of the farmer.

[21] Paragraphs 3 and 4 of the agreement between farmer and processor explain the services provided by the company in terms of sugarcane cultivation and the farmer's commitment with regard to the sugarcane cultivation in the distributed land. For example, the company provides large-scale machinery for land preparation at the farm level, chemicals at a subsidiary rate for weeding, water supply facilities, equipments for harvesting and facilities to transport the cane to the company. Financial facilities for farming activities are also supplied by the company conditional upon repayment through product supply. In addition, farm guidance on land preparation, water management, weed control, and harvesting methods, among others, is also supplied by the company.

utilized by the industry in the resources circulation system for the production of value-added products (see Figure 3-3, arrow (3)[1]). As shown in Table 3-1, 58.8% of agricultural land in the survey area has been used for sugarcane cultivation, and 41.6% of farm households are engaged in sugarcane farming. One hundred percent of the sugarcane harvest of the farmers is supplied to the company. Additionally, the sugar sector has provided a large number of direct and indirect employment opportunities for the people in the survey area (see Table 3-1).

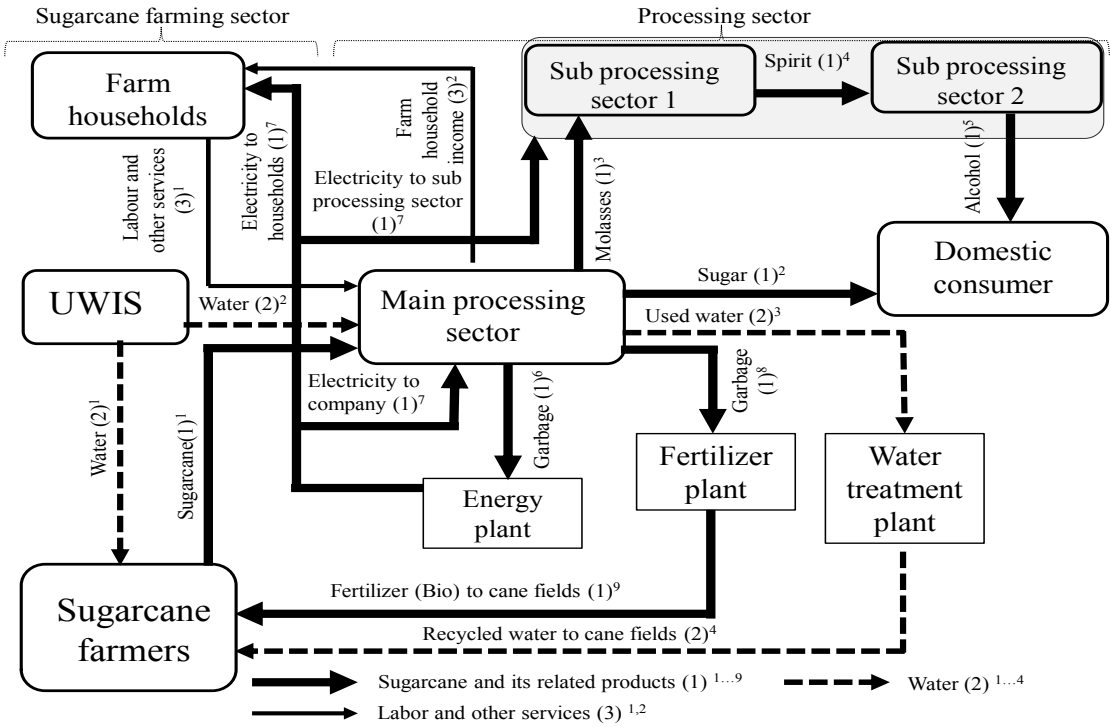

Figure 3-3 Schematic representation of the circulation of rural resources and their conversion into value-added products in the UWIS area

Source: Field survey of farm households and the sugar processing industry in the Sewanagala DS division, 2008

Notes:

(1) The degree of effects of the RRCS can be determined using several indicators of the system. For instance, annually, farmers provide approximately 265,000 tons of sugarcane to the company. The average price of sugarcane was Rs. 1,650 per ton during the surveyed period. Additionally, approximately 615 people were directly employed in the industry. In 2008, the company produced 20,000 tons of sugar, 9,120 tons of molasses and 2,597,630 liters of spirit. The spirit sale price was Rs. 77 per liter in 2004. The company produced 1.5 MV of electricity using the waste of sugarcane and approximately 1,500 tons of bio fertilizer annually in the surveyed year [Sri Lanka Sugarcane Research Institute (SLSRI), 2000-2010].

(2) The rupee (Rs.) is the Sri Lankan official currency. ¥1 = Rs. 0.89 (2008).

Figure 3-3 further illustrates that the main processing sector uses rural resources

to produce sugar as a main product (see Figure 3-3, arrow (1)[2]). The garbage (leaves of cane prior to processing and bagasse after the squeezing state) of main processing sector of the company are directed to the energy plant, facilitating the generation of electricity (see Figure 3-3, arrow (1)[6]). This electricity produced in the industry is mainly used for the sugar and alcohol processing systems of the industry and the sugarcane farm households in the area (approximately 800 households) (see Figure 3-3, arrow (1)[7]). Moreover, after the squeezing stage, garbage (mud) is directed to the fertilizer-producing plant to produce the organic fertilizer (see Figure 3-3, arrow (1)[8]). This produced fertilizer is supplied to the farmers with the goal of restoring and improving the field conditions (see Figure 3-3, arrow (1)[9]). Similarly, used water goes to the sugarcane fields after the recycling process at the water treatment plant (see Figure 3-3, arrows (2)[3] & (2)[4]). The molasses, the main by-product of sugar production, is used for spirit production and, subsequently, for alcohol production as a final product for domestic consumers (see Figure 3-3, arrows (1)[3], (1)[4] & (1)[5]). Finally, the circulation of rural resources among sugarcane farmers and the processing sector leads to a huge monetary stream to the rural sector with multiplier effects on the economy of the area (see Figure 3-3, arrow (3)[2]). Therefore, the RRCS can be identified as a rational system with a close relationship with rural resources. The important feature of this process is that it is leading to an economically viable and environmentally friendly resource circulation system. Thus, the matching between the material and the processing sectors in terms of sustainable resources circulation is a vital subject for the system.

Table 3-1 Role of the sugar sector in the survey area

Item	Number
Sugarcane land of total agricultural land (%)	58.8
Sugarcane farm household of total households (%)	41.6
Sugarcane supplied by each sugarcane farmer to the company (%)	100.0
Direct employment to the area by the company (%)	20.0
No. of direct employment opportunities provided by the company (in 2008)	615
No. of indirect employment opportunities provided by the company	Over 2000

Source: Field survey of sugarcane farm households and the processing industry in the Sewanagala DS division, 2008

3.3.2 Economic effects of the RRCS

3.3.2.1 Economic effects of the RRCS on the processing sector

According to the field survey results, the effects of the RRCS on the processing sector can be identified based on three important aspects of the system: location, resource reuse and value added, and relationship with farmers. First, the processing sector is located inside the main material base (4,000 ha of sugarcane and sufficient water resources) of the RRCS (see Figure 3-2 and 3-3). The proximity to inputs has made it convenient to obtain the raw materials and other resources (water, land, labor, etc.) at relatively low cost, resulting in relatively low transportation costs for the main material (sugarcane). According to the field survey, the average transportation cost per ton of sugarcane inside the system was Rs. 116, compared to Rs. 500 per ton outside the system (Sri Lanka Sugarcane Research Institute (SLSRI), 2000-2010). This resulted in a cost advantage of Rs. 384 per ton because the company solely depends on materials (265,000 ton per year) from inside the system (see Figure 3-3).

Second, the value-adding process of the RRCS yields a range of value-added

by-products such as molasses, spirit, and alcohol. The study revealed that 52.6% (Rs. 538 million) of the company income in 2008 was derived from these by-products and this income has showed an increasing trend (see Figure 3-5). For instance, the real income from the by-products has increased by 195% during the period from 2002 to 2008. During the same time, the spirit and molasses production of the company have increased by 18% and 16%, respectively (see Figure 3-4). In addition, the resource reuse process (bagasse and leaves) of the RRCS has enabled the company to generate 100% of its required energy. This energy self-reliance of the company has eliminated the need for alternative high-cost energy sources for needs such as lighting and heating. Additionally, it has eliminated the influence of price fluctuations of alternative energies: energy prices in Sri Lanka highly fluctuate in line with fluctuations of world market fossil fuel prices (Central Bank of Sri Lanka (CBSL), 1960-2012). Another waste of sugar processing, mud, is used to produce bio-fertilizer. The company annually produces 1,500 tons of bio-fertilizer and distributes it to the farmers free of cost. This environmentally and farmer-friendly method has been used as a market promotion strategy to increase demand for RRCS products, achieve a higher price and compete with imported sugar on the domestic market.[22] Third, the field survey revealed that the company has

[22] In this study, we did not identify free supply of bio-fertilizer to farmers as loses of income to the processing sector. Though the sugarcane farmers gain profit at the sacrifice of processor`s income, the processor uses it as a good strategy to collect high quality materials. This is one of conditions of the agreement between the farmers and processor. This strategy reduces the production cost of sugarcane farming and increases the supply of high quality materials to the processor. The production of high quality materials by the farmers cause to production of high quality products through

established a relationship with the farmers in various forms. These steps have assured that the farmers supply 100% of their material to the company (see Table 3-1).

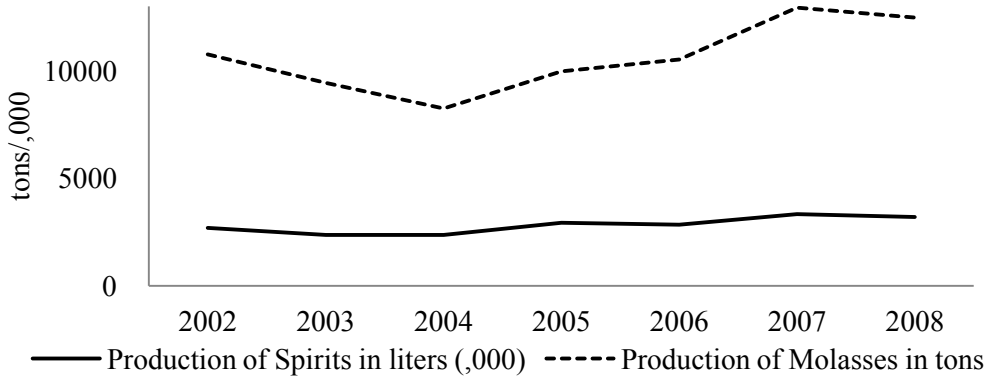

Figure 3-4 Trends of spirit and molasses production of Sevanagala Sugar Processing Industry, 2002-2008

Source: Sri Lanka Sugarcane Research Institute, Annual Reports, 2000-2008

Notes:

(1) Spirit and molasses production of each year was determined using 3-year average value.

(2) Declining trend of spirit and molasses production during the year 2003 and 2004 are mainly due to the huge decrease of main material, sugarcane, occurred due to the heavy drought.

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environmentally friendly and farmer friendly ways. The processor uses this provision as a strategy to get price advantages and enhance the product competitiveness in the domestics market. Therefore, this provision complements each other (farmers and processors).

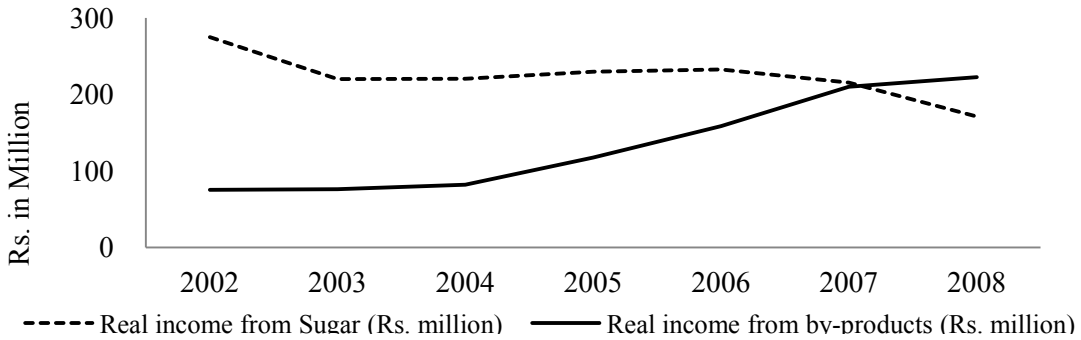

Figure 3-5 Trends of real income from sugar and by-products of Sevanagala Sugar Processing Industry, 2002-2008

Source: Sri Lanka Sugarcane Research Institute, Annual Reports, 2000-2008

Notes:

(1) Income from sugar and by-products of each year was determined using 3-year average value.

(2) The real income was calculated by adjusting for price fluctuations based on the GDP deflator (GDPD) in Sri Lanka.

3.3.2.2 Economic effects on the sugarcane farming sector

A) Economic effects on the comparative advantage of sugarcane farming under the system

Table 3-2 presents the distribution of available agricultural land for each surveyed farmer in the survey area, and it clearly shows that 77 out of 96 surveyed farmers have 2 to 3 acres of sugarcane land. Moreover, paddy farming takes place on a very limited area (mostly less than 1 acre), and it does not provide sufficient income, but is performed for self-sufficiency. Table 3-3 presents and compares the influence of sugarcane farming on the agricultural income of households, and it shows that 83.9% of farmers earn incomes of more than Rs. 40,000 from sugarcane farming. However, the agricultural income generated by paddy and banana cultivation is quite low, and only 7 (10%) and

6 (55%) of farmers earn incomes of more than Rs. 40,000 from paddy and banana, respectively. This shows that sugarcane farming provides a comparatively higher income, which certainly helps farmers at low-income levels. This finding is also important because most of the farmers (58%) are primarily involved in sugarcane farming and used to be encroachers in the area, who were supplying labor and implementing slash-and-burn cultivation.

Table 3-2 Distribution of agricultural land and the number of farmers in the selected survey area

Crop	Land size			
	0 Acre	0-1 Acre	1-2 Acre	2-3 Acre
Sugarcane	16	1	2	77
Paddy	10	81	0	0
Banana	78	11	0	2

Source: Field survey of farm households in the Sewanagala DS division, 2008

Note: There were five farmers in the surveyed sample who did not report their agricultural land size in terms of paddy and banana cultivation.

Table 3-3 Distribution of household agricultural income by major crops

Crop	Income group (Rs.)					Total number of responded farmers
	0-20,000	20,000-40,000	40,000-60,000	60,000-80,000	80,000<	
Sugarcane	6 (8%)	7 (9%)	34 (41%)	21 (26%)	13 (16%)	80
Paddy	26 (37%)	38 (53%)	7 (10%)	0 (0%)	0 (0%)	71
Banana	4 (36%)	1 (9%)	6 (55%)	0 (0%)	0 (0%)	11

Source: Field survey of farm households in the Sewanagala DS division, 2008

Note: Parentheses indicate percentage of responded farmers under each income group.

Table 3-4 evaluates the efficiency and profitability of sugarcane production in the RRCS. It shows that the production cost per ton of sugarcane is Rs. 884,

which is relatively low compared to the national average of Rs. 1,065 per ton of sugarcane (Sri Lanka Sugarcane Research Institute (SLSRI), 2000-2010). In this system, the company produces bio-fertilizer and distributes it to the farmers free of cost, reducing the cost of using chemical fertilizer on the sugarcane fields. As shown in Table 3-4, the imputed cost of bio-fertilizer, which was calculated based on the market price of substituted chemical fertilizer, is Rs. 3,326, corresponding to 55% of the total fertilizer cost of each farmer. It was previously analyzed that the processing company in the RRCS performs several functions to enhance farm productivity.[23] The empirical results of the surveyed year prove the high farm productivity of 62.5 ton per ha in the area, compared to the national average of 48 ton per ha (Central Bank of Sri Lanka (CBSL), 1960-2012). In addition, an interesting feature of the system is that farmers receive part of the value of a by-product, molasses, based on their level of sugarcane supply. During the surveyed cultivation year, the sugarcane farmers had earned Rs. 7,363 from the by-product of molasses, resulting in an increase in gross income from Rs. 103,125 to Rs. 110,488. By minimizing costs and maximizing income, the sugarcane farmers realized an income of Rs. 10,689 from the system, which is 22.4% higher than the net income per ton that excluded the benefits from bio-fertilizer application and by-products (see Table 3-4).

[23] This study highlighted the several important characteristics of the system related to increase the farm productivity. They are supply of bio-fertilizer to the farmers freely based on the amount of farm productivity, allocation of value of by-products (molasses) based on the amount of sugarcane supply and supply of technical guidance, credit provisions at subsidiary interest rate and other inputs.

Table 3-4 Average cost and income of sugarcane cultivation (per ha): 2008

	Variable		Mean value (Rs.)	Min.	Max.	Sta. Dev.
Cost	Land preparation		12,158	10,000	14,520	560.1
	Planting		8,842	7,800	9,400	450.9
	Weeding		5,526	5,200	5,950	388.9
	Fertilizer - Bio-fertilizer		3,326	2,750	4,200	258.1
	- Chemical fertilizer		2,753	2,050	3,400	388.5
	Irrigation		4,421	3,750	5,100	132.1
	Harvesting, loading and transportation		16,579	14,500	18,800	1,276.3
	Other costs		1,658	1,250	1,800	176.5
Cost per ton	Total sugarcane production cost	(a)	55,263	50,520	61,255	1,949.1
	Average production (ton per ha)	(b)	62.5	55	75	4.8
	Production cost per ton of sugarcane	(c = a/b)	884	866	912	13.3
Gross income	Price per ton of sugarcane	(d)	1,650	1,650	1,650	0
	Total gross income from sugarcane supply	(e = b*d)	103,125	90,750	123,750	5,853.4
	Income from by-products	(f)	7,363	6,728	7,412	182.7
	Total gross income from sugarcane farming	(e + f)	110,488	97,478	131,162	6,134.2
Net income per ton	Net income per ton of sugarcane (including cost of bio-fertilizer and excluding income from by-products)		766	731	833	26.4
	Net income per ton of sugarcane (excluding cost of bio-fertilizer and including income from by-products)		936	918	1087	30.1

Source: Data were supplied by 80 sugarcane farm households in the Sewanagala DS division, 2008.

Notes:

(1) In terms of apportioning data on cost of sugarcane cultivation, I used annual cost and income statement (balance sheet) which was given to each farmer by the company. In addition, I collected the data on hired and family labor usage and any other cost incurred to farmers through the farmer interviews.

(2) The economic value of bio-fertilizer was calculated based on the market price of substitute chemical fertilizer. The farmers reported two

types of chemical fertilizers issued by the company: Basel "B" fertilizer (prepared using urea, triple phosphate and muriate of potash) and Ammonia fertilizer. On average, the farmers have purchased Basel "B" fertilizer and Ammonia fertilizer at Rs. 13.75 per/kg and 12.25 per/kg, respectively at the time of survey. The company has recommended 300 kg and 200 kg of Basel "B" fertilizer and Ammonia fertilizer per ha, respectively. The imputed cost of bio-fertilizer was calculated by taking into account the prices of these two fertilizers and reduced amount of these fertilizers from the recommended level due to application of bio-fertilizer. Applied amount of bio-fertilizer per ha is different from farmer to farmer because of different conditions of sugarcane land in terms of soil, location, seed type, cultivation techniques etc.

(3) The national average data on sugarcane farming in the surveyed year: 1) Average production per hectare = 48 ton, 2) Sugarcane price = Rs. 1,650 per ton.

(4) To calculate production costs, I included the imputed cost of family labor. The imputed cost of family labor used is the prevailing agricultural wage rate at the time of the survey in the survey area.

(5) Other cost includes the interest of loan received for sugarcane cultivation (maintenance of cultivation, seed, fertilizer, weedicides, land preparation etc.), land rent, irrigation and operational cost, and overhead cost.

(6) There is no variation in sugarcane price due to the contracted price between the farmers and the company (see End Note 8).

(7) Net income per ton of sugarcane was estimated under two criterions: 1) excluding and 2) including the benefits from the system with regard to bio-fertilizer and by-products.

(8) The rupee (Rs.) is the Sri Lankan official currency. ¥ 1 = Rs. 0.89 (2008).

At the initial stage of the system in the area, all the farmers were poor. The reason is that the farmer settlement under the sugar development program gave priority for the poor. By taking into account this initial condition of the farmers, the study analysis poverty and employment situation among them by using farmer survey data. In addition to the income from sugarcane farming, the RRCS is an important working place for the farm households. First, according to the survey data, 88.7% of the sugarcane farm households benefit from the system by earning labor income in addition to farming income. Second, 72.5% of farmers (58 out of 80 farmers) had been able to move out of the poverty. Specifically, these all farmers were bellow the poverty line at the initial stage of the system. The number of farmers above the poverty line is high among farmers who receive labor income from the system. Table 3-5 shows that 55 out of 71 farmers are above the poverty line, which corresponds to 77.4%. In contrast, only 33.3% of farmers (3 farmers) who are involved in farming only are above the poverty line. Third, the labor income of Rs. 36,379 of the farmers above the poverty line is high compared to Rs. 24,690 earned by the poor in the same category. The reported 16 poor farmers (22.2%), who receive benefits from both farming and labor supply to the system, have also high possibility to move out of poverty since still they have relationship with the system in terms of labor supply. Fourth, Table 3-5 further shows that selling quantity of sugarcane is higher among the farmers above the poverty line. It indicates the direct contribution of sugarcane farming to household income and thereby reduce the poverty. Therefore, the results proved the positive effects of the system in terms of labor income for the majority of the farmers, poverty reduction and the income

situation among the farm households. However, the study found 6 out of 80 farmers who have the problem in terms of poverty.

Table 3-5 Summery of the farm households' labor supply, income and poverty situation

Sugarcane farmer classification	No. of farmers	No. of farmers	Ave. sugarcane production quantity (tons)	Average agri. Income (Rs.)	Income from employment activities in the system (Rs.)	Other income (Rs.)	Total income (Rs.)
Farming + labor supply to the system	71 (88.7%)	Above the poverty line = 55 (77.4%)	45.3	82,948	36,379	46,224	165,551
		Below the poverty line = 16 (22.5%)	34.4	61,768	24,690	19,936	106,394
Farming only	9 (11.3%)	Above the poverty line = 3 (33.3%)	42.3	73,156	-	46,480	119,636
		Below the poverty line = 6 (66.6%)	36.9	62,530	-	19,576	82,106

Source: Data were supplied by 80 sugarcane farm households in the Sewanagala DS division.

Notes:

(1) The income group was determined based on the official poverty line in the survey district, which was Rs. 114,636 in the surveyed year (DCS, 2010).

(2) Type of employment activities in the system: direct and indirect employment at the processing company, employment on the sugarcane fields, employment activities related to other services, etc.

(3) Other income includes income derived from off-farm activities in outside the system such as government employments, employments in garment factories, self-employment activities, etc.

(4) Labor income received by each worker from the system is different due to difference of number of working days and difference of salaries because of different types of employment activities in the system.

(5) In parentheses are percentages.

B) Economic effects on household's economic and living conditions

In this section, we assess the long-term effects of the RRCS on farm household economic and living conditions. Table 3-6 shows that the sugarcane farmers have been able to receive long-term economic benefits from supplying material under the agreement between the farmers and the processing company. The main effect is that the agreement with a fixed price between the farmers and the company has ensured a stable market for the farmers' main agricultural products. According to the agreement, the company is legally bound to purchase the entire harvest at a fixed price and price is subjected to annual revision. Almost all of the surveyed farmers indicated that other crops (banana, papaya and other minor crops) grown in areas such as paddy fields do not have such a regular market with a guaranteed or fixed price. The prices of other crops tend to be much lower during the harvesting period, creating severe financial hardship for farmers. However, this secured market created for the farmers by the RRCS has improved the agricultural income of farm households (see Table 3-6). Figure 3-6 further proves that the fixed nominal price of sugarcane per ton under the agreement has increased annually since 1987. It has also minimized the uncertainty of agricultural income, which is mostly affected by market fluctuations, post-harvest losses due to the delay in acceptance of materials, and non-harvest at the maturity period. Farmers also reported the reduction of post-harvest losses thanks to specific harvesting-time information as another important benefit. Therefore, farmers have been able to avoid delays in supplying sugarcane after harvesting without affecting the weight of the sugarcane.

Table 3-6 Material supply to the processor from the perspective of the farmers

Item	Rank	Mean score	Sta. Dev.
Stable market for main agricultural products	1	1.181	0.052
Increase and stabilize the farm household agricultural income	2	1.555	0.175
Reduce the post-harvest losses	3	2.133	0.133

Source: Data were supplied by 80 sugarcane farm households in the Sewanagala DS division, 2008.

Note: Ranking from 1 (most important) to 5 (least important).

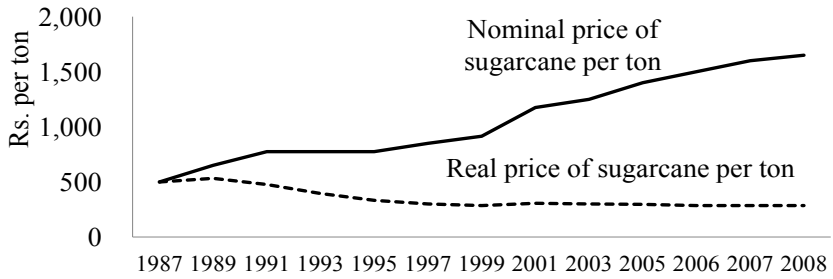

Figure 3-6 Trend of contracted nominal price of sugarcane per ton and its real value, 1987-2008

Source: Sri Lanka Sugarcane Research Institute, Annual reports

Note: The real value of sugarcane per ton was calculated by adjusting for price fluctuations based on the GDP deflator (GDPD) in Sri Lanka.

Table 3-7 shows the impact of the RRCS on the living conditions of farm households. Eighty-two percent of surveyed farmers reported that the improved living standard of households was due to the long-term, stable supply of raw materials (sugarcane) and other related services. Because of changes in living conditions, 89% and 88% of farm households have been able to improve their housing condition and the education of their children, respectively (see Table 3-8). In particular, stable economic conditions have led to an increase in food

accessibility for poor households, while reducing indebtedness. For instance, 43% of households have been able to increase the amount spent on food; previously, they were deprived of food accessibility due to their low income. Therefore, the long-existing RRCS in the area has improved the living conditions of the farmers in multiple ways.

Table 3-7 Changes of household living condition

Condition	No. of farmers (N=80)	%
Improved	66	82
Not improved	10	12
Declined	4	6

Source: Data were supplied by 80 sugarcane farm households in the Sewanagala DS division, 2008

Table 3-8 Elements of improved changes in household living conditions

Item	%
Improved the house condition	89
Improved the education of their children	88
Stabilized the household income	81
Reduced the debt burden	48
Increased the household food security	43
Increased the household savings	25
Purchased new assets	22

Source: Data were supplied by 80 sugarcane farm households in the Sewanagala DS division, 2008

3.3.3 Current problems facing the resources circulation system

The main current problem in the system is the non-availability of materials at the off-season for the year round functioning of the system. Approximately six month lengthy off-season has constricted the production of sugar, which is the main product of the system, and employment opportunities at the system. Alcohol,

energy, fertilizer and water treatment plants continue their production during the off-season, but material supply problem negatively affects employment, value-added products and income. According to the field survey, farmers supply material once a year, and the company is managing the field in the area for two harvesting seasons, from February to April and from August to October.

The main reasons for non-availability of materials for the year round functioning of the system are decline of sugarcane cultivated area, decline of number of sugarcane farmers, productivity problems and very short two harvesting seasons. For instance sugarcane cultivation area has declined from by 28.2% during the period from 1995 to 2008. At the same time, number of sugarcane farmers has decreased 21.2% (Sri Lanka Sugarcane Research Institute (SLSRI), 2000-2010). The field observations also confirmed that some farmers have reduced or abandoned the area of sugarcane cultivation. Empirical data showed that during the surveyed year, the company's material utilization capacity was at approximately 60%.

These problems are mainly associates with low farm gate price. The analysis of time series data of the sugarcane farm-gate price shows that although the nominal value of the farm-gate price per ton of sugarcane has increased from Rs. 500 to Rs. 1,650 (230%), the real value has declined by 52% between 1987 and 2008 (see Figure 3-6). Moreover, a perusal of farmers' views on the constraints of sugarcane production revealed that 90% of farmers face the problem of low farm-gate prices (see Table 3-9).

Table 3-9 Constraints of sugarcane production from the perspective of sugarcane farmers

Constraint	No. of farmers (N=80)	% of farmers
Low price for sugarcane	72	90
Increasing cost of production	61	76
Lack of labor at the peak time	51	64
Resistance to crop diversification	43	54
Lack of training and knowledge of new field management techniques	30	38
Environmental issues	09	11

Source: Data were supplied by 80 sugarcane farm households in the Sewanagala DS division, 2008

The study found two reasons for low farm gate price per ton of sugarcane in the area. First, even though there are sugarcane farmer organizations in the survey area, annual fixed price (contracted price) is exclusively determined by the company. This indicates that there is no farm gate price negotiation system between the farmer organizations and the company. Second, from a company perspective, processors cannot obtain a better selling price, which results in an inability to pay high prices for raw material. The main cause is that imported cheap sugar has dominated the domestic market since 1995. This period marked an accelerated restructuring process in the sugar sector under economic liberalization policies and as per rules established by the WTO in the international trade. At the surveyed year, 265,000 tons of sugarcane (52% of total sugarcane production of the country) was produced in the survey area. This sugarcane production in the area only accounted for 2.7% of the country`s annual national demand for sugar.

