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CAPSA WORKING PAPER No. 83

Enhancing Sustainable Development of Diverse Agriculture in Sri Lanka

A.R.M. Mahrouf



**United Nations
ESCAP**

UNESCAP-CAPSA

The Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and the Pacific (CAPSA) is a subsidiary body of UNESCAP. It was established as the Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) in 1981 and was renamed CAPSA in 2004.

Objectives

CAPSA promotes a more supportive policy environment in member countries to enhance the living conditions of rural poor populations in disadvantaged areas, particularly those who rely on secondary crop agriculture for their livelihood, and to promote research and development related to agriculture to alleviate poverty in the Asian and Pacific region.

Functions

1. Coordination of socio-economic and policy research on secondary crops.
2. Networking and partnership with other international organizations and key stakeholders.
3. Research and analysis of trends and opportunities with regard to improving the economic status of rural populations.
4. Production, packaging and dissemination of information and successful practices on poverty reduction.
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WORKING PAPER 83

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A.R.M. Mahrouf



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List of Abbreviations

AGRIDIV	:	Identification of Pulling Factors for Enhancing the Sustainable Development of Diverse Agriculture in Selected Asian Countries
CGPRT Crops	:	Coarse Grains, Pulses, Roots and Tuber Crops
CWE	:	Co-operative Wholesale Establishment
DAPH	:	Department of Animal Production and Health
DARP	:	Diversified Agricultural Research Project
DC&S	:	Department of Census and Statistics
DEC	:	Dedicated Economic Centres
DOA	:	Department of Agriculture
DRC	:	Domestic Resource Cost
FAO	:	Food and Agriculture Organization
FCRDI	:	Field Crop Research and Development Institute
FO	:	Farmer Organizations
FRC	:	Forward Sales Contract
GDP	:	Gross Domestic Product
HARTI	:	Hector Kobbekaduwa Agrarian Research and Training Institute
HIES	:	Household Income and Expenditure Survey
HORDI	:	Horticultural Crops Research and Development Institute
ITI	:	Industrial Development Institute
Maha Season	:	Wet Season (Major Season)
MARD	:	Mahaweli Agricultural Research and Development
MPCS	:	Multipurpose Co-operative Societies
MRI	:	Medical Research Institute
NAPP	:	National Agricultural Production Plan
PMB	:	Paddy Marketing Board
RRA	:	Rapid Rural Appraisal
SID	:	Simpson's Index
SP	:	Specialization Quotient or Specialization Index
Yala Season	:	Dry Season (Minor Season)

Foreword

Most Asian countries succeeded in multiplying major cereal production through the green revolution. This was made possible by the introduction of high yielding varieties and policy support which promoted the construction of irrigation facilities and the use of modern inputs such as chemical fertilizers and pesticides. However, recently the growth in productivity of major cereals has reached a plateau. Agricultural diversification has a number of positive effects, among others, food security, risk mitigation, labour absorption and conservation of biodiversity. It is crucial to be aware of the driving forces and constraints to agricultural diversification to formulate policy options which realize the coexistence of sustainable agricultural development and poverty reduction in rural areas.

Responding to this vital need, UNESCAP-CAPSA conducted a three-year research project, “Identification of Pulling Factors for Enhancing Sustainable Development of Diverse Agriculture in Selected Asian Countries (AGRIDIV)”, from April 2003, in collaboration with eight participating countries, namely Bangladesh, India, Indonesia, Lao People’s Democratic Republic, Myanmar, Sri Lanka, Thailand and Viet Nam.

It is my pleasure to publish “**Enhancing Sustainable Development of Diverse Agriculture in Sri Lanka**” as a result of the first phase of the Sri Lanka country study of the project. This volume presents a descriptive and quantitative analysis of the current secondary crop agriculture and development constraints and options. This study focuses on policy recommendations, as well as areas of/for farther study.

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Executive Summary

UNESCAP-CAPSA (former CGPRT Centre) initiated this study in 2003, under the research project “ Identification of Pulling Factors for Enhancing the Sustainable Development of Diverse Agriculture in Selected Asian Countries” (AGRIDIV), with funding from the Government of Japan. This report presents the findings of Phase 1 of the study, which provides a descriptive and quantitative analysis of the current status of CGPRT crops and identifies the constraints faced in developing diverse agriculture in Sri Lanka.

Achieving self-sufficiency in rice production has been considered the priority of successive governments during the last five decades to ensure food security, generate employment and eliminate poverty. As a result, the country was nearing self-sufficiency in the production of rice in 2003. However, the production of Other Field Crops (OFC), inclusive of CGPRT crops, has declined during the last decade mainly due to inadequate commitment on the part of the government towards agricultural diversification in the country. The open economic policy introduced in the country in 1977 and the liberalized trade policies in the mid 1990s, led to adverse impacts on the production of these crops.

Assessing the socio-economic impacts of recent developments in the country, including trade liberalization on the production of CGPRT crops, and the identification of constraints and opportunities towards the sustainable development of diverse agriculture for poverty alleviation was the primary objective of this study. Ten major CGPRT crops grown in Sri Lanka were studied in detail in relevance to agricultural diversification and poverty alleviation. The crops included Coarse Grains (Maize and Finger millet), Pulses (Mungbean, Black gram, Soybean, Cowpea and Groundnut) and Roots and Tubers (Potato, Cassava and Sweet potato).

The primary data on the production and marketing of CGPRT crops was collected from farmers and traders through Rapid Rural Appraisal (RRA). Secondary data was collected mainly from the publications of the Central Bank of Sri Lanka, the Department of Census and Statistics, Department of Agriculture, Department of Animal Production and Health, Hector Kobbekaduwa Agrarian Research and Training Institute and the Department of Customs. The data collected was analyzed through estimation of Simpson’s Diversity Index, Specialization Quotient, Domestic Resource Cost Ratio and Growth Accounting. Structure-conduct-performance approach was applied to study the prevalent agricultural marketing system for the CGPRT crops.

Basic socio-economic profile data indicated that the population growth rate ranged from 1.3 –1.5 per cent during the last decade. The share of the agricultural sector in GDP has declined from 25 per cent in 1993 to 19 per cent in 2003 and the rate of employment in the agricultural sector reduced from 42 per cent to 35 per cent during the same period. The per capita GDP was US\$ 947 in 2003. A Gini-coefficient estimate of 0.46 indicated increasing inequality in income distribution. A decline in real wage rates has also been observed in the agricultural sector. The unemployment rate was 8.8 per cent in 2003 and relatively high in the rural areas. About 80 per cent of the population live in rural areas and landholdings are becoming smaller due to fragmentation. About 7 per cent of the population in 2003 was identified as poor in terms of below the lower poverty line (one US\$ per day). About 24 per cent of the population live below the poverty line based on the nutritional adequacy approach. Agricultural diversification based on the production of CGPRT crops has the potential to increase food security, create more employment, and improve income distribution and the living standards of the escalating population, living mainly in rural areas.

A Simpson’s Diversity Index of 0.67 in 2003 indicated greater horizontal diversification of food crops. Vertical diversification is seen mainly in maize and soybean, which are used in

both animal feed and human food industries. The development of agro-based industries would increase the utilization of these crops and create off-farm employment mainly for the younger generation.

Although CGPRT crops are grown in almost all regions, Specialization Quotient estimates demonstrated regional specialization in growing CGPRT crops. Potential exists for enhancing the production and processing of CGPRT crops in these districts. However, appropriate soil and water conservation practices have to be adapted in order to avoid environmental degradation and achieve sustainable development of diverse agriculture.

Analysis of DRC ratio estimates indicates that while rice production is not competitive under rainfed conditions, mungbean and cassava have comparative advantage. Therefore, some of the marginal rice lands could be cultivated with CGPRT crops to provide additional income to farmers.

Although the government has implemented several poverty alleviation programmes in the past, poverty remains a major problem in rural areas. Food and nutritional availability to the rural poor are relatively low compared to the urban population due to their low level of household income. The average calorie per capita intake per day of the poor households has been estimated at 1,778 calories, which is relatively low compared to the per capita intake of non-poor households, estimated at 2,185 calories. Agricultural diversification based on CGPRT crops will improve the food supply and nutritional availability in rural areas. Off-farm employment created through CGPRT crops owing to vertical diversification in storage, processing and expansion of input and output markets will increase wage rates and the income of the rural population. This would enhance their capacity to spend on non-food items and improve their general living standards.

CGPRT crops are not consumed as staple foods, but consumed as breakfast foods, special preparations and as snacks. The demand for most of the CGPRT crops for food consumption depends on their availability, changes in the consumption patterns and prices. CGPRT crops such as maize, soybean, cassava and sweet potato have a greater potential for processing and value addition at the cottage level as well as large-scale industries. The derived demand for maize and soy meal in 2010 from the animal feed industry will be 344,920 mt and 146,869 mt respectively. The domestic production of these crops has to be increased in order to meet the industrial demand. Industrial facilities are also needed for the production of soy meal and cassava starch in the country.

Crops such as potato, soybean and black gram provide relatively greater financial returns than rice under the present yield levels. CGPRT crops require less water compared to rice and can be successfully grown under major and minor irrigation systems, in well drained soils during the yala (dry) season. Since uncultivated rice lands are available for agricultural diversification and some of the CGPRT crops could be inter-cropped with perennial crops, the land is not a major limiting factor constraining the expansion of CGPRT crops. About 31 per cent and 54 per cent of the total asweddumized rice land (total land area that could be cultivated with rice) are not cultivated during the maha (wet) and yala (dry) seasons respectively, and cultivation of some of these lands with high potential CGPRT crops would provide additional income to resource poor farmers. CGPRT crops could be successfully cultivated with supplementary irrigation from agro-wells during the yala (dry) season.

However, the present tariff structure for most CGPRT commodities discourages farmers from growing these crops. Cultivation of these crops also requires more labour and capital compared to rice. The income generated from smallholdings is inadequate to meet the household expenses of the resource poor farmers. The risk involved in cultivation is also high due to crop damage by unpredictable weather conditions. These crops require better preparation of land and irrigation management. Research information available to farmers on new production technologies is limited and the adoption of traditional methods results in low productivity and poor quality of the produce. Marketing, storage and processing facilities are

not available at the village level and affect the expansion of cultivation of these crops. Some innovative policy options are required, in order to enhance agricultural diversification and to improve the income of the CGPRT farmers.

Future food crop production policies in Sri Lanka should be three-pronged: maintain a high degree of self-sufficiency in rice, encourage agricultural diversification in potential areas, and develop agro-based industries to ensure household food security, nutritional security, employment and enhance the income of farmers leading to poverty alleviation and improvement in their quality of life. These objectives can be achieved through the proper integration of policies, appropriate technologies and development of infrastructure facilities in the country.

1. General Introduction

1.1 Background and justification

Agriculture continues to remain an important sector in the Sri Lankan economy contributing 19 per cent to GDP and providing employment to about 35 per cent of the labour force as of 2003. The population was 19.3 million in 2003 with about 80 per cent living in rural areas, with a sizeable proportion dependant upon agriculture for their livelihood. Self-sufficiency in rice production has been the major strategy of the agricultural policies during the last five decades to ensure food security, generate employment and to eliminate poverty mainly in the rural areas. In 2003, the country almost achieved self-sufficiency in the production of rice, which is the staple food of the nation.

Consequent to the above strategy of achieving rice self-sufficiency, the emphasis on the production of Other Field Crops¹ (OFCs) received low priority compared to rice. The cultivation of OFCs inclusive of CGPRT crops² was promoted through the 'Food Drive' programme of the government, implemented in the 1960s. Agricultural diversification through the cultivation of non-rice crops was encouraged during 1970-1977 by imposing a ban on their imports in 1971. The said ban on the imports of OFCs including CGPRT crops resulted in their short supply and an unprecedented price increase. Farmers responded by increasing the area cultivated with these crops and thus, the production of most of them doubled (Hafi and Erickson, 1989).

In 1977, the government introduced open economic policies. However, domestic agricultural production was protected through tariff and non-tariff barriers. Production of most of the CGPRT crops reached their peak levels in the mid 1980s. Most import restrictions were removed in the mid 1990s and as a result the domestic production of CGPRT crops faced competition from imports. Most of the CGPRT crops grown in Sri Lanka were not competitive with the world market prices due to low productivity and the high costs of production involved. Inconsistent trade policies have adversely affected agricultural diversification and the production of CGPRT crops. As a result, the production of CGPRT crops declined during the last decade.

At present, large quantities of maize, lentils, soybean, mungbean, black gram and potatoes are being imported into the country to meet the domestic requirement for food and the animal feed industry. The demand for these crops is expected to increase further with the increasing population and rapidly growing poultry industry.

According to the Household Income and Expenditure Survey (HIES) of 2001/2002 (Department of Census and Statistics) about 24 per cent of the households are considered poor, based on nutritional adequacy approach³. The poverty level in rural areas (31.3 per cent) is more than three times that in urban areas (8.6 per cent). Over 80 per cent of the poor live in rural areas and the majority of them depend on agriculture for their employment as well as household income.

¹ In Sri Lanka, Other Field Crops or Subsidiary Food Crops refers mainly to condiments (chilli and onion), coarse grains (maize and finger millet), pulses (mungbean, black gram, soybean and cowpea) and oil crops (groundnut and gingelly (sesame). In Sri Lanka, groundnut is generally classified as an oil crop. However, it is also considered as pulses). Roots and tuber crops such as potato, cassava and sweet potato are considered vegetables.

² Major CGPRT crops grown in Sri Lanka include coarse grains (maize and finger millet), pulses (mungbean, black gram, soybean, groundnut and cowpea) and roots and tubers (potato, cassava and sweet potato).

³ Defining poverty in terms of adequacy in energy intake, those households that spend more than 50 per cent of their expenditure on food and average adult equivalent food expenditure is less than Rs 1,338.48 per month are considered as poor households in the HIES Reports, 2002.

Chapter 1

Rice production, which has been given highest priority for improving the income level and employment in rural areas did not provide adequate income to farmers as there have been steady increases in the cost of production. The net income from rice cultivation in real terms has shown a decreasing trend during the past two decades (Wijayadasa *et al.*, 2003). The gradual dismantling of the inward looking tariff policy and the decrease in the state protection of domestic non-plantation crop production, particularly rice, which is still a major source of rural employment accounting for more than half of rural employment, affected the livelihoods and welfare of a large segment of farmers in rural areas (Ratnayake, 2002). Trade liberalization adversely affected the cultivation of CGPRT crops and contributed to further deterioration in the plight of the rural poor.

About 80 per cent of the CGPRT crops' extent is grown in highland areas during maha (wet) seasons under rainfed conditions. Only about 20 per cent of the extent is cultivated with irrigation during the yala (dry) season. These crops require less water compared to rice and can be successfully grown in marginal land areas where the supply of water is not adequate for rice cultivation. According to available statistics, about 54 per cent of the total asweddumized rice land (total land area that could be cultivated with rice) was not cultivated during the yala (dry) season in 2002. About 32 per cent of the total asweddumized rice land was not cultivated in the maha season of the same year. Governmental policies towards enhancing agricultural diversification through the cultivation of CGPRT crops on unutilized rice land would improve employment, household income and also reduce the poverty in rural areas. The development of the processing industry would also provide additional employment within this sector.

Although agricultural diversification based on CGPRT crops could improve food security, employment, household income and poverty alleviation in the rural sector, the performance of this sector has only been moderate during last two decades. The government's policies affording priority towards self-sufficiency in rice production, inconsistent trade policies, a lack of quality inputs, heavy dependence on rainfed cultivation, poor crop management practices, inadequate information on new technologies, lack of credit and infrastructure facilities, inefficient marketing systems and inadequate processing facilities are some of the constraints affecting the production of CGPRT crops. These problems reflect low productivity and profitability, price volatility, producer unrest and migration, which are some of the threats affecting the sustainable development of diversified agriculture in the country.

1.2 Study objectives

Sri Lanka is not in a position to expand agricultural diversification to produce the total domestic requirement of CGPRT crops due to various factors associated with the global economic environment and related government trade policies. The principal objective of this study is to investigate the socio-economic impacts of recent developments in the country, including trade liberalization, on the production of CGPRT crops and to identify the constraints faced in the efforts towards the sustainable development of diverse agriculture for poverty alleviation.

Therefore, the specific objectives of this study are focussed on the following aspects:

1. Review the historical development and current status of CGPRT crops and other crops relevant to agricultural diversification.
2. Review and analyze policies related to agricultural diversification.
3. Evaluate the impact of global trade orientation on CGPRT crops.
4. Examine the benefits of agricultural diversification specially towards poverty alleviation.
5. Review the demand for CGPRT crops as staple foods and their industrial importance.
6. Identify the constraints and potentials of diverse agriculture in the country.
7. Suggest policy recommendations for the development of sustainable diverse agriculture for poverty alleviation.

1.3 Scope of the study

Unfavourable government trade policies, along with inefficient production and marketing systems have adversely affected agricultural diversification and the production of CGPRT crops in Sri Lanka. As these crops are almost entirely produced by the resource poor, small farmers, any decline in production would have a negative impact on their food security, income and livelihood. A quantifiable assessment of the impact of government policies on agricultural diversification, especially on the cultivation of CGPRT crops and towards poverty alleviation in the country is still lacking. This study should hopefully be able to provide some indication on these aspects. The study will also investigate the real constraints and opportunities for further agricultural diversification based on CGPRT crops and identify policy options.

2. General Conceptual Framework and Research Methodology

2.1 General conceptual framework

Ten major CGPRT crops grown in Sri Lanka are studied in detail to examine the sustainable development of diverse agriculture in Sri Lanka. In the coarse grain's group, maize occupies the dominant position and its contribution to the animal feed industry and human food consumption are analyzed. Finger millet is the other important crop in this group. Pulses, mungbean, black gram, soybean, cowpea and groundnut are studied in detail with relevance to agricultural diversification. The roots and tubers' group includes potato, cassava and sweet potato, which are here been analyzed separately and comparatively. The list of crops studied under different crop groups is presented in Table 2.1.

Table 2.1 Crops selected for the study under the different crop groups

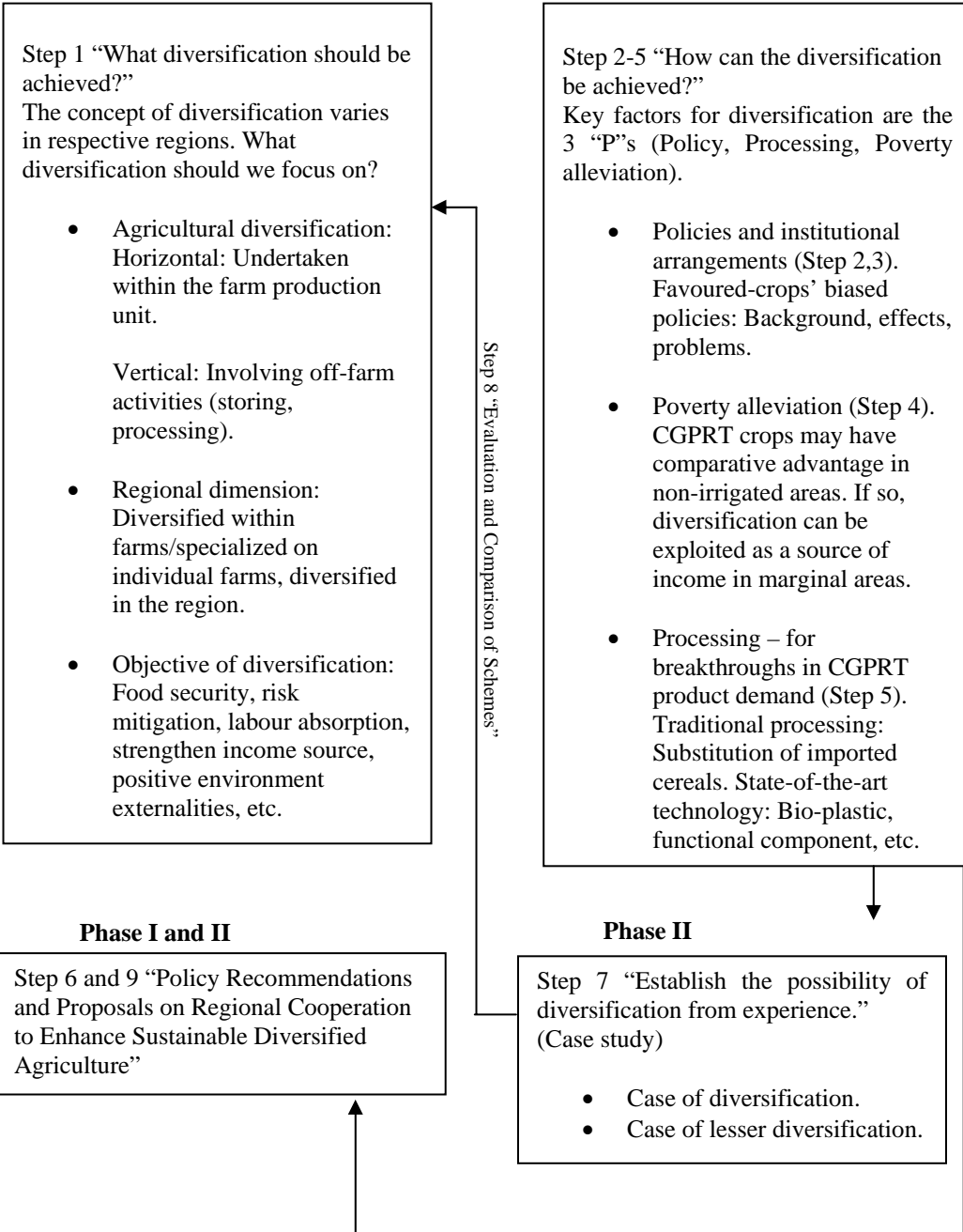
Crop group	Selected crops
Coarse grains	Maize (<i>Zea mays L.</i>) Finger millet (<i>Eleusine coracana</i>)
Pulses	Mungbean (<i>Vigna radiata</i>) Black gram (<i>Vigna mungo</i>) Soybean (<i>Glycine max</i>) Cowpea (<i>Vigna unguiculata</i>) Groundnut (<i>Arachis hypogaea L.</i>)
Roots and tubers	Potato (<i>Solanum tuberosum</i>) Cassava (<i>Manihot esculenta cranz</i>) Sweet potato (<i>Ipmea botatas L.</i>)

The study is conducted in two phases. Phase I of the study, which is presented in this paper, covers descriptive and quantitative analyses of the current status of CGPRT crop agriculture and the identification of its development constraints. Phase II of the study covers descriptive and quantitative assessments of the performance of CGPRT crop based farming systems and their vertical integration in relation to private sector processing and institutional arrangements.