3.4 Conclusion and Considerations

This study has examined the RRCS initiated by the sugar sector in Sri Lanka in order to reveal the significance and development conditions of the system. Through the analysis of empirical data, this study has shown the economic rationality of the RRCS in an environment of economic liberalization in Sri Lanka. The conclusions drawn from the analysis are as follows.

First, the system has potential of circulation of local resources effectively without depending upon the external imported resources. It indicates that the system does not have link with the international competition in terms of production of sugar and related products. The system depends entirely on resources from the area such as raw materials (sugarcane, water and energy), land and labor. Diversification of production system and more value-added steps based on a single and the most adaptable crop (sugarcane) to the natural features of the area are important characteristics of the company. The company has been able to strengthen its economic condition, thanks to a diversified production system and the internal conversion of resources into different value-added products. It has led to a minimal dependency on external resources such as energy for the company and fertilizer for the farmers. Second, the RRCS has important economic impacts on the processing and sugarcane farming sectors. Specifically, the study proved the economic impacts of the system in terms of comparative advantage of sugarcane farming (cost and income), employment opportunities for local people, poverty alleviation in sugarcane

growing areas and improvement of household living condition in long term. The results showed that the sugarcane farming in the RRCS has economic advantages compared to sugarcane farming outside the system in terms of land and water utilization. (1) It enables lower production costs and a higher net income per unit of output. The study revealed production costs of Rs. 884 per unit of output (ton), which is low compared to the national average of Rs. 1,065 per ton in the surveyed year (Sri Lanka Sugarcane Research Institute (SLSRI), 2000-2010). (2) The attributed factors are a relatively high sugarcane production per ha and a high production efficiency, supported by the system. (3) Under the system, the farmers have been able to increase their net income per ton of sugarcane by 22%, from Rs. 766 to Rs. 936. The farmers have been able to reduce their production costs with the use of bio-fertilizer, which is produced by the company from processing waste, and increase their income with revenue from the by-product (molasses). For the company, providing this product does not signify a loss. It uses this environmentally and farmer-friendly method as a strategy to obtain quality material from farmers and to produce high-quality products, which it can sell on the domestic market for a high price. Additionally, the system positively affects the labor income of the majority of the sugarcane farmers, and thus, it reduces the poverty and improves the income situation of the sugarcane farm households. According to the farmers' view on the material supply, the strong relationship between the farmers and the processor in the RRCS resulted in a secure and stable market for sugarcane, which reduced price uncertainty and post-harvest losses. In the system, 82% of farmer households have been able to upgrade their living conditions due to the

long-term supply of materials and labor services to the processing sector. Third, the non-availability of materials at the off-season is a main stumbling block to an improved year-round functioning of the system in terms of producing sugar, related by-products, fertilizer and energy, and the working opportunities for the people in the area. Currently, there is approximately six month lengthy off-season. The reasons for material supply problem for the year round functioning of the system are decline of sugarcane cultivated area, decline of number of sugarcane farmers, productivity problems and very short two harvesting periods. The study confirmed that the low farm gate price as a main cause of above reasons. Specifically a smaller market for final products of the system and non-availability of price negotiation system between the farmers and the company has resulted in a lower farm gate price per ton of sugarcane.

In order to overcome the problem of current material supply, the study recommends following developing conditions to the system. First, the farm gate price should be determined through a negotiation system between the farmer organizations and the company. The agents of the farmer organizations in the negotiation system would be appointed in a democratic way and they would have sufficient knowledge about the production costs of sugarcane cultivation and living cost in the area. Second, as a precondition to sustain the system, it would be necessary for the government to establish a special market for final products on the domestic market. The target of this special market would be consumers who can realize the consequences of buying cheep imported sugar on the domestic market. Those consumers would be able to realize that the

consumer demands on imported sugar have a negative impact on a large number of concerned traders, a more value-added system, rural labor market of more than hundred thousands and poverty alleviation, among other factors, in Sri Lanka. In this connection, the government should inform and persuade those consumers through explaining important content of its products. For example, information about the producer (rural farmers and local industry), production method (using environmentally friendly) and type of materials (from the most adaptable crop to the natural features of the area) is important. It is essential to explain the social function of the processor in terms of its contribution to the local labor market, poverty alleviation, utilization of rural resources and importance to the value-added system. On the other side, the company should aware of a difference of consumption in domestic market. Based on those information, the company should search the market space and the channel. Third, the government should invest in the processing sector of the RRCS and aim to increase product demand on the domestic market. The increased demand for the final products leads to an increase in the supply of raw materials and labor services by the farmers in the system. Doing so will activate all the functions of the system and expands the benefits to the farmers.

Chapter 4 : Sustainability of Resources: Dairy Sector Dual Circulation System under Market Liberalization: A Case Study of the Dairy Sector in the Kurunegala District, Sri Lanka

4.1 Introduction

The dairy sector in Sri Lanka has historically played multiple roles in rural areas, where 72% of the total population lives. Today, the sector accounts for 6.5% of the country`s agricultural GDP while producing 220 million liters annually (Central Bank of Sri Lanka (CBSL), 1960-2012). The annual per capita consumption of milk is 36 kg (Department of Census and Statistics , 2010), which is marginally higher than the rate in developing countries (32.9 kg) and close to the Medical Research Institute recommended level (41.6 kg) (Ibrahim, et al., 1999). The total number of dairy farms is 196,346 (Department of Census and Statistics , 2010), and 99% of the dairy farmers are smallholders (Abegunawardene, et al., 1997). Farmers owning less than 1 hectare (ha) keep 45% of the country`s cattle and 37% of the country`s buffalo. Approximately 12.6% of farm households in the local area, which are mostly poor,[24] are primarily dependent on dairy farming (Department of Census and Statistics , 2010). There are approximately 400,000 dairy farmers receiving daily income from dairy farming, and 2.45 million people (70% of the estimated number who are livestock dependent) earn their livelihoods in the dairy sector (Silva, et al., 2010). A considerable number of the

[24] The persons living in the households whose real per capita monthly total consumption expenditure was below Rs. 3,307 in the year 2010 in Sri Lanka are considered poor (Department of Census and Statistics , 2010).

total households produce milk-related products as a cottage industry within the economy. Moreover, this sector plays a key role in feeding infants and alleviating nutritional poverty in all other age groups (Alwis, et al., 2009). Additionally, the household expenditure data suggest a positive expenditure elasticity (1.17) of demand for milk and milk products (Ibrahim, et al., 1999) while indicating the important opportunities for domestic producers to increase their production. Therefore, the contribution of this sector for people residing in the countryside in terms of increasing household dietary intake, alleviating household nutritional and income poverty, and generating gainful income and employment opportunities is significant.

Although the dairy sector undoubtedly plays a major role in several aspects of people's lives and the economy, an adequate increase in milk production to satisfy the rapidly growing demand has not occurred since 1977. This is mainly due to the liberalization of the import market of milk and milk products in 1977 (Gajanayake, 2004) and a commitment since 1995 to meet the regulations of the World Trade Organization (WTO). The market liberalization policies were aimed to achieve the seemingly paradoxical objectives of protecting the welfare gains of both milk consumers and producers. Imported milk powder has been quite controversial as it is subjected to low tariff measures in order to keep consumer prices low. The increase in the tariff is unlikely caused by commitment to the WTO (Ranaweera, 2007). The milk powder is also designated as an essential food item by the government of Sri Lanka. The worsening condition of the dairy sector is reflected by the increasing trend in imports, the decreasing

trend in domestic raw milk production and the self-sufficiency ratio of milk and milk products (see Figure 4.1). For instance, during the period from 1977 to 2010, the level of imported powdered milk increased by 499%, from 9,508 Mt to 56,995 Mt (Department of Census and Statistics , 2010). Simultaneously, domestic milk production declined by 19%; thus the self-sufficiency ratio declined from 80% to 17%. The lower cost of milk and milk product imports is making farmers reluctant to continuing dairy farming due to the difficulties in deriving an income that is sufficient to cover the production cost (Gajanayake, 2004). Today, 75% of the formal sector milk market[25] is controlled by a few large scale companies with monopolistic practices (Ranaweera, 2007; Perera & Jayasuriya, 2008). This situation has put the livelihoods of 2.45 million people (including dependents) who are mostly poor and smallholder dairy farmers in jeopardy because there is a high risk of smallholders giving up dairy farming due to the insufficient income of dairy farming, which cannot cover the production cost. This would adversely affect the dairy farmer`s primary and supplementary income sources. Additionally, it has increased the burden on the country`s food import bill. Currently, the import of milk and milk products accounts for 18.7% of the country`s total food import bill, second only to sugar (Central Bank of Sri Lanka (CBSL), 1960-2012). Thus, raising the domestic milk production by protecting the farmers has become a priority of the government. To address these major problems facing the dairy sector, Sri Lanka must identify a sustainable dairy

[25] The formal sector market consists of the milk collecting network of MILCO, Nestle, Rich Life, Kothmale, Cargills, Fontera and a few other companies. The informal sector market consists of a large number of small producers producing yogurt and curd and selling unprocessed raw milk directly to consumers.

farming system that can derive sufficient economic benefits for the farmers in Sri Lanka.

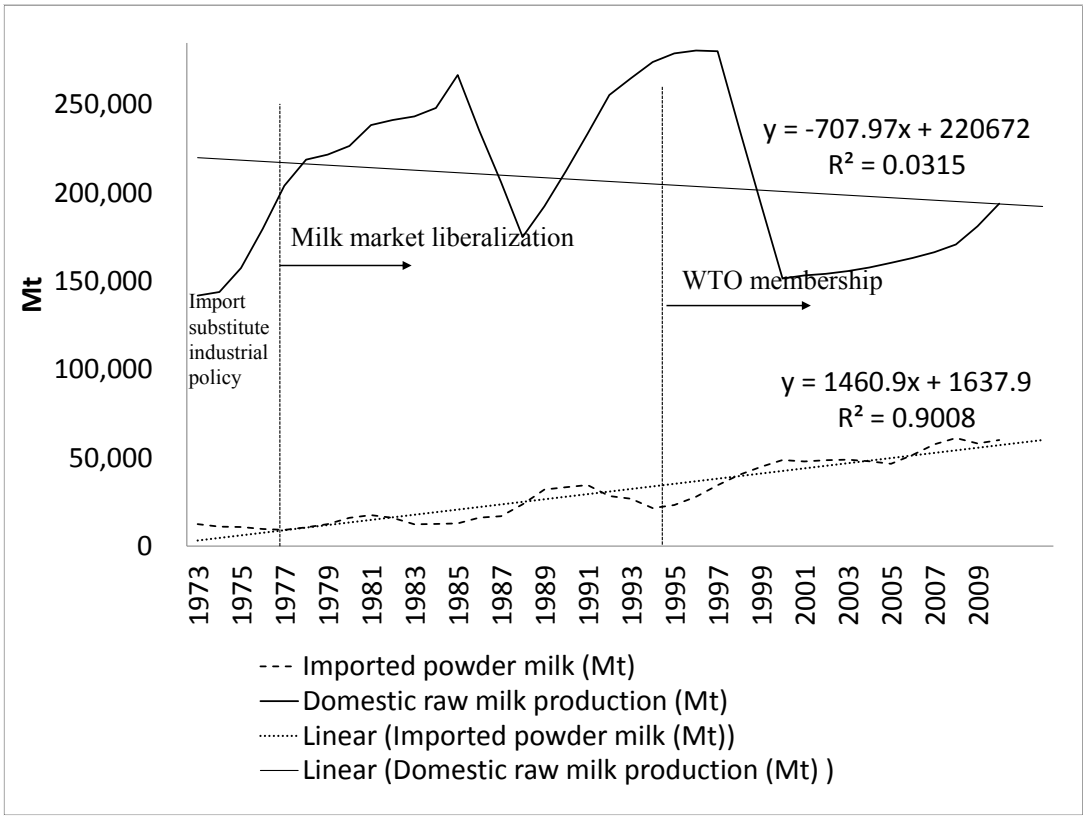

Figure 4-1Trends of domestic raw milk production and imported milk: 1971-2010

Source: Department of Census and Statistics, Sri Lanka

The existing literature provides rather mixed evidence about the current problems of Sri Lanka`s dairy sector. Many studies have cited the low returns of dairy farming due to the high cost of production, low farm gate price[26], marketing issues, small farm size, technical inefficiency, lack of new technology, and issues in genetic upgrading and veterinary health care (Abegunawardene,

[26] The farm gate price of the raw milk is the price that is available at the farm, excluding any separately billed transport or delivery charge.

et al., 1997; Maheepala, 2002; Nawarathna, 2002; Gajanayake, 2004; Ranaweera, 2007; Edhirisinghe, et al., 2008; Perera & Jayasuriya, 2008). Some studies have examined dairy farming as an agricultural diversification method (Amaratunga, et al., 2001) and have given special emphasis to milk- and vegetable-based farming systems (Maheepala, 2002). According to (Gajanayake, 2004), the import market liberalization of milk and milk products has adversely affected the domestic milk production. In this context, (Abegunawardene, et al., 1997) emphasized that revitalizing the Sri Lankan dairy sector is a formidable challenge faced by scientists, development workers and farmers. The bulk of literature on the Sri Lankan dairy sector further indicates that careful analyses focused on identifying a sustainable system to revitalize Sri Lanka`s dairy sector have not been sufficiently documented on empirical grounds (Amaratunga, et al., 2001; Gajanayake, 2004; Perera & Jayasuriya, 2008; Ibrahim, et al., 1999).

In this context, the acceptability of a sustainable system of dairy production in Sri Lanka will largely depend on its ability to create acceptable levels of stable production and generate stable and profitable farm income. There is evidence of positive economic benefits to be gained by integrating both dairy and crops with sustainable agriculture (Thomas & Sumberg, 1995; Thelma, 2002). However, farm income stability and profitability will also be critical for the sustainability of dairy farming, as 99% of dairy farmers are categorized as smallholders in Sri Lanka (Abegunawardene, et al., 1997). Therefore, dairy farm conditions at the farm level and the local economy level become important.

Given this backdrop, this study hypothesizes that the Resources Dual Circulation System (RDCS) would be a suitable method for revitalizing the Sri Lankan dairy sector in the post-liberalization period because RDCS takes into account the factors at the farm and local economy levels. The RDCS includes dual circulations. First, it circulates the resources by means of farm management to decrease the cost and increase the income and labor utilization in dairy-crop farming in the farmer-level. Second, it circulates resources, such as local raw milk, local labor and local capital, by means of a Non-integrated Local Independent Supply Chain (Non-integrated LISC) system in the local economy-level.[27],[28] The history of the RDCS goes back to the 1970s and 1980s.[29] This system was

[27] The terms "*RDCS*" and "*Non-integrated LISC*" have not been used in the literature. In this study, we adopted our own definition for these terms based on the specific characteristics of Sri Lanka`s dairy sector that have emerged from the bottom-up, specifically during the period of 1970-77. During this period, Sri Lanka adopted stringent import control to achieve self-sufficiency in milk and to protect the local milk-based marketing, processing and distribution systems (Central Bank of Sri Lanka (CBSL), 1960-2012; Food and Agriculture Organization, 1977). The *Non-integrated LISC* is essentially included in the *RDCS*.

[28] In the milk marketing structure of Sri Lanka, a noteworthy *Non-integrated LISC,* which consists of local farmers, local collectors (dairy cooperative societies and village-level collectors), local processors, local wholesalers and local retailers, has existed historically. They are independent in terms of capital and functions. This system originated in a period that experienced an import substitute industrial policy in Sri Lanka (see Figure 1).

[29] The encouraging environment that resulted from the stringent import control promoted the dairy farmers into adopting an *RDCS*. Initially, the *RDCS* that emerged was bottom-up with regard to the dairy farmers. Then, in the late 1970s and early 1980s, many dairy development projects, such as the International Scheme for Coordination in Dairy Development, the Agricultural Diversification of Uneconomic Tea and Rubber Land, and the Mid-Country Livestock Development Scheme, supported the

designed to promote local economic development through the proper utilization of local resources (animal feed, cow dung and other farm residues, labor, local land and local capital). The main goals behind the establishment of the RDCS were twofold. The first goal was to reduce the production cost and minimize the living cost by using farm-level animal feed, organic fertilizer and biogas, which would provide year-round working opportunities for the local people, utilize family labor effectively and result in the profitability of raw milk marketing by reducing the raw milk shipping and storage costs. The second goal was to provide employment opportunities for local people in the local processing industries; provide a better market for the local processors to sell fresh, cheap raw milk by shortening the transport distance and lowering transportation and storage costs; create value addition for the local processors, wholesalers and retailers; create agribusiness opportunities in the local area; and revitalize commercial transactions by securing a cash income for the people in the local areas. By taking into account these specific goals of the local dairy sector, this research identifies and assesses the Resources Dual Circulation System as a means to revitalize the domestic dairy sector in the post-liberalization period. The study addresses three aspects: the characteristics of the RDCS of the dairy sector; the assessment of the production and income viabilities of the system; and the role of Non-integrated LISC in the RDCS and the opportunities to use Non-integrated LISC to promote the development of the dairy sector.

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development of these dual aspects of local resource circulation (Food and Agriculture Organization, 1977; Food and Agriculture Organization, 1980; Essers, 1987).

4.2 Materials and Methods

4.2.1 Reasons for Selecting the Study Area

This research was carried out in the Kurunegala district in Sri Lanka during March 2011. The Kurunegala district was selected for several reasons: (i) This district accounts for 18% (210,540 liters) of the total milk production, 11.7% (136,530 cattle) of the total cattle population and 13.9% (27,791 dairy farms) of the total number of dairy farms, which are the highest percentages recorded in a single district (Department of Census and Statistics , 2010). (ii) It was observed that there were two types of dairy farming systems practiced in the area: the RDCS of the dairy sector and a more conventional system. Specially, this district was largely influenced by the major dairy development project named the "Sri Lanka Dairy Development Project", which was initiated by the government with the assistance of the FAO in the 1980s. This project was designed to improve farmer income in the Coconut Triangle area by implementing an alternative to agri-monoculture consisting of the systematic integration of livestock into a farming system (Amaratunga, et al., 2001). This project was funded under the International Scheme for Coordination in Dairy Development. When the RDCS was established, all of the conditions faced by dairy farmers were the same with regard to management scale and the number of cows in the survey area. (iii) Today, there are many small- and medium-scale Non-integrated LISC participants working in milk marketing and processing within the dairy sector of the Kurunegala district and competing against large-scale companies, such as Nestle and Milco. Particularly, these large-scale companies are integrated in terms of capital and functions, and their process is characterized by

capital-intensive and large-scale manufacturing. The smallholder dairy farmers process small amounts of their produced raw milk with the intention of fulfilling the household demand for milk and milk products. (iv) Additionally, the Kurunegala district is located near the capital city (Colombo) and surrounds a district that includes several large cities, such as Gamapaha, Kandy and Kegalle. The dairy sector in this district has better market potential for its dairy products compared to other districts in the country because the largest markets for dairy products are located in the capital city and the other main cities due to the high population, urbanization and income in this area. In other districts, the relatively large distance to the main market has created a market access problem for dairy farmers.[30] These reasons explain the high density of the dairy farmers in the Kurunegala district who practice both the RDCS and the conventional system; therefore, it is believed that this district is a good location for this research.

4.2.2 Sampling Strategy, Data Collection and Method of Analysis

Dairy farmers and participants in the milk marketing system in the Ganewaththa DS division of the Kurunegala district were selected to participate in the farmer survey and marketing survey, respectively. Most of the farmers in this area began to practice dairy farming with the integrated management of dairy animals and crops due to the influence of projects such as the Sri Lanka Dairy

[30] In some dry zones where the production densities are low, the distance to market adversely affects the market access. In areas where the production densities are high, numerous agencies have built facilities to improve the market access (Ibrahim, et al., 1999).

Development Project as well as some national and local government-initiated dairy development projects. Their main marketing source consists of the Non-integrated LISC participants, which include local collectors (dairy producer cooperative societies and village level milk collectors), local processors, local wholesalers and local retailers. The participants in each stage of the Non-integrated LISC system are independent in terms of capital and functions. This system has good linkages with local raw materials, labor, value additions and marketing based on its unique relationship with the local area. The study first considered the integrated resource management technique of the farmers at the farm level and the dependency on the Non-integrated LISC system by the farmers in the local economy level as parameters relevant to identifying the farmers in the RDCS. The main parameters adopted to identify the farmers in the conventional system were the non-integrated resource management technique at the farm level and the farmers' dependency on the integrated supply chain system for their raw milk marketing at the local economy level. The processed data demonstrate a clear distinction between farmers in the RDCS and those in the conventional system (see Table 4.1). Therefore, to facilitate a more informative analysis, the farmers in the area were categorized into two groups: (i) related farmers in the RDCS of the dairy sector; and (ii) other farmers in the conventional system.

Table 4-1 Basic characteristics of farmers in each system: RDCS vs. the conventional system

Farming characteristics	Related farmers (%)	Other farmers (%)
Integrated dairy-crop farming	100	14
Utilization of both milk and manure	93	14
Availability of a cow shed	73	22
Usage of stall feeding	85	11
Collection and storage of manure	97	17
Selling of raw milk to the Non-integrated LISC	90	22

Source: Survey of dairy farm households in the Kurunegala District, March 2011.

Note: At the surveyed time, there were 5 dairy farmers in the other farmers group who practice the integrated dairy-crop farming but selling raw milk to an agent of large-scale companies. Six and 8 dairy farmers in related and other farmers group respectively were selling their marketable raw milk production to both marketing sources.

At the time of the survey, the dairy farmer population size in the survey area was 155, which included 97 related farmers and 58 other farmers. From the total population, a sample of 96 dairy farmers, including 60 related farmers and 36 other farmers, was chosen using a stratified sampling technique. Farmers in each sub-sample were randomly selected. Both farmer groups represent approximately 62% of the dairy farmers in each group in the survey area. In addition to the farmer survey, a survey of the participants in the milk marketing system, including both Non-integrated LISC participants and integrated supply chain participants, was conducted simultaneously. The survey involved 36 milk processors, including 11 small-, 19 medium- and 6 large-scale processors. The milk processors, who added value to the raw milk by producing final products such as yogurt, curd, ice cream, milk sweets and other milk-based products, were randomly selected for the survey. The survey also included 8 village-level

assemblers, including 3 agents of large-scale companies and 3 dairy cooperative societies.

The sustainability of the RDCS was analyzed using the following criteria. First, roles of the Non-integrated LISC in dairy sector development in the survey area were analyzed using the percentage shares of participants in the milk marketing structure, farm gate raw milk price data, employment characteristics and farmers` viewpoints about the dependency on Non-integrated LISC. The statistical significance of the farm gate raw milk price data from the two farmer groups was tested using the Student`s t-test. SPSS statistical package was used to perform the t-test. Second, the RDCS impact on production sustainability was analyzed using three variables: total milk production per farm, milk productivity per cow and total number of cows per farm. The statistical significance of the growth of these variables was tested using the Student`s t-test for the two years 2006 and 2011. The impact of the farm-level resource management techniques of each farmer group was analyzed by estimating technical efficiency.[31] The

[31] Technical efficiency indicates the percentage production of a farm in relation to the potential output of that farm for a given input level. Technical efficiency was calculated for each dairy farm based on the stochastic production frontier model. The general specification of the model is as follows:

$$Y = f(X_i, \beta) + \varepsilon$$

where Y is the output of the i-th farm, Xi is the i-th input, β is a vector of unknown parameters and ε is the composite error term. The functional form used to obtain these estimates was the Cobb-Douglas production function.

$$LnY_i = LnA + \sum_{K=1}^{n} \beta_i LnX_i + \varepsilon$$

The dependent variable used in the empirical model is total milk production. The

estimations were obtained using Frontier 4.1 software, which was developed by Collie (1995). Third, the profitability of a dairy farm was calculated and compared by analyzing the cost and income variables of each dairy farm. The milk income was determined using the market price of raw milk and the amount of milk sold by each farmer. The other income relevant to dairy farming consists of income gained by selling cows and calves and using manure in the crop land and biogas plant. The manure income was calculated based on the value of reduced cost of chemical fertilizer in the crop land and reduced energy cost at the household and farm. This method was adopted because manure, which is the main material of compost fertilizer, is a substitute for chemical fertilizer, and the biogas produced using the manure and other dairy farm wastes is a substitute for energy from the national grid. In terms of cost, two types of animal feeds, rice bran and coconut poonac, were identified in the commercial cattle feed market in the Kurunegala district.[32] The other costs of dairy farming include labor (hired labor), veterinary services, cattle shed maintenance, transportation, electricity, fuel and farm credit interest. The opportunity cost of family labor used in the dairy farm was determined based on the agricultural wage rate in the area. The scale economies of the dairy farming were analyzed by comparing the dairy income per cow with each cattle herd size. Finally, sustainable

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independent variables are animals producing milk, labor spent on dairy farming, expenditure on animal feed, and expenditure on medical and veterinary services.

[32] Poonac is the coconut residue remaining after the extraction of the coconut. Rice bran is the outer layer of the rice. They are the by-products of the coconut oil processing and rice milling process.

elements of the system were assessed by describing a typical case study of the dairy farm RDCS.

4.3 Results and Discussion

4.3.1 Characterization of the RDCS of the Dairy Sector in the Survey Area

Figure 4.2 illustrates the mechanism of the RDCS of the dairy sector in the survey area. The main features of the RDCS of the dairy sector are the effective use of farm-level resources and the dependence on Non-integrated LISC participants for milk marketing. Under this type of system, farmers obtain the animal feed from the crop lands that they simultaneously operate with cattle farming [① Animal feeds (rice straw and other crop residuals)]. During the post-harvest season, farmers collect and store crop residuals (paddy straw and other crop residuals) to use as a year-round feed supply. The cow dung and other droppings from the dairy farm are used to produce compost fertilizer for crop cultivation instead of chemical fertilizer [② Compost fertilizer]. Some of the cow dung and droppings from the dairy farm are directed to a biogas plant located at the household level. The by-products of biogas generation are also directed to the crop fields, and the produced energy is used for household lighting and cooking [③ Cow dung and other droppings, ④ Compost fertilizer, ⑤ Bio energy]. All of the functions related to the farm economy are primarily handled by household labor, particularly female household labor [⑥ Household labor]. The surveyed farm households` milk consumption data revealed that 12.3% of the total milk production (approximately 1 liter per day by each farm household) is consumed by household family members [⑬ Milk for self

consumption].

On the local economy level, the farmers mainly rely on Non-integrated LISC in milk marketing [⑦ Dairy production,⑧ Crop production]. It is a non-vertically integrated system in which each participant operates independently at the small- and medium-scale levels. Dairy cooperative societies, village-level private assemblers, village- and regional-level processing firms, local wholesalers and retailers are the main Non-integrated LISC participants in the survey area. The related farmers mainly sell their raw milk production (76% of the marketable milk production of related farmers) to these Non-integrated LISC participants. Payment for the raw milk supply is either direct or through local financial institutions [⑪ Income on milk supply]. However, a portion of the milk production in the survey area is still being handled by large-scale companies (Nestle and Milco), whose operations have the characteristics of a trade monopoly.

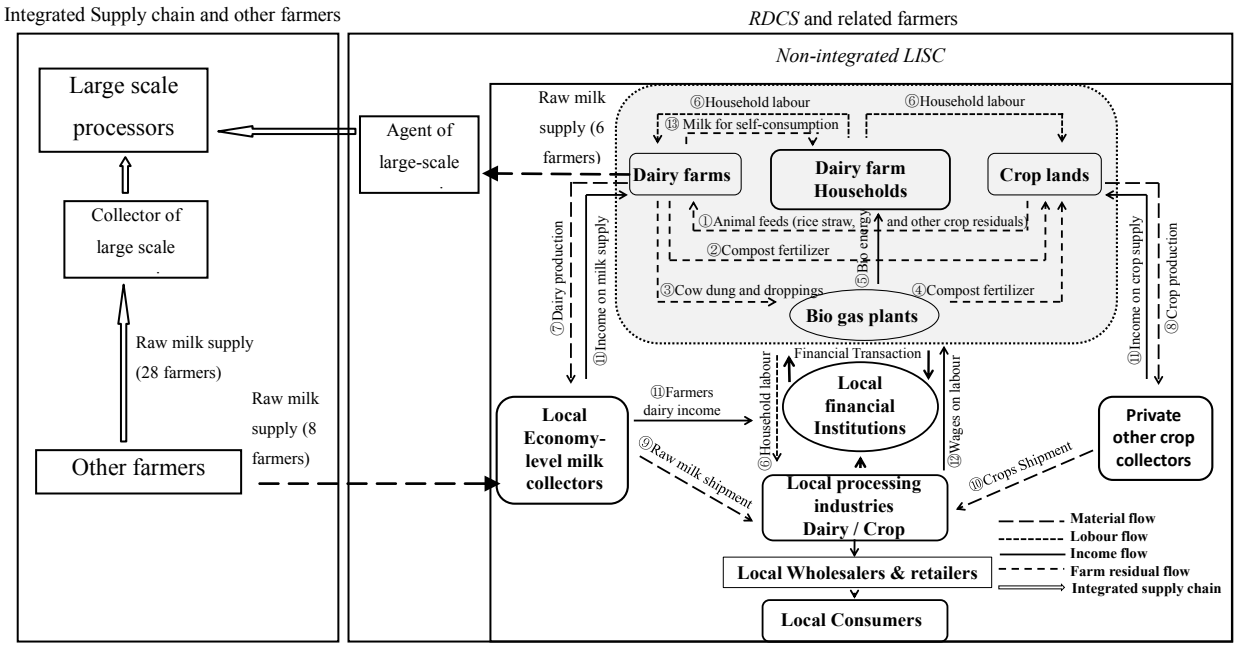

Figure 4-2 Resources Dual Circulation System (RDCS) of dairy sector in the survey area

Source: Field survey of dairy farmers, milk assemblers and processors in the survey area, March 2011.