The expected effects of agricultural diversification will differ based on the efficiency of resource use, risk reduction, response to changes in food demand and other factors involved. Agricultural diversification can be studied from various perspectives. This study is carried out as per the "Roadmap to AGRIDIV", developed by the UNESCAP-CAPSA, which is shown in Figure 1.

Figure 2.1 Roadmap to AGRIDIV

Phase I



2.2 Research methodology

Data collection

Data was collected using both primary and secondary sources. Secondary data was obtained from various publications. The data on demographic profiles, economic profiles, poverty, unemployment, trends in production and consumption of different crops was obtained from various publications of the Central Bank of Sri Lanka and the Department of Census and Statistics. The information on animal production and the feed industry was collected from the Department of Animal Production and Health. Price data was collected from the Hector Kobbegaduwa Agrarian Research and Training Institute. Import, export and CIF price data was obtained from the annual reports of the Department of Customs. The Rapid Rural Appraisal (RRA) method was employed in the collection of primary data from farmers and traders.

Analytical methods

Data was analyzed through the estimation of Simpson's Diversity Index, Specialization Quotient, Growth Accounting, and Domestic Resource Cost Ratio. Structure-Conduct-Performance Approach was used to analyze the characteristics of the marketing system.

Simpson's Diversity Index

The diversity in crop production was calculated using Simpson's Diversity Index. Crop production diversity was calculated based on the following equation:

$$SID = 1 - \sum_{i=1}^n Wi^2, \quad Wi = \frac{Xi}{\sum Xi}$$

SID = Simpson Index
Xi = Area of the ith commodities
Wi = Proportionate area

Where Xi is the area of the ith commodity and Wi is the proportionate area of the ith commodity in the total area. The minimum value of SID is 0 (the least diversity) whereas the maximum value is 1 (the most diversified).

The SID was calculated from the area harvested for ten crop groups namely (i) cereals, (ii) coarse grains, (iii) roots and tubers, (iv) pulses, (v) oil crops, (vi) vegetables, (vii) fruits, (viii) condiments, (ix) plantation crops, and (x) spices. In the regional study of AGRIDIV, SID of participating countries was also calculated for ten crop groups, but by a different classification (Sugino, 2004). SID was calculated for every five years from 1980 to 2002.

This index is a simple mathematical measure that characterizes species/crop group diversity in a community. The proportion of species/crop group relative to the total area of species/crop group is used as the basic unit in the calculation of the index.

Specialization Quotient or Specialization Index (SP)

Specialization quotient indicates the current status of agricultural diversification at a national level.

$$SP_{ij} = \frac{R_{ij}}{R_i}, \quad R_{ij} = \frac{A_{ij}}{\sum A_{ij}}, \quad R_i = \frac{A_i}{\sum A_i}$$

Chapter 2

- SP_{ij} = Specialization index of commodity i in region j
- R_{ij} = Proportion of commodity i in harvested area in region j
- R_i = Proportion of commodity i in harvested area of the whole country
- A_{ij} = Harvested area of commodity i in region j
- A_i = Harvested area of commodity i in the whole country

If SP_{ij} is greater than 1 it means the region j is specialized in commodity i in the country. This will indicate which region in the country is the production centre of the respective commodity.

Domestic Resource Cost Ratio

Domestic Resource Cost (DRC) coefficient is a measure of the domestic resource value, which is required to obtain a unit of foreign currency through export or save it through import substitution. This indicates the comparative advantage of producing a commodity in the country.

$$\text{DRC} = \frac{\sum_{j=k+1}^n A_{ij} V_j}{P_i^b - \sum_{j=1}^k A_{ij} P_j^b} = \frac{\text{Opportunity cost of non-tradable input}}{\text{Value of output in border price} - \text{Value of tradable inputs}}$$

- A_{ij} = k+1 to n refers to domestic resources
- A_{ij} = 1 to k refers to tradable inputs
- V_j = Refers shadow price
- P_{ib} = Border price of output
- P_{jb} = Border price of traded inputs

The numerator values non-tradable domestic resources at shadow prices. The value added is the difference between the unit output price and the cost of tradable inputs to produce the crops where it is evaluated at border prices included in the denominator. A DRC ratio of more than 1 indicates that the production is not socially desirable because the economy commits equal or more worth of domestic resources to produce one unit of output. If the DRC ratio is less than 1 it reveals that domestic resources are used in an efficient way and production of that crop is better than importing.

Growth accounting

Growth accounting analyzes the contribution of yield, crop intensity and farming area to crop production separately. Proportionate change in yield, crop intensity and farm area are used as indicators to identify the main course of the crop production.

$$Q = Y * I * A \quad \Delta Q / Q = \Delta Y / Y + \Delta I / I + \Delta A / A$$

- Q = Production
- Y = Yield
- I = Intensity
- A = Area

Decline in production is mainly the result of a negative proportionate change in yield, crop intensity or farm area.

The Structure – Conduct – Performance (SCP) Approach

The Structure-Conduct-Performance Approach is one of the most common and pragmatic methods used for analyzing marketing systems. This analytical method is based on the theory that market structure and market conduct determine the performance of a marketing system. All three parameters of structure, conduct and performance are inter-related and have an interdependent relationship.

Data on market participants, distribution, market share, functional importance, marketing channels, and conditions of entry and market transparency was examined to evaluate the market structure. The conduct of the marketing system was examined with respect to strategies of buying, selling and pricing. Data on producer and consumer prices were collected to estimate the market margins and to evaluate market performance. Some of the characteristics analyzed in the SCP of a marketing system are summarized in Table 2.2.

Table 2.2 The characteristics analyzed in the SCP of a marketing system

Structure	Conduct	Performance
Market participants	Strategies of selling	Economic criteria Efficiency
Market distribution	Strategies of buying	Effectiveness Marketing margins
Market share	Pricing strategies	Price risk Integration
Market channels	Competition and collaboration	Social criteria
Conditions of entry	Innovation	Employment Equity Income distribution
		Political criteria Food security Foreign exchange
		Ecological criteria

3. Basic Socio-economic Information of the Country

3.1 Demographic profiles

The population of Sri Lanka was estimated to be 19.3 million in 2003, recording an increase of 12 million within a time span of 50 years. The population growth rate was 1.3 per cent in 2003 (Table 3.1). The average annual growth rate in the country varied between 1.1-1.5 per cent during the last 10 years.

Table 3.1 Trends in population, its growth rate, age composition, sex ratio and percentage share of employment in agriculture

Year	Mid year population ('000)	Mid year growth rate	Age composition years ('000)			Sex ratio male/female	Percentage share of employment in agriculture
			<20	20-64	>64		
1993	16,850	1.3	8,106	8,752	761	100.3	41.5
1994	17,089	1.4	8,219	8,876	770	100	39.5
1995	17,280	1.1	8,333	8,997	782	99.7	36.7
1996	17,490	1.2	8,425	9,101	789	99.4	37.4
1997	17,702	1.2	8,543	9,224	801	99.1	36.2
1998	17,935	1.3	8,637	9,327	810	98.8	40.5
1999	18,208	1.5	8,762	9,460	821	98.5	36.2
2000	18,467	1.4	8,906	9,618	835	98.2	36.2
2001	18,732	1.4	6,821	10,713	1,198	97.9	32.6
2002	19,007	1.5	6,923	10,869	1,215	96.2	33.1
2003	19,252	1.3	7,009	11,016	1,233	96.2	35.0

Source: Department of Census and Statistics.

Central Bank of Sri Lanka, Annual Reports.

The percentage of the active working population among the age group of 20-64 years was about 57 per cent in 2003 (Registrar General's Department, 2003). In the past, there have been more males than females in Sri Lanka. This difference narrowed however, and the structure of the population had reversed by 1995, with the female population outnumbering the male population. The sex ratio of males per 100 females decreased from 100.3 in 1993 to 96.2 in 2003. The Dependency Ratio was 52.8 in 2003.

Sri Lanka maintains a literacy rate of around 90 per cent, which is the highest in the South Asian region. The literacy rate increased from 86.9 per cent in 1993 up to 90.1 per cent in 2003, with relatively faster improvements in literacy among females. The male and female literacy rates that stood at 90.1 and 83.1 per cent respectively in 1991/1992 increased to 92.5 and 87.9 per cent by 2003.

The demographic profile data indicates that the population increases annually by about 250,000 people, which includes approximately 57 per cent of the active working population. This demonstrates an increasing demand for food and employment in the country. Although the share of agriculture within employment has declined from 42 per cent in 1993 to 35 per cent in 2003, it is one of the major sectors that have provided employment to a rapidly increasing population. The expansion of agricultural diversification through the introduction of selected CGPRT crops will no doubt ensure the food security of the increased population and also provide wider employment opportunities within the country.

An increasing trend is also observed in the population growth rate and literacy rate of females. This indicates the need for the formulation of policy strategies to provide more employment opportunities for females. The development of cottage level processing industries

with CGPRT crops will lead to a solution to overcome the female unemployment problem in the rural sector.

3.2 Economic profile

The growth rate of the economy was positive and was in the range of 3.8-6.9 per cent during 1993-2003 except in 2001, which amounted to a low profile of -1.5. In 2003, the Sri Lankan economy recovered from its setback experienced in 2001, benefiting from improved domestic conditions, mainly owing to the peace process, strong fiscal consolidation efforts, flexible monetary policies, renewed commitment to structural reforms, and through the creation of a more favourable international environment. Growth of 1.5 per cent in the agricultural sector was achieved in 2003.

Table 3.2 Trends of GDP per capita, GDP growth rate and GDP contribution

Year	GDP per capita		Growth rate (%)	GDP contribution (%)		
	Rs million	US\$		Agriculture	Industry	Services
1993	29,647	615	6.9	25.0	25	50.5
1994	33,902	686	5.6	25.0	25.5	50.3
1995	38,695	755	5.5	24.0	26	50.0
1996	43,969	796	3.8	22.0	26	51.0
1997	50,292	853	6.3	22.0	26.4	51.0
1998	56,760	879	4.7	21.1	27.5	51.4
1999	60,741	863	4.3	20.7	27.3	52.0
2000	68,102	899	6.0	19.9	27.3	52.8
2001	75,133	841	-1.5	20.1	26.8	53.1
2002	83,267	870	4.0	20.5	26.3	53.2
2003	91,434	947	5.9	19.0	26.3	54.7

Source: Central Bank of Sri Lanka, Annual Reports.

The service sector makes up the largest component of GDP (54.7 per cent in 2003) followed by industry, which was about 26 per cent. The share of agriculture, which was about 25 per cent during 1993, underwent a marginal decline to about 19 per cent in 2003. The contribution of Other Field Crops, which includes potatoes, chillies, onions, mungbean, cowpea and finger millet to GDP was about Rs 16,216 million in 2003. The enhancement of the production of CGPRT crops will further increase the existing rate of contribution to GDP through value addition.

The percentage share of employment in agriculture has decreased from 42 per cent in 1993 to 35 per cent in 2003 (Table 3.3). In contrast to the agricultural sector, the industry and service sectors have gradually improved in respect of their shares of GDP as well as employment. Potential exists in the agricultural sector to increase the level of employment where a vital role could be expected in the production and processing of CGPRT crops.

Table 3.3 Sectorial shares within national employment

Year	Agriculture and forestry (%)	Manufacturing (%)	Mining (%)	Construction (%)	Services (%)
1993	41.5	14.3	1.5	4.3	39.4
1994	39.4	14.7	0.8	4.1	41.3
1995	36.7	14.5	1.6	5.3	41.5
1996	37.4	16.4	1.5	5.3	41.0
1997	36.2	14.2	1.6	5.5	40.2
1998	40.5	14.8	1.2	4.9	38.9
1999	36.2	16.6	1.2	5.2	42.3
2000	36.2	16.9	1.0	5.5	40.5
2001	32.6	16.7	1.7	5.1	43.4
2002	33.1	17.0	-	4.1	45.8
2003	35.0	16.1	-	5.6	43.3

Source: Central Bank of Sri Lanka, Annual Reports.

Basic Socio-Economic Information of the Country

The Gini coefficient, which measures the inequality in income distribution, demonstrates an increase in the inequality in income distribution during the last two decades. The Gini coefficient increased from 0.43 in 1980/1981 to 0.46 in 1995/1996 and to 0.48 in 2002 (Consumer Finance and Socio economic Surveys of the Central Bank).

The nominal wages of agricultural employees have increased two-fold during the period of 1992-2003 (Table 3.4). However, real wages declined in 2003. Appropriate strategies are required to reduce inequality in income distribution and to improve real wages within the agricultural sector. The appropriate development of agro-based industries within rural areas through CGPRT crops would no doubt improve the present status of income distribution and agricultural wage rates.

Table 3.4 Agricultural wage rates

Year	Nominal wage rate	Real wage rate
1993	803.9	1067.87
1994	821.5	998.29
1995	830.9	931.50
1996	907.9	907.9
1997	971.8	894.26
1998	1,097.7	931.59
1999	1,116.0	907.46
2000	1,142.7	871.09
2001	1,176.4	798.42
2002	1,269.6	795.53
2003	1,382.2	823.13

Source: Central Bank of Sri Lanka.

According to the Census of Agriculture in 1982, 61.1 per cent of the agricultural holdings was reported to be less than 2 hectares (Table 3.5). The total number of agricultural smallholdings was 1.8 million in 1982. According to the Census of Agriculture in 2002, about 45 per cent of the agricultural holdings remain in the range of less than 1 ha. The size of agricultural holdings has declined due to subdivision and fragmentation. The land to man ratio, which was 0.8 ha/person in 1953, declined to 0.3 ha/person in 2003.

Table 3.5 Number of agricultural holdings classified by size, 1982

Size class	Operated area (ha)	% of holdings
Less than 0.2 ha	37,174	2.6
0.2 - 0.4 ha	74,923	5.3
0.4 - 0.8 ha	196,336	13.9
0.8 - 1.2 ha	220,057	15.6
1.2 - 1.6 ha	201,866	14.3
1.6 - 2 ha	133,138	9.4
2 - 2.8 ha	198,178	14.0
2.8 - 4 ha	123,008	8.7
4 - 8 ha	143,097	10.1
8 ha and above	86,457	6.0
Total	1,414,235	100

Source: Department of Census and Statistics.

The increasing fragmentation of landholdings demonstrates a population demand for land. Agricultural income received through smallholdings, particularly from rice cultivation is adequate to meet the total household expenditure of the family. Therefore, it is also necessary to develop strategies to increase land productivity and the farm income of smallholdings. Agricultural diversification with selected CGPRT crops would be an ideal and timely option to achieve this objective. The application of research and development strategies is required to increase the productivity of smallholdings by growing CGPRT crops.

3.3 Extent of agricultural diversification

Agricultural diversification of a country can be examined in terms of horizontal as well as vertical diversification. Horizontal agricultural diversification includes diverse activities undertaken within farm production units where the objective is to increase the number of crops grown based on their economic viability. Vertical diversification highlights income-earning activities undertaken through off-farm activities.

Horizontal agricultural diversification

Horizontal diversity of the agricultural sector has been relatively high in Sri Lanka when compared to other countries in the region. The Simpson Index (SID) estimates, based on crop area harvested indicated about 0.68 for the period 1980 to 2003 (Table 3.6). A decreasing trend in SID has been observed during the period of 1995 to 2003.

Table 3.6 Recent trends of SID in selected years

Year	SID (based on crop area harvested)
1980	0.6730
1985	0.6778
1990	0.6768
1995	0.6856
2000	0.6794
2003	0.6660

Source: Department of Census and Statistics.

Agro-ecological conditions, profitability, consumption patterns, availability of technology, market access, institutional arrangements, the global economic environment and government policies are some of the factors that determine the levels of agricultural diversification.

The wide variation in the agro-ecological conditions is one of the most important factors that favour agricultural diversification in Sri Lanka. The rainfall pattern of Sri Lanka represents a bimodal distribution leading to two distinct cultivation seasons in most parts of the country (Annex 1). The major cultivation season identified as maha (wet season) extends from September to February. The rainfall during this season flows mainly from convention, depressions and the North-East monsoon. The minor season, yala (dry season) beginning in March, extends to August and receives rainfall through conventional rains followed by the South-West monsoon.

On the basis of rainfall regime, the country is divided into three climatic zones, namely wet, dry and intermediate. These three climatic zones in turn, are classified into seven agro-ecological zones based on the altitude, temperature and landform (Table 3.7). The seven zones are further sub-divided into 46 well-defined agro-ecological regions based on soil type, elevation, landform, temperature and rainfall pattern. The wide variation in agro-ecological conditions favours the cultivation of temperate and tropical food crops including CGPRT crops.

Table 3.7 Environmental parameters of major agro-ecological zones in Sri Lanka

Zone/region	Elevation (m)	Temperature (c ⁰)	Mean rainfall (mm)
Wet Zone			
Up-country	1,000-2,400	10-15	2,500-5,000
Mid country	500-1,000	15-20	2,000-3,000
Low-country	0-500	20-25	2,000-3,000
Intermediate Zone			
Up-country	1,000-1,500	15-22	1,500-2,250
Mid country	350-500	24-26	1,500-2,250
Low-country	0-350	25-29	2,000-2,200
Dry Zone			
Low-country	0-300	28-30	900-1,000

Basic Socio-Economic Information of the Country

Although CGPRT crops are grown within almost all agro-ecological regions of the country, only a few districts have been identified as the major CGPRT crop growing areas. The districts with high potential for growing CGPRT crops were so identified based on the calculation of “Specification Quotient” or “Specialization Index” (SP). The related findings are presented in Table 3.8.

The analysis of the specialization quotient reveals that the growing of CGPRT crops is concentrated in only a few districts. Vast potential exists for the development of agro-based industries in leading CGPRT crop production districts.

Table 3.8 Major districts of growing CGPRT crops based on estimation of specialization quotient or specialization index (SP)

Crop	Major districts growing CGPRT crops	Specialization quotient (SP)
Maize	Anuradhapura	1.0530
	Badulla	1.0094
	Moneragala	0.8606
	Ampara	0.5551
Finger millet	Anuradhapura	4.6291
	Moneragala	3.2789
	Hambantota	2.8996
	Kurunegala	0.9656
Mungbean	Hambantota	2.7353
	Moneragala	2.4564
	Kurunegala	1.3219
Black gram	Anuradhapura	6.3417
	Mullativu	5.1069
	Vavuniya	3.6199
Soybean	Anuradhapura	27.6266
	Mahaweli ‘H’	5.6231
	Matale	4.2784
	Nuwara Eliya	1.3447
	Kilinochchi	1.1002
Cowpea	Ampara	2.7051
	Moneragala	1.6077
	Hambantota	1.0087
Groundnut	Moneragala	2.5481
	Ampara	1.2280
	Mullativu	1.7405
	Hambantota	0.9509
Sweet potato	Matale	2.0410
	Kurunegala	1.6274
	Moneragala	1.5849
	Ratnapura	1.3878
	Badulla	0.9973
	Gampaha	0.9045
Cassava	Kurunagala	0.5632
	Gampaha	0.3919
	Ratnapura	0.3784
	Moneragala	0.2960
Potato	Badulla	16.1009
	Nuwara Eliya	2.8762

Source: Department of Census and Statistics.

Vertical agricultural diversification

Although there is a potential for the use of CGPRT crops in agro-based industries, most of the produce is not used in industry due to the high demand for human consumption in its processed or raw forms. At present, processing technologies and the required facilities are available to a limited extent, but only to cater maize and soybean.

Maize and soybean are the major CGPRT crops used in the animal feed industry. Several private sector companies are engaged in 'Forward Sales Contract System' (FSC) with farmers in the purchase of maize and soybean where seeds are provided by the relevant companies. Ceylon Grain Elevators Ltd. (largest feed producer), Gold Coin (Pvt) Ltd. and Nutrina (Pvt) Ltd. are the main buyers through forward sales arrangements.

In addition to animal feed manufacturers, there are a few major human food producers who also purchase quality maize and selected CGPRT crops at higher prices. The state controlled 'Thripasha' project which supplies a high nutrient food of the same brand name to pregnant mothers and children, consumes a quantity of 8,000 mt of aflatoxine free maize annually. The Plenty Foods (Pvt) Ltd. and Cereal products (Pvt) Ltd. are also engaged in human food production using aflatoxine free maize. The local production of maize, soybean, mungbean and other pulses for food formulations are utilized by these organizations.

Plenty Food Ltd. supplies all inputs (seed, fertilizer, agro-chemicals, etc.) in order to enable the farmers to undertake soybean cultivation. The produce is purchased from farmers at a relatively higher price in the case of 'Samapasha', which is also used as a nutritional food for human consumption.

The development of agro-based industries for CGPRT crops can assist in resolving anticipated demand problems by absorbing surplus production and processing into value added forms to suit domestic consumption as well as export purposes. The availability of these processed items can exploit the existing local demand, and it continues to increase. Agro-industrial development based on CGPRT crops will create income generation, and off-farm employment opportunities in rural areas.

3.4 Extent of unemployment and poverty

Poverty and unemployment are the major concerns affecting the development of socio-economic conditions in the country.

Unemployment

The unemployment rate has declined from 13.8 per cent in 1993 to 8.8 per cent in 2003 (Table 3.9). The labour force which was 6.0 million in 1993 increased to 7.0 million by 2003. The share in the labour force participation rate marginally declined to 48.7 per cent in 2003 from 49.1 per cent in 1993.

The increasing rate of unemployment was identified as a problematic issue in Sri Lanka after the 1950s. The foreign exchange crisis, stagnation of private sector investment and the contraction in the economy on labour demand and the decline of employment in the agricultural sector were the major factors affecting the extent of unemployment on the whole within the country.

Table 3.9 Labour force and their participation

Year	Labour force ('000)			Labour force participation rate	Unemployment rate
	Total	Employed	Unemployed		
1993	6,032	5,201	831	49.1	13.8
1994	6,079	5,281	798	48.7	13.1
1995	6,106	5,357	749	47.9	12.3
1996	6,241	5,537	704	48.7	11.3
1997	6,266	5,608	658	48.7	10.5
1998	6,660	6,049	611	51.7	9.2
1999	6,673	6,082	509	50.7	8.9
2000	6,827	6,310	517	50.3	7.6
2001	6,773	6,236	537	48.8	7.9
2002	7,121	6,467	654	50.2	8.8
2003	7,593	6,945	648	48.7	8.6

Source: Central Bank of Sri Lanka, Annual Reports.

Rural areas make up the largest section of the unemployed population. Urban migration has been relatively low in Sri Lanka while urban population growth rates also remain low. In the rural sector, the unemployment rate declined from 13.3 per cent in 1993 to 8.0 per cent in 2001 (Table 3.10).

Table 3.10 Unemployment rates in urban and rural sectors

Year	Urban			Rural		
	Male	Female	Total	Male	Female	Total
1993	12.7	24.6	16.1	9.0	21.2	13.3
1994	10.8	23.9	14.7	9.4	19.3	12.8
1995	12.1	20.9	14.8	8.3	18.3	11.7
1996	9.5	18.8	12.3	8.3	17.9	11.5
1997	7.9	19.5	11.3	7.5	16	10.3
1998	7.2	15.9	9.9	6.4	13.8	9.1
1999	7.8	13.3	9.5	6.5	13	8.8
2000	6.5	11.5	8.1	5.7	11.5	7.5
2001	6.3	11.1	7.7	6.2	11.5	8.0

Source: Department of Census and Statistics.

However, the wide gap between urban and rural unemployment rates has been reduced considerably over the last decade for both genders. In both urban and rural sectors, the unemployed female percentage was higher than that of the male percentage. In terms of these statistics, there is a considerable extent of unemployment within the rural sector. The expansion of cultivation and value addition of CGPRT crops will provide more employment opportunities in the rural sector.

Poverty

Poverty has been a major economic problem in Sri Lanka, despite various poverty alleviation programmes implemented, since Independence in 1948. According to the Annual Report of the Central Bank (2003) about 7 per cent of the population was identified as poor in terms of the lower poverty line (one US dollar per day) and about 45 per cent as per the higher poverty line (two US dollars per day).

According to the Household Income and Expenditure data of the Department of Census and Statistics (HIES Report, 2002), the share of population considered to be below the poverty line has declined from 30.4 per cent in 1990/1991 to 23.9 per cent in 2001/2002 (Table 3.11). Those households spending for more than 50 per cent of their expenditure on food and average adult equivalent food expenditure less than Rs 1,338.48 per month are identified as poor households in the HIES Report, 2002.

Table 3.11 Percentage share of population categorized below the poverty line

Year	Poverty (%)
1990/1991	30.4
1995/1996	26.7
2001/2002	23.9

Source: Department of Census and Statistics.

Urban, rural and estate sectors (resident population and employed on the plantation such as tea and rubber, etc.) showed a declining trend in poverty during 1990-2002. In the rural sector, the share of the population below the poverty line declined from 34.7 per cent in 1990/1991 to 26.4 per cent in 2001/2002 (Table 3.12). In the urban sector the poor household percentage was low when compared to the other two sectors. The estate sector, indicates a declining trend also. As such, poverty in Sri Lanka can basically be considered as a rural phenomenon.

Table 3.12 Extent of rural and urban poverty

Year	Urban	Rural	Estate
1990/1991	18.2	34.7	20.5
1995/1996	13.4	28.7	26.1
2001/2002	7.9	26.4	22.1

Source: Department of Census and Statistics.

About 80 per cent of the population live in rural areas, with a sizeable proportion dependant on agriculture for their livelihood. According to HIES of 2001/2002, approximately 26, 27 and 8 per cent of the populations in rural, estate and urban areas respectively, were found to belong to the poor category. According to the findings of the 1999-2000 Sri Lanka integrated Survey (SLIS), income through crop cultivation, livestock activities and agricultural casual labour wages accounted for only about 23 per cent of total rural household income (World Bank Report, 2002). Therefore, agricultural diversification together with selected CGPRT crops and integrated livestock farming is considered as a positive solution to improve employment, household income and to alleviate poverty in the rural sector.

3.5 Extent of environmental problems

Sri Lanka's forest cover extends to approximately 1.6 million hectares representing 24 per cent of the total land area. Of this, 1.5 million hectares represent natural forest and 0.1 million hectares account for planted forest. The percentage of forest cover, which was 44 per cent of the total area in 1956, has declined to 24 per cent in 2001. The annual rate of deforestation amounts to about 25,000 hectares. A major impact of deforestation is the loss of topsoil which negatively affects soil fertility. Due to the rapidly increasing demand for land for settlement as well as agricultural activities there is a constant struggle between forest and other uses of land.

Since the state owns most of the forestlands, forests are being cleared periodically to facilitate the provision of lands to peasant farmers and the landless under the village expansion schemes and major settlement programmes. Cleaning of forestland for cultivation and settlement particularly in the less favourable and more fragile rainfed environments prone to soil and water degradation has resulted in environmental degradation and low productivity.

Most of the CGPRT crops were grown on chena (shifting cultivation or slash-and-burn farming practiced by farmers on highland) lands during the maha (wet) season in the past. The chena, where forestland is cleared for cultivation has declined due to government restrictions imposed with a view to conserve the forests and environment. However, crops such as potato are often cultivated on sloppy lands without adhering to proper soil conservation methods and thus resulting in soil degradation and declining productivity in potato growing areas. Therefore,

agricultural diversification programmes have to be implemented with care and clear objectives of achieving sustainable agricultural diversification, through adapting appropriate natural resource management practices.

3.6 Concluding summary

The demographic profile of the population reveals an escalating demand for food and employment to cater to the requirements of the ever-increasing population. Agricultural diversification based on selected CGPRT crops will be of immense value to overcome this problem. The high literacy rate and the increasing population growth rate of females indicate the need to develop appropriate strategies for the government to provide more employment opportunities for females. The development of agro-based cottage industries with CGPRT crops will create more employment opportunities to the younger generation.

The economic profiles of the country indicate the need to improve the GDP per capita as well as the growth rate. The agricultural sector is still one of the major fields contributing to GDP and employment for which the growth is inadequate. There is a potential to increase the contribution to GDP, the agricultural growth rate and the generation of employment through enhancing the production and value addition of CGPRT crops. Inequality in income distribution has increased during the last two decades. A decline in real wages has been observed in the agricultural sector. The development of agro-based industries with CGPRT crops will improve the income distribution and agricultural wages in the rural sector. Farm holding sizes are becoming smaller due to continued land fragmentation. Research and development activities are needed to increase the productivity of smallholdings through the cultivation of CGPRT crops.

The Simpson's Index estimate reveals greater horizontal diversification in the country. Wide variations in the agro-ecological conditions favour the cultivation of diverse food crops including most of the CGPRT crops. Although CGPRT crops are grown in almost all the agro-ecological regions, a few districts can be identified as the major CGPRT crop growing districts based on specialization quotient estimates.

Varietal diversification of CGPRT crops is not being developed due to limited agro-based industries and the high demand for human consumption of these crops. The development of agro-based industries in major growing areas will improve the utilization of these crops and create off-farm employment and export opportunities.

The available data reveals more unemployment in the rural sector, particularly among females. The cultivation and value addition of CGPRT crops require more labour compared to that for rice and has to be promoted to create more employment opportunities in the rural sector.

According to the Department of Census and Statistics about 24 per cent of the population live below the poverty line and the poverty rate is higher in the rural sector. About 80 per cent of the population live in rural areas and the production of CGPRT crops with integrated livestock farming will contribute to the alleviation of poverty in rural areas.

Deforestation of land for human settlement and cultivation has created environmental degradation based on low productivity in many regions. Therefore, agricultural diversification with CGPRT crops should be implemented with appropriate soil and water conservation practices in order to achieve sustainable diversified agricultural production.

4. Historical and Current Status of CGPRT Crops and Other Crops' Production in the Country

4.1 Trends in the production and consumption of CGPRT crops

The area planted, total production and average yields pertaining to significant crops during the period 1993-2003 are presented in Annex 2. The trends in area cultivated, average yield, production and consumption of major CGPRT crops are discussed below.

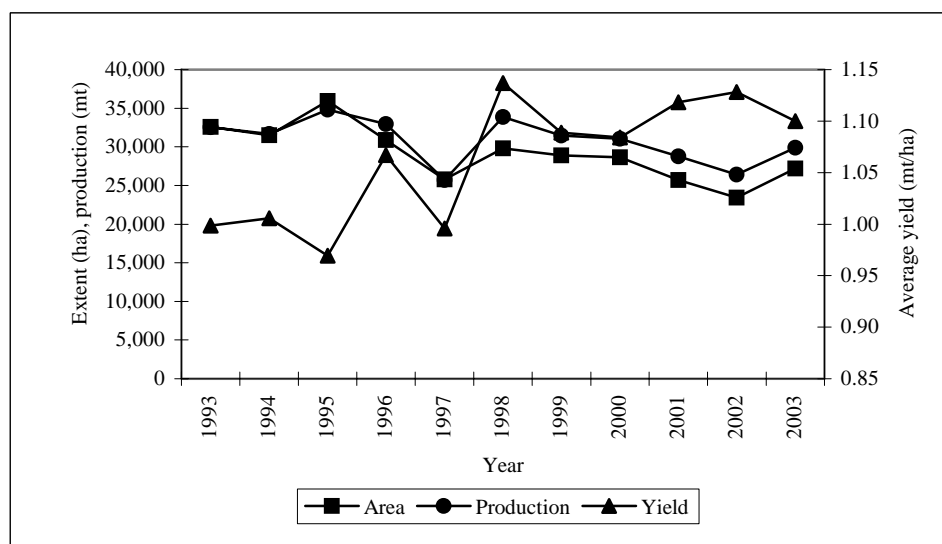
Trends in area planted, production and average yields of CGPRT crops

Coarse grains

Maize and finger millet are the major coarse grains cultivated in the country. Sorghum is grown only on a small-scale. Declining trends have been observed in the area planted and production rate of maize and finger millet since the early 1990s.

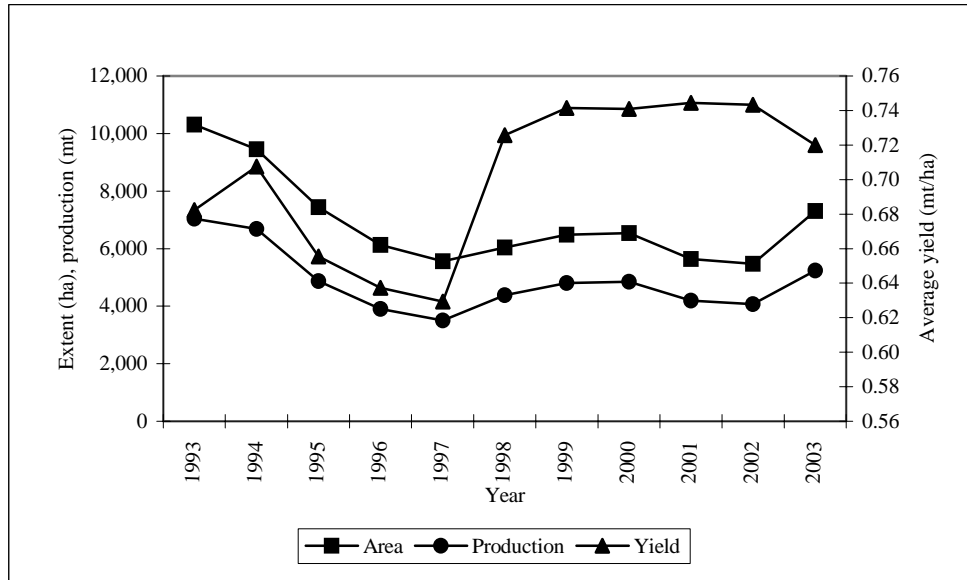
Maize is the second most important grain crop being cultivated in Sri Lanka. The extent cultivated with maize was 35,938 hectares in 1995 but this declined by 24 per cent to 27,208 ha in 2003 amounting to a total production of 29,881 mt (Annex 2a). Average yield was 1.11 mt/ha. A marginal increase was observed in the productivity of maize during the last 3 years. (Figure 4.1).

Figure 4.1 Trends in extent, production and average yield of maize



The extent cultivated with finger millet was 10,315 ha in 1993 which dropped by 29 per cent to 7,312 ha in 2003. Total production was 5,241 mt (Annex 2b). The average yield was low (0.72 mt/ha) and it has been almost stagnant during the last 6 years (Figure 4.2).

Figure 4.2 Trends in extent, production and average yield of finger millet



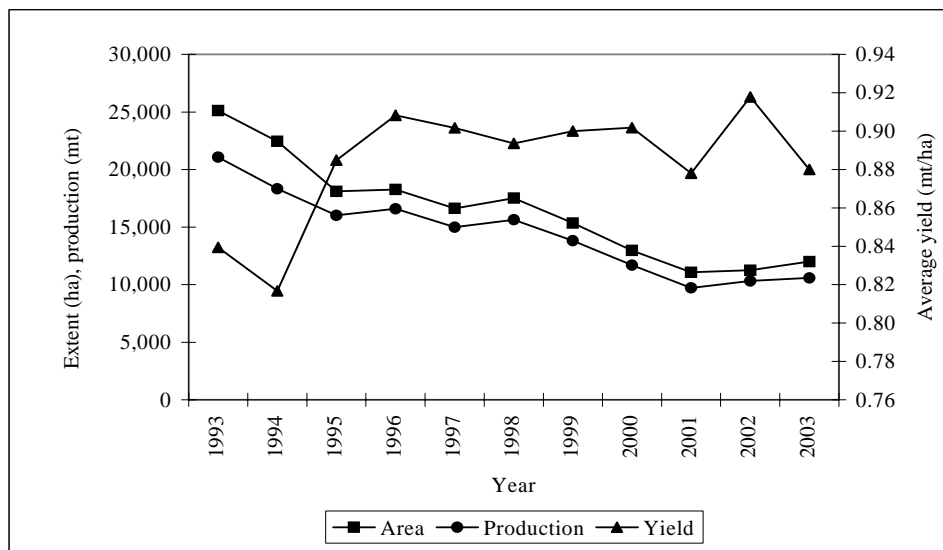
Pulses

Production and area planted with mungbean, black gram, soybean, groundnut and cowpea show a declining trend since the early 1990s. A marginal increase was observed in the extent and production of soybean and groundnut in 2003.

The total extent cultivated with mungbean was 25,108 ha in 1993 and declined by 52 per cent to 11,997 ha in 2003. Total production was 10,582 mt at an average yield of 0.88 mt/ha (Annex 3a). A marginal increase in yield was seen in 2002 (Figure 4.3).

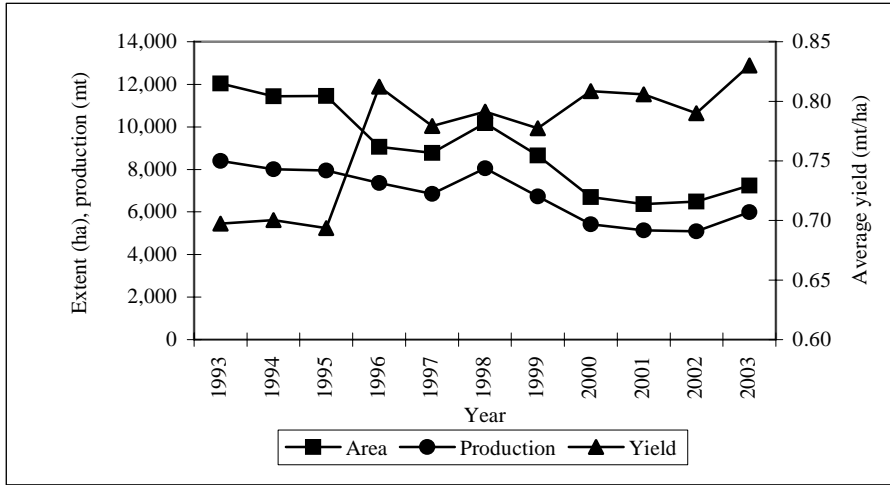
The area cultivated with black gram was 12,045 ha in 1993. It decreased by 40 per cent to 7,234 ha in 2003 with total production at 5,998 mt (Annex 3b). The average yield was 0.83 mt/ha and has almost been stagnant during the last 4 years (Figure 4.4).

Figure 4.3 Trends in extent, production and average yield of mungbean



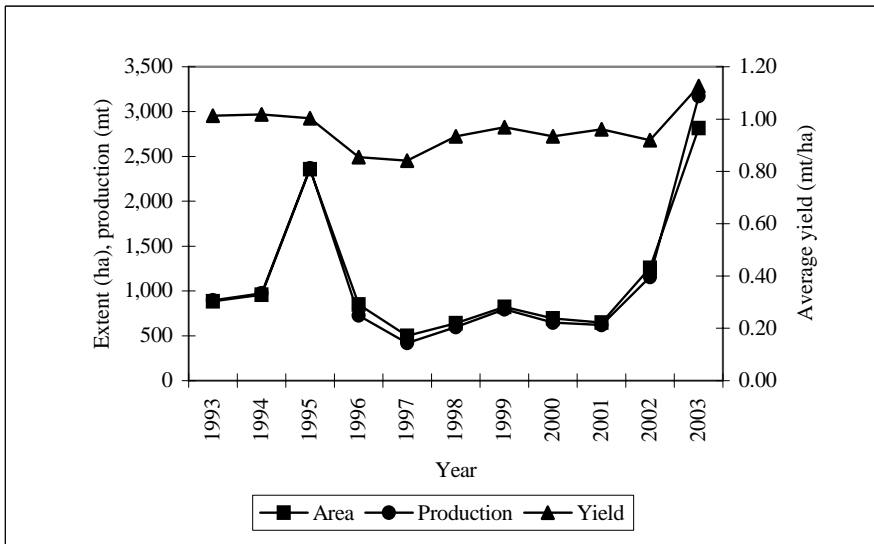
*Historical and Current Status of CGPRT Crops and
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Figure 4.4 Trends in extent, production and average yield of black gram



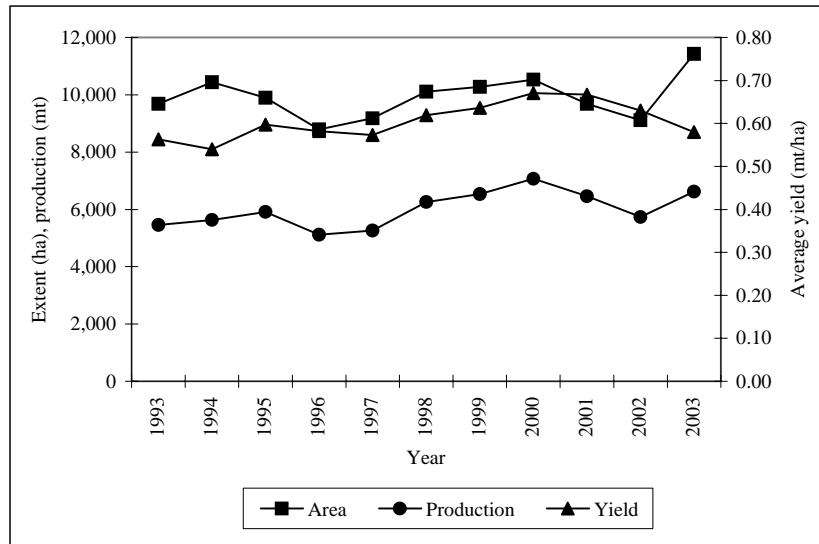
The extent of land cultivated with soybean was 2,359 ha in 1995 and it increased by 19 per cent to 2,817 ha in 2003. Total production was 3,173 mt (Annex 3c). The average national yield was 1.13 mt/ha. A marginal increase in yield was observed in 2003 (Figure 4.5).

Figure 4.5 Trends in extent, production and average yield of soybean



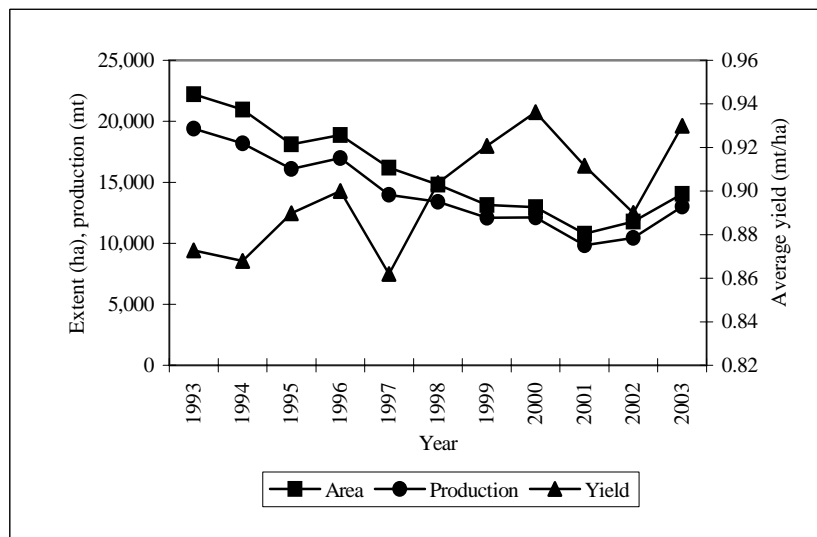
The extent cultivated with groundnut was 10,436 ha in 1994 increasing by 10 per cent to 11,425 ha in 2003 with production at 6,624 mt (Annex 3d). Average yield in 2003 was 0.58 mt/ha reporting a marginal decline compared to the previous year (Figure 4.6).

Figure 4.6 Trends in extent, production and average yield of groundnut



The extent cultivated with cowpea was 22,213 ha in 1993 declining by 37 per cent to 14,062 in 2003 and total production was 13,023 mt (Annex 3e). The average yield was 0.93 mt/ha and a yield drop was observed in 2001 and 2002 (Figure 4.7).

Figure 4.7 Trends in extent, production and average yield of cowpea



Roots and tubers

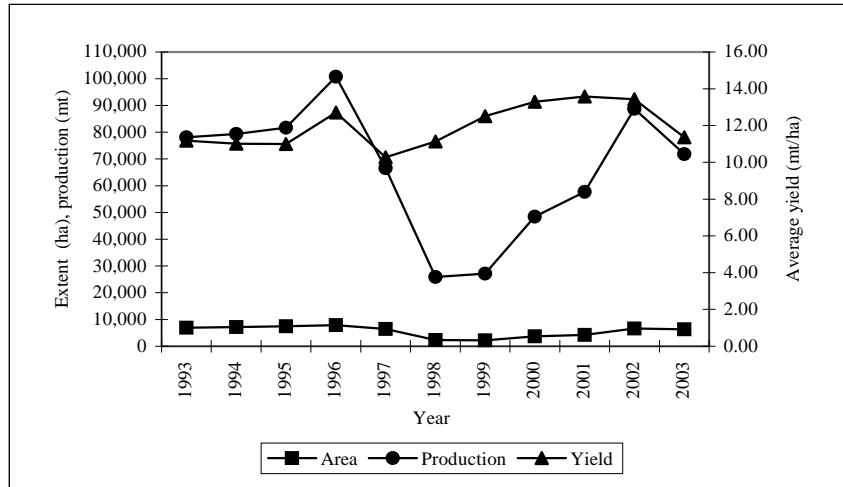
Declining trends have been observed in the area planted and the rate of production of cassava and sweet potato. The production output and extent cultivated have been fluctuating with respect to potato.