Note: The processing industries in the survey area produce yogurt, curd, ice cream, milk sweets, etc. Assembled milk by large scale companies (Nestle and Milco) is shipped to processing plants located outside of the district, particularly in urban areas. Farmers who sell their raw milk to dairy cooperative societies receive income through local financial institutions (Rural Banks). These societies maintain a compulsory saving scheme based on milk supply to establish reliance between dairy farmers and financial institutions.

4.3.2 Assessment of Purchasing and Marketing Structure Regarding Milk and the Opportunities for Developing the Dairy Sector

An examination of the milk marketing data obtained from the surveyed farmers revealed that 477 liters of milk produced by related farmers was purchased by Non-integrated LISC participants: dairy cooperative societies, village-level private assemblers, and village- and regional-level processing firms (see Figure 4.3). This amount corresponds to 91% of the total raw milk purchased by Non-integrated LISC participants. The other 9% (53 liters) was purchased from the other farmers. As shown in Figure 3, 52.1% (520 liters) of the total milk production in this area was purchased by Non-integrated LISC participants. This amount represents 58.9% of the total marketable milk production (876 liters) in the area. Of the remaining total milk production, 35.6% was purchased by the collection centers of large-scale companies (Nestle and Milco) and 12.3% (123 liters) was used for household consumption by the farmers. The Non-integrated LISC participants have provided the farmers with three market options. The raw milk marketing data from the surveyed farmers revealed that, out of the total raw milk collection by the Non-integrated LISC participants, dairy cooperative societies, village-level private assemblers, and village- and regional-level processors were responsible for 45.1%, 40.9% and 15%, respectively. These values indicate the competitiveness of the milk purchasing system in the surveyed area. The raw milk channeled through Non-integrated LISC was mainly processed within the survey area.

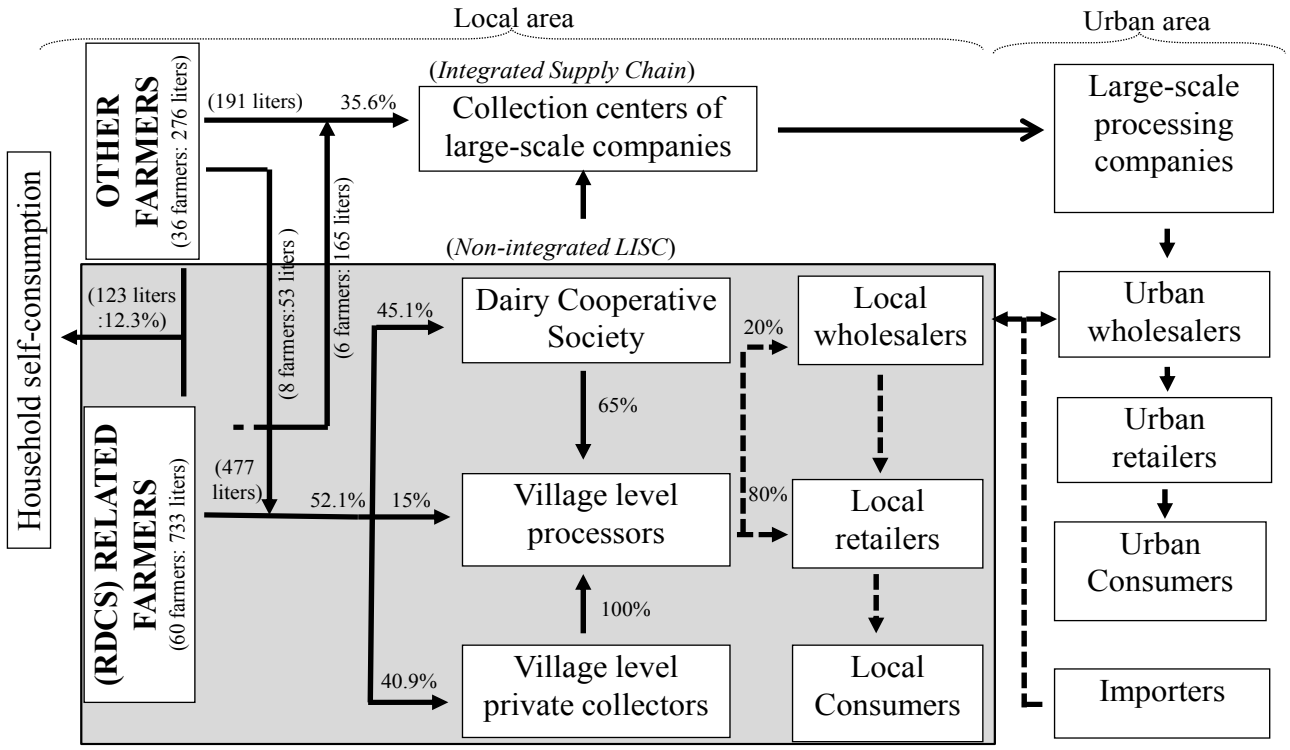

Figure 4-3 Milk marketing structure and Non-integrated LISC participants in the survey area

Source: Field survey in the Kurunegala district, 2011.

Note: Among the 60 surveyed related farmers, 6 farmers (10%) provided their raw milk production to the collecting centers of large scale companies. Among these 6 farmers, 2 farmers owned more than 20 cows. Additionally, 8 (22%) out of the 36 surveyed other farmers provided their raw milk to the Non-integrated LISC participants.

Table 4-2 Farm gate price offered by each participant in the milk marketing channel

Item	Non-integrated LISC participants				Large-scale companies	t value
	Dairy cooperative society	Village-level private collectors	Village- and regional-level processing firms	Total sample		
Average farm gate price (Rs./per liter)	33.7	35.3	36.5	35.2	31.7	6.968***
Standard deviation	3.41	4.12	4.12	3.73	2.07	3.47

Source: Data were supplied by 60 related farmers and 36 other farmers.

Notes:

(1) The t-test was performed based on the price levels of the Non-integrated LISC participants and large-scale companies.

(2) ***$P < 0.01$ significance level.

(3) Rs. 1 = ¥ 0.76 (March 2011)

The farm gate price data revealed a significant difference in farm gate prices between Non-integrated LISC participants and large-scale companies. On average, Non-integrated LISC participants offered rupees (Rs.) 35.2, while the large-scale companies offered Rs. 31.7 (see Table 4.2). The result of the Student`s t-test indicated that the difference between the two mean prices was statistically significant; t = 6.9, at a 1% ($\mathbf{P} < 0.01$) significance level. This price gap limits the influence of large-scale companies on the raw milk market in the surveyed area. For instance, Nestle and Milco directly purchase only 35.6% of the total milk production (41.1% of the total marketable milk production) in the area, although these companies control 75% of the market share in the formal milk market in Sri Lanka (Ranaweera, 2007). However, the influence of large-scale companies on the milk marketing system is still extant due to their

monopolistic practices, their substantial market share of the formal sector milk market and their high level of operational capital. In addition to the marketing of raw milk, this circulation of material at the local economy level also provides employment and income opportunities for local inhabitants in the area. This study revealed that the milk processing industries provided direct employment to 231 people in the area. Among the total number of workers employed by the selected firms, 63%, 79% and 80% of workers were from the categories of women, poor households and agricultural households, respectively. However, the labor market contribution to the integrated supply chain is substantially smaller because large-scale companies perform milk processing outside this district.

Figure 4-4 Percentages of related farmers who rely on the service functions of the Non-integrated LISC

Item	No. of farmers	%
Better price for raw milk	52	86.7
Saving time for farming activities	47	78.3
Credit facilities	40	66.7
Convenience of the process of selling of raw milk	40	66.7
Farm guidance and training	38	63.3

Source: Data were supplied by 60 related farmers among the surveyed farmers.

Note: Non-integrated LISC participants provide the following marketing functions: milk collection from the farm gate or at the centers located in the village level, and storage and processing at the village level. These participants provide credit facilities based on the relationships among the following factors: the long-term milk supply and demand; veterinary services; farm training and guidance, particularly by cooperative societies; and welfare facilities. Large-scale companies only operate their milk collecting functions at the village level.

Table 4.3 presents farmers` viewpoints about the Non-integrated LISC

participants in terms of marketing functions and services. Notably, 86.7% of the related farmers claimed that they received comparatively better farm gate prices from Non-integrated LISC participants. Additionally, 78.3% stated that they were able to save time spent on farming activities due to the localized and direct purchasing system offered by Non-integrated LISC participants. The problem of the distance to the raw milk market was addressed by the localized and direct purchasing system of the Non-integrated LISC. Although the production density was high in the survey area, the availabilities of transportation, electricity and communication facilities are low; thus, the quick sale of raw milk is essential. The easy market access offered by the Non-integrated LISC reduces the time devoted by the farmers to selling raw milk and saves time for the activities of dairy farming. Notably, the farmers indicated that timely feeding and watering after milking significantly affected the milk productivity. The convenience of the milk marketing process at the collection points in terms of functions such as the twice daily collection of milk, milk quality testing (water and fat content) and the collection of milk at farms and credit facilities were also equally reported by 66.7% of the related farmers.

4.3.3 Analysis of Milk Production in the RDCS of the Dairy Sector in the Surveyed Area

In this section, the milk production in the RDCS and the conventional system are comparatively analyzed. The farm-level milk production can be increased by expanding the herd size, improving productivity or both. According to Table 4.4, a significant difference between the related farmers and the other farmers was

observes in terms of average daily milk production, farm productivity and herd size. The average farm-level milk production and the productivity of the related farmers increased from 9.9 liters to 12.1 liters per day and from 4.8 liters to 5.7 liters per cow, respectively, from 2006 to 2011. The results of Student`s t-test indicated the statistically significant difference between the two periods in terms of daily milk production ($t = 1.67$ with $p = 0.07$), farm productivity ($t = 2.43$ with $p = 0.02$) and total number of cows ($t = 1.97$ with $p = 0.03$). Despite the positive trends in the related farmer group, worsening trends of milk production and its key determinant variables (productivity and herd size) were reported by the other farmers. For example, among the other farmers, the average daily milk production, productivity and the average total number of cows declined by 37.0%, 4.9% and 15.4%, respectively, during the same period. Only the 37% decline of the average daily milk production from 12 liters in 2006 to 7.6 liters in 2011 was statistically significant ($t = 2.24$ with $p = 0.03$). The comparison of the recorded milk production by related farmers and other farmers in 2011 also confirmed that farmers in the RDCS of the dairy sector were able to produce an average of 12.1 liters of milk. This figure is 4.5 liters higher than that of other farmers in the conventional system.

Table 4-3 Changes in the number of cows, milk production and milk productivity: 2006-2011

Variable	Related farmers				Other farmers			
	2006	2011	% change	t value	2006	2011	% change	t value
Average daily milk production (liters per farm)	9.9 (11.568)	12.2 (6.688)	22.4	1.69*	12.0 (12.701)	7.6 (6.951)	-37.0	2.24**
Farm productivity (liters per cow)	4.8 (2.537)	5.7 (2.093)	15.9	2.43**	4.3 (2.605)	4.1 (3.080)	-4.9	0.83
Total no. of cows (farm size)	6.2 (3.146)	7.3 (4.638)	18.5	1.97**	8.2 (7.775)	6.9 (4.122)	-15.4	0.91

Source: Field survey of dairy farm households in the Kurunegala district, March 2011.

Notes:

(1) Mean tests for each group were performed based on the years 2006 and 2011.

(2) The research utilized a five year difference because changes in the Sri Lankan economy cannot be observed annually.

(3) ** $P < 0.05$ significance level; * $P < 0.10$ significance level.

(4) Parentheses indicate standard deviations.

Table 4-4 Mean milk production efficiency scores of dairy farms: related farmers vs. other farmers.

Item	Related farmers	Other farmers	Total
Mean score	0.687	0.486	0.614
Standard deviation	0.197	0.178	0.206
Median	0.724	0.458	0.613

Source: Estimations were performed based on the survey data using the computer program Frontier 4.1, which was developed by (Coellie, 1995). The data were supplied by 96 farmers, including 60 related farmers and 36 other farmers.

Note: Animals producing milk, labor spent on dairy farming, expenditure on animal feed, and expenditure on medical and veterinary services were used as independent variables in estimating the milk production efficiency of each farm.

The study provides clear evidence of the difference between actual and potential milk production under constant resource conditions. Table 4.5 presents the mean milk production efficiency score of dairy farms. The determination of the mean efficiency scores of each farmer sample and of the total sample (related farmers + other farmers) is important to several aspects of dairy farms because it indicates the possibilities of either increasing the total production of milk using the same inputs, decreasing the amount of inputs required to obtain the current level of milk production or the potential for a mixture of both this processes, which would be achieved by filling the gap between the best producer and the other producers.[33],[34] The results presented in Table 4.5 show

[33] For more details, see Battese & Coelli (1988); Battese & Coelli (1995); Battese, et al. (1997).

[34] The mean efficiency score indicates the percentage production of each farmer group in contrast to the potential output of that group for a given input level. The mean efficiency score ranged from 0 to 1. An efficiency score of 1 indicates that the dairy

that the mean efficiency score of the milk production was 0.69 for the related farmers and 0.49 for the other farmers, which is 20% lower than that of the RDCS of the dairy sector. Although the related farmers recorded high production efficiency relative to that of the other farmers, the difference between the actual (69%) and potential (100%) efficiency score indicates that the related farmers could increase output by 31% without additional inputs at the farm-level. The increase in the milk production efficiency from the actual level (0.69) to potential level (1) could be achieved by adopting the technology and techniques used by the best dairy farmers in the related group.

The mean efficiency score of each dairy farmer group indicates the percentage of production of each farmer group in contrast to their potential output for a given input level. The high and low efficiency categories for each dairy farmer group were defined based on the mean efficiency score of the total sample, which is 0.61 (see Table 4.5). As shown in Figure 4.4, 65% of the related farmers are above the mean efficiency score of the total sample (0.61). Furthermore, only 25% of the other farmers are above the mean score of the total sample. This low value indicates that the majority of the other farmers are in the low efficiency category. Additionally, 46.6% of the related farmers reported an efficiency score higher than 0.75 while only 11.1% of the other farmers reported such a high score. This study identified several specific techniques and

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farms are completely efficient in terms of input use for milk production. The difference between the completely efficient score (1) and the mean efficiency score indicates the potential for increased milk production that could be achieved by adopting the technology and techniques used by the best dairy farmers.

technologies adopted by the related farmers in the high efficiency category: the management of breeding for year-round milking (69%), the maintenance of a well-managed fodder grass block under the coconut land and the application of cow dung as fertilizer on the fodder grass block (51%), the expenditure of an increased amount of labor on watering and feeding (84%) and the implementation of twice-a-day milking (48%). Thus, the relatively high technical efficiency of the related farmers of the RDCS of the dairy sector indicates their capacity for high levels of milk production while managing the local resources at the farm level.

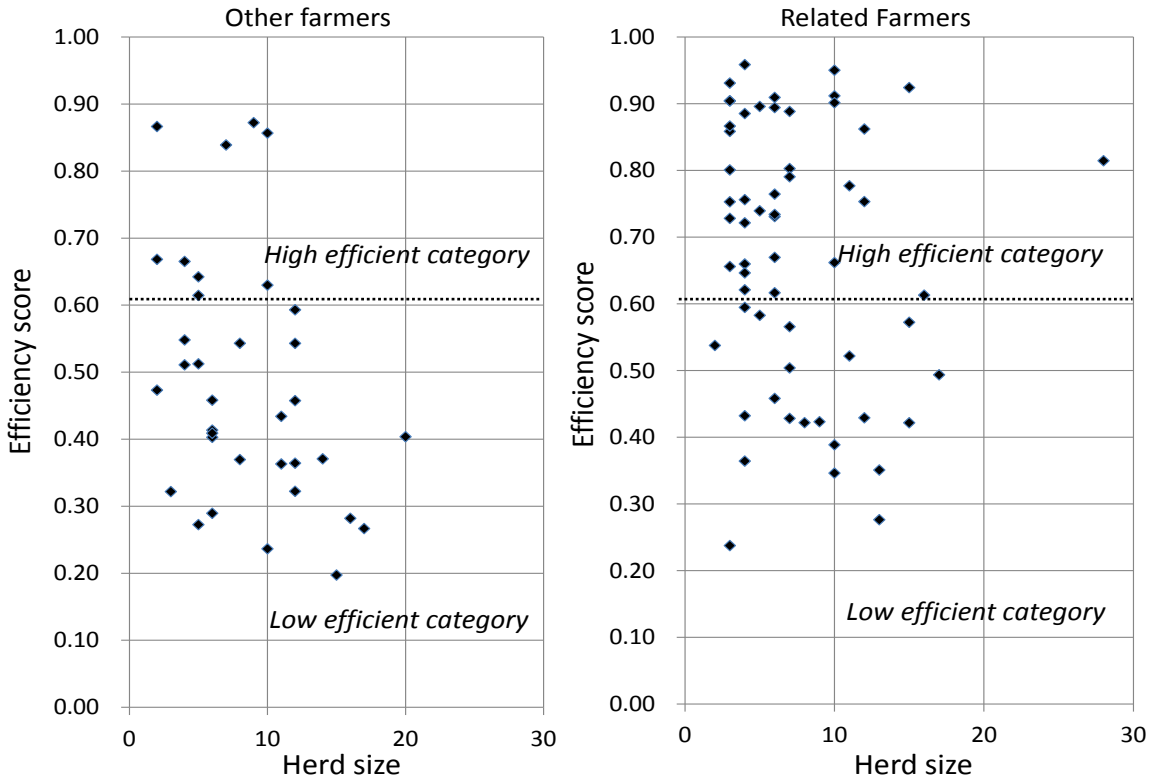

Figure 4-5 Distribution of the production efficiency scores of dairy farms: related farmers vs. other farmers.

Source: Author's calculation based on the survey data collected from dairy farm households in the Kurunegala district, March 2011.

Note: In determining the low and high efficiency regions for the dairy farmers in each group, the mean efficiency score of the total sample (related farmers + other farmers) was taken into account. It provides the mean efficiency score for the dairy farmer population in the area.

4.3.4 Analysis of Cost and Income of RDCS of the Dairy Sector in the Survey Area

The data in Table 4.6 suggest that the related farmers earned an agricultural net income that was more than Rs. 7,824 higher than that of the other farmers. In terms of the management cost of dairy farming under RDCS, animal feed cost constitutes the largest portion. Still, this cost is relatively low compared to that of the other farmers. This study determined that most of the efficient related farmers utilized their agricultural field to grow fodder grass efficiently. The labor cost constituted the primary cost item for this cultivation. The dependency of these related farmers on the animal feed market was low relative to that of the other farmers. Moreover, both farmer groups faced similar market conditions with regard to the prices of commercially prepared feeds: coconut poonac and rice bran. The prices of 1 kg of coconut poonac and rice bran were Rs. 28 and Rs. 12, respectively, at the time of the survey. The average milk income and dairy farm-related other income (gained from selling cows and calves, the direct sale of manure selling and the use of manure in crop fields and the biogas plant) received by the related farmer were Rs. 19,555 and Rs. 8,382, respectively. The biogas plants are on the farm scale. Biogas is produced using the cow dung, urine and other waste material from farms. This gas is used for domestic purposes, and the remaining slurry is used to fertilize the crop fields and fodder grass land. Manure usage in crop lands and biogas plants generates indirect income in an environmentally friendly way. The economic value of the use of manure in the crop fields and biogas plants, which was calculated based on the opportunity cost with respect to substitute chemical fertilizer costs and substitute household

energy costs, was Rs. 2,225. Additionally, due to the forage management at the farm level, the related farmers were able to save Rs. 929 more than the other farmers, even though dairy farming under RDCS recorded a relatively high average herd size. Additionally, 85% of the surveyed related farmers reported that they store field residues from paddies (paddy straw) after harvesting during every production season to create a better supply of animal feed. Fifty-one percent of the related farmers, who were in the high efficient milk production region, grow fodder grass by managing the banana and coconut crop fields. However, for the other farmers, the milk income and other dairy-related income were lower than those of the related farmers (milk income: Rs. 14,681; other income: Rs. 5,587). The results of Student`s t-test also indicated the statistical significance of the agricultural net income difference between the two farmer groups ($t = 2.01$ with $p = 0.04$). This significant income difference between the two farmer groups suggests that the RDCS of the dairy sector enhanced the dairy farmers' incomes. However, no statistically significant difference was observed between the related farmers and the other farmers in terms of the management cost of dairy farming ($t = -0.17$ with $p = 0.86$). Therefore, issues related to the management cost still persist in the system.

Table 4-5 Average monthly cost and returns of dairy farming under each system: Values in Sri Lankan rupee (Rs.).

	Herd size	No. of farmers	Gross Agricultural Income of dairy farms ①			Management Cost of dairy farms ②			Agricultural Net Income ①– ②	Calculated family labor cost
			Milk income	Other income	Total	Animal feed	Other	Total		
RELATED FARMERS	2	1	5,550	0	5,550	3,100	300	3,400	2,150	20,250
	3 - 4	19	10,391	7,395	17,786	2,514	5,252	7,766	10,020	16,313
	5 – 6	11	14,474	5,812	20,286	2,791	4,576	7,367	12,919	14,932
	7 - 8	7	13,933	5,543	19,476	3,645	2,076	5,721	13,755	18,964
	9 – 10	7	20,404	9,936	30,340	3,389	6,488	9,877	20,463	21,214
	11 - 12	5	17,550	8,948	26,498	4,140	5,763	9,903	16,595	19,800
	13 - 14	2	6,900	2,448	9,348	4,400	8,425	12,825	-3,477	21,375
	15 - 16	3	21,600	5,504	27,104	7,500	3,900	11,400	15,704	27,750
	17 - 18	2	29,700	27,448	57,148	13,600	15,108	28,708	28,440	15,750
	19 - 20	0	-	-	-	-	-	-	-	-
	20 <	2	55,050	10,781	65,831	10,500	26,733	37,233	28,598	34,875
Total (A)		59	19,555	8,382	27,937	5,558	7,862	13,420	14,517	21,122
OTHER FARMERS	2	3	6,840	1,056	7,896	1,650	3,622	5,272	2,624	13,500
	3 - 4	4	6,960	2,916	9,877	3,525	3,029	6,554	3,323	18,652
	5 – 6	8	5,839	2,667	8,505	1,974	1,930	3,904	4,601	15,046
	7 - 8	4	12,150	3,333	15,483	2,825	1,600	4,425	11,058	24,468
	9 – 10	4	19,410	1,041	20,451	4,250	7,642	11,892	8,559	23,062
	11 - 12	5	13,685	7,569	21,254	5,348	7,657	13,005	8,249	25,500
	13 - 14	1	18,000	0	18,000	15,000	9,083	24,083	-6,083	36,000
	15 - 16	2	11,280	3,333	14,613	3,800	8,725	12,525	2,088	18,000
	17 - 18	1	19,200	10,000	29,200	9,000	6,800	15,800	13,400	15,750
	19 - 20	-	-	-	-	-	-	-	-	-
	20 <	2	33,450	23,958	57,408	17,500	20,816	38,316	19,092	31,500
Total (B)		34	14,681	5,587	20,269	6,487	7,089	13,576	6,693	22,147

– (B)		4,874	2,795	7,668	-929	773	-156	7,824	-1,025
t value (p value)		2.16** (0.034)	1.76* (0.066)	1.74* (0.072)	-0.31 (0.474)	-0.59 (0.462)	-0.17 (0.862)	2.01** (0.041)	1.02 (0.263)

Source: Data were supplied by 59 related farmers and 34 other farmers.

Notes:

(1) Gross Agricultural Income of dairy farms = Milk income + Other income (Selling cows + Selling calves + Usage of manure in the crop lands and biogas plant). Management Cost of dairy farms = Animal feed + Other (Hired labor + Veterinary services + Cattle shed maintenance + Transportation + Electricity + Fuel + Farm credit interest).

(2) The cost of family labor was calculated based on the agricultural wage rate in the area.

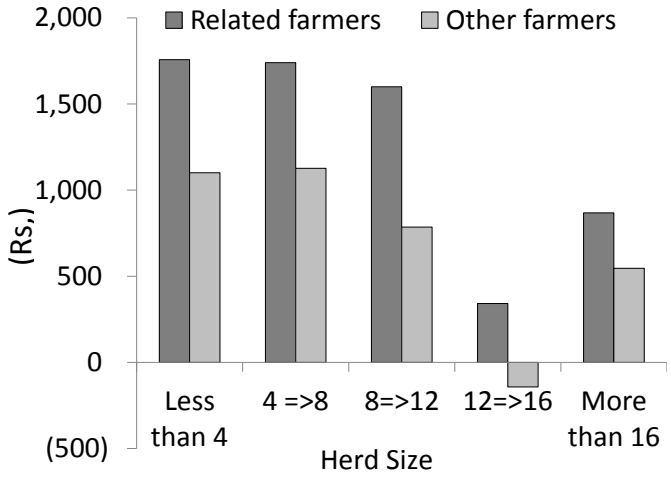

Figure 4-6 Distribution of monthly net income per cow with respect to different herd sizes: Related farmers vs. other farmers

Source: Field survey of dairy farm households in the Kurunegala district, March 2011.

As shown by Figure 4.5, all of the related farmers in each category reported higher agricultural net income per cow than that of the other farmers. This also confirms the relative potential of the related farmer group to achieve high net income per cow despite small herd sizes. In particular, the farmers with fewer than 12 cows showed better economic performance. The focus on the small herd size is important because 99% of the dairy farmers in Sri Lanka are smallholders. Therefore, the comparison of the agricultural net income per cow with respect to different cattle herd sizes could enhance the income of dairy farmers, particularly the small-scale dairy farmers, by encouraging the farmers to participate in an RDCS.

4.3.5 Case Study: Functions and Sustainable Elements of Dairy Farms in RDCS

This typical case study reveals in detail how dairy farms function and their main elements of sustainability in the RDCS. Mr. Rathnayake is 31 years old and passed the GCE Ordinary Level (O/L) at the village school in the Ganewatta DS division in Sri Lanka. When he started dairy farming, he owned two acres of paddy land and one acre of upland, which can be cultivated only under rain-fed water condition or by providing lift irrigation, for other crops, such as banana and a few seasonal crops. He has been engaging in dairy farm activities since 1996, along with family members, including his father (age 67), his mother (age 62) and his wife (age 29). He initially began dairy farming with assistance from the central government and received one cow from the provincial government. The raw milk produced by Mr. Rathnayake was purchased by a collecting agent of Nestle Company (Multi National Company) in the area. The daily milk production ranged from two to four liters per cow during the period from 1996 to 2002, and two cows were milked. During this period, he did not receive any incentives from the buyer except for a stable market for raw milk.

However, he realized that farmers working with dairy cooperative societies exhibited better performance. He required increasing economic benefits from his dairy farm. So in 2002, he joined the dairy cooperative society in the area. He changed his raw milk marketing source from the agent of a large-scale company to the dairy cooperative society. During the first year of membership,

he was able to attend two training sessions that covered pasture field management, animal feed management, improved milking methods, technology transfer, integrated farming and better living activities. According to the terms and conditions of the society, he was required to save Rs. 2 per liter of milk supplied. The payments for the supplied milk were made by the society via the state bank (Bank of Ceylon) twice a month. At the end of the first year of his membership, Mr. Rathnayake was able to save approximately Rs. 7,000 at the state bank. The established relationship between Mr. Rathnayake and the state bank, which was achieved because of the intermediation of the cooperative society, qualified him for his first agricultural loan of Rs. 10,000. The loan guarantee was provided by the dairy cooperative society. This loan was utilized to build a cattle shed. The management of his savings and handling of his loan repayment were performed by the society based upon the raw milk supply. Because he continued to supply raw milk to the society, he received a second financial credit to buy two cows (hybrid) under the dairy development program enacted by the provincial government. In 2004, he started to practice dairy farming in an integrated manner with crops, such as paddy, banana and vegetable cultivations, based on the cooperative society training and field observations. This encouraged Mr. Rathnayake`s family to get involved in organic farming as they started producing compost fertilizer using cow dung and other droppings. In 2008, he set up a farm-scale biogas plant with the technical assistance of the cooperative society. This helped him to reduce the use of fossil fuel energy for household cooking and lighting. He used the generated biogas to light the cattle shed. By 2011, his financial savings, which

were achieved through the cooperative society functions, reached approximately Rs. 250,000. Recently, he was able to buy a small tractor, which is being used mainly for manure management, animal feed transportation, and the transportation of raw milk and other field crops to selling points.