Potato remains a highly protected crop in Sri Lanka, with a ban on imports of consumption potato since 1967. The import restriction was removed in 1996. But local production was not competitive enough in price with imports due to the high costs involved in

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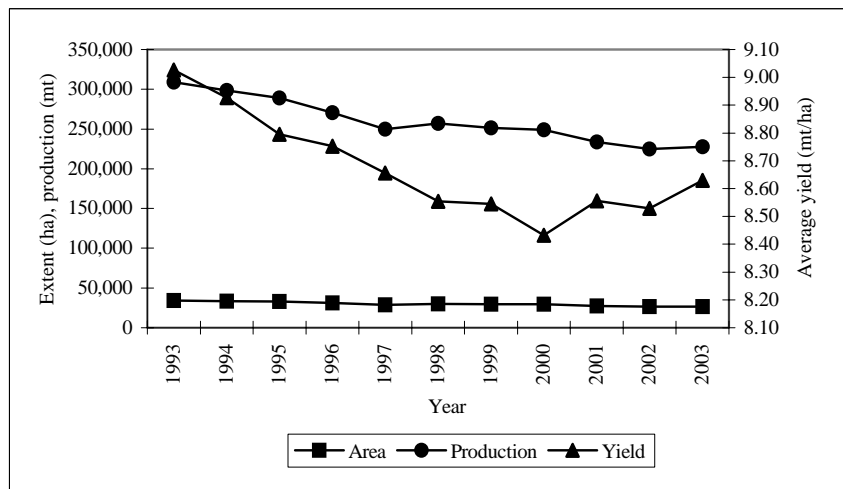
the production. As a result, the extent of potato cultivated in the country declined from 7,925 ha in 1996 to approximately 2,171 ha in 1999 (Annex 4a). The cultivated extent has once again increased, up to 6,605 ha in 2002, due to the 'Specific duty' imposed by the government in 2000 to protect the local farmers. Average yield was 11.36 mt/ha in 2003 (Figure 4.8).

Figure 4.8 Trends in extent, production and average yield of potato



The extent cultivated with cassava during 1993 was 34,233 ha but it decreased by 23 per cent to 26,402 ha in 2003 with production at 227,755 mt (Annex 4b). The average yield was 8.63 mt/ha and productivity has been almost stagnant for the last 6 years (Figure 4.9).

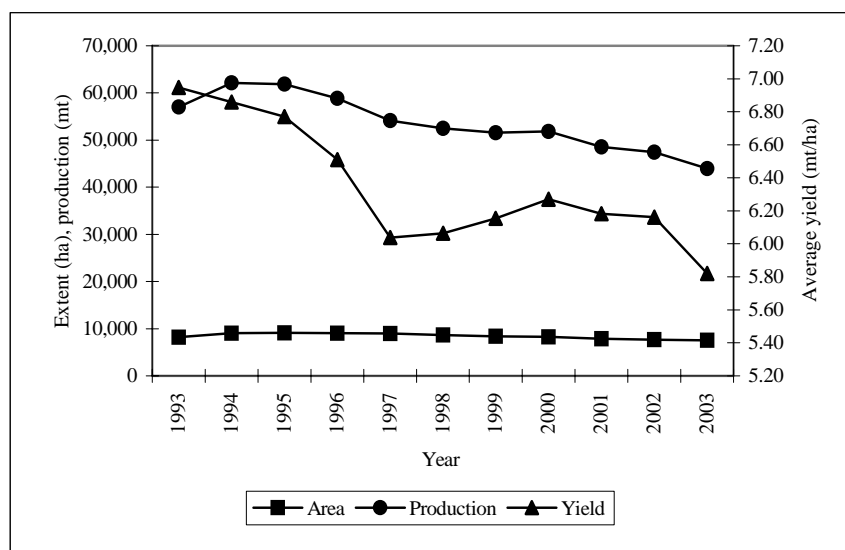
Figure 4.9 Trends in extent, production and average yield of cassava



Chapter 4

The extent cultivated with sweet potato was 9,929 ha in 1992 but declined by 24 per cent to 7,547 ha in 2003 with production at 43,940 mt (Annex 4c). In 1993, the average yield was 6.95 mt/ha but has been almost stagnant for the last 6 years (Figure 4.10).

Figure 4.10 Trends in extent, production and average yield of sweet potato



The production data indicates that the declining trends in production have been greater in respect of finger millet, mungbean, black gram and cowpea. The analysis of Growth Accounting in 1990 and 2000 indicates that the negative change in cultivated area was the main factor that contributed to the declining production of most of the CGPRT crops (Table 4.1). The factors contributing to the decline in cultivated area have to be identified and remedial measures taken in order to increase the production of these crops.

Table 4.1 Growth accounting estimates for 1990 and 2000

Crop	$\Delta Q/Q$	$\Delta Y/Y$	$\Delta I/I$	$\Delta A/A$
Maize	-0.027	0.046	0.038	-0.12
Finger millet	-0.442	0.068	0.055	-0.636
Green gram	-1.693	0.065	-0.125	-1.56
Black gram	0.1225	0.113	0.022	-0.011
Soybean	-1.907	-0.027	0.505	-4.725
Groundnut	0.0602	0.119	-0.115	0.043
Cowpea	-0.956	0.043	-0.009	-1.025
Cassava	-0.5	-0.068	0.039	-0.462
Sweet potato	-0.459	-0.05	0.028	-0.43
Potato	-1.078	0.074	-0.037	-1.166

Source: Department of Census and Statistics.

Note: Q - Production, Y - Yield, I- Intensity, A- Cultivated area.

CGPRT cropping patterns

About 80 per cent of the total extent of coarse grains and pulses are generally cultivated on highlands under rainfed conditions during the maha (wet) season. Only about 20 per cent of the total extent is cultivated with irrigation during the yala (dry) season. These crops are mostly cultivated in the dry and intermediate zones. Potato is grown successfully in the hill country, wet (Nuwara-Eliya) and intermediate (Badulla) zones during maha and yala seasons under both

Historical and Current Status of CGPRT Crops and Other Crops' Production in the Country

rainfed and irrigated conditions. A small extent is cultivated in the low country dry zone during the maha season.

Cassava is mainly grown as a rainfed crop throughout the island excluding high elevation areas, concentrated mainly in the wet and intermediate zones. The major production system of cassava has been identified as one of a backyard cropping pattern. It is also grown on large-scale open land cultivations in the wet zone as well as in the intermediate zone in the form of mixed crops with coconut and pineapple cultivations. Chena cultivation on a large scale in the dry zone is also a widely adopted cropping pattern. Sweet potato is cultivated throughout the year in all ago-ecological zones under both rainfed and irrigated conditions.

Cultivation of CGPRT crops under irrigation

The water requirement of most CGPRT crops is relatively low when compared to rice and other field crops (Table 4.2). Therefore, most CGPRT crops can be successfully grown under major and minor irrigation schemes¹ where the shortage of water becomes a problem for the cultivation of rice.

Table 4.2 The water requirement of selected food crops

Crop	Crop duration (days)	Water requirement (mm)	
		Yala	Maha
Paddy			
Lowland	105	910	470
Upland	105	-	430
Coarse grains			
Maize	115	825	460
Sorghum	110	1,075	610
Pulses			
Soybean	105	710	390
Mungbean	75	460	245
Cowpea	90	770	370
Groundnut	110	735	395

Source: Field Crop Research and Development Institute, Maha Illuppalam.

Dimantha (1987) has estimated that about 80,000 hectares of well-drained soils exist under the major irrigation schemes, which is considered well adapted for the diversification of cropping during the yala season. According to Wijeyaratne (1996) diversification on rice lands has been mainly confined to major tank systems that have a deficient or inadequate irrigation water supply during the dry season. The maximum irrigated area brought under OFCs (on rice lands) so far in one cultivation season has been around 40,000 hectares.

The vegetables and CGPRT crops are successfully grown in the dry zone during the yala (dry) season under minor tank irrigation systems. Minor tanks have been designed to supply water to the command area during the maha season mainly for rice cultivation. Any water remaining in the reservoirs at the end of the maha crop is utilized to cultivate a second crop, mostly vegetables and CGPRT crops during the yala season. The crops are cultivated in the well-drained rice soils or *akkarawelas*.

When the availability is not adequate to cultivate the entire command area a 'bethma' system is adapted where a portion of land is divided equally among all the farmers. During some years, farmers cannot cultivate even during the maha season with rice due to inadequate rainfall. During most years, the occurrence of crop losses and partial abandonment of rice fields due to water shortages are very common in the minor irrigation schemes (Dharmasena, 1989). Therefore, crop diversification with less water-consuming CGPRT crops will definitely be a viable option to overcome this situation if necessary, with the provision of appropriate policy decisions being made for the purpose.

¹ Minor irrigation schemes provide irrigation water to extents less than 80 hectares.

Trends in per capita availability of CGPRT crops

The per capita availability of most CGPRT crops, except maize and potato, has declined during the last decade as shown in Figure 4.11, 4.12 and 4.13.

Figure 4.11 Trends in per capita availability of coarse grains

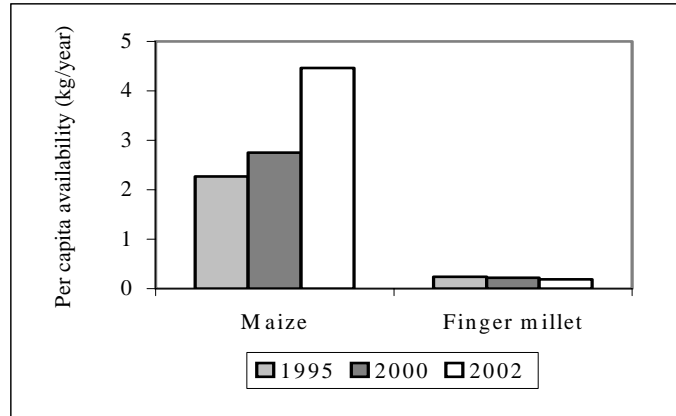
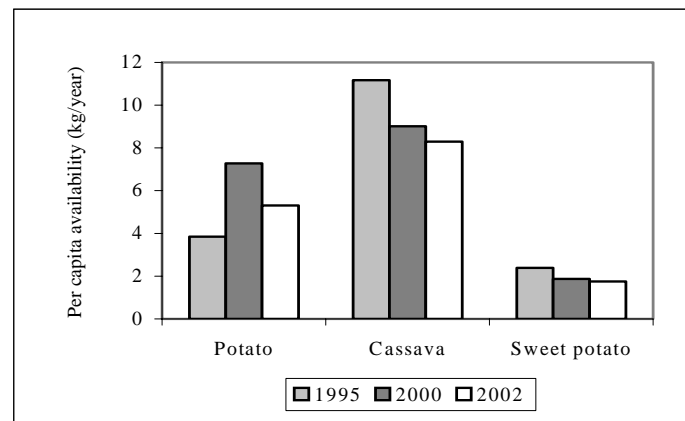


Figure 4.12 Trends in per capita availability of pulses



Figure 4.13 Trends in per capita availability of roots and tubers



Historical and Current Status of CGPRT Crops and Other Crops' Production in the Country

Per capita availability has increased in respect of maize and potato due to the availability of their imports. The detailed Food Balance Sheet Data for the years 1995, 2000 and 2002 are presented in Annex 5.

There is an increasing demand for maize and soybean especially as ingredients for animal feed. The total annual demand for maize for 2005 has been estimated to be 289,000 mt (Karunatilake, 2003). Per capita consumption was 4.46 kg/year in 2002. Current local production is sufficient to cater to only around 20 per cent of the total requirement. Per capita availability of finger millet was 0.19 kg/year in 2002 but there is increasing demand within the country for finger millet as a nutritional food.

The production of groundnut has been mainly used to meet the domestic demand except in a few years where some stock was exported. During the early 1980s, the country was able to produce to meet its entire requirement of mungbean, black gram, groundnut and cowpea. However, since different lentil varieties were freely available on the market the demand for these crops has declined. Consumer demand has increased towards imported lentils.

The per capita availability of cassava is the highest among CGPRT crops (8.29 kg/year), which stands out in the country to be the most important source of energy for the calorie deficient low-income population strata. The per capita availability of potato has increased due to the availability of import facilities.

The nutritional standards of the population could be improved through increasing the per capita availability of CGPRT crops, as many of them are protein-rich legumes.

Factors contributing to declining trends in the production and consumption of CGPRT crops

Various factors contributed and continue to contribute to the declining trends in production and consumption of CGPRT crops. Some of the main factors identified by the farmers during the Rapid Rural Appraisal (RRA) exercise are listed below in order of priority:

- i. Liberalization of imports of lentil and other food commodities.
- ii. Low farm gate price and profitability.
- iii. Low productivity due to lower levels of input application, particularly fertilizer.
- iv. Non-availability and high price of quality seeds.
- v. Unavailability of water during critical growth periods.
- vi. High incidents of pests and diseases.
- vii. Unavailability of new high yielding varieties.
- viii. Lack of organized marketing systems and storage facilities.
- ix. Non-availability of information on new technologies to farmers.
- x. Poor land preparation and crop management resulting in low yields.
- xi. Lack of capital.
- xii. Inadequate processing facilities and agro-based industries.
- xiii. Small landholdings.
- xiv. Uncertainty under rainfed nature of cultivation.
- xv. Restriction of cultivation on marginal land owing to high productivity areas being utilized for the cultivation of rice.
- xvi. Government policies with low priority given to the production of CGPRT crops.

Government policies are needed to address the above constraints encountered in the production of CGPRT crops.

4.2 Trends in non-CGPRT food crops production and consumption

Rice

Rice is the staple food in Sri Lanka and almost achieved self-sufficiency in 2003. The annual extent cultivated and production was 982,610 ha and 3,071,206 mt respectively, in 2003 (Annex 6).

The current per capita consumption level is 100 kg and the annual requirement is expected to reach 3.2 million mt by 2005. This requirement can be met by increasing productivity as well as through substantial increases in cropping intensity. The ongoing Granary Area Programme (GAP) recommends implementing a programme to improve productivity in selected irrigation schemes. It is expected that a yield level of 6.0 to 6.5 mt/ha could be achieved and 80 per cent of paddy requirement will flow through GAP in high potential areas an extent of encompassing around 270,000 ha.

At present, only about 69 per cent and 46 per cent of the total asweddumized rice lands are cultivated during the maha (wet) season and yala (dry) season respectively, and part of the uncultivated land could be utilized for agricultural diversification. In addition, as Sri Lanka starts producing a surplus of rice with little prospective for exporting any of the surplus, it is likely that considerable areas of rice land could be utilized for the cultivation of other crops. Alternative and profitable uses have to be ascertained for the utilization of this land in the future. As a response to this need the government's strategies need to focus on sustainable diverse agriculture, based on the production of CGPRT crops.

Vegetables

Vegetable production in Sri Lanka is dominated by about 40 species including roots and tubers cultivated on approximately 110,000 hectares. Annual production is about 1,000,000 mt. Data on 17 major vegetables show that production has been around 540,00 mt and stagnant for the last ten years (Annex 7). Details of different vegetables produced in the country are given in Annex 7.

Per capita availability of vegetables is estimated to be around 35.70 kg/year (Food Balance Sheet, 2002), which is much lower than the values recommended by the Medical Research Institute (MRI) and the FAO. The corresponding value for roots and tubers (excluding potato) is around 14.5 kg/year. Envisaging a domestic per capita consumption of about 200 grams/day of vegetables in the future, it becomes explicitly important to increase vegetable production in Sri Lanka. This could be achieved through increasing the productivity of most vegetables that have remained nearly stagnant over the last decade.

4.3 Trends in perennial crop production

Sri Lanka is blessed with a wide range of agro-climates and soil types with accommodation for as many as 40 tropical, subtropical and temperate fruit cultivars. The present average extent cultivated with fruit crops is about 90,000 ha. Of this, 46 per cent is for banana. Annual production of fruits is about 640,000 mt of which about 58 per cent is locally consumed, 30-40 per cent is wasted and only about 2 per cent is exported (Annex 8a). The details of different fruit crops' production are given in Annex 8b. The per capita consumption of fruits is about 9.01 kg/year, considered to be one of the lowest in Asia. According to the MRI recommendations 25-40 kg/year of the edible portion of fruits should be included in a balanced diet. The current productivity level is low but could be improved.

The area cultivated with plantation crops such as tea, rubber, coconut and spices was about 189,000 157,000, 439,000 and 98,500 hectares respectively, in 2003. Tea, rubber and spices are grown in relatively cooler agro-ecological conditions, which are not CGPRT growing areas. Some of the CGPRT crops can be inter-cropped under coconut. Therefore, land-use

competition between perennial crops and CGPRT crops will not be a hindrance to increase the cultivation of CGPRT crops in the country.

4.4 Trends in animal production

The national livestock population in Sri Lanka in 2002 was estimated to consist of 60 million poultry, 0.08 million swine, 0.52 million goats and 1.9 million cattle. Milk production was estimated to be at 92 million litres (Annex 9). The total number of eggs produced in 2002 was 954 million, and there was 74,709 mt of chicken meat production recorded. During 2002, 9,500 mt of pork meat production was recorded.

In the hill country, mid country and within the Northern peninsula, cattle are reared primarily for milk production. In the low country wet zone and the coconut triangle, cattle and buffalo are integral parts of the local agricultural system. There have been increases in poultry farmers over the last decade in the country. Egg and broiler industries have developed over the last two decades from backyard and semi-intensive production to intensive commercial production systems. Unlike the other animal industries private entrepreneurs dominate this sector. The per capita availability of chicken meat has increased from 1 kg in 1992 to 4.3 kg in 2002.

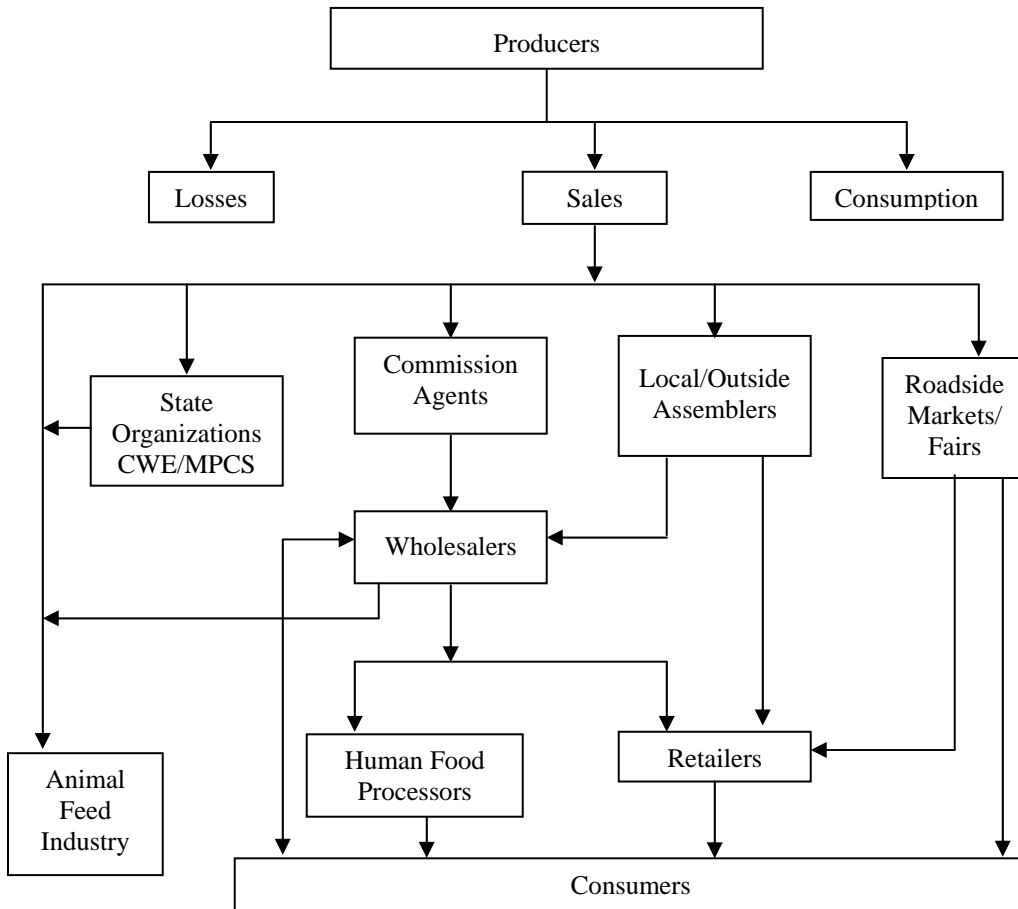
Due to the rapid expansion of the poultry industry, the demand for feed crops has also increased substantially. About 65-70 per cent of the raw materials required for compound feed production are being imported. The main raw materials imported are maize (80 per cent) and soybean meal (100 per cent). At present, other pulses, roots and tubers are not used in the feed industry and they are not likely to play a significant role in the animal feed industry (Karunatilake, 2003). Maize and soybean can easily be grown in Sri Lanka. However, the liberalization of imports of feed ingredients such as maize and soybean discourages local production.

4.5 Trends in marketing of CGPRT crops

Marketing structure

Sri Lanka does not have a strong market structure for CGPRT crops. It is almost entirely in the hands of the private sector, which are sales oriented rather than market oriented. Assemblers, always referred to as collectors in Sri Lanka, are major buyers at the farm level. Many collectors are located in the production area itself and a few are from outside areas. Collectors have different types of buyers such as wholesalers, retailers, processors and consumers. The marketing channels of CGPRT crops are shown in Figure 4.14.

Figure 4.14 Marketing channels of CGPRT crops



CGPRT crop distribution through the wholesale market is limited. Colombo, Kandy and Dambulla are the biggest wholesale markets where more than 200 traders are dealing with CGPRT crops. Collectors send products to the wholesale market but farmers rarely send directly due to the small quantity they have. Investigations revealed that collectors in and around the producing area purchase about 80 per cent of the CGPRT produce. In the case of potato, about 70 per cent of the farmers sell their potato to commission agents located in the Colombo wholesale market (Mahrouf, 1999).

CGPRT crop retailing mainly takes place in villages and towns as well as at weekly fairs and along the roadsides. During the season, there are large numbers of roadside shops in the production area, selling products to local and outside consumers. Retailing is a highly specialized business activity and often confined to different graded products.

Many processors purchase their supplies through wholesalers and assemblers. At present, several private sector companies are also engaged in the 'Forward Sales Contract System' with farmers, for the purchase of maize, soybean and mungbean. This system, which was introduced in 1999, is gaining popularity among farmers as it ensures a reasonable price for their produce.