As Mr. Rathnayake noted, his dairy farming activities have continued to grow. The development of his dairy farm began under the influence of the dairy cooperative society. Today, he owns 15 cows, including 5 milking cows, 3 heifer calves, 2 heifers, 2 bull calves and 3 bulls. In the last five years, he has been able to increase his daily milk production from 20 - 25 liters to 40 – 45 liters. His daily average milk production per cow currently ranges from 7 to 12 liters, which is higher than the national average milk production per cow (Department of Census and Statistics, 2010). This has resulted in an increase in the monthly income from the sale of raw milk from Rs. 12,600 – Rs. 15,750 to Rs. 40,440 – Rs. 45,495. This income range includes the minimum and maximum income levels. This income variation was recorded due to the slight fluctuation in the milk production. This is an 86% - 106% increase over the last five years in terms of real value.[35] In terms of the cost of production, he did not indicate an increase because the increase in the costs due to the expense of fuel for the tractor and other expenses was off-set by the cost reduction due to the application of organic manure in the crop land and the production of biogas using the animal

[35] The real value of milk income was calculated by adjusting for price fluctuations based on the Colombo Consumer Price Index (CCPI) in Sri Lanka. The CCPI is used as the official Consumer Prices Index (CPI) in Sri Lanka (Central Bank of Sri Lanka (CBSL), 1960-2012).

waste. In addition to the income from the sale of raw milk, he earns an average income of Rs. 1,600 per month from the sale of his excess manure to other farmers in the area. Additionally, since he initiated the integrated farming practices, he has been able to reduce chemical fertilizer application in the crop fields by 60%. Based on his experience with integrated farming since 2004, Mr. Ratnayaka observed an approximate 20% increase in farm productivity as well as high resistance to the water shortages that occur in the drought season due to the application of organic manure. All of the family members currently provide labor to the system. However, Mr. Rathnayake and his father were only involved in dairy farming and other crops activities before moving into the present system; his wife and mother were unemployed and only involved in household activities. His wife and mother are currently engaged in cleaning the cattle shed; watering and feeding in the dairy farm; and producing and applying organic fertilizer in the crop field and home garden. This is interesting given the high unemployment rates among women in the local area (Department of Census and Statistics , 2010). This system has created activities at the farm level that can increase the demand for labor by unemployed farm household females. The availability of organic manure has motivated his wife and mother to grow needed vegetables, such as eggplant, long beans, okra, bitter gourd, snake gourd, lima beans and some leafy vegetables, such as spinach and amaranths. It has enabled them to produce the required fresh and safe vegetables for household consumption and to reduce the household expenditure on food by approximately 40%. Moreover, the implicit value of using an alternative energy source in the household and cattle shed is an

average of Rs. 1,500 per month.

The analysis of Mr. Rathnayake`s dairy farming practices revealed several elements relevant to the sustainability of dairy farms. The contribution of the dairy cooperative society as a Non-integrated LISC participant to address the human capital and financial capital problems faced by farmers is critical; other studies have cited these two issues as obstacles that hinder the growth of smallholder dairy farms (Jayaweera, 1995). The human capital development functions of the society improved the farmers' knowledge regarding better utilization of farm-level resources in an integrated way. The society also diversified the farm-level economic activities while strengthening and stabilizing farmers' incomes. Accessing the formal financial market is very critical for farmers, as they lack collateral. The income sustainability for the farmer was established through resource circulation at the farm level and material circulation with a guaranteed market at the local economy level. The generation of the energy required for the cattle shed and house minimizes the cost of dairy farming and the cost of living for the farm household. The utilization of household labor in farming activities, particularly female labor, has increased. This indicates the capacity of the system to generate demand for household unemployed female labor. The increase in female labor employment is significant due to the relatively few employment opportunities available to females in the surveyed area. The production of vegetables and leafy vegetables using organic manure at the household level ensures a fresh and safe food supply for the household while reducing the household food expense.

Supplying raw milk to the local value-added industries through the dairy cooperative society enhances the social value of dairy farming under RDCS.

4.4 Summery and Key Findings

This study assessed the RDCS of the dairy sector to find support for the contention that this system contributes to the sustainability of dairy farms in the era of trade liberalization in Sri Lanka. By comparing the RDCS of the dairy sector and the conventional systems in the surveyed area, the study found that the RDCS was related to the sustainability of dairy farms. The results of this study indicated the rationality of developing the domestic dairy sector using RDCS. First, in this system, the marketing structure and its functions and services (particularly its direct purchasing system and credit provisions) largely supported the local dairy sector. In addition, it provided more market options for local farmers. Prices ranging from Rs. 33.7 to Rs. 36.5 per liter of milk were offered by participants in the Non-integrated LISC; these prices were higher than the average price offered by the agent of the large-scale companies and reported by the surveyed other farmers (Rs. 31.7 per liter of milk). The functions and services of the Non-integrated LISC with regard to smallholder dairy farms limited the influence of large-scale companies on milk marketing in the survey area by reducing the raw milk collection share of such companies to 35.7% of the total milk production; however, these companies control approximately 75% of the formal sector milk market of the country (Ranaweera, 2007). Second, the study identified a relatively high milk production per dairy farm and productivity per cow for the related farmers and found that the positive growth of those two important variables was related to dairy farm development during the five year

period from 2006 to 2011. The high level of technical efficiency of the system was also indicated by the production efficiency analysis between the related farmers and the other farmers. The related farmers in the system reported a high degree of production efficiency (0.69) in comparison to the 0.49 efficiency score reported by the other farmers surveyed and the results cited in most previous studies (Edhirisinghe, et al., 2008). Third, this study revealed that this system yielded both low costs and high incomes. The existing capability of the system to generate relatively high income compared to the conventional system was suggested by the significant difference in the net income from dairy farming between the related and other farmers; this difference was Rs. 7,824. Furthermore, this difference can be mainly attributed to the combined effects of the Non-integrated LISC and the integrated manure and forage management utilized in the dairy farm and crop fields. Additionally, 22.5% of the net income of the related farmers was obtained by managing manure and forage at the farm-level; these management strategies were not practiced by the other farmers. The farmers in the system benefitted from scale economies. This study also found that some issues still persist in the system: the influence of large-scale companies on the system, which includes the trade monopoly characteristics of these companies; the gap between the actual and potential production efficiencies in terms of milk production; and limited impact on the minimization the management cost of dairy farming.

In this context, this study supports the contention that the RDCS contributes to the sustainability of dairy farming due to the efficiency in farm-level integrated

resource management techniques, the contribution to smallholder dairy farmers in terms of improving milk income and productivity, the provision of a competitive supply chain system with better raw milk prices, and positive responsiveness to environment in terms of organic manure usage and biogas production. These characteristics of the RDCS are important for the development and strengthening of Sri Lanka`s dairy sector, which is currently facing challenges in the post-economic liberalization period that include issues of profitability, farm-level resource use, raw milk marketing and smallholder dairy farmer economic development. These study findings are new to the existing body of knowledge in Sri Lanka. This study suggests that strategies designed to develop the dairy sector and improve the welfare of dairy farmers in Sri Lanka in the economic liberalization period should consider the characteristics of the RDCS of the dairy sector.

Chapter 5 : The Current Roles and Development Conditions of the Traditional Circulation System of Local Coconuts: A Case Study in the Kurunegala District of the Coconut Triangle, Sri Lanka

5.1 Background and Subject

Coconut (*Cocos nucifera*) farming plays a dominant and multilayered role in rural areas of Sri Lanka. Today, this sector accounts for 10.7% of the country`s agricultural Gross Domestic Product (GDP) while providing employment opportunities for approximately 500,000 people in cultivation and processing. Approximately one million farm households in rural areas are directly involved in coconut farming for their livelihoods. The sector's contribution to local household dietary intake and food security is important because it accounts for 20% of per capita calorie intake, second only to rice. Seventy percent of coconuts produced in Sri Lanka are domestically consumed (Department of Census and Statistics , 2010). Moreover, 21% of the country`s agricultural land is used for coconut farming, and 82% of it falls into the smallholding category (Department of Census and Statistics , 2010). The history of the coconut sector in Sri Lanka has gone through several key stages. The British first introduced the coconut monoculture system to Sri Lanka in the 1840s, mainly in the Kurunegala, Puttalam, Gampaha, and Colombo districts, the area known as the coconut triangle. Today, the coconut triangle accounts for 59.6% of the country's coconut land (Central Bank of Sri Lanka (CBSL), 1960-2012). Commercially, the industry sector grew by providing a diverse range of raw materials and finished products to Western countries until 1948, when the country regained its

independence. Since then, this sector has traditionally played an important role in circulating local resources between agriculture and industry, bringing important economic benefits to local inhabitants, processors, and traders. It has played a strategic commodity role in local areas because it provides raw materials for a diverse range of value-added industries such as coconut oil, desiccated coconut, and other products (coco peat and coconut fibers, shells, and water).

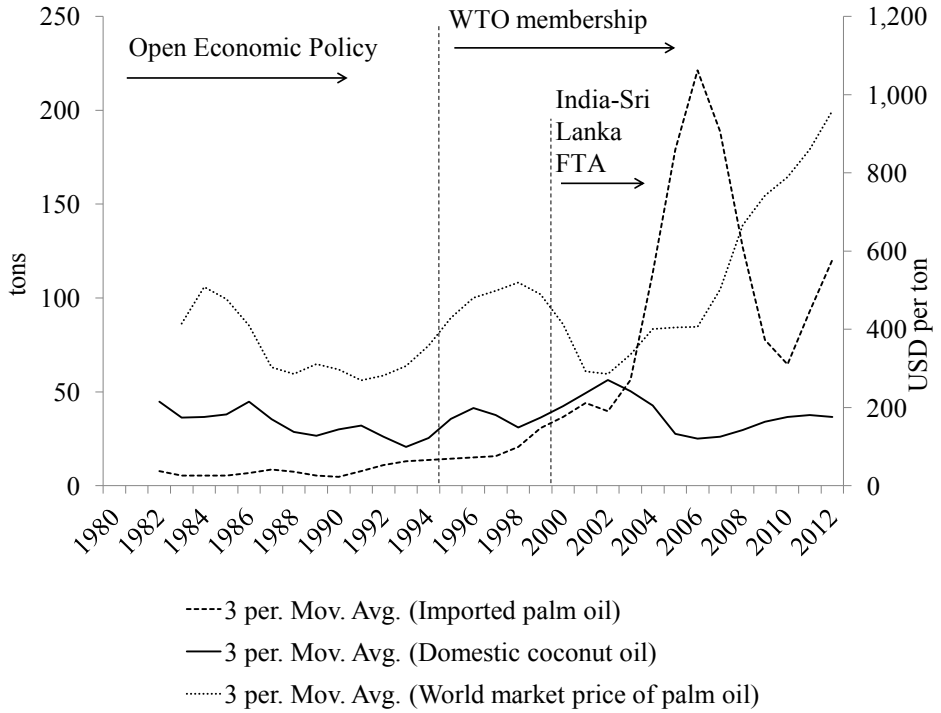

Figure 5-1 Trends for domestically produced coconut oil consumption, consumption of imported palm oil, and the world market price of palm oil: 1980–2012

Source: Central Bank of Sri Lanka, annual reports; FAO statistics, 2012; World Bank, commodity price data, 2012

Note: The rapid increase of imported palm oil from 2000 to 2007 was due to the effects of the India-Sri Lanka Free Trade Agreement (FTA) introduced in 2000. Palm oil was imported duty free into Sri Lanka by Indian-owned enterprises, processed into Vanaspathi (a vegetable oil substitute for ghee) and exported duty free into India as a Sri Lankan product, thereby avoiding an 80% customs fee on direct imports (Kelegama, 2006). In response to the increase in global commodity prices in 2007–2008, India cut import taxes on food items, including palm oil, making Vanaspathi exports from Sri Lanka unviable.

However, since the introduction of an open economic policy in 1977, the coconut sector's significance within the local economy has become controversial because of the past three decades of poor performance. For

instance, the quantity of imported edible palm oil, a substitute for locally produced coconut oil, increased significantly—1,116%—from 12,000 tons in 1980 to 146,000 tons in 2012 (see Figure 5-1). Specifically, a drastic increase of imported palm oil was reported from 2000–2007 due to the India-Sri Lanka FTA (Kelegama, 2006). The quantity of domestically produced coconut oil, the main local coconut kernel product, decreased from 46,000 tons to 36,000 tons—a 22% reduction—between 1980 and 2012. The price of imported palm oil determines the price of locally processed coconut oil because palm oil is considered a substitute product (Karunagoda, et al., 2001). That means importing duty-free palm oil and exporting it to India also inevitably negatively affects the local coconut oil industry and growers. The traders' practice of adulterating cheap palm oil with coconut oil has also raised concern because it abuses the local coconut oil market and results in lower prices being paid to coconut farmers. It put the economies of coconut-growing regions and the livelihoods of local coconut farmers into a vulnerable position. Moreover, as of 2009, the extent to which the land has been used for coconut cultivation in the country has decreased by 5.1% since 1982, from 416,253 ha to 394,836 ha, with an average recorded daily loss of 254 coconut trees. Moreover, it is evident that the poverty situation in the main coconut cultivation areas is worsening.

However, the economics literature does not suggest an appropriate empirical method for supporting strong policy implications to revitalize the local coconut sector in the context of open economic policy. Some studies have suggested alternative methods to address issues in the coconut-growing regions

(Amaratunga, et al., 2001; Karunagoda, et al., 2001; Kelegama, 2006). Therefore, it is important to identify a system that could bring strong policy changes to this sector. This empirical study focuses on a traditional circulation system for local coconuts (TCSLC), focusing on the coconut triangle, in order to identify its current roles and development conditions. The coconut triangle's coconut sector shows better economic performance in an open economic policy phase. This study examines the following points: the role of this localized traditional circulation system in the local economy, the coconut marketing structure within the system; the characteristics and functions of each coconut supply chain participant; the consequences of marketing systems on farmers' agricultural practices, and areas for improvement to restrict emerging adverse trends.

5.2 Research Methodology

Empirical data for the study were drawn from a field survey conducted in the Kurunegala district in March 2011. We selected the Kurunegala district as the study area due to the following criteria: First, it is the main traditional coconut growing and producing district in Sri Lanka's coconut triangle. It accounts for 33.5% (133,570 ha) of the country's total coconut land (394,836 ha) and produces 40% of the coconuts, the highest percentages recorded by a single district (Department of Census and Statistics , 2010). Second, there is a diverse range of coconut-related industries within the district. It accounts for 13.7% (17,025) of all Sri Lankan industries, and a majority of these are coconut related (Department of Census and Statistics , 2010). Third, this district has the highest land-use decline rate for coconuts (11.9%), much higher than the national

average decline rate of 5.1%. It also has the highest daily drop in the number of coconut trees (184 per day) (Department of Census and Statistics , 2010). The high density of coconut land, coconut farmers, and coconut-related industries within the district informed the sampling designs and the overall purpose of this research.

The Pannala Divisional Secretariat (DS) division was selected as a sampling unit for the study because of its high concentration of coconut farms and number of related industries as well as the presence of the Sandhalankawa Coconut Producer Cooperative Society (CPCS), one of the nation's oldest coconut producer organizations.[36] To better represent population and phenomena being studied, the farmers were divided into two groups: CPCS member farmers (MFs) and non-member farmers (NMFs).[37] One-hundred and thirty coconut farm households consisting of 71 non-member farmers and 59 member farmers in four hamlets—Elibijja, Nalawalana, Hendiyagala, and Wetakeyawala—were randomly selected. They were interviewed via a semi-structured questionnaire.

[36] Sandhalankawa Coconut Producer Cooperative Society was established in 1939 in order to avoid market imperfections made by urban large-scale wholesalers in the local coconut market. The coconut farmers who have more than 0.5 acre of coconut land have the right to join the cooperative society in their area. Today, there are 1,568 member farmers. The CPCS mainly produces coconut oil as well as ponnac, mud-oil, and coconut husks as byproducts.

[37] The researchers were motivated to include CPCS member farmers in the sample because the CPCS has played a vital role against the privately led market channels in the local economy for a long time, attempting to avoid market imperfections and increase competition. In addition, member farmers are traditionally involved in supplying commodities to the local CPCS.

In addition, in-depth interviews with 46 randomly selected coconut-related processors in coconut-related fields were held. This represents 60% of government-registered processing firms, including six large-scale, 18 medium-scale, and 22 small-scale processors as well as 16 supply chain intermediaries consisting of nine village assemblers, four regional assemblers, and three commissioned agents. A descriptive data analysis technique was used to analyze both quantitative and qualitative data.

5.3 Results and Discussion

5.3.1 Current Roles of the Traditional Circulation System

The TCSLC includes the production of coconuts, use of local resources (land, labor, materials, capital, traditional technology) in production and processing, marketing of coconut and coconut-based products, and value addition. Figure 5-2 depicts the TCSLC for the survey area. It establishes strong interrelationships among three pillars of the economy: agriculture (farmers), commerce (primary product assemblers, wholesalers, and retailers), and industry (processors). The farmers' behavior during the primary stage is decisive in terms of materials supply, local labor force mobilization, and provision of other services (1). In the intermediary stage, materials flow is traditionally handled by local and regional assemblers, and by the CPCS. They partially process coconuts to produce various partially raw materials such as coconut husk, coconut kernel, copra, coconut shell, and coconut water (2). These materials are used to support the diverse range of related local industries (oil, desiccated coconut, coco peat, coconut fibers, coconut shell, and coconut water) (3). Moreover, the system is

capable of generating two types of resource streams—monetary (income from the system's usage of materials and other local resources) and physical (raw materials and products) resources—for the downstream population segment. These are critical for determining the agricultural commodity supply rate for value-adding industries in the advanced stage (4).

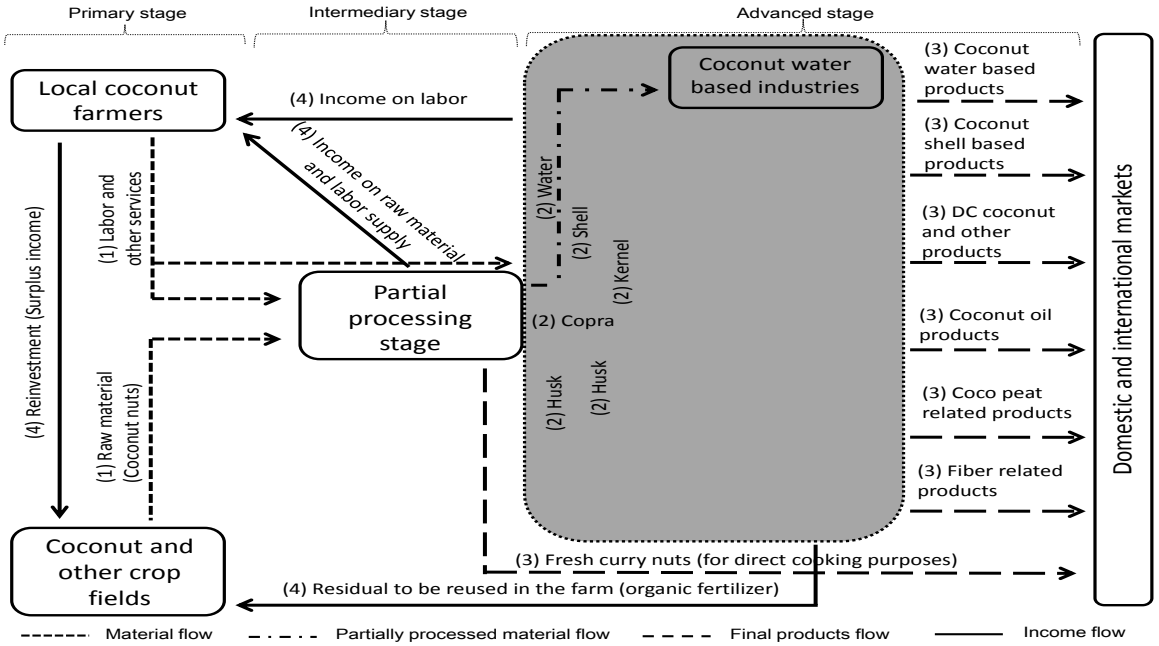

Figure 5-2 Schematic representation of resource circulation and conversion into value-added products

Source: Field survey, March 2011

Note: Types of related products produced by each processing industry or using each processing industry product: (1) coconut water-based industries (coconut vinegar, arrack, sweet toddy, palm sugar, honey), (2) coconut shell-based industries (charcoal, handicrafts, and many other products), (3) desiccated coconut industries (cake, cookies, and other sweets), (4) coconut oil industries (coconut oil, cosmetics, soaps, margarine, creams, ready-made ponnac [animal feed]), (5) coco peat plant-products (dark coco peat, raw coco peat, washed coco peat, buffered coco peat, grow bags, coco husk chips, and various other products), (6) fiber-based products (fibers, coir, coir rope, coir twine, geotextiles, and other products).

This study found that the TCSLC highly contributes to local economic development in multiple ways. First, it uses local materials, labor, and labor-intensive traditional technology. Particularly, the labor force characteristics of the processing firms are well matched with the local labor market characteristics explained by the (Department of Census and Statistics , 2010). Among the workers at the selected firms, 63%, 75%, 79%, and 80% represented women, people with low education, poor households, and agricultural households, respectively. Second, production waste is reused at the farm level, particularly with agricultural diversification practices on coconut growing lands that combine coconut crops with banana, pineapple, ginger, pepper, coffee, cocoa. This is a cost-effective and environmentally friendly method since it causes a reduction in the application of chemical fertilizer and an increase in the water retention capacity of the soil. Third, the system is capable of generating many kinds of value-added products (product mix) to both domestic and international markets, creating trade in the open economic policy phase (see Table 5-1). Specifically, a diversified industrial system based on one main regional crop has strengthened the system in terms of open economic policy. The processing firms' annual turnover demonstrates that this system adds significant value to the main crop coconut. Fourth, it is entirely dependent on local resources, which keeps the distance supplies must travel to a minimum. Fifth, the circulation of local resources provides a stable market for each participant in the system—farmer, trader, or processor—by constructing strong relationships among agriculture, commerce, and industry. Therefore, the system has huge potential for strengthening the local economy in multiple ways.

Table 5-1 Current condition of surveyed coconut-based processing industries in the survey area

No. of products (Product mix)	No. of companies	Avg. no. of employers	Avg. annual turnover (Rs.)
1	6	4.6	965,000
2	12	12.9	9,698,461
3	9	16.6	16,760,888
4	8	27.6	16,163,750
5	7	27.6	11,287,142
6	3	19.6	18,500,000
Total	45	18.2	12,229,207

Source: Field survey, March 2011

Note: Type of product—Coconut oil, Desiccated coconut, Coco peat, Coconut husk, Fiber-related products, Activated carbon products, Coconut vinegar, Fresh curried nuts, Ponnac, Other.

Rs. 1 = ¥ 0.76 (March 2011)

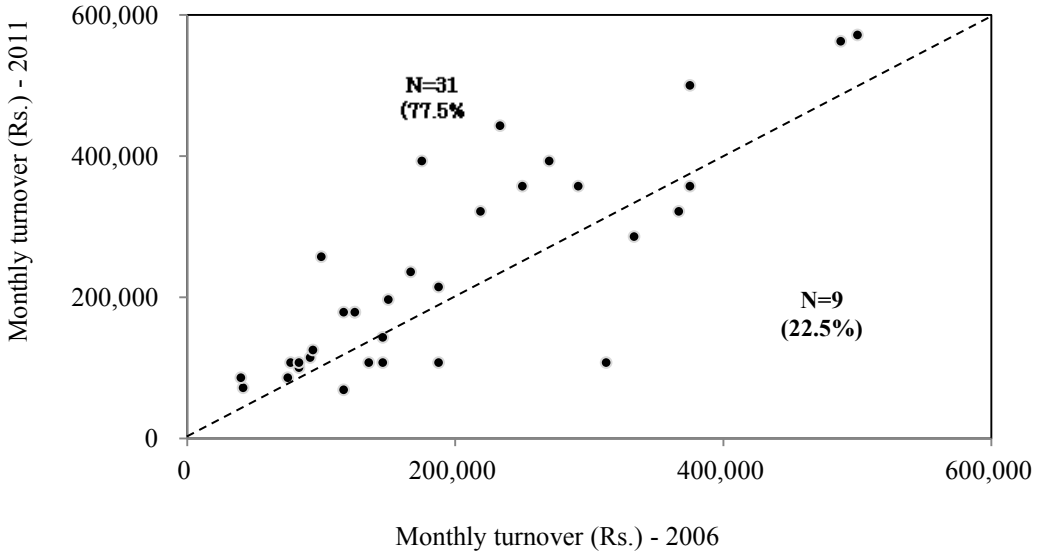

Figure 5-3 Changes in monthly turnover of the related industries surveyed (2006–2011)

Source: Field survey, March 2011

Note: Data were supplied by 18 medium-scale and 22 small-scale processors. Six large-scale companies were excluded in Figure 5-3 due to significantly high data gaps. However, those six companies also reported positive growth.

The system indicates the potential for eliminating the influence of imported palm oil and contributes to a stable regional economy. First, the study found that this diversified industrial system has established the conditions necessary for local economic survival (see Figure 5-2). Table 5-2 shows that majority of Sri Lankan companies produce more than one coconut product while expanding the employment opportunities for local people. Figure 5-3 shows that 77.5% of small- and medium-scale processing companies have recorded positive growth in terms of monthly turnover from 2006 to 2011. Second, the material crop (coconut) in this system is more adaptable to the natural features of this region such as soil, rainfall, temperature, and humidity (Peiris, et al., 2008; Peiris, et al., 1995). The Kurunegala district is located in the intermediate low-agroecological region. The average annual rainfall and temperature in this region are 1,662 mm and 27 C^0, respectively. The average humidity is 85%, and main soil type is sandy loam with soft lateritic subsoil. These four natural regional features are conducive to coconut cultivation.

5.3.2 Development Conditions of the Traditional Circulation System

5.3.2.1 Coconut Marketing Structure in the Survey Area

Figure 5-4 depicts the structure of the coconut marketing system in the survey area. It shows two types of marketing channels, *private merchants* (village assemblers, regional assemblers, commission agents) and *CPCS initiated*. Eighty-four percent of farmers` production is channeled through private merchant-led market channels, and the rest (15.6%) through CPCS. The private merchants' market share distribution shows that 44%, 35.4%, and 3.6% are

handled by regional assemblers, village assemblers, and local small-scale processing firms, respectively. Eighty percent of products built by village assemblers are shipped to regional assemblers through commissioned agents who act based on a charge of Rupee (Rs.) 1 per coconut in the local coconut market. According to the survey, commissioned agents and assemblers revealed that prior to product assembly at the village level, the commissioned agents are informed about the required quantities, production deadline, and pricing. Finally, 72.3% of production sold by the farmers is handled, directly and indirectly, by four regional assemblers channeling village assemblers in the survey area (see Table 5-2). Therefore, it is posited that there is an oligopolistic market structure in the survey area since a large amount of farm produce is handled by only a few assemblers at the regional level. Although the CPCS handles less of the assembly work, it undertakes all of the marketing functions, particularly by making industrial interventions for value addition and distribution through cooperative outlets.

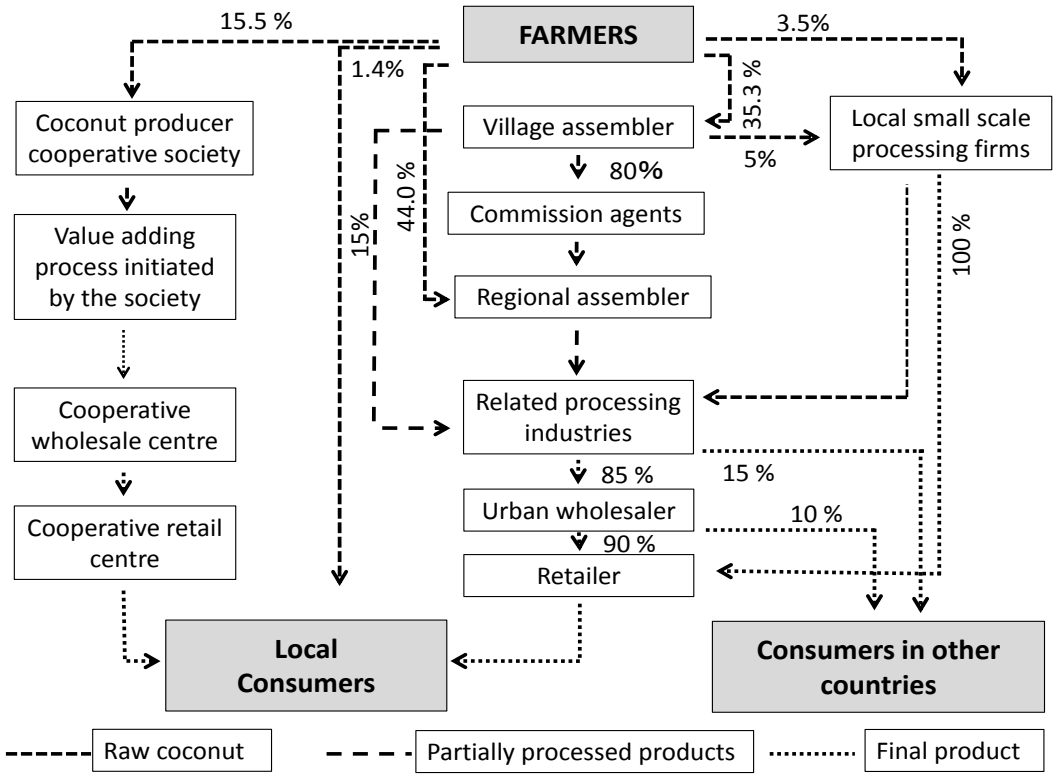

Figure 5-4 Coconut marketing system in Kurunegala district

Source: Field survey, March 2011

Table 5-2 Market share of regional level large scale assemblers at the farm level

Market source	% of market share
Directly from farmers	44.0
By channeling village assemblers	28.3
Sub-total	72.3
Other	27.6
Total	100.0

Source: Field survey, March 2011

5.3.2.2 Nature and Functions of Participants in the Marketing Channel

According to Tables 5-3 and 5-4, the regional assemblers obtain economy of scale in their market operations through a high level of operational capital (cash) along with a comparatively large area of operation. The average operational capital ranges from Rs. 5–10 million with a monthly capacity of

150,000–200,000 coconuts. This has optimized liquidity, resulted in bulk purchases of raw materials to control prices in the primary commodity market, and ensured stability in product purchases and market distribution. The size of the area of operation is also comparatively greater than in other regions. Table 5-4 further shows that regional assemblers handle all the functions of marketing, including product assembly, grading, transportation, partial processing, and price determinations.