Unlike the rice sector, there is no organized government marketing network for CGPRT crops in Sri Lanka. Therefore, marketing continues to be one of the most significant bottlenecks for enhancing the production of CGPRT crops in many high-potential areas. A small proportion of marketing of CGPRT crops has been undertaken in the past by the Co-operative Wholesale Establishment (CWE), which was the principal state trading enterprise operating in the

Historical and Current Status of CGPRT Crops and Other Crops' Production in the Country

marketing of CGPRT crops. CWE had over 40 wholesale depots and 120 retail outlets throughout the country to distribute and market imported and local CGPRT crops. CWE purchased bulk quantities of CGPRT produce from commercial producers at a fixed market price and sold it in their retail shops. CWE stores were privatized in 2003.

In addition to this, the Multi Purpose Co-operative Society (MPCS) is also engaged in the marketing of CGPRT crops. They purchase local products during the harvesting seasons in an open, competitive market from farmers as well as from local or outside assemblers and sell in their retail outlets.

To improve the marketing infrastructure, the government has recently established a number of Dedicated Economic Centres (DEC) in major agricultural areas. These centres provide a convenient trading floor for farmers to sell their products to the retail and wholesale traders directly, thereby realizing a better price for their produce.

Marketing conduct

Since market structure is not strong, market function is limited to a few activities. Crop storage and transportation using proper packaging are non-existent. Even processing is limited to flour and a few value-added products produced from crops such as soybean, maize, finger millet, green gram, black gram and cassava. Most of the crops are transported without any packaging in normal trucks. Transactions at the farm level are based on cash payments on the spot. Sometimes transactions take place on an after-sales payment basis. Wholesale transactions in some markets take place on the spot using cash. In Colombo, Kandy and Dambulla, wholesale transactions take place on a commission basis. Commission fees are generally about 10 per cent of the selling price. The commission fee for potato is 5 per cent of the selling price in the Colombo wholesale market.

Facilitative functions such as pre- and post-harvest research, standardization, market information, credit and infrastructure are barely existent to in respect of most CGPRT crops. Remedies proposed to reduce post-harvest losses are not market driven due to lack of strong market structure, low purchasing power and low demand of the consumer.

As regard to market information, there is no mechanism to disseminate prices among farmers at the village level. There is limited demand for market information due to the small number of commercial farmers. Trading of CGPRT crops is entirely in the hands of small businessmen. Nevertheless, credit is a major problem for them. They cannot obtain credit from banks due to problems of collateral.

With regard to pricing decisions, the existing market structure is not geared up enough to provide a stable framework to operate the market efficiently. Therefore, assemblers act as the main authority in deciding on the prices at the market. As a result, producers obtain lower prices for their product due to the lack of market stability. The quality of produce reaching the markets and the consumers is of poor standards. If processed products of better quality are available the demand will invariably rise for CGPRT products.

Market performance

Market performance is examined through the analysis of prices, and farmers share in consumer prices. Average farm gate and retail prices of some CGPRT crops are given in Annexes 10 and 11. Analysis of marketing margins of selected crops is presented in Table 4.3.

Table 4.3 Analysis of marketing margins of selected CGPRT crops, 2003

Crop	Farm gate price (Rs/kg)	Wholesale price (Rs/kg)	Retail price (Rs/kg)	Producers margin (%)	Wholesalers margin (%)	Retailers margin (%)
Potato	46.33	52.9	63.66	73	10	17
Green gram	41.4	56.8	70.68	59	22	20
Cowpea	33.62	41.82	56.91	59	14	27

Source: HARTI.

Chapter 4

Farmers share of the consumer price is less than 65 per cent for most of the CGPRT crops. The balance is shared among wholesalers and retailers. Retailers share of the consumer price is higher than the wholesalers share for most CGPRT crops.

Factors affecting marketing of CGPRT crops

- i. High marketing cost, which may be due to:
 - a. Unjustifiable profits to local buyers or middleman as a result of the weak bargaining power of farmers.
 - b. High costs incurred by retailers and wholesalers due to inadequate storage facilities, deterioration in quality and lack of market information.
- ii. The unit cost of production of most CGPRT crops is high due to low productivity and the price received by the farmers, which does not even cover the cost of production during peak harvesting months. This leads to a deterioration in the farmers' well-being over time, causing social unrest among their community.
- iii. Transport problems: Inadequate transportation is often a key reason for the low farm gate prices of CGPRT crops. Transport difficulties and the lack of organization or group action results in farmers tending to depend purely on local buyers. Losses during transportation are also a common hazard.
- iv. Inadequate storage facilities: CGPRT crops are being sold at low prices immediately after the harvest owing to difficulties in storage. The expansion of storage facilities is restricted owing to a lack of organization, knowledge and capital.
- v. Competitiveness within the farm markets has been curtailed due to the prevalence of only a few traders and the absence of alternative marketing channels.
- vi. High price spread between producer and consumer level: Price differences between retailers and producers are high. This is due to small-scale businessmen and intermediater's involvement in distribution.
- vii. High post-harvest losses: Quantitative losses are as high as 20-30 per cent due to the produce being supplied without cleaning or sorting by the farmers.
- viii. Marketing infrastructure and marketing support services have not developed yet to establish an efficient marketing system.
- ix. Inadequate processing facilities for CGPRT crops prevent the producers from receiving the economic benefits from value addition.

Marketing through Farmer Organizations will improve market structure at the village level. Also, vertical integration such as storage and processing is essential for improving market performance. Product differentiation is also needed to improve market conduct for CGPRT crops. Further, the education of market participants on marketing orientation is a prerequisite for improving market efficiency.

4.6 Concluding summary

Declining trends have been observed in the area planted and in the production of CGPRT crops since the early 1990's. Average yields have been almost stagnant during the recent past. Implementation of policies focussing more attention towards rice self-sufficiency, but neglecting other crops and trade liberalization are the main factors that have had a negative effect on the production of CGPRT crops. Inadequate availability of information on new technologies, cultivation on marginal lands under rainfed conditions, poor crop management practices leading to low productivity, unavailability of quality seeds, low tangible price and profitability, inadequate marketing and agro-based industries are the other salient factors that are attributed to the decline in production of CGPRT crops.

However, there is an increasing demand for CGPRT crops for human consumption and from the animal feed industry. The adaptability of most CGPRT crops to wider agro-ecological conditions and low water requirements indicate the potential of these crops towards agricultural diversification. CGPRT crops can be successfully cultivated under major and minor irrigation tanks in well-drained soils during the yala season, when there is a scarcity of water for rice cultivation.

Some of the CGPRT crops could be inter-cropped with perennial crops such as coconut and thus land-use competition is not an issue in expanding the cultivation of CGPRT crops. These crops can contribute to the sustainability of self-sufficiency and also the alleviation of poverty in rural areas.

Unavailability of organized marketing and storage facilities are a major constraint towards the cultivation of CGPRT crops. The establishment of these facilities at the village level is important to ensure a better price and income to farmers and to develop sustainable diverse agriculture in the country. Changes in government policies and the application of appropriate research and development programmes are required to expand the cultivation of CGPRT crops as an economically viable venture among resource poor farmers. More private sector investment is vital in seed production, marketing and the development of agro-based industries in order to improve employment opportunities and to increase the income levels of farmers involved in the cultivation of CGPRT crops.

5. Overview of Agricultural Diversification Related Policies in the Country

5.1 Public policies on CGPRT crops and OFC production

Other field crops inclusive of CGPRT crops was an important component of domestic agriculture in Sri Lanka long before it regained independence. Crops such as maize, finger millet, cassava and sweet potato, commonly identified as highland food crops, have been grown on chena lands, mainly in dry and intermediate zones.

From the 1950's onwards, the attention of the state was mainly focused on achieving self-sufficiency in rice. The promotion of CGPRT crops and other field crops was initiated in the mid 1960's with the introduction of the government's "Food Production Drive" programmes. Local production of these crops was encouraged during the period 1970-1977 through protective policies. The ban on imports of these commodities in 1971 resulted in short supply and unprecedented price increases. Farmers responded by increasing the area cultivated with these crops. The production of most such crops doubled as a result.

Even after the economic liberalization of the country in 1977, some of these commodities were heavily protected right up until 1996. During the period 1977-1980, production in this sector declined due to direct effects caused through the economic liberalization policies introduced in 1977.

From the 1980s onwards, the government, through various projects, encouraged domestic production of OFCs including CGPRT crops. The Diversified Agricultural Research project (DARP) funded by USAID, was implemented by the government in 1980. The aim of this project was to increase the production of subsidiary food crops, inclusive of CGPRT crops as well. The goal of the project was to increase the income of small farmers in the dry and intermediate zones by fostering subsidiary food crop production. The objective of the project was to strengthen the institutional capability in Sri Lanka to generate and effectively transfer technologies and the supply of adequate seed quantities required to increase and sustain subsidiary food crops including CGPRT crops. The production of most OFCs and CGPRT crops reached their peak production levels in the early 1980s.

Crop diversification in Mahaweli system "H" area began in the early eighties. The Mahaweli Agriculture and Rural Development project (MARD) funded by USAID was implemented in 1986 to promote agricultural diversification in 'Mahaweli' areas. More emphasis was afforded for crop diversification programmes with the reclaiming of new lands for cultivation under the major river basin development project named "Mahaweli Development Project" in the early eighties. However, the efforts made by the agricultural extension staff to persuade the farmers to diversify their crops did not materialize as anticipated, as the farmers were not enthusiastic (Jayawardene, 1992) due to various constraints encountered in production and marketing.

A pigeonpea development programme was funded through Asian Grain Legume Network (AGLN) in 1989. The crop did not become popular among farmers due to pest problems and constraints in processing and marketing.

The Department of Agriculture was re-structured in 1994 with a view of making the organization more productive, commodity oriented and to strengthen its relevance in meeting the national needs and demands. Research and development activities related to coarse grains and pulses were brought under the Field Crop Research and Development Institute (FCRDI) located at Maha Illuppalama in the dry zone. The Horticultural Crop Research and Development

Institute (HORDI) located at Gannoruwa was entrusted with the responsibility for the research and development programmes on roots and tubers.

Certified seed production and the importation of seeds were extended to private sector organizations with the Department of Agriculture being engaged in the entire basic seed production process. This situation was created through the formulation of a National Seed Policy (1996) and Seed Act (2003). The private sector is at liberty to import and introduce hybrid varieties of maize and vegetable seeds.

The restrictions imposed on imports of food commodities through tariff and non-tariff barriers were removed in 1996. Domestic production of all CGPRT crops declined in 1996 due to the free availability of cheaper imports in the domestic market.

The 1996 Agricultural Policy Recommendations of the National Development Council outlined priorities for the promotion of agricultural growth representing an initial shift in emphasis from a 'paddy self-sufficiency' orientation towards a commercial, market-driven, and diversified agricultural economy.

The national policy statement of the government in 2003, which also includes CGPRT crops, states that it is intended to mobilize state and private sector resources for the sustainable production of grains and other field crops making them profitable to farmers through high quality and productivity, and to promote the emergence of an industry based on such production. It was targeted to produce the total national requirement of potato, dried chili, red onion and finger millet, three times the current production of maize, soybean, cowpea, mung gram, groundnut and big onion and twice the current production of black gram and gingelly from local farmlands within three years.

5.2 Public policies on food diversification

Self-sufficiency in rice to ensure food security and to generate rural employment was considered a priority of the government during the last five decades. As a result, the per capita availability of rice increased to about 98 kg/year in 2002. Total calory intake increased to 2,372 calories/per day out of which 56 per cent generated from cereals (Food Balance Sheet, 2002). However, per capita availability of pulses, roots and tubers, vegetables, and fruits have been low and are estimated at 7.4, 15.3, 35.7 and 9.01 kg/year contributing to 3 per cent, 2 per cent, 2 per cent and 1 per cent of the total calorie availability respectively in 2002 (Food Balance Sheet, 2002).

Realizing the importance of increasing the consumption of OFCs, vegetables, fruits and other food commodities to improve the nutritional status of the population, successive governments have promoted the production and the consumption of these commodities. Although the country did develop a Nutritional Policy in the 1980s, its effectiveness diminished over the years due to various reasons. A Task Force appointed by the government for the formulation of a Food and Nutrition Policy for Sri Lanka recommended that the development of the domestic agricultural sector including fisheries and animal husbandry be pursued as a major strategy to overcome rural poverty and to ensure the sufficient availability of food at the national as well as at the household level (Wijayadasa *et al.*, 2004).

Under a special project named 'National Agricultural Production Plan' (NAPP) additional funds were provided to boost the consumption of CGPRT crops and other field crops by the government and to enhance the productivity and the consumption of OFCs including CGPRT crops. However, no significant impact has been evident on food diversification in the country in spite of the efforts made.

5.3 Public policies in food processing

Successive governments have implemented numerous policies to develop food processing, focusing mainly on supply to cater to the domestic demand from the animal feed industry as well as for processed food for human consumption. Two state owned provender mills dominate commercial animal feed production, which were established in the 1950s. In the late 1970s the government implemented a decision to privatize the animal feed industry. As a result, at present, the entire feed milling industry is governed by the private sector.

An “Animal Feed Law” was enacted in 1986 by the government to protect the farmers as well as the producers. It provided provision to appoint a Registrar of Animal Feeds, annual licensing of manufactured feed and imports, and to ban the sale of unlicensed feed products in the market. It also allows farmers to make representations against poor quality feed products and provides facilities for sampling and analysis of food products.

The present open economy policies permit foreign firms as well as local investors to consolidate their investments on the industries with less restrictions. It is also not necessary for foreign investors to collaborate with any local partners and there is no restriction on exports. The government provides a range of incentives such as, priority of allocating lands on industrial estates, duty free imports for machinery and project related items, and tax free export status to investors through the Bureau of Investment (BOI). The government’s assistance such as financing through soft loans, allowing importation of duty free machinery and related items, and a grace period for the repayment of loans are extended to small- and medium-scale entrepreneurs who are interested in agro-processing activities.

The government also initiated various programmes to promote the production of processed food items using locally produced rice and other food commodities including CGPRT crops. A separate Post Harvest Research and Development Institute was established in the dry zone at Anuradhapura for the above purpose. The Food Research and Technology Unit of the Department of Agriculture and the Industrial Technology Institute (ITI) are the other government institutions involved in research and development related to food processing in Sri Lanka. Several Soybean oriented products have been commercially processed by the technology developed by these institutes.

Although there is a potential for most of the CGPRT crops grown in Sri Lanka in the processing industry, only maize is used for the animal feed industry, as the present production of other crops are adequate to meet the human consumption demand. Poultry feed which is the main compound feed (90 per cent of the total) is produced mainly from imported ingredients. The local ingredients used include maize, rice bran/polish, broken rice, coconut, and minor ingredients such as gingelly and poonac (the residue obtained after extracting oil from either coconut or gingelly). The entire soy meal and 80 per cent of the maize requirement continue to be imported (Ranaweera, 1999).

5.4 Public policies on marketing

The direct intervention of the Government of Sri Lanka in the marketing of agricultural products has been activated during different time periods in order to afford a certain degree of protection to local farmers engaged in producing mainly rice, CGPRT crops and OFCs.

The Paddy Marketing Board (PMB) was established as a state organization in the early sixties mainly to purchase and process paddy grown by local farmers. The PMB catered to only about 10 per cent of the production but controlled the entire grain market. This institution was actively involved in maize marketing in the seventies and eighties on behalf of the state owned animal feed milling industry. The state owned Oils and Fats Corporation purchased soybean seed for oil extraction and used the by-product cake for the animal feed industry.

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However, the activities of these establishments were gradually withdrawn with the adoption of open economic policies in the late eighties. As a result, the PMB was closed down in 1996 with the idea of creating a competitive environment for grain marketing. The Oils and Fats Corporation was privatized with the intension of creating a favourable atmosphere for the upliftment of the poultry industry in the country.

The government has initiated several measures to protect the local producer as well as the consumer since the open economic policies were introduced in 1977. It also introduced a producer price system for selected CGPRT crops and OFCs in August 1997. The Co-operative Wholesale Establishment (CWE) was entrusted with the responsibility of purchasing selected commodities whenever the producer prices dropped below the recommended prices. The activities of CWE were privatized in 2003.

The Multi-Purpose Cooperative Societies (MPCS) were also encouraged to be engaged in developing an appropriate marketing system for agricultural produce. They received government patronage in the early 1990s, while the MPCS's operational activities are now completely independent. They purchase local produce during the harvesting season at open competitive market prices.

The government has established a number of Dedicated Economic Centres (DECs) in major agricultural producing regions to improve facilities for private sector marketing. These Centres provide a trading floor for the farmers to sell their products directly to retailers and wholesalers.

The Central Bank of Sri Lanka introduced a forward sales contract system (FSC) in 1999 to promote the trade of agricultural products at a pre-determined price and an assured quality. Feed and food producers who use locally grown raw materials such as paddy, maize and essential commodities purchase a portion of their requirement under this system. Financial assistance is provided by the Central Bank through Commercial Banks as short-term soft loans. This forward sales contract system helped to stabilize the producer price scheme as well as to assist in the maintenance of the quality of the product specified by the industrialists. The progress of the FSC system in 2003 is summarized in Table 5.1.

Table 5.1 Forward sales contracts, 2003

Crop	No. of agreements signed	No. of farmers benefited	Forward price determined (Rs/kg)
Maize	6,322	6,967	14-18
Paddy	11,192	12,220	13-14
Finger millet	1,925	2,245	20-22
Soybean	5,222	5,830	27-30
Mungbean	5,291	6,002	45-50
Other crops	8,055	9,110	25-65
Total	38,007	42,374	-

Source: Central Bank of Sri Lanka, 2003.

5.5 Concluding summary

Although several programmes and projects were envisaged by the government in the past to promote agricultural diversification, the impact on the production of CGPRT crops has been negative due to the inadequacy of continuous commitment on part of the government towards agricultural diversification and also as a result of various constraints faced in the production and marketing process.

More emphasis is required for the implementation of food diversification policies to achieve food and nutritional security in the country.

There is a great demand for CGPRT crops such as maize, soybean, black gram, finger millet, cassava and sweet potato, arising mainly from animal feed and human food industries. Current production is inadequate to meet the said industrial requirements. An organized and a

Overview of Agricultural Diversification Related Policies in the Country

systematic production process and the introduction of appropriate policies for the implementation of industrial development activities will increase the demand for CGPRT crops and generate employment while assisting in the alleviation of poverty in the rural sector.

Even though the government implemented various direct market intervention policies, priority was afforded for the purchase of paddy. The marketing of OFCs and CGPRT crops are still dominated by the private traders. Facilities are not available at the village level for the marketing and storage of CGPRT crops. Government involvement in the marketing of CGPRT crops is initially needed to intensify the production and processing of related crops. The forward sales contract system and private sector investment in marketing has to be facilitated accordingly in order to attract more farmers towards the production of CGPRT crops.

6. Impact of Global Trade Orientation on CGPRT Crops Agriculture in Sri Lanka

6.1 Brief overview of the country's international trade policies for CGPRT and other agricultural products

Sri Lanka has introduced major trade policy reforms, including the introduction of Tariff Concessions, by removing a great deal of non-tariff measures (NTMs) during the last two decades (Somaratne, 2002). Sri Lanka also increasingly simplified and liberalized its trade policy during the 1990s. The government revised its import tariff structure several times, narrowing a thirteen-band structure in 1990 down to four bands in 1991 and three in 1998 (5 per cent, 20 per cent and 35 per cent). As per recommendations of the Presidential Trade and Tariff Commission in 1997, the tariff bands were further reduced to 5 per cent, 10 per cent and 30 per cent respectively in 1998. The structure was altered to two bands 10 per cent and 25 per cent in 2002. A six-band tariff system (3, 6, 12, 16, 20 and 27.5 per cent) was introduced in January 2004.

Agriculture, however, remains excluded from the two-band tariff structure. Import duties on agricultural products have been kept outside the reach of the standard tariff structure. This policy was intended to provide the sector with more time to adjust itself over the medium-term in order to lower tariff rates after the liberalization of all non-tariff barriers in 1996. The major changes in import tariffs in the agricultural sector are presented in Table 6.1. In addition to the import duty, there is a 10 per cent surcharge on all imported CGPRT commodities.

Table 6.1 Major changes in import tariffs in the agricultural sector, 1999-2004

Commodity	1999	2000	2002	2004
Coarse grains				
Maize	35 % duty	10 % duty	Duty free	3 % duty
Finger millet	35 % duty	25 % duty	25 % duty	27.5 % duty
Pulses				
Soybean (seeds)	35 % duty	25 % duty	35 % duty	27.5 % duty
Mungbean	35 % duty	25 % duty	35 % duty	5.00 Rs/kg
Black gram	35 % duty	10 % duty	15 % duty	12 % duty
Groundnut	35 % duty	25 % duty	25 % duty	27.5 % duty
Cowpea	35 % duty	25 % duty	25 % duty	5.00 Rs/kg
Roots and tubers				
Potato	35 % duty	25 % duty	20.00 Rs/kg	18.50 Rs/kg
Sweet potato	35 % duty	25 % duty	25 % duty	27.5 % duty
Cassava	35 % duty	25 % duty	25 % duty	27.5 % duty

Source: Tariff Guide, Sri Lanka Customs.

Agricultural tariffs in Sri Lanka are subject to unpredictable and frequent changes as experienced in the past. In January 2002, the ad-valorem taxes for some key agricultural imports were converted into a specific duty¹. For example, instead of a 35 per cent valorem tax, the import duty for rice became Rs 7/kg, a tariff equivalent to 36 per cent of the unit import value in 2000. It was increased to Rs 9/kg in 2003.

Imports of most of the CGPRT crops were restricted until the 1990s through non-tariff barriers such as licensing requirements. Licence requirements for imports of maize were

¹ Ad-valorem tax refers to a certain percentage (per cent) of duty (tax) imposed on the import value of a commodity (e.g. 35 per cent). Specific duty refers to a fixed value of duty (tax) imposed based on quantity imported (Rs/kg).

removed in March 2003. A 10 per cent duty and a 40 per cent surcharge were imposed in May 2001. All taxes were removed in March 2002. A 3 per cent duty and a 10 per cent surcharge were introduced in 2003.

Imports of potato were brought under licence control with effect from June 1992 under a taxation scheme. Imports were liberalized in 1996. Import duty was reduced from 35 per cent to 20 per cent and the turnover tax was also removed. A 35 per cent tariff protection was imposed in 1998 and a tariff surcharge of 35 per cent was imposed in addition to the existing 35 per cent duty in 2000. A specific duty of 20.00 Rs/kg was imposed in December 2001 to protect local production. Farmers were able to obtain a higher price for their produce due to specific duties. Similarly tariff structures of all CGPRT crops have been revised as shown in Table 6.1.

In order to provide some additional assistance to agriculture, the imports of several agricultural inputs and equipment were liberalized in 1997. Imports of fertilizer and agro-chemicals; cleaning, sorting and grading of machines for seeds, grain, and dried leguminous vegetables and for seed-packing machines were exempt from duty from 1997. Other items exempt from duty include: greenhouses, poly tunnels, sprinklers, drip-irrigation systems, and some types of packing materials. Duty free concessions also apply to the import of farm mechanical vehicles such as tractors, lorries, prime movers, refrigerated trucks and buses.