Table 5-3 Nature of participants in the local coconut circulation system

Participant	Years of experience	Operational capital: cash (Rs.)	Size of operation (km)	Monthly capacity (nuts)	Avg. no. of suppliers (farmers)
Regional assembler	20	5-10 million	10-20	150,000-200,000	n. a.
Village assembler	16	50,000-100,000	2-4	40,000	120
Coconut Producer Cooperative Society	72	4 million	10-15	50,000	1,568
Commissioned agent	11	n. a.	10	n. a.	155
Regional-level processor	17	10-50 million	10-15	200,000	n. a.
Small-scale processor	8	100,000-200,000	2	5,000	15

Source: Field survey, March 2011

Note: Data were supplied by 46 processing companies, including six large-scale, 18 medium-scale, and 22 small-scale processing companies, along with 16 intermediaries including nine village-level collectors, four regional-level collectors, and three commissioned agents.

Table 5-4 Functions and services undertaken by selected supply chain participants

Participant	Functions					Services		No. of respondents
	A	B	C	D	E	X	Y	
Regional assembler	4	4	4	4	4	4	no	4
Village assembler	9	5	6	1	4	8	no	9
Commissioned agents	0	0	0	0	3***	3	no	3
Coconut Producer Cooperative Society	yes	no	yes*	yes	no**	yes	yes	1
Small-scale processing companies	15	12	09	22	17	15	no	22

Source: Field survey, March 2011

Notes:

(1) Type of functions: A (product assembling directly from supplier place), B (grading), C (transportation from supplier's place), D (partial processing), E (price determination).

(2) Type of services: X (provision of loan, either direct or indirect [provide guarantee]), Y (welfare activities).

(3) * Cooperative society does not provide transportation facilities regularly. ** Pre-determined price is offered. *** The commissioned agent is not a price setter, but he communicates the prices determined by regional-level large-scale assemblers.

The main purpose of deregulating the market was to increase its efficiency through competition. However, this study found that deregulation has strengthened the oligopolistic assemblers, who are characteristic of pre-modern economies. The regional assemblers' domination of farmers' markets (72.3% of market share) has adversely affected competitiveness at the farm level. The regional assemblers primarily determine the price of coconuts by considering the price of imported palm oil and of the current stock of palm oil within the country. Therefore, any adverse impacts resulting from market liberalization are shifted to local farmers at the bottom of the supply chain. Palm oil's market domination reduces the demand for local coconut oil, the main locally produced value-added coconut product, thanks to its relatively low price. At the survey time, the cost, insurance, freight (CIF) value of palm oil was Rs. 220, while coconut oil's price in local markets was Rs. 323. This has led to the traders' adulterating cheap palm oil with coconut oil, as cited by studies (Kelegama, 2006). This initially weakened the cooperative system its main value-added product was coconut oil.

Moreover, although the system is now part of the global economy, pre-modern economic characteristics still exist in the marketing structure. For instance, assemblers use credit provisions as a strategy to maintain product supply. This negatively affects CPCS farmers' negotiation power and market share and has caused a decline in the number of MFs. The main reasons for these characteristics are the insufficient access to financing for the smallholding farmers and a lack of marketing information. Particularly, the farm gate price of

coconuts is set unilaterally by regional assemblers. On the other hand, the CPCS has not chosen to diversify the production system by accounting for market demands for related products such as coco peat, desiccated coconut products, coconut shell-based products, or coconut fiber-based products. As a result, the market power of regional assemblers has further increased thanks to the import market liberalization of palm oil. In addition, although the CPCS holds a high level of working capital, its collecting capacity is low (see Table 5-3). This is indicative of poor operational performance. Moreover, regional assemblers undertake partial processing functions, notably producing coconut husks. However, farmers do not receive any direct income from by-products, even though they add Rs 3 per husk local coconut.

According to Table 5-4, all intermediary-level participants use credits to provide service to material suppliers and ensure a stable product supply. This can be recognized as a strategic action used by regional assemblers to not only maintain their market shares but also prevent new assemblers from breaking into the market. However, repayments on credit provided by village and regional assemblers (informal sources) are conditional and based on product supply. This partly explains why farmers have lost primary market bargaining and negotiation powers. In the repayment stage, farmers must pay high interest rates on credit from informal sources, a situation not likely to be immediately apparent to an independent observer. The study results revealed that 70.7% of Sri Lankan coconut farmers depend on informal credit sources for their capital needs. As a result, farmers must accept the trading terms offered by the

assemblers. This further demonstrates that farmers are facing unfair trade practices within the system.

5.3.3 Current Conditions and Problems of the Farmers in the Circulation System

5.3.3.1 Farmers' Income Analysis

In Sri Lanka, 82% of coconut farmers are smallholders. One hundred percent of the 130 surveyed farmers were smallholders. This means the income they receive from coconut farming is not sufficient to cover their costs of living. As a result, they must also work for the area's coconut-related processing industries. The TCSLC offers employment opportunities that increase the incomes of these farmers. The surveyed farmers can be classified into two groups: farmers who practice agricultural diversification, and farmers who do not practice. Table 5-5 shows that 37% of farmers cultivate coconut only. The rest (63%) practice agricultural diversification techniques. They cultivate crops such as bananas, pineapple, ginger, pepper, coffee, and cocoa or practice dairy farming on their coconut lands. These farmers receive their fertilizer and other required organic materials for their crops from the system (see Figure 5-2). In terms of dairy farming, the farmers receive their main animal feed (ponnac) from the system. This reduces the overall cost of farming and upgrades their net incomes. The survey results indicate that all smallholding farmers receive economic benefits from the system in terms of producing coconut, cultivating other crops and grazing livestock on coconut-growing land, and providing labor to the related industries. Therefore, the system provides opportunities for smallholders to move

out of poverty. Table 5-5 further shows that 48% and 52% of MFs and NMFs cultivate coconut alone. The remaining respective 44% and 56% of MFs and NMFs practice agricultural diversification.

Table 5-5 Agricultural income in terms of agricultural diversification in the coconut-growing lands

	Type of Diversification	MFs		NMFs		Total farmers
		No. of farmers	%	No. of farmers	%	
Non-agricultural diversification	Coconut	23	48	25	52	48 (37%)
Agricultural diversification	Coconut + Dairy	6	44	12	56	18 (14%)
	Coconut + Other crops	24		24		48 (37%)
	Coconut + Dairy + Other crops	6		10		16 (12%)

Source: Field survey, March 2011

Note: Other crops include banana, pineapple, ginger, pepper, coffee, cocoa.

Table 5-6 presents changes to coconut farming performance and income from 2006 to 2011. The previous section's analysis revealed that market liberalization has strengthened the oligopolistic market structure in the coconut sector and weakened the CPCS. Individual NMFs have thus lost their negotiation power in the coconut products assembly market. According to Table 5-6, the extent of coconut cultivation and number of harvestable palms per acre have marginally declined. Production of coconuts per acre has declined for both groups but is comparatively high among NMFs. The income derived from coconut farming has also declined by 1.8% and 31.7% in the MFs and NMFs, respectively. This indicates the similar conditions faced by both groups and the CPCS's current problems related to farming and assembly market activities. However, the

domination of household labor is still vital in coconut farming.

Table 5-6 Changes of performance of farming practices and income of coconut farming in the system

Indicator	Member farmer			Non-member farmer		
	2006	2011	% of change	2006	2011	% of change
1. Extent under coconut (acres)	1.4	1.3	-3.6	1.6	1.6	-4.3
2. Average no. of harvesting palms	69.9	66.5	-4.8	73.1	70.8	-3.2
3. Productivity (nuts per acre)	291.3	273.6	-6.1	367.8	233.9	-36.4
4. Unit price (Rs in real terms)	9.3	9.7	5.2	8.9	9.8	9.8
5. Monthly income (per acre in real terms)	2,725	2,677	-1.8	3,295	2,252	-31.7
6. Monthly labor usage (per acre)						
a) Family labor	n. a.	6.0		n. a.	8.5	
b) Hired labor	n. a.	2.1		n. a.	3.6	

Source: Field survey, March 2011

Notes:

(1) Real coconut farming income was calculated by deflating the nominal income derived from coconut farming based on the Colombo Consumer Price Index (CCPI), which is based on 2002 (2002 = 100) figures. The 2006 CCPI = 140.8, and 2011 = 233.

(2) The recommended density of coconut land is 70 trees per acre.

(3) Parentheses are calculated coconut palms per acre.

5.3.3.2 Farmers' Perceptions about the Constraints of the Circulation System

According to Table 5-7, and farmers mentioned credit as the main reason for their dependency on the supply of coconuts to village (37.3%) and regional assemblers (47.4%).This number is critical in terms of assemblers' objectives and farmers' conditions, resource poor farmers in particular. The primary target of assemblers is the total coconut farmers. In addition, the long term-supply and buying relationships between farmers and village assemblers have also been

noted and this shows pre-modern economic characteristics still in the marketing system.

Table 5-7 Reasons for selling primary products to current buyers

Reason	% of total farmers					
	Credit	Long-term relationship	Proximity	Possibility of negotiation	Price offered	No fraud
Regional assemblers	37.3	24.0	21.3	10.7	13.3	22.7
Village assemblers	47.4	41.1	42.3	25.6	30.7	43.6
Coconut Producers Cooperative Society	24.8	16.2	8.4	6.9	9.2	16.2
Local small-scale processing companies	7.1	3.8	3.6	3.3	3.2	2.6

Source: Field survey, March 2011

Note: All the farmers who depend on assemblers for their credit needs are bound to supply their coconut harvests to them.

Second, according to Table 5-8, non-requirement of collateral or securities, credit freedom, and efficiency are comparatively critical reasons (85.2%, 81.5%, and 74.2%, respectively) for farmers' dependence on informal credit sources. This indicates an underdevelopment problem related to formal financial market activities in the coconut-growing areas and a failure to target smallholders. Third, the main expectations of farmers joining the CPCS are finding a better marketplace, accessing the formal sector credit market, and obtaining stable prices for their products. The members` opinions about the cooperative functions revealed that the CPCS has deviated from its members` main expectations (see Table 5-9). Member farmers are now moving toward privately led market sources. This indicates the cooperative's insufficient, ineffective actions in protecting coconut farmers.

Table 5-8 Farmers' opinions about their dependence on informal credit sources

Indicator	Total (%)
No collateral or securities	85.2
Freedom of credit usage	81.5
Efficiency	74.1
All-time access	40.7
Proximity	29.6
Lower transaction cost	22.2
Repayment flexibility	14.8

Source: Field survey, March 2011

Table 5-9 Members' opinions about cooperative functions

Indicator	Total (%)
Advisory services and information (extension services)	70.8
Welfare activities	61.0
Cash payments on sold output	46.7
Procurement of operational credit	45.1
Regulation of market prices for primary agricultural products	44.2

Source: Field survey, March 2011

5.4 Conclusion and Considerations

This study examined the current roles and development conditions of the TCSLC in Sri Lanka's open economic policy environment. The results indicated the importance of this system to developing the local coconut sector. The study also found three characteristics of that system which support eliminating the influence of globalization on the TCSLC: a diversified industrial system based on one main regional crop, adaptability of that main crop (coconut) to the natural features of the region, and important economic opportunities for all smallholder farmers. Moreover, the study identified the TCSLC's development conditions. First, its oligopolistic market structure is the main bottleneck in the system's economic gains "trickling down" to the local farmers. The lion's share of the

local coconut market is handled by a few oligopolistic assemblers (regional assemblers) presenting unfair marketing conditions to local farmers. Particularly, by adopting strategic actions (credit provisions) in their market operation, these assemblers strengthen their market power and establish entry barriers against new assemblers. This has led to a loss in farmers` bargaining and negotiating power, and they pay high interest rates on the credit they receive from assemblers, as repayment is conditioned upon product supply. The CPCS has weakened because of deregulation policies, which have also increased the market power of oligopolistic assemblers. Specifically, although the TCSLC links to the modern economy, pre-modern economic characteristics such as informal credit and a general lack of marketing information still exist within its market structure. Second, the inefficient and ineffective nature of formal sector institutional involvement in terms of marketing and financial capital for farmers was found to be a reason for those pre-modern structural characteristics. This is the main reason oligopolistic assemblers can dominate the market and set farm gate prices. Third, for these reasons, farmers' net gains from coconut farming to the have gradually been squashed. This study found that farmers' real incomes from coconut farming have diminished over the last few years. However, the farmers' overall economic condition has not weakened because of labor income opportunities offered by the system as well as agricultural diversification in their coconut-growing lands.

The authors suggest the following considerations in order to further improve and strengthen the TCSLC in this era of globalization. First, the external shocks

(imports of substitute raw materials) to the country should be minimized through market regulations such as import taxes on palm oil in order to provide a favorable environment for the main traditional industry, coconut oil. Second, in order to enhance the welfare gains to both consumers and coconut farmers, the value of byproducts, which are not presently considered in price determinations, should be taken into account in the market price determination of final products, simultaneously reducing the consumer price and increasing the farm gate price. Third, the oligopolistic market structure is the main system problem. Therefore, for fair trade, the marketing structure should be changed to a competitive market in line with government investment in marketing facility development and new regulations with regard to marketing. Fourth, local wholesale markets should be established and an open auction system introduced in order to prevent a few oligopolistic assemblers from exerting huge influence on price decisions. Fifth, in order to eliminate the pre-modern economic characteristics in the marketing structure and the price-fixing power of the oligopolistic assemblers, the government should support the CPCS in upgrading the credit and marketing choices for smallholder farmers. Doing so will increase the farmers` negotiation power, the CPCS's market share, and the number of MFs.

Chapter 6 : Base and Conditions of a Stable Regional Economy under Economic Liberalization in Sri Lanka: A Case Study of Diversified Traditional Coconut Industry in the Kurunegala District

6.1 Introduction

The coconut industry undoubtedly plays a multidimensional role in the local economy of Sri Lanka by accounting for 10.7% of agricultural Gross Domestic Product (GDP) and offers employment opportunities for approximately 5% of the total employed population. The industry contribution to country`s food supply is also vital since 70% of coconut based food production is domestically consumed while 22% accounts for the per capita calorie intake which is second only to rice (Gunathilake, et al., 2009; Peiris, et al., 2008). Currently, 21% of agricultural land is used for coconut cultivation and 82% is under the smallholding sector (DCS, 2010). More than 200,000 are presently involved in coconut growing, processing of coconut and coconut farming. Typically, the coconut oil processing sector uses 70% of the coconut kernel as a single industry in Sri Lanka, which is the main value added industry (DCS, 2010).

However, since joining the World Trade Organization (WTO) and market liberalization of the coconut trade in the 1980s, the heavy import of cheap palm oil has dominated the domestic market (Karunagoda, et al., 2001). Palm oil is the substitute oil to coconut oil which is produced by the main value-added industry in the coconut sector. Thus, an increased import of palm oil has

negatively affected the growth and survivability of coconut oil processing industry (see Figure 6-1) (Karunagoda, et al., 2001). Although a policy shift to market liberalization of coconut was meant to a high import of substitute products to the industry main value-added product, the coconut industry has shown a great performance in the coconut growing regions and the entire economy at large. For instance, from 1977 to 2010, the coconut production increased by 27.3% from 1,384,000 tons to 1,761,680 tons (Food and Agricultural Organization (FAO), 2010). The export earnings from the sector increased by 285% from US$ 69 million in 1995 to US$ 266 million in 2011 (DCS, 2010). The employment and a number of value-added industries are also increasing at a significant rate.

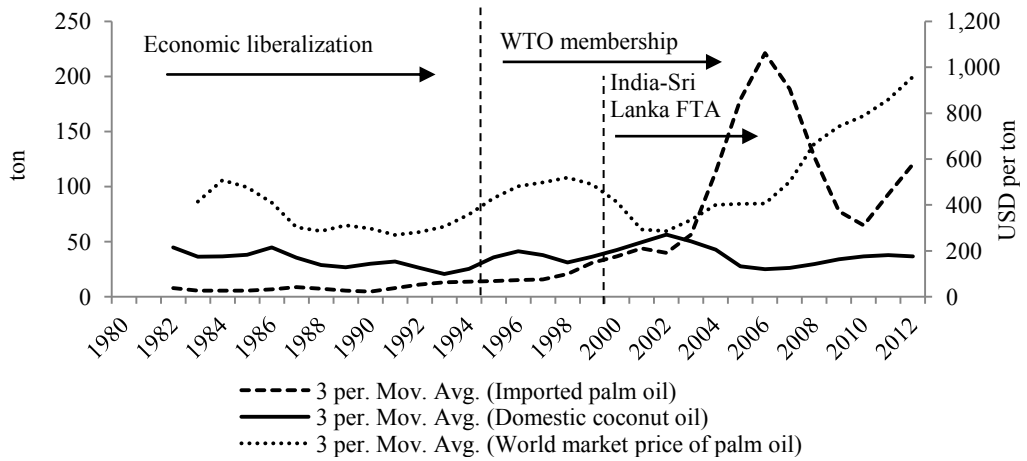

Figure 6-1 Trends for domestically produced coconut oil consumption, consumption of imported palm oil, and the world market price of palm oil: 1980–2012

Source: Central Bank of Sri Lanka, annual reports; FAO statistics, 2012; World Bank, commodity price data, 2012

Note: The rapid increase of imported palm oil from 2000 to 2007 was due to the effects of the India-Sri Lanka Free Trade Agreement (FTA) introduced in 2000. Palm oil was imported duty free into Sri Lanka by Indian-owned enterprises, processed into Vanaspathi (a vegetable oil substitute for ghee) and exported duty free into India as a Sri Lankan product, thereby avoiding an 80% customs fee on direct imports (Kelegama, 2006). In response to the increase in global commodity prices in 2007–2008, India cut import taxes on food items, including palm oil, making Vanaspathi exports from Sri Lanka unviable.

Table 6-1 Distribution of total coconut production different processing sectors

Total coconut production (annual)	Material received from coconut nuts	% of material processed in local processing industries
2,600-3,000 million nuts	Coconut kernel	Home manufacturing (65%) 1. Coconut milk and coconut oil 2. Sweet 3. Hair oil 4. Other many products Processing industry (35%) 1. Coconut oil 2. Desiccated coconut
	Coconut husk	100%
	Coconut shell	100%
	Coconut water	Na.

Source: Department of census and statistics, Sri Lanka

6.2 Aims and objectives of the study

The pressing concern today is the declining performance of the Sri Lankan agriculture under the trade liberalization since 1977 and commitment to the WTO regulations. This has unfavorably affected the main sectors of agriculture such as dairy, sugar, rubber, etc. while putting the livelihood of a large number of people in the different agro-ecological regions at risk. This has aggravated the burden on the country`s trade balance in an unprecedented way. Therefore, an object of this study is to examine the base and conditions of stable economy of different agro-ecological regions since it supports strong policy implications to regional agro-based economies under economic liberalization policies. Due to the above mentioned characteristics of the coconut sector in the post economic liberalization period in Sri Lanka, this study will examine the research subject by taking into account the traditional coconut sector in the coconut triangle. According to the history of coconut cultivation in Sri Lanka, in

the 1840s, the coconut monoculture system was introduced by the British in the coconut triangle area. Therefore, the main purpose of the study is to examine the base and conditions of stable traditional coconut based regional economy of Sri Lanka. The study examines: (1) factors associated with base of the regional economy, (2) conditions of the stable regional economy and (3) existing constraints to stability of the regional economy in the era of economic liberalization.

6.3 Description of data collection and selection of the survey area

In order to deal with research subject, the data for the study was collected through a field survey conducted in the Kurunegala district during March 2011. The Kurunegala district was selected because (i) district is located in the main traditional coconut growing region, coconut triangle; (ii) this district records the highest percentage of total coconut land (33.5%) and total coconut production (40%) of the country (DCS, 2011); (iii) there are many kinds of coconut related value-added industries; and (iv) the district is the third highest contributor to the country`s GDP (DCS, 2011). The data used in this study comes from interviews held with farmers, processors and traders in the coconut industry of the Pannala DS division in the Kurunegala district. Randomly selected 130 farmers, 46 processors, and 16 collectors including 9 village-level collectors, 4 regional large-scale assemblers and 3 commission agents were interviewed by employing semi-structured questionnaire. In addition to the primary data, the study uses the secondary data published by various researchers and Census and Statistical Department of Sri Lanka.

6.4 Results and discussion

6.4.1 Causes of traditional coconut has been a base of the stable regional economy

The study found two main reasons for traditional coconut industry has been a base of the stable regional economy. First, the material crop is adaptable to the natural features of the region; rainfall, temperature, soil and humidity. The Kurunegala district is located in the intermediate low Agro Ecological Region (AER) (see Figure 6-2). The mean rainfall and temperature in this region are 1,662 mm and $27C^0$, respectively (see Table 6-2). Relative humidity in the region is also high with a mean of 85% (Liyanage, et al., 1986). Moreover, sandy loam type of soil passing to soft lateritic sub-soil is the main type of soil. These three natural features of the region are more suitable to coconut cultivation (Liyanage, et al., 1986) and thus, high density of coconut cultivation can be seen in the Kurunegala district (see Figure 6-3).

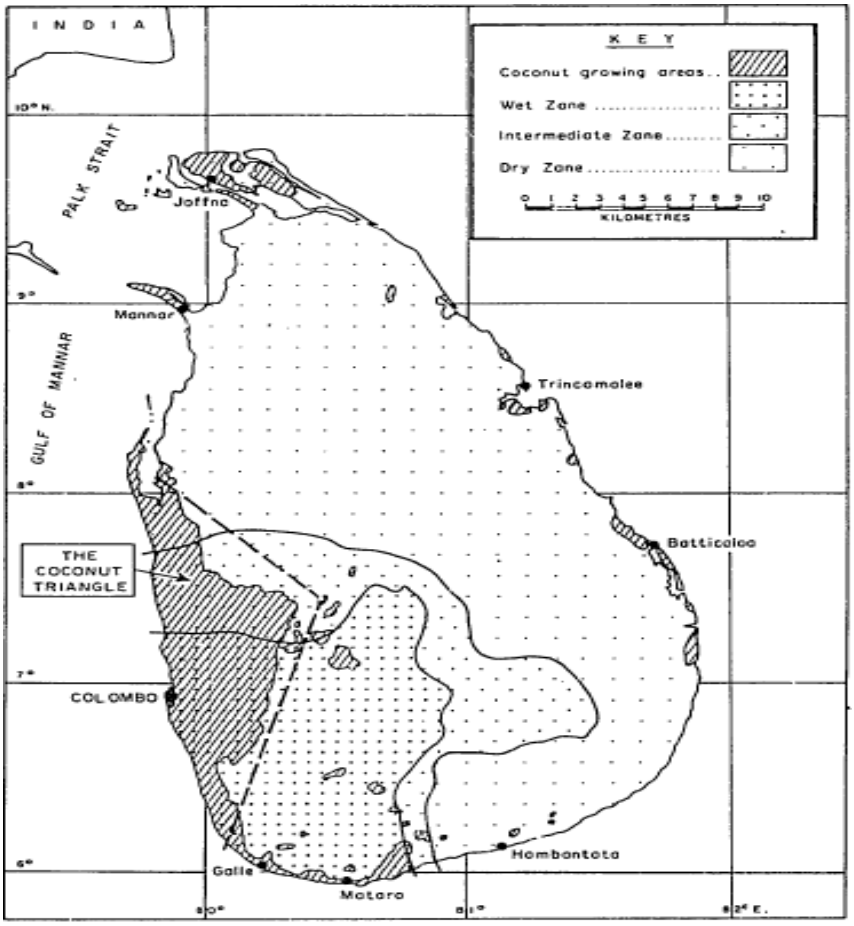

Figure 6-2 Map of Sri Lanka showing three major rainfall zones and coconut growing areas

Source: Liyanage, 1983

Figure 6-3 Distribution of coconut growing areas in Sri Lanka

Source: Department of Census and Statistics, Sri Lanka

Table 6-2 Climatic and weather conditions of principle coconut growing AERs

AER	Distribution of planted extent	Rainfall (mm)	Temperature		Main soil type
			Max.	Min.	
Intermediate zone	59.2%	1662	31.5	23.1	Sandy loam type of soil
Wet zone	24.8%	2435	33.3	23.7	
Dry zone	16.0%	1193	31.6	24.0	

Source: Coconut Development Authority of Sri Lanka, Annual Reports

Note: The AERs are demarcated based on climate, soils and altitude (Panabokke, 1996).

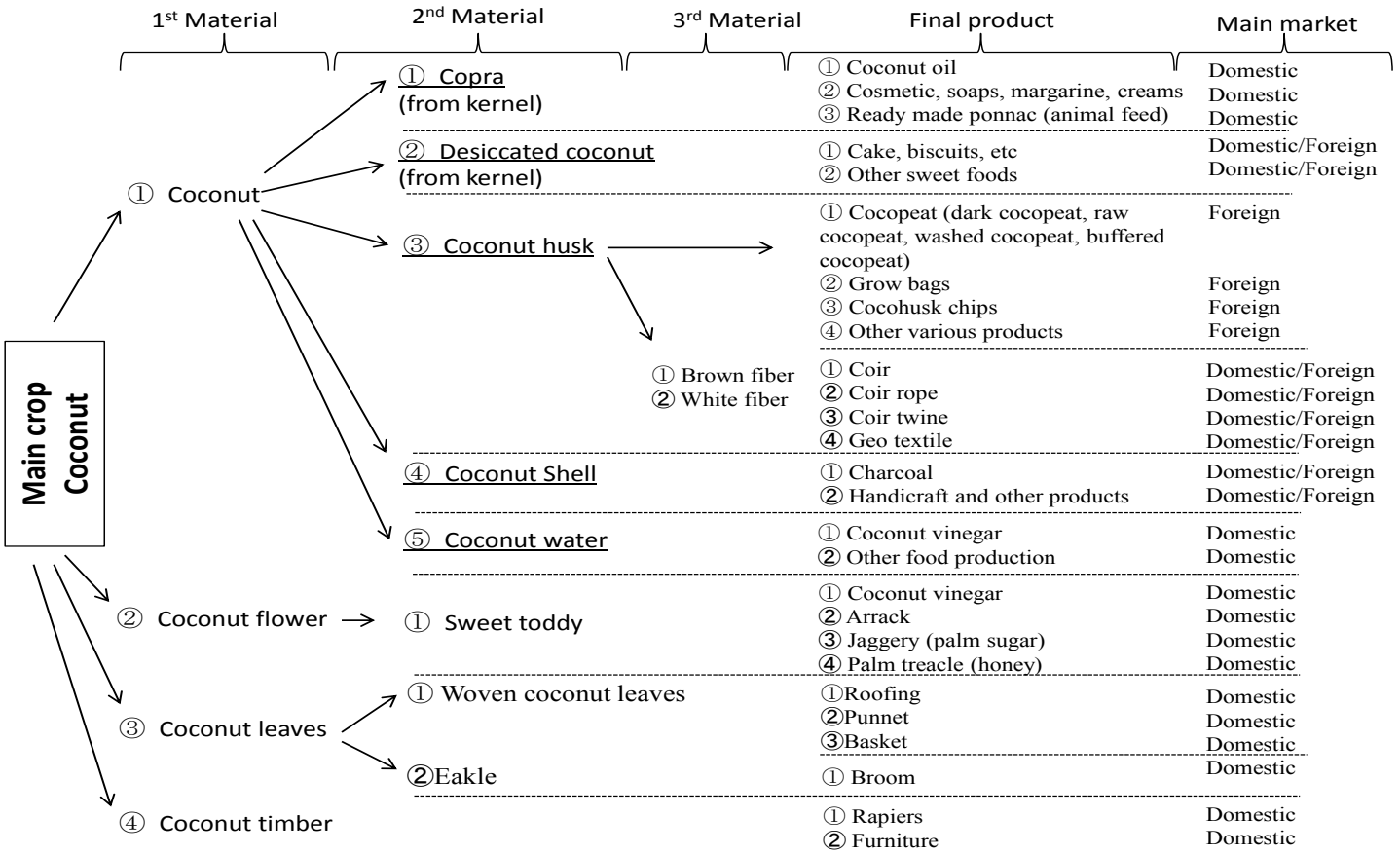

Figure 6-4 Material utilization structure and value adding structure of regional coconut industry

Source: Filed survey, March 2011

Second, the study found that this single crop provides materials to a diverse range of value-added industries in the region (see Figure 6-4). The material utilization structure shows that the product range has dramatically increased by producing the materials to forward to the related industries. The entire industry has 4 material utilization steps. For instance, coconut, the 1st material, becomes a material of five industries, (copra, desiccated coconut, coconut husk, coconut shells and coconut water). Based on materials of five industries in the 2nd material stage, 19 final products are produced in the final product stage. Rest of the materials in the 1st material stage also shows the same trend. Therefore, the traditional coconut industry has more vertically and horizontally broadened value-added steps. The field survey revealed that 37 final products are produced using the main crop, coconut, in the survey area. The Desiccated Coconut and coconut husk based products have the export market. Rest of the final products is sold in the domestic market. This indicates that more specialized crop in the region has resulted in more diversified industrialization in the region. Therefore, more vertically and horizontally broadened material utilization and value-added structure, which is based on more adaptable crop in the region, has been the base of the stable economy in the region.