Although the Government of Sri Lanka has implemented successful economic policy reforms, the agricultural sector including the non-plantation sector (i.e. rice, chili, onion, potato, maize, mungbean, black gram, cowpea, vegetables and fruits) has suffered from stagnation in production and market integration during the last two decades (Somaratne, 2002 and Ratnayake, 2002). The ad hoc tariff changes have adversely affected the CGPRT crop sector, mainly its production, processing and trade environment.

6.2 Extent of exports and imports of CGPRT and other agricultural products

At present, Sri Lanka exports a wide range of agricultural products, which include plantation crops (tea, rubber and coconut) as well as non-plantation crops (spices, fruits, vegetables, cut flowers, foliage and several CGPRT crops). Tea, rubber and coconut are the major agricultural exports, which accounted for 84 per cent of the country's agricultural exports in 2003 (tea 71 per cent, coconut 9 per cent and rubber 4 per cent). Other minor agricultural exports are cinnamon, cloves and un-processed tobacco. Vegetables, fruits, cut flowers and foliage are the other important export commodities.

Cassava is the only CGPRT crop that is being exported in large quantities. An increasing trend has been observed in the export of cassava. The quantity exported has increased from 674 mt in 1993 to 1,494 mt in 2003. The increase amounts to about 122 per cent. Cassava is mainly exported to Middle Eastern countries. Although there is industrial potential for cassava, no industries exist in Sri Lanka to effectively utilize this crop. Cassava could be promoted as an export crop since there is an increasing demand from the industrial sector in several countries.

Negligible quantities of other CGPRT crops are exported and the related details are given in Tables 6.2, 6.3 and 6.4. A marketable surplus of these products is non-existent as domestic production is not adequate to meet the demand for human consumption and the local animal feed industry.

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Table 6.2 Exports of coarse grains

Year	Maize		Finger millet	
	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)
1993	11.5	2349.0	0.4	40.1
1994	0.9	252.1	0.2	9.3
1995	0.0	0.7	0.2	18.4
1996	0.2	70.1	0.3	21.6
1997	-	-	9.9	344.6
1998	-	-	0.2	6.0
1999	0.2	36.7	0.1	7.9
2000	0.2	34.5	3.2	321.1
2001	0.5	53.0	1.2	138.9
2002	0.1	24.7	1.0	59.9
2003	0.24	55	1.6	145

Source: Sri Lanka Customs.

Table 6.3 Exports of pulses

Year	Soybean		Mungbean		Black gram		Groundnut		Cowpea	
	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)
1993	10.5	345.4	3.2	179.5	4.7	208.5	0.6	272.8	0.2	15.9
1994	9.0	6.0	12.8	1690.1	-	-	10.4	339.8	-	-
1995	-	-	1.8	160.1	-	-	0.4	63.1	0.5	24.2
1996	-	-	1.6	154.9	0.2	22.1	0.3	74.1	0.4	32.0
1997	0.1	4.8	3.3	310.5	0.5	36.3	0.1	89.0	0.2	8.9
1998	-	-	2.9	365.9	0.2	20.7	0.6	72.0	0.5	9.0
1999	0.4	75.2	3.7	475.6	5.6	326.9	0.0	34.7	0.1	7.5
2000	0.0	0.6	7.8	970.1	0.0	2.0	0.1	3.9	-	-
2001	0.2	49.5	11.0	1,598.5	0.6	59.0	0.3	38.0	0.6	59.0
2002	0.6	161.1	7.2	1,144.5	2.6	237.8	0.0	21.3	0.4	33.9
2003	1.05	32	8.36	1,143	1.68	235	0.11	7	1.07	49

Source: Sri Lanka Customs.

Table 6.4 Exports of roots and tubers

Year	Potato		Cassava		Sweet potato	
	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)
1993	68.0	2,490	674	18,350	-	-
1994	8.0	610	675	23,900	0.2	30
1995	2.1	80	1,534	45,620	0.2	1
1996	83.4	980	1,085	34,920	0.4	20
1997	14.3	810	1,159	37,870	0.0	1
1998	10.6	540	1,148	41,240	0.5	20
1999	12.0	480	1,211	44,040	2.0	120
2000	0.6	40	1,213	46,040	1.5	40
2001	18.9	2,050	1,179	53,110	0.6	2
2002	2.7	210	1,201	59,340	0.2	1
2003	130.4	9,108	1,494	67,927	-	-

Source: Sri Lanka Customs.

Wheat grain, wheat flour, rice, lentils, sugar and milk foods are the major agricultural commodities being imported to Sri Lanka. A major food item, wheat grain, which has shown an increasing trend in the past declined to 918,700 mt in 2003 compared to 993,200 mt in 2002. Wheat flour imports also declined, from 11,325 mt in 2002 to 9,705 mt in 2003. Rice imports declined from 95,100 mt in 2002 to 34,580 mt in 2003 due unprecedented domestic production in 2003.

Maize, soybean and potato are the major CGPRT crops imported into Sri Lanka. The quantities of CGPRT crops imported are presented in Tables 6.5, 6.6 and 6.7.

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Table 6.5 Imports of coarse grains

Year	Maize (seed)		Maize (other)		Finger millet	
	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)
1993	17,242	120,589	63,520	414,533	49	230
1994	9,009	68,499	84,824	587,843	50	308
1995	3,504	32,099	76,554	602,636	-	-
1996	35,502	425,568	56,076	665,419	499	4,332
1997	10,859	212,439	70,382	675,036	1,254	13,613
1998	38,358	359,128	68,179	580,574	695	8,881
1999	66,669	620,514	58,956	494,738	277	3,968
2000	7,864	75,348	115,248	1,088,006	551	8,932
2001	69	1,466	157,334	1,794,638	816	12,740
2002	7	1,456	94,588	1,204,675	1,134	17,367
2003	8,247	129,937	128,450	1,797,794	610	9,555

Source: Sri Lanka Customs.

Table 6.6 Imports of pulses

Year	Soybean		Mungbean		Black gram		Groundnut	
	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)
1993	2,989	52,035	43	637	-	-	20	399
1994	14,779	197,149	141	1,903	-	-	1,431	13,359
1995	2,669	32,356	1761	28,628	3,979	62,267	298	7,422
1996	285	4,854	22	377	4,034	77,297	1,194	31,725
1997	200	5,119	2,091	39,938	1,659	29,584	1,756	52,835
1998	179	3,617	5,132	113,278	677	13,275	2,350	34,848
1999	1,830	37,179	7,528	183,330	4,928	99,554	4,348	158,402
2000	2,972	61,828	6,767	172,548	7,332	170,082	4,382	172,266
2001	3,166	80,393	8,717	271,434	7,891	225,054	4,890	210,160
2002	3,512	98,612	7,121	223,083	6,939	223,850	5,494	233,318
2003	1,451	40,439	8,181	241,893	7,597	220,751	2,680	79,556

Source: Sri Lanka Customs.

Table 6.7 Imports of roots and tubers

Year	Potato (seed)		Potato (consumption)	
	Quantity (mt)	Value ('000 Rs)	Quantity (mt)	Value ('000 Rs)
1993	2,635	91,294	-	-
1994	9,662	379,026	7,900	90,087
1995	14,188	612,578	11,958	160,761
1996	5,200	205,394	25,784	410,397
1997	1,122	31,861	108,403	1,300,764
1998	1,706	70,185	115,613	1,562,314
1999	1,764	71,079	128,921	1,501,495
2000	2,794	101,209	116,453	1,415,056
2001	6,725	335,665	62,559	875,931
2002	7,028	418,243	37,997	599,116
2003	5,031	346,835	40,487	537,659

Source: Sri Lanka Customs.

There has been a considerable increase in the importation of maize for local seed requirement purposes and the animal feed industry during the last decade. About 8,247 mt of maize seed was imported in 2003. The quantity of maize imported for the animal feed industry doubled from 63,520 mt in 1993 up to 128,450 mt in 2003. The rapid growth in the poultry industry was the major contributing factor to the above increase. About 80 per cent of the total maize requirement and total soybean requirement are imported for the animal feed industry.

Imports of potato declined after 2002 with increased production due to better producer prices received by farmers as a result of imposing specific duty on imports. There have been

increasing trends in the imports of mungbean, black gram and groundnut which can be easily grown in Sri Lanka under prevailing farming conditions.

6.3 Impacts of trade liberalization on production, marketing and demand for CGPRT crops

With the introduction of open economic policies in 1977, the trade of many CGPRT crops were liberalized in the late 1990s. The government also intermittently introduced tariff changes to protect the domestic production of these crops as well as to support the animal feed industry. Therefore, liberalized trade policies have had varied impacts on the production, marketing and demand of CGPRT crops.

Since potato imports were liberalized in 1996, local potato production has encountered price competition from cheaper imports. As a result, local production of potato became non-profitable and hence, potato farmers refrained from cultivation. Potato production declined to its lowest level in 1998. However, after the imposition of a specific duty of 20.00 Rs/kg in 2001, production increased in 2002.

Similarly, large quantities of red lentils were imported from India and this had an adverse impact upon the production of pulses such as mungbean, black gram and cowpea. About 87,284 mt of red lentils were imported in 2003. Local production of pulses was not competitive in price and production declined to a level where the output was not adequate to meet the local demand of these commodities. As a result, large quantities of mungbean and black gram have been imported in recent years. These crops can be successfully grown in the country to meet the local demand.

Maize and soybean are also imported in large quantities for the animal feed industry. The total soybean requirement and 80 per cent of the maize requirement are met through imports. About 89,126 mt of soy meal was imported in 2002.

Trade liberalization has assured the expansion and sustainability of the animal feed industry through the continuous supply of raw materials at affordable prices. It also assisted with the importation of new seed varieties including hybrid seeds.

The government intermittently lowered tariffs through duty waivers and permitted imports by way of licensing in respect of major agricultural imports during periods when they were in short supply. These unpredictable changes, which occur frequently, create a considerable amount of uncertainty, and escalate the price risks for farmers, consumers and local entrepreneurs. They undoubtedly tend to adversely affect the demand and supply of these crops.

The domestic demand for CGPRT crops is expected to increase with the rising population and growth of the animal feed industry. The estimated demand in 2005 and the supply of selected CGPRT crops in 2003 are given in Table 6.8.

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Table 6.8 Estimated demand and supply of selected CGPRT crops

Crop	Requirement (mt) in 2005	Availability (mt) in 2003 (production and imports)
Coarse grains		
Maize ¹	229,880	166,578
Finger millet	17,730	5,851
Pulses		
Mungbean	35,315	18,763
Black gram	14,150	13,595
Soybean seeds	6,000	4,268
Soybean meal	106,651	89,105
Cowpea	20,460	13,023
Groundnut	27,000	9,304
Roots and tubers		
Potato	148,686	112,231
Cassava	310,100	227,755
Sweet potato	128,063	43,940

Source: Task Forces on OFCs and Vegetable, Ministry of Agriculture and Livestock, Department of Animal Production and Health.

¹ Requirement of maize includes both for human consumption as well as the animal feed industry.

According to the estimate, the demand for maize in livestock production is mainly attributed to the levels of broiler and egg production. The co-efficient estimated (Karunatilake, 2003) indicated that a one per cent increase in broiler and egg production would increase maize demand by 0.5 per cent and 0.35 per cent respectively. The same study revealed that income elasticity of food demand for maize was 1.6 per cent. This result does not indicate a clear picture of maize consumption patterns. The rural masses, at times, consume maize as a staple food when rice is in short supply. In addition, consuming maize in the form of snacks is becoming popular among the urban sector.

Recent studies show that the income and price elasticities of potato were 0.37 and -0.73 respectively (Ratnasiri *et al.*, 1999). This indicates that the demand for potato would increase with income level and would decline with increases in prices. The consumption of potato is expected to increase further with the increasing per capita income levels in the country. Information on the income elasticities of other CGPRT crops is not available.

The data in Table 6.8 indicates that all the CGPRT crops are in short supply compared to the estimated demand. Domestic production of most CGPRT crops could undoubtedly be increased to meet local demand.

The liberalized trade policies and associated market prices affect the production of CGPRT crops. Both profit margins and the stability of farm income depends on the producer prices, which in turn are determined by the price and tariff levels of these commodities.

The average producer price of most of the CGPRT crops are higher than the CIF prices as shown in Table 6.9. The producer price of most crops were maintained at a higher level through specific duties and taxes to protect local production. However, the present tariff levels of some CGPRT crops such as mungbean, black gram, soybean and groundnut are not adequate to maintain high producer prices and farmer income, which determines the farmers adaptability toward the production of these crops. Therefore, a revision of the present tariff structure of CGPRT crops would be necessary to increase the producer prices, farmer income and domestic production as well as to prevent product dumping.

Impact of Global Trade Orientation on CGPRT Crop Agriculture in Sri Lanka

Table 6.9 Producer price and CIF prices of selected CGPRT crops in 2003

Crop	Producer price (Rs/kg)	CIF rice (Rs/kg)
Coarse grains		
Maize	18.11	15.78
Finger millet	27.20	15.66
Pulses		
Mungbean	41.39	29.57
Black gram	43.59	29.06
Soybean	36.20	27.88
Groundnut	36.14	29.68
Cowpea	37.39	No imports
Roots and tubers		
Potato	46.98	13.28
Cassava	10.71	No imports
Sweet potato	13.42	No imports

Source : Hector Kobbekaduwa Agrarian Research and Institute.
 Department of Census and Statistics.
 Department of Customs.

Comparative advantage of CGPRT crops

Appropriate trade policies and a tariff structure are important to ensure efficient resource use in CGPRT crop production. The present level of efficiency has been determined as low through the estimation of the Domestic Resource Cost Ratio, which indicates the comparative advantage of producing a specific crop in the country. Domestic Resource Cost Ratio (DRCR) estimates calculated for selected CGPRT crops are presented in Table 6.10.

Table 6.10 Domestic resource cost ratios of CGPRT crops

Crop	District	Season	Non-tradable ¹ (Rs/ac)	Tradable ¹ (Rs/ac)	DRCR
Maize	Anuradhapura (Rainfed)	Maha 2002/2003	7,486.84	1,240.29	1.24
Finger millet	Anuradhapura (Rainfed)	Maha 2002/2003	9,126.92	0.27	1.92
Mungbean	Hambantota (Rainfed)	Yala 2003	6,197.25	587.50	0.56
Black gram	Kalawewa (Irrigated)	Yala 2003	9,630.29	2,552.12	1.44
Soybean	Anuradhapura (Irrigated)	Yala 2002	10,767.10	2,442.88	1.29
Groundnut	Moneragala (Rainfed)	Maha 2002/2003	12,641.79	806.20	1.85
Potato	Nuwara Eliya (Irrigated)	Yala 2003	81,183.04	55,436.04	1.03
Cassava	Gampaha (Rainfed)	Maha 2002/2003	15,436.21	2,758.62	0.51
Rice	Polonnaruwa (Irrigated)	Yala 2003	12,651.65	4,203.09	0.58
Rice	Kalutara (Rainfed)	Yala 2003	10,833.24	2,821.05	1.14

Source: Socio Economics and Planning Centre.

¹ Estimates based on shadow prices.

DRCR indicates that mungbean and cassava have comparative advantage among CGPRT crops. These two crops could be successfully grown under rainfed conditions on marginal rice land to obtain additional income for farmers. Domestic production of other CGPRT crops do not

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have comparative advantage mainly due to low productivity caused by low levels of input use and poor crop management. The quantity of tradable inputs used in the cultivation of most CGPRT crops except for potato is relatively low. The prices of imported inputs are also relatively high due to the depreciated value of the Sri Lankan rupee against the US dollar.

The DRCR estimates also indicate that rice production under rainfed conditions does not bear comparative advantage. Hence, some of the marginal rice lands in the wet zone could be utilized for agricultural diversification with high-potential CGPRT crops.

Comparative advantage is not a static situation and can vary with different production environments. DRCR of CGPRT crops would be different under irrigated farming conditions. Comparative advantage is not the only criteria that should be considered in determining the domestic production of CGPRT crops. The role of CGPRT crops is more important in its relevance to food security, food diversification, employment, income generation and poverty alleviation.

6.4 Concluding summary

Liberalized trade policies introduced in the mid 1990's and frequent changes in tariff structures have adversely affected the domestic production of the CGPRT crops. However, trade liberalization has contributed to the expansion of the animal feed industry through the availability of imported raw materials such as maize and soybean. The present tariff level of CGPRT commodities will have to be revised in order to provide better producer prices and income to farmers, as well as to ensure sustainable growth in agro-based industries, particularly the animal feed industry.

Analysis of the DRCR estimates indicates that while rice production does not show competitiveness under rainfed conditions, mungbean and cassava have comparative advantage among CGPRT crops. Therefore, some of the marginal rice lands could be utilized for promoting the cultivation of potential CGPRT crops.

7. Benefits of Agricultural Diversification to Poverty Alleviation in the Country

7.1 Overview of poverty alleviation public policies and their limitations

Poverty and unemployment cause a great deal of problems to social and economic development in Sri Lanka. The Household Income and Expenditure Survey (HIES) of 2001/2002 (Department of Census and Statistics) estimated the percentage of poor households in Sri Lanka to be around 24 per cent based on a nutritional adequacy approach. According to HIES approximately 26, 27 and 8 per cent of the populations in rural, estate and urban areas respectively, were found to be poor. Hence, poverty is a rural phenomenon in Sri Lanka.

The Government of Sri Lanka has initiated a series of policies and programmes to reduce poverty through the development of the agricultural sector in the country. Self-sufficiency in rice production was given the highest priority by successive governments of Sri Lanka to eliminate poverty and generate employment in rural areas. Rice production has increased mainly through the introduction of “green revolution” technologies such as improved varieties, the use of fertilizer and proper pest management. Irrigated land settlement programmes in the dry zone have contributed towards reducing the number of landless people, while increasing employment and food availability. Local production of CGPRT crops and other field crops was encouraged during 1970-1977 through import restrictions. The fertilizer subsidy scheme, agricultural credit facilities, price support schemes and import restrictions were other government policies implemented in order to increase agricultural production and reduce poverty in rural areas.

Successive post-independence governments in Sri Lanka have also implemented several direct poverty reduction strategies such as providing subsidies on essential foodstuffs like rice, free education, free medical care, subsidized prices for public transportation and housing, etc. Out of these, food subsidies (1974-1978) and food stamps (1979-1989) that were targeted to benefit the poor played a vital role in containing poverty and malnutrition to a significant extent. The ‘Janasaviya’ programme implemented between 1989 and 1994 was a significant landmark in poverty alleviation, which was proposed to directly address issues pertaining to rural poverty.

The ‘Samurdhi’ programme, which was introduced as a substitute for Janasaviya, in June 1995, is still being continued to combat poverty. Samurdhi promotes savings amongst targeted groups and provides loans at low interest rates for income generating activities of the poor. According to HIES, the percentage of the population living below the poverty line in rural areas has declined from 34.7 per cent in 1990/1991 to 26.4 per cent in 2001/2002. This achievement could be attributed mainly to the expansion of agricultural production and direct poverty alleviation programmes implemented in rural areas. Despite the reasonable growth in agricultural and non-agricultural sectors’ production over the last four decades, poverty remains pervasive in the country (Ratnayake, 1995).

7.2 Assessment of potential benefits of agricultural diversification for poverty alleviation

Improvement of food supply for the poor

In Sri Lanka, food security at the national level has been maintained at a satisfactory level by increasing domestic food supply, mainly rice production, combined with imports. The food balance sheet data of 2002 indicates the per capita availability of 2,372 calories and 60 grams of protein per day is enough to meet the average food requirement of 2,200 calories and

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50 grams protein as recommended by the MRI. However, the mentioned average figures appear to be misleading, in view of the fact that family income of the rural poor is not sufficient to sustain the required levels of nutrition and household food security, when compared to the urban situation. The average per capita intake per day by the poor households has been estimated as 1,778 calories, which is relatively low compared to the per capita intake of non-poor households, estimated at 2,185 calories (Table 7.1). One of the major reasons was the dependency of the poor population on a few selected food commodities such as rice and wheat.

Table 7.1 Per capita energy intake per day by household income decile

House income deciles (Rs)	Non-poor households (kilo cal)	Poor households (kilo cal)	All households (kilo cal)
All deciles	2,185	1,778	2,078
Less than - 3,301	2,229	1,719	1,964
3,301 - 4,660	2,228	1,692	1,937
4,661 - 5,823	2,606	1,691	2,236
5,824 - 7,000	2,238	1,809	2,098
7,001 - 8,387	2,196	1,925	2,106
8,388 - 10,000	2,101	1,806	2,023
10,001 - 12,688	2,157	1,829	2,092
12,689 - 16,390	2,111	1,887	2,079
16,391 - 24,225	2,140	1,784	2,116
More than 24,225	2,102	1,883	2,097

Source: Household Income and Expenditure Survey 2002, Preliminary Report – DC&S.

Agricultural diversification has played a key role in assuring food supply to the poor in the past, especially in the rural areas. Mixed crop farming systems practiced in the rainfed highlands provide food security for the farmers who could satisfy their coarse grain, pulses, root and tuber and vegetable requirements from the same land. Successful farmers, when conditions are favourable, can produce, and therefore satisfy, the whole family requirement of these crops, until the next harvest. Favourable weather conditions and soil conditions are of paramount importance in achieving these goals. To sustain the system, the farmers have sufficient experience to harness the above-mentioned factors in favour of their requirements.

Agricultural diversification to shift from low-value rice to high-value non-rice crops including selected CGPRT crops is considered to be one of the main approaches to improve sustainable food supply and reduce poverty within the rural sector. The introduction of modern production technologies and processing technologies are important to improve the productivity of non-rice crops and to be competitive under liberalized economic policies, given the ever-increasing cost of imported inputs such as fertilizer, agro-chemicals and hybrid seeds.

Improvement of quality of food intake by the poor

The available data on expenditure on different food items as a percentage of household expenditure indicates that the rural population spend more of their income on rice and pulses compared to the urban population as shown in Table 7.2. The rural poor depend on pulses to meet their protein and vitamin requirements, compared to the urban sector that consume more animal-based products for the same purpose.

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Table 7.2 Expenditure on different food items as a percentage of total household income

Item	Expenditure on food and by sector for 2002			
	All Island %	Urban %	Rural %	Estate %
Rice	19.3	19.9	20.3	26.4
Wheat flour	1.2	1.1	0.8	9.7
Bread	4.3	4.1	4.2	2.4
Condiments	3.1	10.5	3.2	4.3
Pulses	7.5	3.7	7.7	9.8
Vegetables	9.1	10.0	9.3	9.3
Coconuts	3.1	6.8	2.5	1.9
Meat	6.0	4.6	5.8	1.2
Fish	3.4	6.7	3.8	2.3
Dried fish	7.3	4.3	7.7	7.7
Milk	7.8	0.3	7.5	4.2
Milk products	0.1	6.9	0.1	0.4
Eggs	0.8	1.2	0.8	1.1
Fruit	3.8	1.9	3.6	1.4
Sugar	3.3	5.3	3.4	3.4
Other food and drinks	20.1	12.9	19.0	14.7
Total food expenditure (Rs)	6,016	8,540	5,670	5,457
Total household expenditure (Rs)	13,733	23,763	12,507	9,075

Source: Preliminary Report, Income and Expenditure Survey – DC&S, 2002.

Vegetable proteins such as pulses are relatively cheap compared to animal proteins and the rural population cannot afford to consume more animal proteins due to their limited income. Agricultural diversification by including cereals and CGPRT crops in their cropping patterns would enable the rural farmers be able to satisfy their starch, protein and vitamin requirements. Integrated livestock farming with CGPRT crops would also improve the quality-food intake of the rural poor.

Improvement of employment opportunities for the poor

Rice farming is the main source of employment in rural areas. In terms of labour, CGPRT crops are more labour intensive compared to rice as presented in Table 7.3. Hence, agricultural diversification using these crops will create more employment in rural areas.

Table 7.3 Labour requirement for the cultivation of selected CGPRT crops

Crop	Labour requirements (Person day/ha)
Maize	102
Finger millet	125
Mungbean	105
Black gram	93
Soybean	128
Cowpea	150
Groundnut	145
Potato	368
Sweet potato	284
Cassava	146
Rice	98

Source: Socio Economics & Planning Centre, Department of Agriculture.

Agricultural diversification also reduces idle family labour as different component crops of the system demand different time and spatial requirements. Crops which require high moisture could be planted with the onset of the monsoon rains and those demanding less water be planted during the minor season or after the main crop has been harvested. Similarly, crops with a short cropping cycle could be planted during the minor rainy season. This year round

cultivation could keep the family farm members engaged almost throughout the year minimizing unemployment in rural areas.

Improved income for the poor

According to the findings of the 1999-2000 Sri Lanka Integrated Survey, only about 23 per cent of rural household income was from agricultural activities (Table 7.4). Non-farm income amounted to 56 per cent of rural household income (World Bank Report, 2002).

Table 7.4 Average percentage share of different sources of income in total rural household income, 1999-2000

Source of income	Percentage share
Agricultural	23.3
Farm	17.8
Casual ag. wages	5.5
Non-farm	56.4
Casual non-ag. wages	20.2
Public salaries	21.3
Private salaries	16.7
Sale of farm products ¹	0.9
Transfer	9.1
Samurdhi	3.6
Farm subsidies	0.1
Remittances	5.6
Other	5.6
Fisheries	0.6
Estate	1.3
Total	100.0

Source: SLIS 1999-2000.

¹ Consists of sales of forest products and processed food

The share of income that rural households obtain from agriculture has declined mainly due to declining profits from rice farming. Agricultural diversification based on selected CGPRT crops could contribute to increase the income of the rural poor. Development of cottage level processing and marketing would provide additional income to the rural poor.

7.3 Basic requirements for realizing the benefits of agricultural diversification for poverty alleviation

The rural poor are the major beneficiaries of agricultural diversification programmes. Therefore, government policies are needed to ensure that adequate food and nutrition are produced and available to the farmers, but also to improve their quality of life through enhanced employment and income earnings. Government policies are needed to provide quality seeds of CGPRT crops, and fertilizers to farmers at the village level. Farmer participatory programmes should be promoted in the selection of farming systems, irrigation management and organizing input supplies as well as marketing should also be prioritized. Cottage industries could be promoted at the village level to generate additional income to the farming families. Awareness programmes are needed to educate the farmers on the importance of nutritional aspects and food diversification. Marketing systems need to be developed to ensure the availability of marketing facilities. Trade and tariff policies have to be restructured to provide better farm gate prices for their produce. Information on new production technologies should be made available regarding CGPRT crops to increase productivity and be competitive with world market prices. Promoting the export of crops as such as cassava would also be helpful to make this sector profitable to farmers.

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Inadequate growth, particularly low growth in agriculture, lack of opportunities and access to resources and markets, and isolation of the poor are the main causes of poverty in Sri Lanka (Central Bank of Sri Lanka Annual Report, 2003). Adequate infrastructure facilities for marketing and storage are important to facilitate easy access for the poor to markets. Development of facilities for cottage level and large-scale processing industries are important to generate additional employment and income in this sector. Regional countries may be encouraged to invest in large-scale industries so that Sri Lanka will have access to new processing technologies, machinery and export markets.

Adoption of new crop-production technologies is vital for increasing productivity. At present, technologies developed and disseminated include new varieties, fertilizer recommendation, pest management, irrigation management, cropping systems, post-harvest handling and value addition but are inadequate and more investment is needed to improve research and development programmes of CGPRT crops.

7.4 Concluding summary

Food and nutritional availability to the rural poor are relatively low compared to the urban population due to their low level of household income. Agricultural diversification based on CGPRT crops will improve the food supply and nutritional availability in rural areas. Off-farm employment created through CGPRT crops owing to vertical diversification in storage, processing and expansion of input and output markets will increase wage rates and the income of the rural population. This would enhance their capacity to spend on non-food items and would improve the general living standards of the rural population.

More public and private sector investment is needed in the areas of research, marketing and agro-based industries. Regional countries may be encouraged to invest in large-scale industries in Sri Lanka, utilizing domestic and imported CGPRT products. Increasing the production and productivity of CGPRT crops and the development of an agro-processing industry are essential for realizing the benefits of agricultural diversification for poverty alleviation.

8. Demand for CGPRT Crops as Staple Foods and their Industrial Importance in the Country

8.1 Extent of diversified ways of consuming CGPRT crops as staple foods

Rice is the staple food consumed by almost the entire population in the country. CGPRT crops are often consumed as a breakfast food as well as different preparations with rice. The national consumption and per capita availability of CGPRT crops are presented in Table 8.1. The detailed food balance sheets for 1995, 2000 and 2002 are given in Annex 5.

Table 8.1 National consumption and per capita availability of CGPRT crops, 1995-2002

Crop	National consumption ('000 mt)			Per capita availability (kg/yr)		
	1995	2000	2002	1995	2000	2002
Coarse grains						
Maize	41.17	53.15	84.72	2.27	2.88	4.46
Finger millet	4.41	4.28	3.56	0.24	0.23	0.19
Pulses						
Mungbean	14.69	17.62	16.70	0.81	0.95	0.88
Soybean	17.96	3.45	4.44	0.99	0.19	0.23
Cowpea	72.55	90.04	109.59	4.01	4.88	5.77
Groundnut	4.70	9.75	9.84	0.26	0.53	0.52
Roots and tubers						
Potato	69.77	140.98	100.76	3.85	7.63	5.30
Cassava	202.14	174.38	157.49	11.16	9.44	8.29
Sweet potato	43.28	36.27	33.22	2.39	1.96	1.75

Source: Food Balance Sheets DC&S.

Maize is mainly produced during the maha (wet) season as a rainfed crop by the resource poor farmers. These farmers consume boiled cobs as their staple food. Maize flour is also utilized in the preparation of special substitute food items such as 'Rotti' and 'Pittu' in various parts of the country.

Immature maize cobs are boiled and consumed as a snack by all sectors of the society. It is estimated that about 20 per cent of the maize produced is consumed as green cobs. Roadside selling of green cobs is a very popular enterprise in the country. The few varieties grown are used in the animal feed industry as well as for consumption as green cobs. Sweet corn varieties are not grown in Sri Lanka for domestic consumption.

Resource poor farmers have consumed finger millet as a staple food in the past. Finger millet flour is used for making a special kind of bread and different food items such as Pittu and Rotti, which are becoming popular among diabetic patients as a health food. Its current availability is about 5,850 mt.

Mungbean is consumed as a breakfast food in many parts of the country. Sweets made from mungbean are commonly used especially during religious festivals and various other cultural programmes. The current demand for mungbean is around 18,800 mt. A large quantity of mungbean was imported in 2003, because local production was of poor quality and also inadequate to meet the national requirement.

Black gram is mainly consumed by the Tamil ethnic group for making different food items mixed with other cereals and pulses. The black gram is a major component in a food item named Thosai which is popular in the northern part of the country. The black gram is also used

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as an important component of a special food item called Pappadam mainly through cottage industries. Large quantities of black gram were imported in 2003 to meet local demand, which is around 13,600 mt.

Cowpea is another CGPRT crop the seeds of which are mainly consumed in boiled form as a breakfast food and to make curries to be consumed with the staple food. Split seeds are roasted and used as a snack food. A number of cottage level industries are involved in processing and packing cowpea seeds. The demand for cowpea has been declining due to the availability of imported lentils in the market. Its current demand is about 13,000 mt.

Toasted soybean and groundnut are also popular snack food items. Groundnut is boiled and consumed as a snack in some parts of the country. The demand for groundnut has increased over the years as it is used in the preparation of sweets. The current demand is about 9,300 mt and large quantities are imported to meet this demand. Soy seeds are mainly used in the food industry and the estimated demand is about 8,000 mt.

Potato is mainly used in the preparation of different food forms to be consumed with the staple food rice. Potato consumption has increased over the years and current demand is about 124,000 mt.

Cassava and sweet potato are boiled and consumed for breakfast as well as a curry with the staple food in rural areas. A series of cottage level food processing centres have been established recently and they are engaged in preparing various snack food items using cassava. The current demand for cassava and sweet potato is about 228,000 mt and 44,000 mt respectively.

Although CGPRT crops are consumed in different forms, their consumption levels are affected by various factors. The major factors affecting the consumption of CGPRT crops as a staple food or in any other form are listed below:

- i. Higher consumption of imported lentils affects the consumption of pulses.
- ii. High utilization of maize and soybean in the animal feed industry.
- iii. High cost of production and low seasonal availability.
- iv. Price fluctuations due to seasonal supply.
- v. Inadequate facilities to produce processed products that can be consumed with minimum preparatory effort.
- vi. Non-availability of sufficient stocks throughout the year.
- vii. Lack of processing industries to remove toxic substances from fresh products e.g. cassava.
- viii. Exportation in raw forms e.g. cassava.
- ix. Low demand as an energy or nutrition source due to high consumption levels of rice and animal nutrition sources. The per capita consumption and demand for animal products shows an increasing trend due to increases in the income levels and resulting changes in the consumption patterns.

Since CGPRT products are not consumed as the staple food their demand varies every year depending on the supply situation. As such, the accurate future requirement cannot be estimated accordingly. The frequent fluctuations in demand and supply, lack of information on food preparation industries, comparatively lower demand as a human food and lack of information on consumption in a processed food form are some of the reasons for difficulties encountered with regard to the demand estimation.

8.2 Extent of scope to expand CGPRT crop demand for food consumption

The demand for maize for human consumption as green cobs is expected to increase with the increase in per capita income in the country. It is estimated that the demand for human

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consumption is projected to increase to 168,260 mt by 2010. The demand for finger millet is also expected to increase as a health food. Mungbean, black gram and soybean will continue as protein components of the vegetarian diet. The demand for cowpea depends on the availability of imported lentils. Potato consumption and demand are expected to increase with the improvement in per capita income.

The demand for cassava would increase with the expansion of the snack food sector. The future demand for CGPRT crop consumption as food will depend on the supply development, availability of import substitutes for value-added food preparations, changes in consumption patterns and relevant prices. Demand could be increased further if different types of food preparations are promoted as nutritional and snack foods through the state and private sectors. Consumption of these products could be promoted among school children and the rural populations as nutritional foods.

The imported lentil has acquired an inevitable position in the diet of the Sri Lankan population, irrespective of their social status. The high level of lentil consumption is a real threat for the expansion of other pulses within the country due to its comparative price advantage, consumer acceptance, easy preparation and availability of imports.

8.3 Extent of industrial uses and industrial demand for CGPRT crops

All of the CGPRT crops have a potential to be used as both human food as well as in the animal feed industry. However, most of the CGPRT crops grown in Sri Lanka are not used in the animal feed industry because of the higher demand as human food. Maize is the major CGPRT crop used in the animal feed industry. Poultry feed, which is the main compound feed (90 per cent of the total) in the majority of animal food produced in Sri Lanka, utilizes locally produced maize and other imported ingredients (Ranaweera, 1999). The local ingredients used include maize, rice bran/polish, broken rice, coconut poonac and minor ingredients such as gingelly poonac. At present only 20 per cent of locally produced maize is used in the animal feed industry.

The demand for feed in Sri Lanka is a derived demand and depends mainly on the growth of the poultry industry. The Department of Animal Production and Health has predicted that the broiler and layer (poultry for egg production) industries are expected to grow at rates of 10 per cent and 1 per cent respectively.

In 2000, compound feed production for dairy and piggery were 12,000 mt and 8,000 mt respectively. Only about 20 per cent of maize is used in these rations. Therefore, the total maize requirement for compound feed for dairy and piggery was only 4,000 mt. Due to slow growth in both industries the maize requirement in the future may not be much higher than its present requirement.

At present, almost all the feed manufacturers use 40 per cent and 33 per cent maize in their broiler and layer rations respectively, mainly due to the high cost of other energy substitutes. Compound feed produced during the 1991-2001 period is presented in Table 8.2.

Table 8.2 Trends in compound feed production in Sri Lanka

Year	Compound feed ('000 mt)
1991	205
1992	240
1993	260
1994	265
1995	340
1996	300
1997	320
1998	330
1999	345
2000	385
2001	415

Source: Department of Animal Production and Health.

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At present, the animal feed industry is handled entirely by the private sector. The industry's total output is about 415,000 tons per annum, of which 80 per cent is utilized. Ownership of the industry is completely in the hands of the private sector apart from a few Cooperative Societies which carry out some feed mixing mostly to cater for their own farmers. A few large companies dominate the industry and three of them produce 70 per cent of the total annual production. This means more than 65 per cent of the maize requirement is consumed by these three producers. The balance of 35 per cent is covered by the medium- and small-scale manufacturers and self-mixing poultry feed producers. Almost all the relevant facilities are located mainly in just three districts namely Colombo, Gampaha and Kurunegala, where the poultry industry dominates. The number of registered feed millers and their capacities are presented in Table 8.3.

Table 8.3 Number of registered poultry feed millers and their capacities, 2001

	2001	Estimated usage per cent		
		Maize	Soya	Rice bran
Total number registered	17	100*	100*	100*
Large-scale > 40,000 mt/year	03	65	67	
Medium-scale 10,000-40,000 mt/year	02	35	33	
Small-scale < 10,000 mt/year	12			

Source: Department of Animal Production and Health.

* Number of the self-milling industries is not included.

In addition to these registered feed millers, it is reported that about a few thousand people are engaged in poultry feed production through self-mixing. No official data is available about their capacities, etc. In 2000 it was estimated that these millers produced about 80,000 mt of poultry feed for their own use and for selling purposes.

The state controlled Thriphosa (high nutrient food) project, which produces a high nutrient food for pregnant women, mothers and children uses about 8,000 mt of maize annually, may not be expanded in the near future. Another two private sector medium-scale organizations, namely, Plenty Food (Pvt) Ltd., and Cereal Product (Pvt) Ltd. are also engaged in the production of human food using maize as their main ingredient. There are some other cottage industries that produce flour and other various mixtures for human consumption. Large-scale biscuit manufacturers use maize in the production of cookies. All these organizations utilize aflatoxine free quality maize. It is estimated that the present maize requirement in the human food industry, except Thriphosa, is about 5,000 mt per annum. According to the above-mentioned organizations the industry is growing at a rate of 1-2 per cent annually.

Soybean is another crop, which has a potential for value addition as human food in various forms and as a protein ingredient in animal feed. At present, almost the entire local production of soybean is used in the human food industry. Various food products are developed by cottage level and medium-scale entrepreneurs. Thriposha, Samaphosa, Ranphosa, tempe, soy meat, soy snacks, and soy ice cream are some of the food products manufactured locally.

The Thriposha project managed by the Ceylon Tobacco Company Ltd. and controlled by the Ministry of Health consumes 3,600 mt tons of soybean seed annually. Thriposha (name of the product) is a high nutrient food issued free of charge to pregnant women, mothers and children.

Plenty Food (Pvt) Ltd. produces various cereal food items under their trade name Samaphosa. Another organization, called Cereal Product (Pvt) Ltd., produces another set of snacks under their trade name Ranphosa using soybean and other ingredients. Both these organizations consume about 1,200 mt of soybean (seeds) per annum. Apart from soybean, maize is also used as a main ingredient. These two organizations have arranged contract-growing programmes with selected farmer groups in identified areas to fulfil their soybean and maize requirements. Apart from these organizations there is a large number of cottage level entrepreneurs who produce various soy products from soy seeds.

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Textured Vegetable Protein (TVP) is also imported to make soy meat for human consumption. The total amount of TVP imports are being consumed by very few (3-4) local companies. Soy meat is a popular food item (curry) in the vegetarian daily diet. The demand for this item (soy meat) may rise with the price increases of animal protein sources such as chicken, beef, mutton etc. as well as due to the increasing number of vegetarian food consumers.

The animal feed industry is the major soybean consumer in the country today. But, it consumes only defatted soybean meal. The total requirement of soybean meal is imported for two reasons. The local availability of defatted soybean meal is very low due to the non-availability of industrial facilities for extracting oil and local production is insufficient even for human food needs.

According to the compound feed producers, only soy meal is used as a protein source in their rations. The entire requirement of the feed industry is imported from other countries. Presently, soy meal usage is 20-30 per cent in broiler feed and 15-20 per cent in layer feed. Ranawana (1999) indicated that the large-scale feed producers dominate the industry with three of them being responsible for 70 per cent of the feed produced. The balance is produced by medium- (2) and small-scale (12) feed producers and a few thousand self-mixing poultry feed manufacturers. In 1999, eighteen registered importers were engaged in the importation of energy and protein feed ingredients and a number of feed additives to the country.

Small-scale cottage level industries have been established with the assistance of donor agencies to process mainly maize, finger millet, soybean and mungbean. However, the utilization of machines is not widespread among processors.

8.4 Extent of scope of availability to expand industrial uses and demand for CGPRT crops

Industrial demand for maize from the compound feed industry is expected to increase with the rapid growth of the poultry industry. According to the estimates, a one per cent increase in poultry and egg production will increase maize demand by 0.5 and 0.35 per cent respectively. The derived demand for maize from the animal feed industry is projected to be 344,920 mt in 2010, which is about a three-fold increase when compared to 2001. Total estimated demand for maize is presented in Table 8.4.

Table 8.4 Supply and demand projections of maize for the period of 2005-2010

Year	Estimated production ('000 mt)	Estimated feed consumption ('000 mt)	Estimated food consumption ('000 mt)	Estimated demand ('000 mt)
2005	32.65	187.21	101.81	289.02
2006	33.00	211.55	112.57	324.12
2007	33.36	239.05	124.47	363.52
2008	33.72	270.12	137.64	407.76
2009	34.09	305.24	152.19	457.43
2010	34.45	344.92	168.28	513.20

Source: CGPRT Centre Working Paper No. 67.

The demand for soybean is also projected to increase both in the human food and animal feed industry as the main protein source. Processed soy based food items are becoming popular among both vegetarian and non-vegetarian consumers. Involvement of non-governmental organizations and private sector organizations in human food production has revitalized the soy industry and indicates a greater demand for these products. The total seed demand from the human food industry is estimated to be around 8,000 mt. The soy meal requirement for the animal feed industry is projected to increase to 146,869 mt due to growth in the poultry industry. The projected soybean meal demand for 2005-2010 is presented in Table 8.5.

Table 8.5 Projections of the soybean meal requirement for animal feed

Year	Requirement (mt)
2005	106,651
2006	113,597
2007	121,051
2008	129,051
2009	137,643
2010	146,869

Source: Department of Animal Production and Health.

Cassava has industrial potential in the country. Large quantities of cassava starch are imported to the country to be utilized in various industries. However, no facilities are available in the country for starch production. Due to some technical and economic reasons cassava is also not used in the animal feed industry. Reasons for its non-inclusion are as follows:

- i. Lack of processing technologies, which remove toxic substances from the fresh product.
- ii. High cost of production.
- iii. Availability of energy sources other than cassava.
- iv. High demand as a human food especially among the low-income population.
- v. Seasonal availability and the long-age status of the crop.

8.5 Concluding summary

CGPRT crops are not consumed as the staple food, but consumed as breakfast foods, special preparations and as snacks. Domestic production is inadequate to meet the demand for human consumption. The demand for most of the CGPRT crops for food consumption depends on their availability, changes in the consumption patterns and prices. The demand will increase if promoted as a vegetarian food, a nutritional diet or as a snack food.

CGPRT crops such as maize, soybean, cassava and sweet potato have a greater potential for processing and value addition at the cottage level as well as in large-scale industries. At present, about 80 per cent of the maize and the total soybean requirement are imported to meet the local demand from the animal feed industry. The domestic production of these crops has to be increased in order to meet the industrial demand. Industrial facilities are also needed for the production of soy meal and cassava starch in the country.

9. Potential Scope for the Development of Diversified Agriculture in the Country

9.1 Extent of driving forces for agricultural diversification

Several economic, agro-ecological and social factors together with institutional factors in the country favour agricultural diversification based on CGPRT crops

Economic factors

Contribution to economic growth

A national economic profile data indicates that the contribution of the agricultural sector to GDP and employment has been declining. Real agricultural wage rates have deteriorated and the inequality in income distribution has increased during the last decade. The increasing population results in the demand for more food and employment. About 80 per cent of the population live in rural areas and the unemployment and poverty rates have been relatively worse. Enhancing agricultural production through agricultural diversification is considered as a positive solution to improve the present situation, leading to economic growth and poverty alleviation in the country.

National requirement for food security and animal feed industry

A comparison of local production rates indicates that the current production levels of CGPRT crops are not adequate to meet the domestic requirements of the human food and animal feed industry. Increasing trends in imports of maize, soybean, mungbean, black gram and groundnut have been observed. The domestic demand for CGPRT crops is expected to increase further, undoubtedly, with the increase in population and growth in human food and animal feed industries. Therefore, an urgent need exists for agricultural diversification and to increase the production of CGPRT crops to enhance household food security in the country.

Food diversification and nutritional security

The food balance data indicated that the per capita availability of pulses, roots and tubers, vegetables and fruits have been relatively low compared to the levels recommended by the Medical Research Institute. These crops are sound sources of proteins and vitamins while agricultural diversification with these crops is necessary for food diversification to ensure nutritional security.