6.4.2 Degree of contribution for the regional economy in terms of local material market, value addition to the local materials and labor market

(A)Existence of home manufacturing, and small, medium and large independent and individual processors

Table 6-3 revealed the inter-linkages between home manufacturing and small scale industries, and medium and large scale companies. Mainly, 1st the

material industry is solely under the home manufacturing and small-scale processing sector. Four out of 6 home and small-scale industries were found in the 2nd material industry. 100% of 3rd material industry and 74% of final product industry are handled by medium- and large- scale industries. It is witnessed that large-scale final product industries obtain the materials from the home manufacturing and small-scale industries. Industries in each stage are independent in terms of capital and functions. According to growth of industries in terms of the annual turnover for the year 2006 and 2011, 18 out of 25 surveyed home manufacturing and small-scale industries shows a positive growth. Five out of 6 medium-scale and all large-scale industries also show a positive growth (see Figure 6-5). It indicates the expanding contribution of a more broadened value-added system to strengthen the stability and growth of the regional economy in the era of economic liberalization.

Table 6-3 Classification of coconut based value-added industries in the survey area

Type	1st material industry		2nd material industry		3rd material industry		Final product industry	
Cottage and small scale industries	1. Coconut, 2.Coconut flower, 3.Coconut leaves, 4. Coconut timber	100 %	1. Copra, 2. Sweet toddy, 3. Coconut husk, 4. Coconut shell	66.6 %		0%	1. Handicraft and other products, 2. Rich jiggery, 3. Palm treacle, 4. Woven coconut leaves, 5. Eakle, 6. Punnet, 7. Basket.	26 %
Medium and large scale industries		0%	1. Desiccated coconut, 2. Coconut water	33.3 %	1. Brown fiber, 2. White fiber	100 %	1. Coconut oil, 2. Cosmetic, soaps, margarine, creams, 3. Ponnac, 4. Cake, 5. Other wseet foods, 7. Coconut peat, 8. Grow bags, 9. Cocohusk chips, 10. Other cocopeat products, 11. Coir, 12. Coir rope, 13. Coir twine, 14. Geo textile, 15. Charcoal, 16. Coconut vinegar, 17. Other coconut water based products, 18 Arrack, 19.Rapiers, 20. Furniture	74 %

Source: Filed survey, March 2011

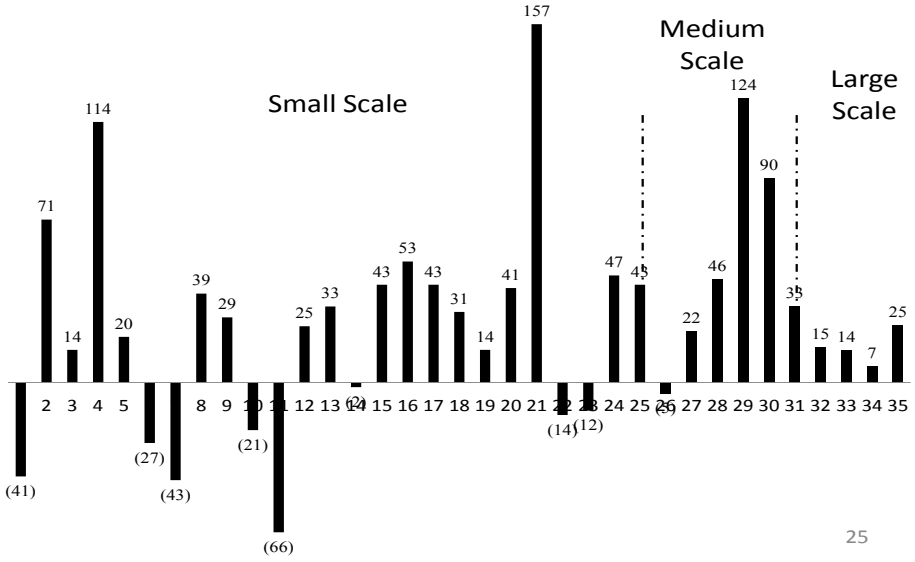

Figure 6-5 Percentage change of annual turnover of surveyed coconut processing industries

Source: Filed survey, March 2011

Note: Real value of annual tern over was calculated by deflating the nominal value based on Colombo Consumer Price Index (CCPI) which is based on 2002 (2002 = 100). CCPI (2006) = 140.8 and CCPI (2011) = 233.

(B) Contribution for value-added to local raw materials

According to Table 6-4, coconut related value-added industries are not dependent on imported materials. The selected industries in 2nd material stage shows that all processors in the copra, coconut oil, desiccated coconut and coconut husk based industries obtain the materials directly from domestic sources; directly from farmers and village- and regional- level collectors. Table 6-5 shows a typical case of more value adding steps of coconut oil production based on coconut and amount of value addition in each stage. It shows that an average of 8 coconut nuts is required to produce 1 kg of copra. The market value of 8 coconuts is Rs. 216. By using 8 coconuts, processors in the 2nd stage

can produce 1 kg of copra, 8 coconut husks and 8 coconut shells while adding value of Rs. 130.7 to the value of primary material (Rs. 216). This has again broadened more in the 3rd value added stage by producing coconut oil and ponnac from copra, coir from coconut husk and charcoal from coconut shell while adding the value of Rs. 139.8. All these final products suit the local living conditions.

Table 6-4 Non-dependency on imported materials by the processing sector

Type of industry	Domestic sources			Imported sources
	Directly from farmers	Village level- and regional level collectors	Other	
Copra	11	12	0	0
Coconut oil	9	10	0	0
Desiccated coconut	0	3	0	0
Coconut husk based processing industry	13	21	1	0

Source: Filed survey, March 2011

Table 6-5 More value added steps based on a single product: Coconut oil as a core product

1st step			2nd step			3rd step		
Main material	Quantity	Value (Rs.)	Product	Quantity	Value (Rs.)	Product	Quantity	Value (Rs.)
Coconut	8 nuts	216.0	Copra	1.625kg	308.7	Coconut oil	1 kg	410.0
						Ponnac	0.487kg	22.5
			Coconut husk	8 husks	28.0	Coir	0.400kg	40.0
			Coconut shell	8 shells	10.0	Charcoal	0.300kg	16.0
Primary value = 216.0			Value addition = Rs. 130.7			Value addition = 139.8		

Source: Authors calculations based on field survey data

(C) Contribution for local labor market

The survey results revealed that 45 surveyed processing firms have provided employment to 805 people in the area. The labor force characteristics of the processing firms are well-matched with local labor market characteristics. Among the total number of workers in the selected firms, there were 63%, 75%, 79% and 80% of workers from the female, low education, poor households and agricultural household categories, respectively.

Table 6-6 Current condition of surveyed coconut based processing industries in the survey area

No. of final products	No. of companies in each final product level	Total no. of employment	Ave. annual turn over (Rs,)
1	6	28	965,000
2	12	155	9,698,461
3	9	149	16,760,888
4	8	221	16,163,750
5	7	193	11,287,142
6	3	59	18,500,000
Total	45	805	12,229,207

Source: Survey on coconut based processing industries in Kurunegala district, March 2011

Note: Product; Coconut oil, DC coconut, Coco peat, coconut husk, Fibre related products, Activated carbon products, Coconut vinegar, Fresh curry nuts for consumption purposes, Ponnac, Other.

6.4.3 Constraints to a stable regional economy

The marketing structure of the local coconut in the survey area suggests oligopolistic coconut assembling market as the main broking problem of the material and material based industrial development in the region. As depicted by Figure 6-4, two types of marketing channels are exist in the region; i.e. private

merchant led and coconut producer cooperative society (CPCS) led. Mainly, 84.4% of farmer production is handled by private merchant led channel and rest by CPCS. The distribution of the private merchant led marketing channel share indicated that 72.3% of total coconut production is handled by a few (four) large-scale regional-level assemblers directly and indirectly with oligopolistic practices. They directly purchased 44% of farmer production and indirectly purchased 28.3% of farmer production by channeling village-level small-scale assemblers (see Table 6-7). Figure 6-4 revealed that 80% of purchased coconut by village-level assemblers is shipped to regional-level large scale assemblers.

The adverse impact of this oligopolistic market structure is that it hinders the economic merits of the diversified industrial development in the region to farmers. First, the study identified that farm gate price is largely influenced and set unilaterally by these regional-level assemblers due to the big market share in the farmer market. The village-level assemblers, who held 35.4% of market share, also set farm gate price based on the informed price by the large-scale assemblers via commission agents. These commission agents of the large-scale assemblers receive Rs. 1 a coconut nut. This unilateral price determining power of the large-scale assemblers has been further strengthened due to their relatively high operational capital and high distance area of collection. The monthly operational capital of them range from Rs. 5 to 10 million with monthly assembling capacity of 150,000 to 200,000 coconut nuts. This high level of operational capital has resulted in bulk buying of coconut which is constituted to control the price in the farmer market.

Second, the coconut farmers` negotiation power in marketing of their products has been limited by this oligopolistic market structure. The study found that all participants in the marketing system use credit as a provision of service to farmers. As condition of the credit provision, the farmer has to supply their production to the credit supplier at a price determined by the assemblers. The results indicated that 70.7% of the farmers are dependent on these informal credit sources for their financial capital requirement in farming and recurrent household expenses. As reported by the surveyed farmers, the main causes of farmer dependency on these informal credit sources are non-requirement of collateral (85.2%), non-conditions in credit usage (81.5%) and ability to take loan within very short period (74.1%). Therefore, the farmers` high dependency on informal credit sources could be identified as the main reason for loosening the bargaining and negotiation power of the farmers in the market.

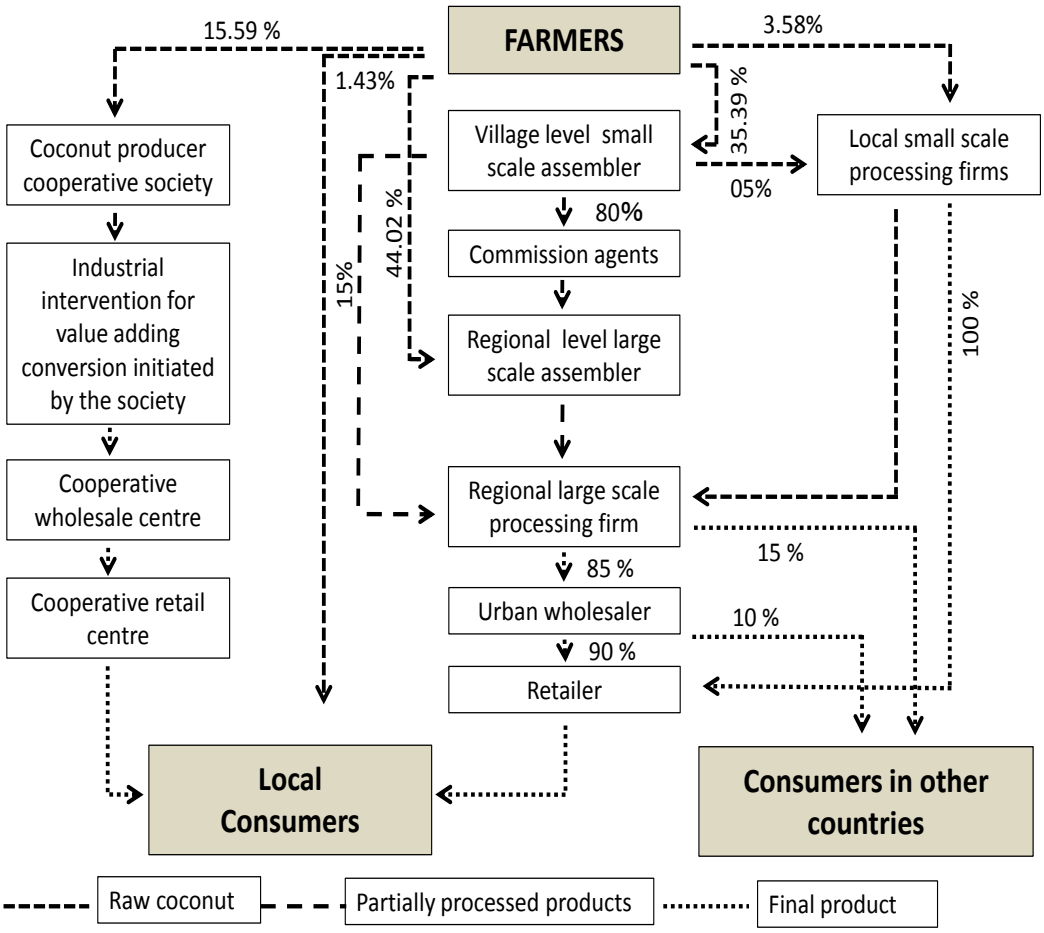

Figure 6-6 Coconut marketing channel in the survey area

Source: Filed survey, March 2011

Table 6-7 Market share of regional large scale assemblers in the survey area

Market source	% of market share
Directly from farmers	44.0
By channeling village level small scale assemblers	28.3
Sub-total	72.3
Other	27.6
Total	100.0

Source: Filed survey, March 2011

6.5 Conclusion and considerations

This study has examined the base and conditions of stable agriculture based

regional economy by taking into account the traditional coconut growing and processing region in Sri Lanka. Large amount of palm oil has been imported from foreign countries under the economic liberalization. This empirical study identified the significance of local coconut sector in the regional economy under economic liberalization and WTO regulations. Followings are the main results.

According to the results of the study, there are two reasons why traditional coconut has been a base of the stable regional economy. First, the main material of diversified traditional coconut industry in the region is adaptable to the natural features of the region; rainfall, temperature, soil and humidity. Second, there are many types of and kinds of processing industries based on the main crop material in the region.

The results indicated three main conditions of stable regional economy. They are, 1) growth of home manufacturing to medium and large scale processing industries in the regional economy in the economic liberalization period, 2) good main material base value adding system in the region and 3) contribution of main crop material base processing industries to the local labor market.

The study suggests oligopolistic marketing structure in the coconut assembling market as a broking problem of industrial development in the region. This oligopolistic coconut assembling system is unfair to the local farmers and it is essential to build a better system to make fair marketing system. It needs a

system to complement other sectors. It can improve both farmers` and processors` condition in terms of productivity under the economic liberalization and WTO regulations. In this connection, building up a good credit system by the public banks (formal institutions) for local farmers and regulations on unfair trade practices are very vital measures.

Chapter 7 : Interaction System between the Group Processing Centers and Smallholder Rubber Farmers under the Economic Liberalization in Sri Lanka: An Evaluation of the Kegalle District Group Processing Centers

7.1 Introduction

The rubber plantation industry plays a dominant and multilayered role in rural areas of Sri Lanka.[38] In 2011, the industry accounted for 8% of the country`s agricultural gross domestic products (AGDP) while occupying 7% (125,600 ha) of the country`s agricultural land. The smallholder units (< 4 ha) occupy 63% of total rubber land and were distributed among approximately 200,000 smallholder farmers (Central Bank of Sri Lanka (CBSL), 1960-2012). Today, the smallholder farmers account for 65% of the total natural rubber (NR) of the country. The industry also provides approximately 400,000 employments directly and indirectly in cultivation, various stages of processing, and marketing.

Since 1977, the economic liberalization policies have penetrated the country's rubber-related industrial system due to the huge inflow of foreign direct investments (FDI) into the sector. The development of rubber-related industrial system was reflected by an increasing trend of domestic consumption of NR

[38] Sri Lanka`s rubber industry consists of two independent sectors: 1) plantation industry, including smallholder rubber farmers, which grows rubber trees and harvests latex that is converted into stable concentrates and raw rubbers and 2) the rubber product manufacturing industry, which converts raw rubber into value-added finished rubber goods (Sri Lanka Rubber Industry Cluster, 2002).

(see Figure 7-1) and an increase of imported synthetic rubber to fill excess demand. However, impacts of economic liberalization policies on smallholder farmers were negative until 2001 due to the decline of domestic NR production and productivity. This stagnancy was due to a lack of measures in the policies to secure the smallholder rubber farmers from global competition. The negative impact was reflected by the decreasing trend in NR production until 2001 (see Figure 7-1). For instance, the industry recorded the lowest NR production in 2001, which is 86,000 tons, though the industry produced 155,000 tons of NR in 1977. The industry's national average yield of 850 kilograms per hectare (kg/ha) in 2001 was at the bottom of the global ranking of countries' rubber land productivity (Sri Lanka Rubber Industry Cluster, 2002). The market liberalization also allowed traders to import synthetic rubber from larger companies located in the USA, the Republic of Korea, Malaysia, EU, South Africa, and other countries. This import clearly indicates that although the economic liberalization policies penetrated the rubber related industrial system, its effects were adverse to the smallholder farmers, which produce over two-thirds of the NR of the country, until 2001. It indicates that the policies do not support an achievement of pro-poor economic growth, and they put the livelihood of smallholder rubber farmers at risk.

Based upon this background, the government reintroduced the group processing centers (GPCs) (*Thurusaviya* Societies) as a method of revitalizing the smallholder rubber plantation industry in 2000.[39] Today, there are 666 GPCs in 12

[39] The Group Processing Center was established under the name of Thuru Saviya Rubber Society under the Thuru Saviya Fund of Ministry of Plantation in Sri Lanka. The Thuru

rubber growing districts which comprise 20,785 registered members (Ministry of Plantation, 2011). The group approach was first introduced to the sector in 1946, and in the 1970s, it was a national basis program under the government five year program (Chandrasiri, et al., 1977). However, the GPCs' system was significantly neglected in the earlier two decades of economic liberalization in 1977 and the World Trade Organization (WTO) membership in 1995 until 2000. Therefore, a refocus of a greater collective approach to more globalized industry under the economic liberalization policy framework in the country is an interesting area of study. Those studies will support the education of appropriate lessons to safe guard the smallholder farmers in the rubber plantation industry and other agricultural sub-sectors within the framework of economic liberalization.

Existing knowledge in the field reveals that there are no empirical studies that examine the effects of the GPCs on smallholder farmers. Researchers have written about technical aspects of rubber farming and processing and issues related to the sustainability of the smallholder rubber sector (Viswanathan & Rajasekharan, 2001; Wijesuriya, et al., 2006; Wijesuriya, et al., 2007). The effects of economic liberalization on rubber industry are also emphasized areas in the literature (Sri Lanka Rubber Industry Cluster, 2002). Therefore, it is important to evaluate the effects of the GPCs on smallholder farmers' economic development as they could suggest strong policy changes to entire smallholder

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Saviya Fund has been established under the Act No. 23 of 2000. It has been established with the aim of strengthening the quality of life for smallholder rubber farmers.

sectors within the framework of economic liberalization. In this circumstance, the empirical study focuses to assess the effects of the GPCs functions on smallholder farmers' economic development. This study will examine the followings: the effects of GPCs' functions (marketing, extension, and financial capital) on processing and the marketing developments of a smallholder sector and on rubber land productivity.

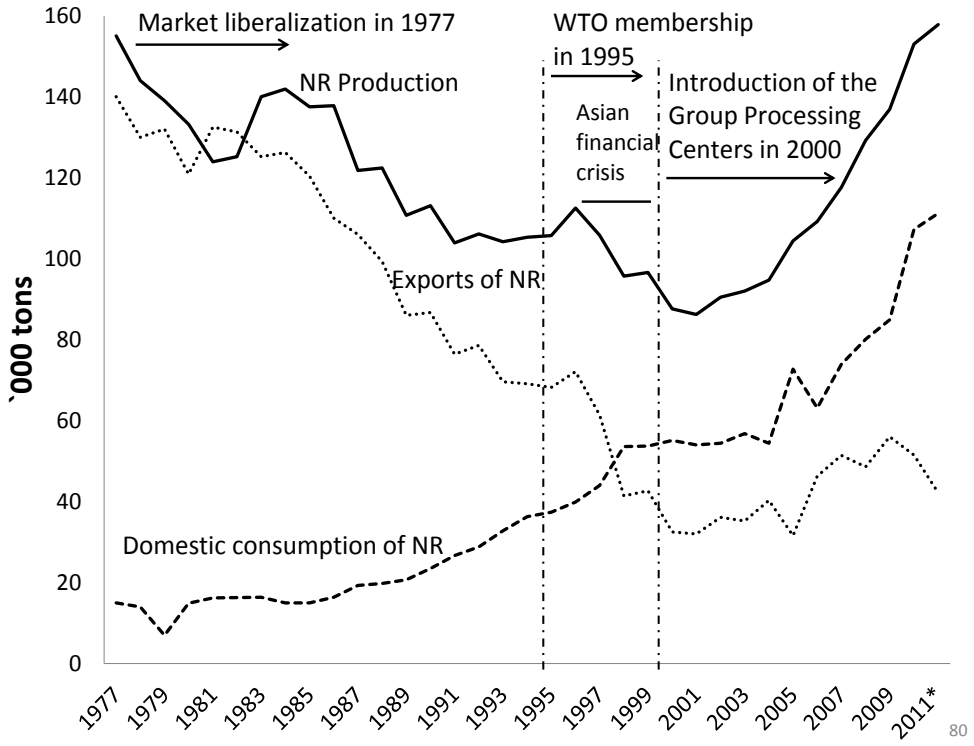

Figure 7-1 Rubber production, exports and domestic consumption (1977-2011)

Source: Central Bank of Sri Lanka, Annual Reports, Various issues

7.2 Research methodology

7.2.1 Data collection and sampling

The data for the study was collected through a field survey conducted in the Kegalle district from August to September 2012. The Kegalle district was selected for several reasons: 1) This district is the largest rubber growing district, which accounts for 18%, 30%, and 30% of the total NR production, rubber land extent, and small rubber farmers, respectively. These percentages are the highest percentages recorded in a single district in Sri Lanka (DCS, 2011). 2) The bulk of the GPCs of the country is located in this district. At the time of the survey, 18% (120) of total GPCs were located in the district. 3) The most related companies are located in this district due to the relatively high supply of materials. The study conducted two surveys: a survey on farmers and a survey on participants in the supply chain. The farmer survey covered 86 farmers consisting of 38 GPCs member farmers (MFs) and 48 non-member farmers (Non-MFs) in six villages in the Warakapola Divisional Secretariat (DS) area by adopting the stratified random sampling technique. The smallholder rubber farmer population size in the selected villages was 285, including 126 MFs and 159 Non-MFs. Farmers in each group were randomly selected. Moreover, four GPCs, 6 village assemblers, 4 regional assemblers, and 3 agents of rubber product manufacturers in the DS area were selected for necessary data collection.

7.2.2 Theoretical model and analytical methods

Figure 7-2 presents a theoretical aspect of the group approach in the smallholder farmer economic development. The studies have cited that

smallholder farmers are poor in marketing, human capital, and financial capital (Jayaweera, 1995). GPCs address these three issues in order to improve the marketing condition and productivity. Finally, an improved marketing condition and productivity leads to the improvement of the living condition of smallholder farmers. This study empirically tests this theoretical concept in the context of economic liberalization in Sri Lanka.

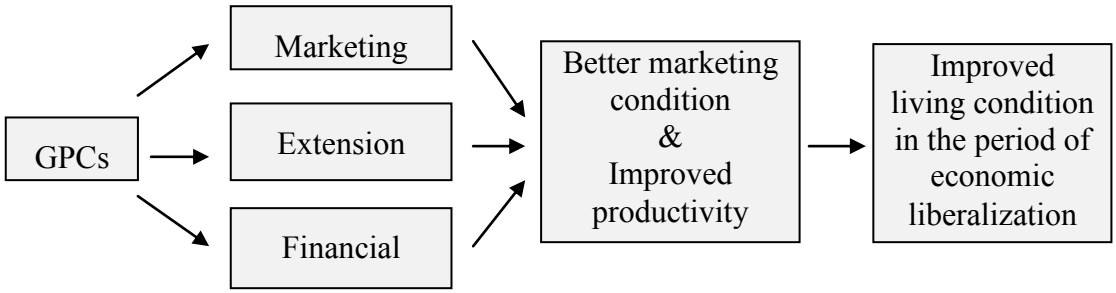

Figure 7-2 Conceptual framework of interaction system

First, the study assesses the GPCs' role in developing marketing conditions of smallholder farmers. In this connection, the study analyzes the economic effects of a marketing structure faced by both MFs and Non-MFs in a comparative way. Second, the study assesses the effects of the GPCs on rubber land productivity (field latex production (kg)/acre). In this regard, we apply methods of descriptive statistics and statistical inference (Student's t-test, correlation analysis, regression analysis). In order to identify the impact of GPCs on field latex production (kg)/acre, multiple liner regression model is estimated. The model postulates that field latex production (kg)/acre is functionally related to demographic and socioeconomic factors, physical factors, technology adoption, and institutional factors (see Equation 1). The relevant variables and

their descriptions are listed in Table 7-1. We also added a statistical interaction variable (X11=(X7*X8)) into the model, because we assumed that there is a theoretical relationship between farmer organizations and agricultural extension services. Stepwise multiple liner regression procedure is used to determine the variables that significantly influence the productivity. SPSS statistical software was used to analyze the survey data.

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots\ldots + \beta_n X_{in} + u_i \text{ ---------- (1)}$$

Table 7-1 Description of the variables in the multiple liner regression model

Characteristics	Description of variables
Dependent variable	Y = Field latex production (kg/acre)
Demographic and socioeconomic factors	X1 = Age (years) X2 = Household size (number of members) X3 = Education level (zero schooling = 0, primary level = 1, secondary level = 2, tertiary level = 3, above tertiary level = 4) X4 = Household income (monthly income) X5 = Experience in rubber farming (years)
Physical factors	X6 = Land size (acre)
Technology adoption	X7 = Technology adoption rate index*
Institutional factors	X8 = Membership in GPCs (dummy variable: GPCs member = 1, otherwise = 0) X9 = Main credit sources (dummy variable: formal credit sources = 1, otherwise = 0) X10 = Field visit by the extension officers (number of field visits during last five years)
Interaction variable	X11 = X7*X8

Note:* Technology adoption rate index = $\sum_1^4 X_{i7}/n$, where X_{i7} is technology adoption rate of ith farmer, $\sum_1^4 1$are particulars of technology (land preparation and planting, input usage, weed and disease control and tapping, and n is number of particulars of technology. Adoption rates were categorized as follow: not adopted = 0; partially adopted = 1; and fully adopted = 2.

7.3 Results and Discussion

7.3.1 Description of the interaction system between MFs and GPCs

The GPCs were established under the name of *Thuru Saviya* Rubber Society under the *Thuru Saviya* Fund of Ministry of Plantation in Sri Lanka. The organizational structure of the GPCs in the country could be depicted under three stages; village, district and national levels. The village level society is formed by the smallholder farmers. The president, secretary and treasurer of the GPCs at the village level form the district level committee, which consists of 8 members. The president and secretary of each district level committee represent the national level committee. The members in the national committee involve in decision making process at the Ministry of Plantation, Sri Lanka. This group approach is expected bring a number of benefits to the smallholder farmers, including assurance of a better price, increase in scale and enhanced product quality and improve the productivity in smallholder rubber sector. In relation to these purposes, the farmers and GPCs work together in the interaction system in terms of credit, purchasing, extension and marketing. As smallholder farmers are resource poor, the government provides credit facilities to the GPCs, particularly to purchase new machineries and build smoke house, storage and drying places. The purchasing activities are undertaken by the GPCs. Extension activities to the farmers are coordinated and reviewed by the GPCs. In terms of marketing, GPCs provide open auction facilities to MFs.

7.3.2 Analysis of the effects of GPCs' functions on the marketing development

The GPCs play a major role in marketing the farmers' primary stage value-added commodities. According to the basis of the interaction system, the MFs' commodities will be sold at the open auction system of the center based on principles of market consignment. Figure 3 depicts the rubber marketing structure in the survey area. In the system, each farmer undertakes the functions related to his/her products in terms of collecting field latex, processing, grading, and selling on spot bidding system. The technical guidance and facilities are provided by the GPCs. Figure 3 first indicates that 100% of the members' field latex is processed, producing Ribbed Smoked Sheet (RSS). RSS is the main primary stage value-added product of the sector, entirely produced by the smallholder farmers. Second, 91% (2,432 kg) of RSS meets the high quality category (RSS1). Thus, both value addition and quality improvement can effectively be accomplished through an interaction system. In terms of Non-MFs, 87% of produced field latex is processed at home manufacturing. Only 6% (59 kg) of RSS production meets the high quality category of RSS1. The reasons causing the poor quality of a main value-added product of Non-MFs can be considered to be the poorly technical knowledge in processing including latex straining, coagulation, milling and drying, and poor facilities at home manufacturing. The survey found that in home manufacturing, no adequate storage space or drying facilities exist. The interaction system addresses this issue due to the facility development at the GPCs with credit support of the Plantation Ministry and extension services with regard to technical information in

processing.

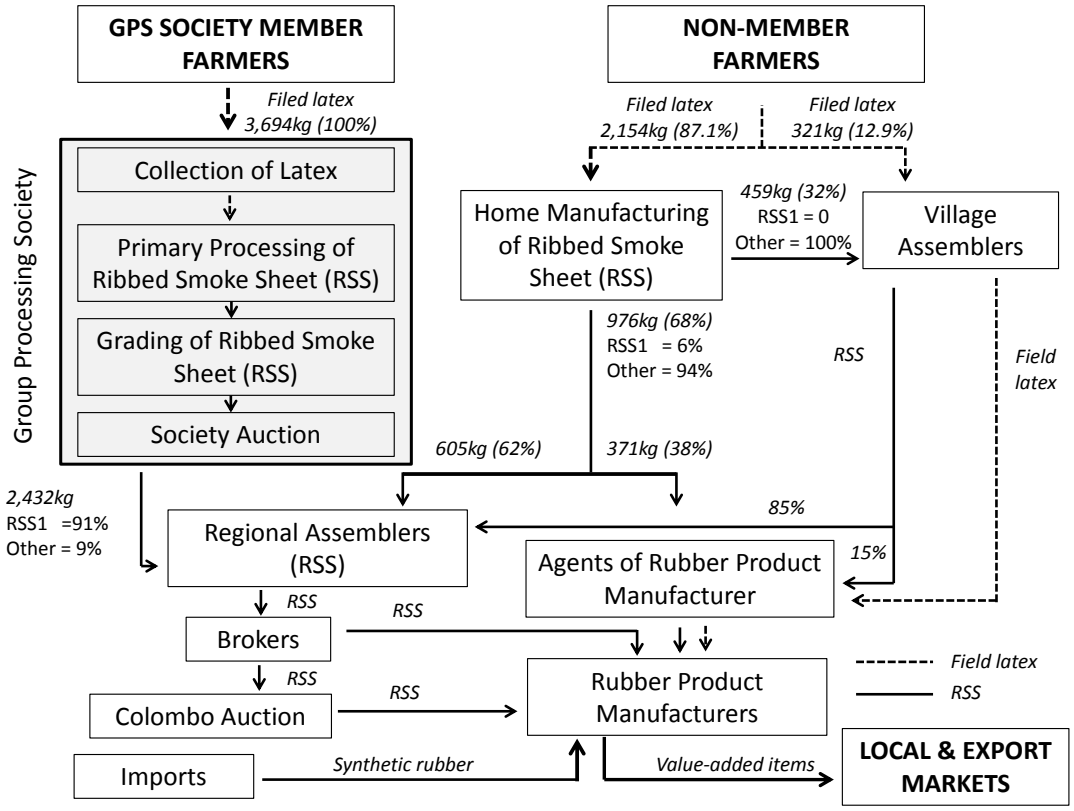

Figure 7-3 Marketing channel for rubber latex/RSS in the survey area

Source: Field survey, September 2012.

Note: Village assemblers make their operation at the village level. They collect the field latex and RSS either directly or by operating the collection points at the village level.

By selling farming products, the system provides spot bidding facilities for buyers avoiding the transportation cost. On average, 4 regional assemblers bid the prices. These buyers are in the middle level of the supply chain in the area. The production of high quality RSS by the MFs and the relatively high quantity of RSS1 enable the system to attract these middle level buyers. Figure 7-3 further shows that 42.1%, 32%, and 25.9% of Non-MFs' products are respectively bought by regional assemblers, village assemblers, and agents of the rubber

manufacturers in the suburban and urban areas. The Non-MFs claim that these buyers do not practice the proper quality grading system and buy all RSS as bulk, particularly the agents of the rubber manufacturers. One of the main reasons causing the application of an improper quality grading system to Non-MFs could be inadequacy and ineffective agricultural extension services regarding marketing information of primary stage value-added products. Applying improper quality grading systems results in lowering the market price received by farmers. In addition, the Non-MFs transport their products to the merchants in the nearest city or village collectors. The transport adds travel cost to these farmers.

Table 7-2 presents the effects of the marketing structure on market prices of field latex and RSS received by MFs and Non-MFs. The results of the Student's t-test indicate statistically significant differences between the market prices in terms of RSS1 (t = 2.07 with p = 0.06) and other quality (t = 2.12 with p = 0.07). On average, the MFs have received Rupee (Rs.) 365 and Rs. 343 for RSS1 and other quality of RSS, respectively. It is Rs. 27 and Rs. 15 higher to received prices by Non-MFs in terms of RSS1 and other quality categories. The MFs do not exercise any transportation cost related to marketing. These results indicate that a market structure established for the MFs by the interaction system can improve the market price of smallholder farmers' main value-added products due to a center level open auction system and extension services related to marketing including the technical know-how of processing and providing financial capital from the government in a facility development at the GPCs. However, the

interaction system is unable to cater to the large scale rubber manufacturers in the industry and do not produce end products to the market. The reasons for this inability could be the insufficient quantity of marketing due to the non-existence of connected systems of GPCs at city, regional, or national levels, catering to the large scale manufacturers, or lack of capital and technical support from the government. Therefore, the GPCs could find new ways to establish city, regional, and national level systems in order to increase their market, credit, and purchasing powers. This establishment will improve their benefits to the members.

Table 7-2 Average price of the products of the MFs and Non-MFs

Product	MFs				Non-MFs				t value (p value)
	Mean	Min.	Max.	Sta. dev.	Mean	Min.	Max.	Sta. dev.	
Field latex (Rs./ kg)	na.	na.	na.	na.	137	123	145	5.12	-
Ribbed Rubber Sheet (Rs./kg): RSS1	365	340	397	5.48	338	320	348	8.57	2.068* (0.06)
RSS2+RSS3+RSS4+RSS5	343	300	370	9.32	328	300	340	7.71	2.131* (0.07)

Source: Field survey, September 2012.

Notes: (1) Members of the GPCs do not sell field latex because they produce RSS. The price of RSS varies based on the quality of RSS. There are five types of RSS quality: RSS1, RSS2, RSS3, RSS4, and RSS5 as consecutive to the quality. (2) $*P < 0.10$ level. Parenthesis is *p* value.

7.3.3 Analysis of the effects of GPCs' functions on farm productivity (field latex kg/acre)

Table 7-3 shows that the mean yield (field latex kg/acre) in the rubber land of the MFs is statistically significantly (t = 7.663 with p = 0.001) higher than Non-MFs and higher than the national average level of 53 kg (Central Bank of Sri Lanka

(CBSL), 1960-2012). The table shows 15.6 kg of productivity differences between MFs and Non-MFs per acre.

Table 7-3 Difference of farm productivity (monthly) per acre of rubber land of the MFs and Non-MFs

Farmer category	Mean yield (kg/acre)	Min. yield	Max. yield	Sta. dev.	t value
MFs	57.1	34.3	83	10.04	7.663***
Non-MFs	41.5	22	64	9.05	(0.001)

Source: Data was supplied by 38 MFs and 48 Non-MFs in the survey area, September 2012.

Note: $***P < 0.01$ level. Parenthesis is *p* value.

To determine the impact of GPCs on field latex production per acre, multiple liner regression analyses were performed. Before estimating the model, a matrix of simple correlation coefficients between field latex production per acre and its components were computed to check the linearity of the variables and determine independent of the variables. Table 7-4 presents the correlation matrix in the rubber farm productivity variables in the survey area. The table shows that the GPCs membership (X8) has the highest correlation of 0.981 with the interaction variable, followed by 0.664 between household income (X4) and land size (X7). Following a stepwise regression method, three variables accounting significantly for the majority of field latex productivity variability were found (see Table 7-5). They are technology adoption index rate (X7), household income (X4) and interaction variable (X11). The diagnostic statistics, variance inflation factor (VIF), and tolerance (1/VIF) confirmed that there is no multicollinearity problem among the independent variables. Results showed

that values of VIF are less than 1.553 in all variables of the selected model in Table 7-5. The model at the selected step was significant with F = 65 at the level of 0.000. According to model summery, R^2 and adjusted-R^2 are 0.77 and 0.76, respectively. The R^2 explains that 77% of variation in the productivity can be explained with the variables in the model. Equation (2) shows the predicted regression derived from a stepwise method.

The regression results indicate the significance of interaction of membership in GPCs and technology adoption index rate as an institutional factor to increase the smallholders' field latex production per acre. This result indicates that Non-MFs can increase field latex production per acre by 34%, if they get the benefits of agricultural extension services joining the GPCs. The variable, household income (X4), is one of the most significant variables in determining the productivity. The field survey identified that the main livelihood activity of surveyed farmers is rubber cultivation. Therefore, income received from the rubber cultivation is obviously critical to enhance the farm productivity. It also suggests the importance of improving the prices of farmers' primary commodities and value-added products related to rubber in the smallholding sector. According to Table 7-4, there is a statistically significant relationship between GPCs and household income (0.412). Section two of the analysis clearly indicated the GPCs' role in upgrading the marketing condition of the MFs. Moreover, the field survey revealed that GPCs' members largely practice intercropping with rubber cultivation. This practice is due to coordinated extension services by the GPCs. The adoption rate of technical guidance

related to intercropping is comparatively higher among the MFs to Non-MFs (see Table 7-6). This high adoption rate also supports the increase of income for the members, which will positively correlate with field latex production per acre.

Table 7-4 A matrix of simple correlation coefficients in rubber farm productivity variables

	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11
Y	1											
X1	-0.106	1										
X2	-0.126	-0.039	1									
X3	0.055	-0.061	-0.022	1								
X4	.613**	-0.15	0.102	0.19	1							
X5	-0.133	.394**	-0.146	0.023	0.038	1						
X6	0.174	0.011	0.235	0.042	.664**	-0.002	1					
X7	.727**	-0.068	-0.252	-0.176	.302*	-0.089	0.009	1				
X8	.697**	-0.049	-0.198	-0.014	.412**	-0.14	0.097	.488**	1			
X9	0.013	-0.004	0.217	-0.095	-0.144	-0.045	-0.161	0.116	0.09	1		
X10	0.096	-0.009	0.075	0.235	0.089	0.063	0.044	-0.082	0.018	-0.108	1	
X11	.721**	-0.028	-0.192	-0.066	.398**	-0.145	0.076	.544**	.981**	0.095	-0.005	1

Source: Authors calculation based on field survey data.

Note: **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Table 7-5 Stepwise multiple liner regression for the purpose of justifying the impact of GPCs on farm productivity (field latex kg/acre)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.990	6.666		1.799	0.077
	Technology adoption index (X7)	25.481	3.160	0.727	8.063	0.000
2	(Constant)	11.635	5.372		2.166	0.035
	Technology adoption index (X7)	20.897	2.671	0.596	7.823	0.000
	Household income (X4)	0.000	0.000	0.433	5.686	0.000
3	(Constant)	20.038	5.039		3.976	0.000
	Technology adoption index (X7)	0.000	0.000	0.434	5.740	0.000
	Household income (X4)	0.000	0.000	0.344	4.964	0.000
	Interaction variable (X7*X8)	6.937	1.570	0.348	4.419	0.000

Note: Dependent variable: Field latex production kg/acre

The regression results further suggest the importance of adopting recommended techniques in the cultivation. The technical information on what to grow, how to maintain the field, how to process, and where to sell are critical for the smallholder farmers to increase productivity and sustainability of their production system. The GPCs provide members with critical access to the knowledge and information by coordinating the government agricultural officers and researchers in the field effectively. This provision is an important function of the GPCs due to the unorganized nature of the smallholder farmers in the sector, which the literature cites (Wijesuriya, et al., 2007). According to Table 6, the adoption rates of recommended practices were higher in the rubber land of the MFs compared to the Non-MFs. The table shows that MFs have fully adopted the recommended technical information with regard to: 1) input usage in rubber land (74%) - rate, method, and time of the application of fertilizer; 2) tapping (84%) - making the tapping panel, using the stencil, angle of tapping, height of tapping, direction of tapping cut and length of tapping cut; and 3) processing of field latex in manufacturing of RSS (100%) - latex straining, coagulation, and milling and drying. The regression results confirmed the statistical significance of variables, technology adoption index rate (t = 5.740 with p = 0.000), in increasing the rubber land productivity in terms of all surveyed farmers. Section two of the analysis also indicated that MFs produce high quality RSS due to proper technical guidance given on latex straining, coagulation, and milling and drying. Table 7-6 further shows that 37% of the MFs equally reported that they fully adopted the recommended practices with regard to weed and disease control and intercropping. In terms of Non-MFs, most of the

farmers reported that they have not fully adopted the recommended practices under each particular described in Table 7-6. The main reason for this difference is that GPCs review the extension activities coordinated by them as the center becomes an important meeting place for its members. This reason indicates that GPCs functions, with regard to technical information transformation, are effective to enhance the farm productivity.

Table 7-6 Adoption rate of recommended practices from the perspectives of the MFs and Non-MFs

Particulars	MFs (%)			Non-MFs (%)		
	Fully adopted	Partially adopted	Not adopted	Fully adopted	Partially adopted	Not adopted
1. Land preparation and planting	32	58	11	21	36	43
2. Input usage in the rubber field	74	26	0	29	71	0
3. Weed and disease control	37	53	11	14	76	10
4. Intercropping	37	42	21	5	31	64
5. Tapping	84	16	0	33	67	0
6. Processing of field latex in manufacturing of RSS	100	0	0	12	71	17

Source: Data was supplied by 38 GPCs MFs and 42 Non-MFs in the survey area, September 2012.

Note: The sub-particulars of the recommended practices are as follows: 1) land preparation and planting – stand per unit land area, type of clone and type of planting materials; 2) input usage in the field – rate, method, and time of applying fertilizer (in immature and mature periods); 3) weed and disease control – manual and chemical methods, control methods of different diseases such as root diseases; 4) intercropping – type of appropriate crops, appropriate time period, distance of cultivation, etc; 5) tapping – making the tapping panel, using the stencil, angle of tapping, height of tapping, direction of tapping cut and length of tapping cut; 6) manufacturing of RSS – latex straining, coagulation, and milling and drying.

However, our regression results suggest that formal sector credit facilities to smallholder farmers are not effective in increasing farm productivity. The survey found that one aim of the GPCs is to mobilize the required financial resource for its members by promoting savings among members and developing the financial services to enable broad access to credit. In this connection, the GPCs maintain a compulsory saving scheme based on produced RSS (Rs. 5/kg) and establish the reliance between MFs and local banks by sending members' selling incomes to the banks. As shown by Table 7-4, a matrix of simple correlation coefficient does not indicate a statistically significant relationship between membership in GPCs and access to formal credit sources. One of the main factors causing the above situation could be inadequate time because the survey identifies that financial capital mobilization activities by the GPCs have initiated in the recent year due to the priority for marketing development and extension services at the early stage. Furthermore, smallholder farmers usually receive small scale credits which are not sufficient in developing the conditions of the rubber land such as: removing old trees and replanting new ones, introducing the cover crop and intercrop, applying the inputs, and constructing the drains and stone terraces. These limitations of financial capital mobilization indicate the GPCs could find effective solutions to correlate the credit facilities and productivity. Doing so will increase the productivity, creating high income for its members.

7.4 Summary and Policy Implications

This study assessed the effects of GPCs in the smallholder rubber plantation

industry, reintroduced in 2000, to find support for the contention that the GPCs contribute to smallholder farmers' economic development in the era of economic liberalization in Sri Lanka. The study analyzed two aspects of GPCs' functions, marketing development and productivity improvement in smallholder rubber plantation industry.

The study shows the rationality of the group approach in smallholder farmers' economic development. First, the results showed that the marketing structure and its functions significantly support the improvement of the marketing condition of MFs. Specifically, facilities and increased technical guidance caused higher quality in the main value-added product of the MFs. The GPCs were able to cater to the middle-level buyers in the rubber supply chain system due to the production of high quality RSS by the MFs and receive scale merits in the bulk buying of relatively high quantity and high quality RSS by the buyers. The auction system also eliminated the transportation cost of marketing incurred to the MFs. The results further showed that GPCs supported the elimination of higher exploitation problems in marketing faced by the smallholder rubber farmers by improving MFs' market power. The improved market power provided the solution for low price realization of the smallholder rubber farmers. The impact of improved market power was indicated by significantly higher prices for their main value-added product, RSS, compared to the Non-MFs. Secondly, the study results indicated the importance of GPCs in improving the productivity in smallholder farmers' rubber land. The findings showed a statistically significant difference of productivity between MFs and Non-MFs. It indicated the important

role of the GPCs in productivity improvement because if other factors such as the increase of the world market price of NR encouraged all domestic farmers, there would not be a productivity difference between the MFs and Non-MFs. Moreover, the interaction of variables of adoption of recommended technical guidance and membership in GPCs positively correlate with rubber productivity. In this connection, the GPCs have provided members with critical access to the knowledge and information by coordinating the government agricultural officers and researchers in the field effectively. This provision is an important function of the GPCs in developing the smallholder rubber plantation industry due to the unorganized and scattered nature of the farmers in the sector.

Therefore, these findings support the contention that interaction between farmers and GPCs is an important strategy to revitalize the smallholder rubber plantation industry within the framework of economic liberalization in Sri Lanka. In order to further develop the system, the study suggests that the GPCs should establish a connected system at city, regional, and national levels in terms of marketing, purchasing, and credit and savings. This establishment will improve the MFs' marketing, purchasing, and credit powers in line with widening benefits to the MFs and increase the number of MFs. In such a connected system, the GPCs would either establish a marketing contract with large scale rubber manufacturers or produce final products. This case study demonstrates the importance of collective farmer organizations to protect disadvantaged smallholder farmers from economic liberalization in Sri Lanka and other developing countries.

Chapter 8 : Conclusions and Policy Implications

8.1 Introduction

The purpose of this PhD thesis is to suggest the alternative RFCSs to identify the best empirical solutions for the main puzzles that emerge with economic liberalization of food, agriculture and resources with no violation of the principles of economic liberalization—giving special emphasis to RFCSs associated resources circulation systems in Sri Lanka. The preceding chapters have reviewed the philosophical and theoretical development of economic liberalization in developing countries, and have found five different case studies and analyzed the existing empirical solutions for the treatment of problems in local agriculture, agriculture related industries, the environment, and resources that emerged with economic liberalization without violation of assumptions of economic liberalization. In this chapter, an attempt is made to provide a concise overall summery of philosophical and theoretical development of the economic liberalization and their influence on food, agriculture, environment and resources in developing countries; key findings of each empirical study with discussions; implications for policies and remaining issues to be addressed in the future for further development of new knowledge of this research.

8.2 Major Findings and Conclusions

A paradigm shift of economic development policies have occurred in most developing countries with the introduction of economic liberalization since the late 1970s. These policies are aimed at fulfilling the long-term objective of

allocation of scarce resources to key sectors including agriculture and manufacturing to make them more productive and export oriented while eliminating the policy distortions. Even though, principles of economic liberalization have emphasized economic stabilization, efficiency, productivity and competitiveness, the failure of this policy has been viewed in the most of countries in Asia, Sub-Saharan Africa and Latin America regions, specifically with regard to pro-local agricultural development, which is very important development area to significant portion of low income population of these countries. This was exemplified by endogenous stagnation or declining performance of agriculture in most of the developing countries where economic liberalization policies was assumed. Despite high growth rate of national income, specifically, poverty and food insecurity is still the persistent problem in developing countries. Thus, these facts have put the economic liberalization policies into further questions in terms of growth linkage of policies in the abatement of poverty in the developing countries, where agriculture plays a dominant role local economy. Moreover, the widening economic and social inequalities within and between countries has been reported. The loss from agriculture based local labor markets are due to high import of predatory or substitute agricultural commodities putting income sources of a large number of people at risk. Moreover, the problems of environmental sustainability and natural resource depletion in the developing countries have been the critical issues that emerged during the period of economic liberalization. Thus, the overall philosophy of economic liberalization has become questionable. It has been mostly evident from the East Asian financial crisis in 1997 and world

economic crisis from 2007 to 2008. Specifically, the world economic crisis from 2007 to 2008 has pushed an additional 125 million people into hunger, particularly in the developing countries, by further questioning about overall philosophy of the suggested policies to the developing countries. These facts have clearly indicated that poor policy linkage with pro-local agricultural development in the developing countries has resulted for aforementioned social, economic, environmental, and resources problems. Specifically, the low aggregate supply elasticities associated with poorly functioning markets, poor infrastructure facilities, limited institutional and management capacity including access to credit and technology, insufficient social capital, poor domestic agricultural policies and other social and political conditions has been one of main reasons which hinder the benefits of policy changes, particularly in achieving the pro-local agricultural development in the developing countries. These facts have indicated that advocated policy reforms have not adequately addressed supply side constraints in developing countries. Thus, the inadequacy of policy linkage to support pro-local agriculture development has adversely affected a large number of small and independent farmers, processors and distributors in agricultural commodity supply chain and sustainability of agriculture, resources and the environment in developing countries. This has indicated that the advocated policy reforms to the developing countries by the multilateral institutions were revised or find new empirical evidence-based solutions without violation of the basic principles of the economic liberalization as these policies have not helped in materializing the anticipated objectives.

A focus of first empirical study (Chapter 3) was to allow researchers/policy makers to understand the empirical model—rural resources circulation system (RRCS)—that addresses the effective use of the local resources and sustainability of local and regional environment, alleviate poverty, improve the livelihoods of local people and secure the food security of local people etc. without being linked to international competition. In this connection, the study has selected a rural resources circulation system initiated by the sugar sector and examined its characteristics, economic effects and development conditions. The results of the study clearly showed that the local farmers and processing sector have benefitted from the RRCS since its establishment in 1986. The study revealed that the RRCS effectively utilizes the local resources and leads to minimal dependency on foreign imported materials in terms of production of sugar and related products. Thus, the system does not link with international competition. The diversification of production system and more value-value added steps based on most adaptable crop to the natural features of the area have resulted in strengthening the economic condition of the company. It has brought about the economic stabilization of the company in an era of economic liberalization while minimizing the need for external resources–mostly the depleting natural resources, specifically energy for the company and fertilizer for the farmers. The study proved the economic impact of the RRCS in terms of comparative advantages of sugarcane farming (cost and income), employment opportunities for local people, poverty alleviation in sugarcane growing areas and improvement of household living condition in the long term. Specifically, the system has enabled lower production costs and a

higher net income per unit of output. A relatively high sugarcane production per ha and a high production efficiency, supported by the system have been the contributory factors for the aforementioned effects of the system. The study revealed that 22% increase of net income per ton of sugarcane is due to the direct impact of the system (with use of bio-fertilizer and with revenue from the by-products (molasses). The provision of labor opportunities in the system for the people in the sugarcane growing area has reduced poverty and improved the income situation of farm households in the area. The study showed that 88.7% of sugarcane farm households have benefitted from the system by earning labor income and of them, 72.5% of farm households had been able to move out of poverty. Specifically, this is a very important contribution of the system since all the farmers have been below the poverty line at the initial stage of the system. The study further revealed that 82% of the farm households have been able to upgrade their living conditions due to the long term supply of materials and labor services to the system. The study also found long-term economic stabilization of the sugarcane farm households due to the strong relationship between sugarcane farmers and processing company in terms of material supply and other services. These results indicated the significance and appropriateness of the RRCS for the treatment of problems emerged with economic liberalization within the agricultural sector. However, the study revealed that the low farm gate price of sugarcane was a main impediment to improved year-round functioning of the system in terms of producing sugar, related products and labor opportunities.

The focus of second empirical study (Chapter 4) was to allow researchers/policy makers to understand the empirical approach—Resources Dual Circulation System (RDCS)—that stimulates the improvement of the dairy industry in Sri Lanka in an era of economic liberalization or under the scenario of global competition. Since economic liberalization in 1977 and WTO membership in 1995, there has been an endogenous stagnation in the dairy sector that puts the livelihood of 3.5 million (including dependents) farmers, thousand of independent processors and distributors at risk. In this context, the study has described independent smallholder dairy farm, integrated dairy-crop farming and independent dairy markets in Sri Lanka. On a completely different scale, this empirical approach has demonstrated that the development of the dairy sector in Sri Lanka in the era of economic liberalization can be realized through independent smallholder farms and Non-integrated LISC participants who had not only the financial capacity, but also the management perspective that provides support to goods and services. The study indicated that the RDCS would stimulate the industry by enhancing the productivity and success of Sri Lanka's dairy farmers and help the industry grow and prosper in an era of economic liberalization. Specifically, this empirical study supported the contention that the RDCS contributes to the sustainability of dairy farming due to the efficiency in farm-level integrated resource management techniques, the contribution to smallholder dairy farmers in terms of improving milk income and productivity, the provision of a competitive supply chain system with better raw milk prices, and positive responsiveness to the environment in terms of organic manure usage and biogas production. The followings are the key conclusions

drawn from the study. First, the marketing structure and its functions and services (particularly its direct purchasing system and credit provisions) have largely supported the local dairy sector. The functions and services of the Non-integrated LISC with regard to smallholder dairy farms have limited the influence on large-scale companies on milk marketing by reducing the raw milk collection share of such companies. Second, the system has contributed to a relatively high milk production per dairy farm and productivity per cow for the related farmers while indicating a high level of production efficiency in the dairy farm. Third, this system has yielded both low costs and high incomes. This study has also indicated that some issues still persist in the system: the influence of large-scale companies on the system, which includes the trade monopoly characteristics of these companies; the gap between the actual and potential production efficiencies in terms of milk production; and the limited impact on the minimization of the management cost of dairy farming. The study has concluded that the characteristics of the RDCS are important for development and strengthening of Sri Lanka's dairy sector, which is currently facing challenges in the post-economic liberalization period that include issues of profitability, farm-level resource use, raw milk marketing and smallholder dairy farmer economic development. Thus, the study has suggested that strategies designed to develop the dairy sector and improve the welfare of dairy farmers in Sri Lanka during the economic liberalization period should consider the characteristics of the *RDCS* of the dairy sector.

A focus of third and fourth empirical studies (Chapters 5 and 6) were to allow

the researchers/policy makers to understand the appropriate empirical method—Traditional Circulation System—that supports strong policy implications on the selective liberalization of agriculture in the developing countries in an era of economic globalization. The third empirical study first identified current roles and development conditions of Traditional Circulation System of Local Coconut (TCSLC) focusing on the Kurunegala district of the Coconut Triangle in Sri Lanka. The selection of local coconut sector for these purposes has been done because of better economic performance of the local coconut sector during the economic liberalization policy phase. The study emphasized the importance of the TCSLC to develop the local coconut based regional economy while indicating three characteristics of the system which support eliminating the influence of globalization on the TCSLC. They were: a diversified industrial system based on one main regional crop; adaptability of main crop to the natural features of the region; and important economic opportunities for all smallholder farmers in the system. The study also identified the oligopolistic market structure as the main bottleneck in the system's economic gains "trickling down" to the local farmers. The study found that a lion's share of the local coconut market is handled by a few oligopolistic assemblers (regional assemblers) presenting unfair marketing condition to the local farmers leading to a loss in farmers' bargaining and negotiation power. It was found that deregulation policies have resulted in weakening the Coconut Producer Cooperative Societies. Specifically, even though TCSLC is linked to the modern economy, pre-modern economic characteristics such as informal credit and general lack of marketing information still exist within its market structure. However, the study indicated

that the overall economic condition of the farmers' has not weakened because of labor income opportunities offered by the system and agricultural diversification practices in their coconut-growing lands. By further contributing to the same field, the fourth empirical study identified the conditions of a stable agriculture based regional economy under the economic liberalization and the WTO regulations focusing on traditional coconut growing and processing region— the coconut triangle in Sri Lanka. The results indicated two reasons why traditional coconut has been a base of the stable regional economy. They were: the main material of the diversified traditional coconut industry in the region is adaptable to the natural features of the region; rainfall pattern, temperature, soil and humidity, and there are many kinds of processing industries based on the main crop material in the region. The results also indicated three main conditions of stable regional economy: growth of home manufacturing to medium and large scale processing industries in the regional economy during the period of economic liberalization; superior main material base value-adding system in the region; and contribution of main crop material based processing industries to the local labor market.

A focus of fifth empirical study was to allow for the researchers/policy makers to understand the empirical approach—Interaction System between Agriculture Cooperatives and Smallholder Farmers—that find strong evidences which support a view that the activation of agricultural cooperation can contribute to economic development of smallholder farmers in the era of economic liberalization of Sri Lanka. Specifically, agricultural cooperation has been

significantly neglected in Sri Lanka during the post economic liberalization period. In this connection, the study has selected the Group Processing Centers (GPCs) in the rubber sector in Sri Lanka and examined the role of GPCs to increase rubber farmers' income and productivity. Specifically, a refocus of group approach to more globalized industry under the economic liberalization policy framework in the country has been done since 2000. Thus, this study has interesting policy implication for smallholder farmers' economic development in an era of economic liberalization. The findings of the study indicated that farmers combining their efforts and resources within form of cooperation in both areas of production and marketing had a significant impact on smallholder farmers' economic development within the framework of economic liberalization. The analysis of marketing structure and its functions showed its contribution to improving the marketing condition of the smallholder farmers. The facilities and extension services of the GPCs has caused higher quality in the main value-added product of the farmers. Specifically, the GPCs has been able to cater to the middle-level buyers in the rubber supply chain due to the combined effect—in producing high quality value-added products and in receiving scale merits in the bulk buying of relatively high quantity. The findings has further showed that the interaction system (combined afford) has eliminated the higher exploitation problem in marketing faced by the smallholder rubber farmers, by providing solution for low price realization caused by the lack of market access or efficiency. Moreover, the study findings have showed the importance of the interaction system in improving the productivity of smallholder farmers' rubber land. The results of the econometric analysis have

showed that interaction variable—adoption of recommended technical guidance and membership in the GPCs—positively correlates with rubber productivity. The reason is that the GPCs have provided members with critical access to the knowledge and information by effectively coordinating the government agricultural officers and researchers in the field. These findings of the study strongly demonstrate the importance of the farmers to combine their efforts and resources within the form of cooperation in both areas of production and marketing in order to protect disadvantaged smallholder farmers from economic liberalization in Sri Lanka and other developing countries.

Figure 8-1 shows summary of empirical findings of selected case studies. Thus, it is important to take into account these empirical findings in formulation of economic policies to counteract the influence coming from global competition in agriculture. Specifically, the study suggests that fiscal and monetary policies should specifically acknowledge different empirical contexts of RFCSs associated RCSs in each country where economic liberalization policies were assumed. Thus, economic policy formulation with regard to local agriculture, related industry and environment in developing countries would acknowledge the heterogeneity of local and regional context of economies of developing countries. Moreover, the countries that expect to implement economic liberalization policies should consider empirical characteristics and economic and environmental functions of the RFCSs associate resources circulation systems in each economy.

8.3 Limitations and Future Research

It is important to mention specific limitations of the study and show appropriate direction towards further extension of knowledge in the field. First, this study primarily depends on the primary data collected through field surveys. Thus, the findings are largely dependent on the quality of the data collected from the field and sample size. In this connection, it would be noted that each field work covered a small number of farmers relative to the total population of each concerned farmer group in the country as mentioned in each case study. However, this limitation in the data collection was minimized by selecting the typical survey areas for each empirical survey. In this connection, the justification for the survey area selection has been done in each case study.

Second, though this study attempted to analyze the existing empirical solutions to counteract the influence coming from global competition in agriculture, the study found that there are no sufficient aggregate level analyses on consumer and producer welfare changes due to the implemented economic liberalization policies. Specifically, the effects of government fiscal and monetary policies on consumer and producer welfare changes have not been sufficiently analyzed yet. Thus, this study had to largely depend on secondary information in selection of cases for each case study. In this connection, the study applied inductive research approach to find in-depth or typical cases which support for appropriate empirical basis for the study. However, analysis of consumer and producer welfare changes in the period of economic liberalization remains and further issues have to be addressed to further support

the extension of existing knowledge in the field.

Third, the present study is limited to find empirical solutions in mitigating and adapting to influence coming from global competition. It is, however, important to take into account future research to identify the effects of government fiscal and monetary measures along with these empirical solutions in counteracting the adverse impact of global competition in agriculture.

Regional Food Chain System for Sustainable Purveyance, Agricultural Production and Regional Resources Use in Sri Lanka

Empirical Type (1) RCS – Sugar Sector	Empirical Type (2) RCS – Dairy Sector	Empirical Type (3) RCS – Coconut Sector	Empirical Type (4) RCS – Rubber Sector

Selected counteracting elements of each RCSs for global economic competition	RCS – Sugar sector	RCS-Dairy sector	RCS-Coconut sector	RCS-Rubber sector
1.Main material adaptation to the natural features of the region	O	O	O	O
2.Dependency entirely on resources from the area by the system	O	O	O	O
3.Year round working opportunities for the people in the system	O	O	O	O
4.Integrated and effective resource management techniques/steps with environmentally friendly way	O	O	O	
5.Non-vertically integrated unit in the supply chain in terms of capital	O	O	O	O
6.Material supply to the forward industries			O	O
7.More vertically and horizontally broadened material industries in the system based on most adaptable crop/livestock in the region			O	
8.Scattered main specialized regional material based independent and individual processors from home manufacturing, small, medium and large scale	O	O	O	O
9.Diversification of material processing systems (internal conversion of resources into different value added products) in the RCSs	O	O	O	O
10.Resource reuse and recycling in the system	O	O	O	
11.Agricultural diversification in the system	O	O	O	O
12.Effective utilization of household labor in the system, specifically the women labor		O	O	O
13.Social marketing strategies in the marketing (use important content of products in marketing such as social, economic and environmental functions of the RCS)	O			O
14.Combined smallholder farmers' efforts and resources within the form of agricultural cooperation				O

Economic stabilization in local area in the era of economic liberalization

(Alleviate poverty, increase income, improve local labor market opportunities, increase family labor utilization, increase demand for local material, improve agricultural marketing condition, minimize dependency on external resources (imported materials), etc)

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Figure 8-1 Mitigation and adaptation fundamentals of FCSs for global economic competition from an empirical point of view

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Appendix 1: WTO and the Structural Design of Control

URUGUAY ROUND AGREEMENT: The Agreement on Agriculture (AoA)

Members,

Having decided to establish a basis for initiating a process of reform of trade in agriculture in line with the objectives of the negotiations as set out in the Punta del Este Declaration;

Recalling that their long-term objective as agreed at the Mid-Term Review of the Uruguay Round "is to establish a fair and market-oriented agricultural trading system and that a reform process should be initiated through the negotiation of commitments on support and protection and through the establishment of strengthened and more operationally effective GATT rules and disciplines";

Recalling further that "the above-mentioned long-term objective is to provide for substantial progressive reductions in agricultural support and protection sustained over an agreed period of time, resulting in correcting and preventing restrictions and distortions in world agricultural markets";

Committed to achieving specific binding commitments in each of the following areas: market access; domestic support; export competition; and to reaching an agreement on sanitary and phytosanitary issues;

Having agreed that in implementing their commitments on market access, developed country Members would take fully into account the particular needs and conditions of developing country Members by providing for a greater improvement of opportunities and terms of access for agricultural products of particular interest to these Members, including the fullest liberalization of trade in tropical agricultural products as agreed at the Mid-Term Review, and for products of particular importance to the diversification of production from the growing of illicit narcotic crops;

Noting that commitments under the reform programme should be made in an equitable way among all Members, having regard to non-trade concerns, including food security and the need to protect the environment; having regard to the agreement that special and differential treatment for developing countries is an integral element of the negotiations, and taking into account the possible negative effects of the implementation of the reform programme on least-developed and net food-importing developing countries;

Hereby *agree* as follows:

Part I: Article 1—Definition of Terms

In this Agreement, unless the context otherwise requires:

(a) "Aggregate Measurement of Support" and "AMS" mean the annual level of support, expressed in monetary terms, provided for an agricultural product in favour of the producers of the basic agricultural product or non-product-specific support provided in favour of agricultural producers in general, other than support provided under programmes that qualify as exempt from reduction under Annex 2 to this Agreement, which is:

(i) with respect to support provided during the base period, specified in the relevant tables of supporting material incorporated by reference in Part IV of a Member's Schedule; and

(ii) with respect to support provided during any year of the implementation period and thereafter, calculated in accordance with the provisions of Annex 3 of this Agreement and taking into account the constituent data and methodology used in the tables of supporting material incorporated by reference in Part IV of the Member's Schedule;

(b) "basic agricultural product" in relation to domestic support commitments is defined as the product as close as practicable to the point of first sale as specified in a Member's Schedule and in the related supporting material;

(c) "budgetary outlays" or "outlays" includes revenue foregone;

(d) "Equivalent Measurement of Support" means the annual level of support, expressed in monetary terms, provided to producers of a basic agricultural product through the application of one or more measures, the calculation of which in accordance with the AMS methodology is impracticable, other than support provided under programmes that qualify as exempt from reduction under Annex 2 to this Agreement, and which is:

(i) with respect to support provided during the base period, specified in the relevant tables of supporting material incorporated by reference in Part IV of a Member's Schedule; and

(ii) with respect to support provided during any year of the implementation period and thereafter, calculated in accordance with the provisions of Annex 4 of this Agreement and taking into account the constituent data and methodology used in the tables of supporting material incorporated by reference in Part IV of the Member's Schedule;

(e) "export subsidies" refers to subsidies contingent upon export performance, including the export subsidies listed in Article 9 of this Agreement;

(f) "implementation period" means the six-year period commencing in the year

1995, except that, for the purposes of Article 13, it means the nine-year period commencing in 1995;

(g) "market access concessions" includes all market access commitments undertaken pursuant to this Agreement;

(h) "Total Aggregate Measurement of Support" and "Total AMS" mean the sum of all domestic support provided in favour of agricultural producers, calculated as the sum of all aggregate measurements of support for basic agricultural products, all non-product-specific aggregate measurements of support and all equivalent measurements of support for agricultural products, and which is:

(i) with respect to support provided during the base period (i.e. the "Base Total AMS") and the maximum support permitted to be provided during any year of the implementation period or thereafter (i.e. the "Annual and Final Bound Commitment Levels"), as specified in Part IV of a Member's Schedule; and

(ii) with respect to the level of support actually provided during any year of the implementation period and thereafter (i.e. the "Current Total AMS"), calculated in accordance with the provisions of this Agreement, including Article 6, and with the constituent data and methodology used in the tables of supporting material incorporated by reference in Part IV of the Member's Schedule;

(iii) "year" in paragraph (f) above and in relation to the specific commitments of a Member refers to the calendar, financial or marketing year specified in the Schedule relating to that Member.

Part I: Article 2—Product Coverage

This Agreement applies to the products listed in Annex 1 to this Agreement, hereinafter referred to as agricultural products.

Part II: Article 3—Incorporation of Concessions and Commitments

The domestic support and export subsidy commitments in Part IV of each Member's Schedule constitute commitments limiting subsidization and are hereby made an integral part of GATT 1994.

Subject to the provisions of Article 6, a Member shall not provide support in favour of domestic producers in excess of the commitment levels specified in Section I of Part IV of its Schedule.

Subject to the provisions of paragraphs 2(b) and 4 of Article 9, a Member shall not

provide export subsidies listed in paragraph 1 of Article 9 in respect of the agricultural products or groups of products specified in Section II of Part IV of its Schedule in excess of the budgetary outlay and quantity commitment levels specified therein and shall not provide such subsidies in respect of any agricultural product not specified in that Section of its Schedule.

Part III: Article 4—Market Access

Market access concessions contained in Schedules relate to bindings and reductions of tariffs, and to other market access commitments as specified therein.

Members shall not maintain, resort to, or revert to any measures of the kind which have been required to be converted into ordinary customs duties (**1**), except as otherwise provided for in Article 5 and Annex 5.

Part III: Article 5—Special Safeguard Provisions

1. Notwithstanding the provisions of paragraph 1(b) of Article II of GATT 1994, any Member may take recourse to the provisions of paragraphs 4 and 5 below in connection with the importation of an agricultural product, in respect of which measures referred to in paragraph 2 of Article 4 of this Agreement have been converted into an ordinary customs duty and which is designated in its Schedule with the symbol "SSG" as being the subject of a concession in respect of which the provisions of this Article may be invoked, if:

(a) the volume of imports of that product entering the customs territory of the Member granting the concession during any year exceeds a trigger level which relates to the existing market access opportunity as set out in paragraph 4; or, but not concurrently:

(b) the price at which imports of that product may enter the customs territory of the Member granting the concession, as determined on the basis of the c.i.f. import price of the shipment concerned expressed in terms of its domestic currency, falls below a trigger price equal to the average 1986 to 1988 reference price(**2**) for the product concerned.

2. Imports under current and minimum access commitments established as part of a concession referred to in paragraph 1 above shall be counted for the purpose of determining the volume of imports required for invoking the provisions of subparagraph 1(a) and paragraph 4, but imports under such commitments shall not be affected by any additional duty imposed under either subparagraph 1(a) and paragraph 4 or

subparagraph 1(b) and paragraph 5 below.

3. Any supplies of the product in question which were *en route* on the basis of a contract settled before the additional duty is imposed under subparagraph 1(a) and paragraph 4 shall be exempted from any such additional duty, provided that they may be counted in the volume of imports of the product in question during the following year for the purposes of triggering the provisions of subparagraph 1(a) in that year.

4. Any additional duty imposed under subparagraph 1(a) shall only be maintained until the end of the year in which it has been imposed, and may only be levied at a level which shall not exceed one third of the level of the ordinary customs duty in effect in the year in which the action is taken. The trigger level shall be set according to the following schedule based on market access opportunities defined as imports as a percentage of the corresponding domestic consumption(**3**) during the three preceding years for which data are available:

(a) where such market access opportunities for a product are less than or equal to 10 per cent, the base trigger level shall equal 125 per cent;

(b) where such market access opportunities for a product are greater than 10 per cent but less than or equal to 30 per cent, the base trigger level shall equal 110 per cent;

(c) where such market access opportunities for a product are greater than 30 per cent, the base trigger level shall equal 105 per cent.

In all cases the additional duty may be imposed in any year where the absolute volume of imports of the product concerned entering the customs territory of the Member granting the concession exceeds the sum of (x) the base trigger level set out above multiplied by the average quantity of imports during the three preceding years for which data are available and (*y*) the absolute volume change in domestic consumption of the product concerned in the most recent year for which data are available compared to the preceding year, provided that the trigger level shall not be less than 105 per cent of the average quantity of imports in (x) above.

5. The additional duty imposed under subparagraph 1(b) shall be set according to the following schedule:

(a) if the difference between the c.i.f. import price of the shipment expressed in terms of the domestic currency (hereinafter referred to as the "import price") and the trigger price as defined under that subparagraph is less than or equal to 10 per cent of the trigger price, no additional duty shall be imposed;

(b) if the difference between the import price and the trigger price (hereinafter referred to as the "difference") is greater than 10 per cent but less than or equal to 40 per cent of the trigger price, the additional duty shall equal 30 per cent of the amount by which

the difference exceeds 10 per cent;

(c) if the difference is greater than 40 per cent but less than or equal to 60 per cent of the trigger price, the additional duty shall equal 50 per cent of the amount by which the difference exceeds 40 per cent, plus the additional duty allowed under (b);

(d) if the difference is greater than 60 per cent but less than or equal to 75 per cent, the additional duty shall equal 70 per cent of the amount by which the difference exceeds 60 per cent of the trigger price, plus the additional duties allowed under (b) and (c);

(e) if the difference is greater than 75 per cent of the trigger price, the additional duty shall equal 90 per cent of the amount by which the difference exceeds 75 per cent, plus the additional duties allowed under (b), (c) and (d).

6. For perishable and seasonal products, the conditions set out above shall be applied in such a manner as to take account of the specific characteristics of such products. In particular, shorter time periods under subparagraph 1(a) and paragraph 4 may be used in reference to the corresponding periods in the base period and different reference prices for different periods may be used under subparagraph 1(b).

7. The operation of the special safeguard shall be carried out in a transparent manner. Any Member taking action under subparagraph 1(a) above shall give notice in writing, including relevant data, to the Committee on Agriculture as far in advance as may be practicable and in any event within 10 days of the implementation of such action. In cases where changes in consumption volumes must be allocated to individual tariff lines subject to action under paragraph 4, relevant data shall include the information and methods used to allocate these changes. A Member taking action under paragraph 4 shall afford any interested Members the opportunity to consult with it in respect of the conditions of application of such action. Any Member taking action under subparagraph 1(b) above shall give notice in writing, including relevant data, to the Committee on Agriculture within 10 days of the implementation of the first such action or, for perishable and seasonal products, the first action in any period. Members undertake, as far as practicable, not to take recourse to the provisions of subparagraph 1(b) where the volume of imports of the products concerned are declining. In either case a Member taking such action shall afford any interested Members the opportunity to consult with it in respect of the conditions of application of such action.

8. Where measures are taken in conformity with paragraphs 1 through 7 above, Members undertake not to have recourse, in respect of such measures, to the provisions of paragraphs 1(a) and 3 of Article XIX of GATT 1994 or paragraph 2 of Article 8 of the Agreement on Safeguards.

9. The provisions of this Article shall remain in force for the duration of the reform process as determined under Article 20.

Part IV: Article 6—Domestic Support Commitments

1. The domestic support reduction commitments of each Member contained in Part IV of its Schedule shall apply to all of its domestic support measures in favour of agricultural producers with the exception of domestic measures which are not subject to reduction in terms of the criteria set out in this Article and in Annex 2 to this Agreement. The commitments are expressed in terms of Total Aggregate Measurement of Support and "Annual and Final Bound Commitment Levels".

2. In accordance with the Mid-Term Review Agreement that government measures of assistance, whether direct or indirect, to encourage agricultural and rural development are an integral part of the development programmes of developing countries, investment subsidies which are generally available to agriculture in developing country Members and agricultural input subsidies generally available to low-income or resource-poor producers in developing country Members shall be exempt from domestic support reduction commitments that would otherwise be applicable to such measures, as shall domestic support to producers in developing country Members to encourage diversification from growing illicit narcotic crops. Domestic support meeting the criteria of this paragraph shall not be required to be included in a Member's calculation of its Current Total AMS.

3. A Member shall be considered to be in compliance with its domestic support reduction commitments in any year in which its domestic support in favour of agricultural producers expressed in terms of Current Total AMS does not exceed the corresponding annual or final bound commitment level specified in Part IV of the Member's Schedule.

4. (a) A Member shall not be required to include in the calculation of its Current Total AMS and shall not be required to reduce:

(i) product-specific domestic support which would otherwise be required to be included in a Member's calculation of its Current AMS where such support does not exceed 5 per cent of that Member's total value of production of a basic agricultural product during the relevant year; and

(ii) non-product-specific domestic support which would otherwise be required to be included in a Member's calculation of its Current AMS where such support does not exceed 5 per cent of the value of that Member's total agricultural production.

(b) For developing country Members, the *de minimis* percentage under this paragraph shall be 10 per cent.

5. (a) Direct payments under production-limiting programmes shall not be subject to the commitment to reduce domestic support if:

(i) such payments are based on fixed area and yields; or

(ii) such payments are made on 85 per cent or less of the base level of production; or

(iii) livestock payments are made on a fixed number of head.

(b) The exemption from the reduction commitment for direct payments meeting the above criteria shall be reflected by the exclusion of the value of those direct payments in a Member's calculation of its Current Total AMS.

Part IV: Article 7—General Disciplines on Domestic Support

1. Each Member shall ensure that any domestic support measures in favour of agricultural producers which are not subject to reduction commitments because they qualify under the criteria set out in Annex 2 to this Agreement are maintained in conformity therewith.

2. (a) Any domestic support measure in favour of agricultural producers, including any modification to such measure, and any measure that is subsequently introduced that cannot be shown to satisfy the criteria in Annex 2 to this Agreement or to be exempt from reduction by reason of any other provision of this Agreement shall be included in the Member's calculation of its Current Total AMS.

(b) Where no Total AMS commitment exists in Part IV of a Member's Schedule, the Member shall not provide support to agricultural producers in excess of the relevant *de minimis* level set out in paragraph 4 of Article 6.

Part V: Article 8—Export Competition Commitments

Each Member undertakes not to provide export subsidies otherwise than in conformity with this Agreement and with the commitments as specified in that Member's Schedule.

Part V: Article 9—Export Subsidy Commitments

1. The following export subsidies are subject to reduction commitments under this Agreement:

(a) the provision by governments or their agencies of direct subsidies, including

payments-in-kind, to a firm, to an industry, to producers of an agricultural product, to a cooperative or other association of such producers, or to a marketing board, contingent on export performance;

(b) the sale or disposal for export by governments or their agencies of non-commercial stocks of agricultural products at a price lower than the comparable price charged for the like product to buyers in the domestic market;

(c) payments on the export of an agricultural product that are financed by virtue of governmental action, whether or not a charge on the public account is involved, including payments that are financed from the proceeds of a levy imposed on the agricultural product concerned or on an agricultural product from which the exported product is derived;

(d) the provision of subsidies to reduce the costs of marketing exports of agricultural products (other than widely available export promotion and advisory services) including handling, upgrading and other processing costs, and the costs of international transport and freight;

(e) internal transport and freight charges on export shipments, provided or mandated by governments, on terms more favourable than for domestic shipments;

(f) subsidies on agricultural products contingent on their incorporation in exported products.

2. (a) Except as provided in subparagraph (b), the export subsidy commitment levels for each year of the implementation period, as specified in a Member's Schedule, represent with respect to the export subsidies listed in paragraph 1 of this Article:

(i) in the case of budgetary outlay reduction commitments, the maximum level of expenditure for such subsidies that may be allocated or incurred in that year in respect of the agricultural product, or group of products, concerned; and

(ii) in the case of export quantity reduction commitments, the maximum quantity of an agricultural product, or group of products, in respect of which such export subsidies may be granted in that year.

(b) In any of the second through fifth years of the implementation period, a Member may provide export subsidies listed in paragraph 1 above in a given year in excess of the corresponding annual commitment levels in respect of the products or groups of products specified in Part IV of the Member's Schedule, provided that:

(i) the cumulative amounts of budgetary outlays for such subsidies, from the beginning of the implementation period through the year in question, does not exceed the cumulative amounts that would have resulted from full compliance with the relevant annual outlay commitment levels specified in the Member's Schedule by more than 3

per cent of the base period level of such budgetary outlays;
(ii) the cumulative quantities exported with the benefit of such export subsidies, from the beginning of the implementation period through the year in question, does not exceed the cumulative quantities that would have resulted from full compliance with the relevant annual quantity commitment levels specified in the Member's Schedule by more than 1.75 per cent of the base period quantities;
(iii) the total cumulative amounts of budgetary outlays for such export subsidies and the quantities benefiting from such export subsidies over the entire implementation period are no greater than the totals that would have resulted from full compliance with the relevant annual commitment levels specified in the Member's Schedule; and
(iv) the Member's budgetary outlays for export subsidies and the quantities benefiting from such subsidies, at the conclusion of the implementation period, are no greater than 64 per cent and 79 per cent of the 1986-1990 base period levels, respectively. For developing country Members these percentages shall be 76 and 86 per cent, respectively.
3. Commitments relating to limitations on the extension of the scope of export subsidization are as specified in Schedules.
4. During the implementation period, developing country Members shall not be required to undertake commitments in respect of the export subsidies listed in subparagraphs (d) and (e) of paragraph 1 above, provided that these are not applied in a manner that would circumvent reduction commitments.

Part V: Article 10—Prevention of Circumvention of Export Subsidy Commitments

1. Export subsidies not listed in paragraph 1 of Article 9 shall not be applied in a manner which results in, or which threatens to lead to, circumvention of export subsidy commitments; nor shall non-commercial transactions be used to circumvent such commitments.
2. Members undertake to work toward the development of internationally agreed disciplines to govern the provision of export credits, export credit guarantees or insurance programmes and, after agreement on such disciplines, to provide export credits, export credit guarantees or insurance programmes only in conformity therewith.
3. Any Member which claims that any quantity exported in excess of a reduction commitment level is not subsidized must establish that no export subsidy, whether listed in Article 9 or not, has been granted in respect of the quantity of exports in question.
4. Members donors of international food aid shall ensure:

(a) that the provision of international food aid is not tied directly or indirectly to commercial exports of agricultural products to recipient countries;

(b) that international food aid transactions, including bilateral food aid which is monetized, shall be carried out in accordance with the FAO "Principles of Surplus Disposal and Consultative Obligations", including, where appropriate, the system of Usual Marketing Requirements (UMRs); and

(c) that such aid shall be provided to the extent possible in fully grant form or on terms no less concessional than those provided for in Article IV of the Food Aid Convention 1986.

Part V: Article 11—Incorporated Products

1. In no case may the per-unit subsidy paid on an incorporated agricultural primary product exceed the per-unit export subsidy that would be payable on exports of the primary product as such.

Part VI: Article 12—Disciplines on Export Prohibitions and Restrictions

1. Where any Member institutes any new export prohibition or restriction on foodstuffs in accordance with paragraph 2(a) of Article XI of GATT 1994, the Member shall observe the following provisions:

(a) the Member instituting the export prohibition or restriction shall give due consideration to the effects of such prohibition or restriction on importing Members' food security;

(b) before any Member institutes an export prohibition or restriction, it shall give notice in writing, as far in advance as practicable, to the Committee on Agriculture comprising such information as the nature and the duration of such measure, and shall consult, upon request, with any other Member having a substantial interest as an importer with respect to any matter related to the measure in question. The Member instituting such export prohibition or restriction shall provide, upon request, such a Member with necessary information.

2. The provisions of this Article shall not apply to any developing country Member, unless the measure is taken by a developing country Member which is a net-food exporter of the specific foodstuff concerned.

Part VII: Article 13—Due Restraint

During the implementation period, notwithstanding the provisions of GATT 1994 and the Agreement on Subsidies and Countervailing Measures (referred to in this Article as the "Subsidies Agreement"):

(a) domestic support measures that conform fully to the provisions of Annex 2 to this Agreement shall be:

(i) non-actionable subsidies for purposes of countervailing duties(4);

(ii) exempt from actions based on Article XVI of GATT 1994 and Part III of the Subsidies Agreement; and

(iii) exempt from actions based on non-violation nullification or impairment of the benefits of tariff concessions accruing to another Member under Article II of GATT 1994, in the sense of paragraph 1(b) of Article XXIII of GATT 1994;

(b) domestic support measures that conform fully to the provisions of Article 6 of this Agreement including direct payments that conform to the requirements of paragraph 5 thereof, as reflected in each Member's Schedule, as well as domestic support within *de minimis* levels and in conformity with paragraph 2 of Article 6, shall be:

(i) exempt from the imposition of countervailing duties unless a determination of injury or threat thereof is made in accordance with Article VI of GATT 1994 and Part V of the Subsidies Agreement, and due restraint shall be shown in initiating any countervailing duty investigations;

(ii) exempt from actions based on paragraph 1 of Article XVI of GATT 1994 or Articles 5 and 6 of the Subsidies Agreement, provided that such measures do not grant support to a specific commodity in excess of that decided during the 1992 marketing year; and

(iii) exempt from actions based on non-violation nullification or impairment of the benefits of tariff concessions accruing to another Member under Article II of GATT 1994, in the sense of paragraph 1(b) of Article XXIII of GATT 1994, provided that such measures do not grant support to a specific commodity in excess of that decided during the 1992 marketing year;

(c) export subsidies that conform fully to the provisions of Part V of this Agreement, as reflected in each Member's Schedule, shall be:

(i) subject to countervailing duties only upon a determination of injury or threat thereof based on volume, effect on prices, or consequent impact in accordance with Article VI of GATT 1994 and Part V of the Subsidies Agreement, and due restraint shall be shown in initiating any countervailing duty investigations; and

(ii) exempt from actions based on Article XVI of GATT 1994 or Articles 3, 5 and 6 of the Subsidies Agreement.

Part VIII: Article 14—Sanitary and Phytosanitary Measures

Members agree to give effect to the Agreement on the Application of Sanitary and Phytosanitary Measures.

Part IX: Article 15—Special and Differential Treatment

1. In keeping with the recognition that differential and more favourable treatment for developing country Members is an integral part of the negotiation, special and differential treatment in respect of commitments shall be provided as set out in the relevant provisions of this Agreement and embodied in the Schedules of concessions and commitments.
2. Developing country Members shall have the flexibility to implement reduction commitments over a period of up to 10 years. Least-developed country Members shall not be required to undertake reduction commitments.

Part X: Article 16—Least-Developed and Net Food-Importing Developing Countries

1. Developed country Members shall take such action as is provided for within the framework of the Decision on Measures Concerning the Possible Negative Effects of the Reform Programme on Least-Developed and Net Food-Importing Developing Countries.
2. The Committee on Agriculture shall monitor, as appropriate, the follow-up to this Decision.

Part XI: Article 17—Committee on Agriculture

A Committee on Agriculture is hereby established.

Part XI: Article 18—Review of the Implementation of Commitments

1. Progress in the implementation of commitments negotiated under the Uruguay Round reform programme shall be reviewed by the Committee on Agriculture.
2. The review process shall be undertaken on the basis of notifications submitted by

Members in relation to such matters and at such intervals as shall be determined, as well as on the basis of such documentation as the Secretariat may be requested to prepare in order to facilitate the review process.

3. In addition to the notifications to be submitted under paragraph 2, any new domestic support measure, or modification of an existing measure, for which exemption from reduction is claimed shall be notified promptly. This notification shall contain details of the new or modified measure and its conformity with the agreed criteria as set out either in Article 6 or in Annex 2.

4. In the review process Members shall give due consideration to the influence of excessive rates of inflation on the ability of any Member to abide by its domestic support commitments.

5. Members agree to consult annually in the Committee on Agriculture with respect to their participation in the normal growth of world trade in agricultural products within the framework of the commitments on export subsidies under this Agreement.

6. The review process shall provide an opportunity for Members to raise any matter relevant to the implementation of commitments under the reform programme as set out in this Agreement.

7. Any Member may bring to the attention of the Committee on Agriculture any measure which it considers ought to have been notified by another Member.

Part XI: Article 19—Consultation and Dispute Settlement

The provisions of Articles XXII and XXIII of GATT 1994, as elaborated and applied by the Dispute Settlement Understanding, shall apply to consultations and the settlement of disputes under this Agreement.

Part XII: Article 20—Continuation of the Reform Process

Recognizing that the long-term objective of substantial progressive reductions in support and protection resulting in fundamental reform is an ongoing process, Members agree that negotiations for continuing the process will be initiated one year before the end of the implementation period, taking into account:

(a) the experience to that date from implementing the reduction commitments;

(b) the effects of the reduction commitments on world trade in agriculture;

(c) non-trade concerns, special and differential treatment to developing country Members, and the objective to establish a fair and market-oriented agricultural trading

system, and the other objectives and concerns mentioned in the preamble to this Agreement; and

(d) what further commitments are necessary to achieve the above mentioned long-term objectives.

Part XIII: Article 21—Final Provisions.

1. The provisions of GATT 1994 and of other Multilateral Trade Agreements in Annex 1A to the WTO Agreement shall apply subject to the provisions of this Agreement.

2. The Annexes to this Agreement are hereby made an integral part of this Agreement.