On-farm and off-farm employment

Agricultural diversification facilitates the year round cultivation of CGPRT crops, through which family labour could be employed effectively, while minimizing unemployment in rural areas. Off-farm employment could also be generated through vertical diversification in post-harvest operations, processing and marketing of CGPRT crops, particularly in rural areas.

Profitability and household income

A comparison of rice and CGPRT crops in terms of profit margins shows that crops such as soybean, black gram and potato provide more income to farmers compared to rice under present yield levels (Table 9.1). The details of the cost of production and financial returns of paddy, maize, finger millet, mungbean, groundnut and potato are given in Annex 12. Profit from rice farming continues to decline in most areas due to its increasing cost of production. The

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current financial returns obtained from the cultivation of most CGPRT crops are also low due to low productivity. The current productivity levels of CGPRT crops are low compared to potential yields and profit margins that could be increased substantially through increasing productivity. Diversification of uncultivated land with CGPRT crops would improve the total household income of the rural population. Therefore, it has a great potential to motivate the farmers towards agricultural diversification.

Table 9.1 Farm level profitability of OFC and rice cultivation in 2002/2003

Crop	District and type of irrigation	Cost of production Rs/ha	Average yield kg/ha	Farm gate price Rs/kg	Unit cost Rs/kg	Net income Rs/ha
Paddy	Anuradhapura (IR)	46,705.90	4,539.00	11.68	10.29	6,312.26
Coarse grains						
Maize	Anuradhapura (RF)	25,379.64	2,446.00	12.30	10.37	4,709.72
Finger millet	Anuradhapura (RF)	28,729.10	1,159.00	30.78	24.79	6,941.80
Condiments						
Chili	Kalawewa (IR)	182,264.52	2,006.00	126.89	90.84	72,384.17
Big onion*	Matale (IR)	189,745.44	15,965.18	21.29	11.88	150,152.19
Red onion	Puttlam (IR)	175,208.67	8.08	28.75	21.22	62,211.18
Pulses						
Soybean [†]	Kalawewa (IR)	39,242.04	2,167.06	27.04	18.11	19,355.44
Green gram	Hambantota (RF)	33,127.58	921.68	42.39	35.94	5,942.55
Black gram	Anuradhapura (RF)	28,218.82	1,245.38	29.84	22.66	8,943.43
Groundnut	Moneragala (RF)	42,332.03	1,361.52	33.18	31.09	
Roots and tubers						
Potato	Nuwara Eliya (IR)	424,303.83	14,722.21	48.32	28.82	287,073.74

Source: Socio Economics & Planning Centre, Department of Agriculture.

* 2003 Yala.

† 2001 Yala.

Comparative advantage

The DRRC estimates indicate that the cultivation of rice under rainfed conditions in the wet zone does not have comparative advantage. Therefore, some of the marginal rice lands in the wet zone could be utilized for agricultural diversification with potential CGPRT crops. DRRC estimates also indicate that mungbean and cassava have comparative advantage under rainfed conditions. The marginal rice lands could be successfully cultivated with these crops to obtain additional income for farmers.

There is a tendency for world market prices to increase in respect to most CGPRT crops. The devaluation of the rupee against the US\$ will further increase the cost of imports. Increases in world market prices would be favourable for the domestic production of CGPRT crops.

Agro-ecological factors

Wide variation in the agro-ecological regions (46 agro-ecological regions) and adaptability of most CGPRT crops to these conditions favour agricultural diversification in most parts of the country. The total extent of asweddumized land available for rice cultivation under different agro-ecological regions is about 742,000 hectares. However, not all of this land is cultivated in any one season due mainly to insufficient irrigation water or poor drainage. In 2002, the total area cultivated during maha and yala seasons were only 69 per cent and 46 per cent of the total asweddumized rice land respectively (Table 9.2). Uncultivated rice lands with well-drained soils have a potential for agricultural diversification.

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Table 9.2 Gross asweddumized extent of paddy land and extent sown in 2001/2002

Irrigation type	Asweddumized paddy land (ha)	Maha 2001/2002		Yala 2002	
		Extent (ha)	Extent sown as per cent of total	Extent (ha)	Extent sown as per cent of total
Major scheme	335,026	256,766	77 %	205,121	61 %
Minor scheme	117,433	108,837	61 %	67,028	38 %
Rainfed	229,257	144,800	63 %	69,977	31 %
Total	741,716	510,403	69 %	342,126	46 %

Source: Department of Census and Statistics.

Most CGPRT crops require less water compared to rice and can be grown successfully under water-deficit conditions of rainfed as well as in major and minor irrigation schemes where well-drained soils are prevalent. It has been estimated that the extent of well-drained soils in major irrigation schemes in the dry zone is about 80,000 ha (Dimantha, 1987), which is suitable for agricultural diversification. About 36,000 hectares of rice land in wet and intermediate zones is abandoned without cultivation due to low profitability, poor drainage and shortages of labour and a part of this land could be utilized for agricultural diversification with the adoption of an improved drainage system. In addition, about 115,000 hectares of land is available for agricultural diversification under minor irrigation tanks, for cultivation during the yala season.

The rainfed land could be cultivated with CGPRT crops during the maha season. CGPRT crops could be successfully grown under rainfed and minor irrigation tanks during the yala season if supplementary irrigation is provided through agro-wells. Water resources are expected to decline in the future. Water saving crops such as CGPRT crops are ideally suited to be grown under such conditions.

Although CGPRT crops are adaptable to different agro-ecological regions and cropping patterns, the information on area cultivated with CGPRT crops indicates regional specialization of these crops in Sri Lanka (Table 9.3). Favourable agro-ecological conditions, ready markets and traditional farmer preferences may have been the reasons for this form of specialization.

Table 9.3 Districts recording successful diversification of CGPRT crops

Crop	Districts recording successful diversification
Coarse grains	
Maize	Badulla, Ampara, Anuradhapura, Moneragala, Mahaweli "H", Polonnaruwa
Kurakkan	Anuradhapura, Moneragala, Hambantota, Kurunegala, Ratnapura, Matale
Pulses	
Mungbean	Kurunegala, Moneragala, Hambantota, Puttalam, Ratnapura, Badulla
Soybean	Anuradhapura, Mahaweli 'H', Matale, Nuwara-eliya
Black gram	Anuradhapura, Mullaitivu, Vavuniya, Mahaweli 'H'
Groundnut	Moneragala, Mullaitivu, Ampara, Puttalam, Kurunegala
Cowpea	Ampara, Moneragala, Kurunegala, Anuradhapura
Roots and tubers	
Potato	Badulla, Nuwara-Eliya, Kandy, Jaffna
Manioc	Kurunegala, Badulla, Moneragala, Ratnapura, Kegalle, Gampaha
Sweet potato	Ratnapura, Kurunegala, Matale, Kalutara, Kegalle, Badulla

Source: Department of Census and Statistics.

Socio-cultural factors

Although CGPRT crops are not consumed as a staple food, their consumption in different forms is interwoven with the religion, culture and customs of Sri Lankan society. Therefore, there is a continuous demand for these items arising from various religious and cultural programmes.

Institutional Factors

Availability of new varieties

The Department of Agriculture has released several open pollinated new varieties of a number of CGPRT crops for cultivation, which are short age, adaptable to drought conditions and high-yielding varieties. Recently a hybrid maize variety has been released by the Department of Agriculture. Cultivation of these varieties would increase current productivity levels.

Forward sales contract system

These activities involve the private sector. Forward sales contract programmes, imports of hybrid seeds and animal feed industries indicate potential for the expansion of diverse agriculture in the country. The cottage level industries have also been developing in the production of animal feed mixtures and different snacks for human consumption.

Importation of machinery and seeds

The present trade policies provide lower tariffs for the importation of irrigation and processing equipment, which are incentives to agricultural diversification. The 'Seed Act' also permits importation of hybrid seeds, which is vital for increasing the current productivity levels of most CGPRT crops.

9.2 Extent of constraining forces for agricultural diversification

The expansion of agricultural diversification, particularly with CGPRT crops is constrained by a number of economic, agro-ecological, socio-cultural and institutional factors.

Economic factors

Trade policies

The present tariff levels for CGPRT crops are not adequate to maintain high producer prices and farmer income. This discourages the farmers from growing these crops. Inconsistent trade policies also discourage private sector investment in this sector.

Non-farm income

The labour requirement for most CGPRT crops is relatively more compared to rice. This would affect the non-farm earning capacity of rural farmers.

Capital investment

Capital requirement is relatively higher for most CGPRT crops like potato (Table 9.1) due to the high cost of seeds and agro-chemicals (Annex 12 (f)). Investments made by the farmers in the adoption of new technologies are restricted due to the unavailability of capital.

Credit facilities

Government sponsored credit facilities are not available for most of the CGPRT crops. The majority of CGPRT crop growers are resource poor farmers and often obliged to sell the products at a low price to money lenders and traders who supply the required inputs.

Agro-ecological factors

At present, there is competition between rice and CGPRT crops where fertile lands with irrigation facilities are used for the cultivation of rice, while most CGPRT crops are cultivated on marginal lands with limited irrigation facilities. This has contributed to low productivity and

profitability from most CGPRT crops. Expansion of cultivation is often affected by unpredictable weather patterns.

CGPRT crops are also generally grown in the highlands where holdings' size is very small, i.e. less than 0.1 ha. Cultivation of small plots with most CGPRT crops, except potato, does not provide adequate remuneration to farmers to attract them to cultivate these crops.

Diversified cropping needs different on-farm water management methods, which require flat beds, raised beds, ridge and furrow, etc. depending on the crop. This would require additional labour and increase the cost of cultivation of CGPRT crops. Most of the CGPRT crops are grown in the highlands and are often damaged by wild animals such as elephants and wild boar.

Socio-cultural factors

The consumption pattern of the population has changed during recent years towards imported lentils. Lentils are preferred by all age groups compared to pulses, produced locally. As a result, the demand for pulses such as mungbean, black gram, groundnut and cowpea has declined over the last decade due to imports of different lentil varieties, which are freely available on the market.

Institutional factors

Access to new technology

Most of the CGPRT farmers are resource poor farmers and they have limited access to quality seeds or information on new production technologies. They use traditional methods in the production and processing of CGPRT crops. As a result, the final products produced are also of poor quality.

Marketing and storage facilities

Unlike rice, most CGPRT crops do not have established marketing or storage facilities at the village level. Private traders mainly dominate marketing. High post-harvest losses and the low producer price to farmers are the causes of the poor marketing system, which discourages farmers from cultivating CGPRT crops.

Processing facilities

At present, processing facilities are not available at the village level. Private sector investment has been very low on the marketing and processing of CGPRT crops. Facilities are not available for the extraction of oil from soybean seed or to convert the seed into other forms such as soy meal, soy meat and soy flour.

9.3 Concluding summary

Development of sustainable diversified agriculture based on the production of CGPRT crops will enhance the contribution of the agricultural sector to GDP, ensure food security and nutritional security and generate employment and income to the rural population. Crops such as potato, soybean and black gram provide relatively more financial returns than rice, under the present yield levels. About 31 per cent and 54 per cent of the total asweddumized rice land are not cultivated during the maha (wet) and yala (dry) seasons respectively, and cultivation of some of these lands with potential CGPRT crops would provide additional income to resource poor farmers. CGPRT crops could be successfully cultivated with supplementary irrigation from agro-wells during the yala season. Availability of new high yielding varieties and hybrid seeds of maize are conducive to the expansion of the cultivation of these crops.

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However, the present tariff structure for most CGPRT commodities discourage farmers from growing these crops. Cultivation of these crops also requires more labour and capital compared to rice. The income generated from smallholdings is inadequate to meet the household expenses of the resource poor farmers. The risk involved in cultivation is also high due to crop damage caused by unpredictable weather conditions. These crops require better preparation of land and irrigation management. Research information available to farmers on new production technologies is limited and the adoption of traditional methods results in low productivity and poor quality of the produce. Marketing, storage and processing facilities are not available at the village level and affect the expansion of the cultivation of these crops. Some innovative policy options are required, in order to enhance agricultural diversification and to improve the income of the CGPRT farmers.

10. Towards Development of Sustainable Diversified Agriculture for Poverty Alleviation in the Region: A Search for Effective Policies

Agricultural diversification, particularly through CGPRT crops, would no doubt be one of the most important approaches adaptable to alleviate poverty in Sri Lanka. However, several structural and operational constraints threaten the economic viability and sustainability of agricultural diversification. The remedies rest on effecting policies that would make substantial structural reforms to promote the production and marketing of CGPRT crops. Some of the important issues concerned and policies required to make CGPRT crop farming remunerative and sustainable are discussed below.

10.1 Revision of the existing trade policies to suit the expansion of CGPRT crops

The current trade and tariff policies are not consistent or conducive to agricultural diversification, particularly of CGRPT crops. Since the imported produce is available on the market at a price lower than the domestic cost of production of these crops, farmers are unable to get a fair price for their produce and therefore make a reasonable profits from the cultivation of these crops. Farmers will not be attracted towards agricultural diversification and the cultivation of CGRPT crops unless trade policies and associated market prices are adequate and sustainable to meet household expenses. Therefore, the revision of present tariff levels in favour of CGPRT crops is necessary to increase production that will increase farmer income, as well as industrial development that will lead to poverty alleviation in rural areas.

10.2 Expansion of area cultivated with CGPRT crops

Expanding the area cultivated with CGPRT crops is important to increase the production of these crops. It is evident from the previous chapters that a large extent of rice cultivated land is available under different agro-ecological regions for agricultural diversification. According to the data presented in Table 9.2 about 64 per cent of the total asweddumized rice land (399,590 ha) was not cultivated during the yala season in 2002. Similarly, about 31 per cent of the total asweddumized rice land (231,313 ha) was not cultivated during the maha season in the same year. Uncultivated rice land in the major and minor irrigation schemes with well-drained soil conditions could be utilized for agricultural diversification during the yala season with proper water management. Rainfed areas could be grown with CGPRT crops during the maha season, adhering to timely cultivation.

The country was able to utilize some of this uncultivated rice land and achieve the highest recorded area of OFC cultivation in 1982 (242,000 ha), which included 195,000 hectares of CGPRT crops. The area cultivated with OFCs has declined to 146,000 ha in 2003, which includes 122,000 ha of CGPRT crops. Therefore, a well co-ordinated production programme is necessary at the national level to promote agricultural diversification and to increase the production of CGPRT crops on unutilized rice land that would enhance the income of farmers in rural areas.

10.3 Increasing productivity of CGPRT crops

The current productivity levels of all the CGPRT crops are low compared to potential yields. The development and introduction of a package of recommended practices is needed for increasing the productivity of CGPRT crops grown under rainfed and irrigated conditions. The package of recommended practices that are to be promoted for adoption by farmers may include the following:

- Proper land preparation.
- Improved drainage systems.
- Use of quality seeds of suitable varieties.
- Recommended plant density for planting.
- Application of balanced fertilizer.
- Improved pest management.
- Proper weed control.
- Efficient irrigation management.
- Improved post-harvest handling practices.

The government should formulate and implement strategies to ensure the supply of quality seeds, fertilizers, other inputs and technological information to farmers at the village level in order to increase the productivity of CGPRT crops. This would improve the competitiveness of the local produce with world market prices and enhance local production.

10.4 Technology development and dissemination

Development and dissemination of appropriate technology packages adaptable under rainfed and irrigated conditions is vital for successful diversification. The technologies on new varieties, cropping patterns, fertilizer application, irrigation management, pest management, off-season production, storage, post-harvest and processing would be essential to increase the productivity and income from the cultivation of CGPRT crops.

Cropping patterns need to be developed considering efficient use of land and water resources, market availability and farmer willingness to adapt such systems. Regional specialization and competitiveness should also be considered in developing technologies for agricultural diversification.

CGPRT crops are generally cultivated on smallholdings under rainfed conditions. Hence, the research and development programmes should pay attention to technology packages that would increase the productivity of CGPRT crops on smallholdings.

At present, the value addition and processing technology is available only for maize and soybean. The development of post-harvest processing technology is important to enhance production of processed products at both cottage as well as industrial levels. This would create off-farm employment for the rural population, especially for the educated youth. Current investment on research and development of CGPRT crops is inadequate and must be increased to enhance agricultural diversification.

10.5 Regional specialization of CGPRT crop production

It is evident from the total area cultivated under major CGPRT crops, that a regional specialization in CGPRT crops has been taking place. Regional specialization of crops should be further strengthened to facilitate the supply of inputs, introduction of new technologies, marketing as well as the development of agro-based industries in major growing areas. Research

and extension programmes should be concentrated in these areas in implementing a package of practices to increase the productivity of prevailing CGPRT crops.

10.6 Farmer group participatory production programmes

At present, most CGPRT crops are cultivated on smallholdings concentrated in a few districts. Farmers in the major producing areas should be organized into small groups covering different 'Yaya' (tracks), so that they would benefit from collective group action. Management of irrigation systems, supply of inputs, marketing processing activities and training programmes could be systematically organized through such farmer organizations. Farmers benefit from economics of scale, in respect of marketing of inputs and outputs due to group action. Linking small farmer organizations (FO) with credit organizations, marketing and processing agencies benefit small farmers by generating more income from agricultural diversification. The 'Yaya' programme has been successfully implemented to increase the productivity of rice and the adoption of similar programmes would ensure sustainable agricultural diversification leading to poverty alleviation in rural areas.

10.7 Availability of quality seeds and planting material of high yielding varieties

The Department of Agriculture has released several high yielding open potential varieties of maize, finger millet, mungbean, black gram, cowpea, groundnut and roots and tubers. Hybrid seeds of maize are imported by the private sector. However, quality seeds and planting materials are often not available to farmers in adequate quantities and at the required times, at the village level. Private sector involvement in seed production of most CGPRT crops is minimal. The production of breeder seeds, basic seeds and certified seeds of CGPRT crops has to be increased through research, government seed farms and the private sector respectively, to facilitate the diversification of these crops. More sales centres should be opened by the Department of Agriculture and the private sector in rural areas to ensure the easy access of the farmers to quality seeds and planting material.

10.8 Promoting cultivation under agro-well irrigation systems

Most CGPRT crops require less water and can be grown under inadequate irrigation environments. This involves a high risk to farmers losing their harvest due to inadequate water supply during critical growth periods. The high risk and uncertainty involved in the cultivation of these crops discourages farmers from growing them which could be eliminated through supplementary irrigation from agro-wells. Therefore, the government should pay attention to provide financial assistance to resource poor farmers in constructing agro-wells and purchase the necessary irrigation equipment required for the cultivation of CGPRT crops. Enhanced irrigation facilities would ensure a sustainable income to farmers.

10.9 Availability of machinery and equipment for processing

The production of some CGPRT crops, such as maize and pulses, is not popular among farmers due to difficulties in initial processing. The development and introduction of thresher dryers is important to popularize these crops, particularly among the younger generation. The private sector and farmer organizations may be facilitated to acquire this machinery from the Department of Agriculture or through imports.

10.10 Promoting commercial production of CGPRT crops

Commercial production of CGPRT crops is essential for the development and sustainability of the animal feed industry and promoting agricultural exports. The private sector, farmer organizations and farmer companies would be encouraged to undertake commercial production of selected crops such as maize, soybean and cassava by providing incentives such as land on long lease, credit facilities, seeds and planting materials. This would generate employment in the rural sector and assist in poverty alleviation in rural areas.

10.11 Strengthening of marketing facilities

At present, CGPRT crops do not have an organized marketing system. Marketing of these crops demands a chain of activities, which includes assembling, sorting, grading, storage, packing and initial processing. Private sector involvement in the marketing of CGPRT crops does not provide better prices to producers. The government should play a major role in the marketing of CGPRT crops through the initial stages, to encourage production. Co-operatives and agrarian service centres should increase their role in marketing. Farmer organizations, farmer companies and animal feed millers may be assisted by the government to open collecting centres and storage systems in the villages of major producing areas. Market price information should be made available to the farmers of CGPRT crops.

10.12 Expansion of forward sales contract system

The forward sales contract system (FSC) that was introduced in 1999 has encouraged farmers to enter into forward contracts with buyers at pre-determined prices. This scheme reduces the volatility of farmer income and promotes agro-business and agro-processing enterprises. The past performance of FSC has been promising in the marketing of rice and selected OFCs. This system could be expanded to most CGPRT crops to overcome the marketing problems of the farmers and sustain reasonable income from the cultivation of CGPRT crops.

10.13 Forecasting production and market prices

Production and the price of CGPRT crops have been fluctuating due to changes in the supply and demand of these products. This has created uncertainty in the price and farm income of the farmers, which discourages them from cultivating these crops. Fluctuations can be minimized by assisting the farmers in key producing areas through the proper planning of their production, based on forecasted demand, supply and related prices. Therefore, it is necessary to establish a crop production and market price forecasting system to assist the farmers.

10.14 Development of agro-based industries

Development of cottage level and large industries are important for the sustainability of agricultural diversification programmes that would result in poverty alleviation.

Farmer organizations, especially womens' farmer organizations may be given credit to develop cottage-level industries at the village level. The members may be encouraged to operate a Revolving Fund System in the production, marketing and processing of selected CGPRT crops. This would enhance the income of CGPRT farmers and encourage saving among them.

Private sector investment could be promoted in medium- and large-scale processing of CGPRT crops to increase processed food production for human as well as animal feed. The

government should provide necessary credit facilities as well as duty free provision for the importation of necessary processing equipment.

The availability of human food in processed form will increase demand in urban areas. Growth in the animal feed industry will increase the demand for locally produced maize and other ingredients. The demand generated from related industries encourages more farmers to cultivate these crops.

10.15 Collaborative programmes with regional countries

The country may not be able to produce the entire requirement of processed food for human food as well as animal feed due to various constraints such as financial, technological, equipment and raw materials. Therefore, collaborative programmes may be arranged with regional countries to increase the production, processing and trade of CGPRT crops.

Regional countries may be encouraged to establish various collaborative industries in Sri Lanka, such as facilities for soybean oil extraction and cassava starch production, which are not prevalent in the country. Raw materials such as soy seeds could be imported duty free through regional trade agreements. These industries would generate off-farm employment and income to a large number of unemployed youth in the country.

10.16 Export promotion

Export demand for cassava has increased over the last decade. The country has also exported small quantities of mungbean, black gram and groundnut in the past. Strategies are required to increase the export of such crops.

10.17 Promoting food diversification and nutritional security

Although several policies were formulated in the past, no significant impact has been evident in terms of food diversification. A national programme has to be prepared with the involvement of relevant agencies and implemented to promote food diversification to achieve nutritional security.

10.18 Establishment of a national agricultural diversification authority

A national agricultural diversification authority should be established for the formulation of policies relevant to agricultural diversification and to ensure their effective implementation. The major functions of the proposed authority would be:

- Formulate a production plan for agricultural diversification at national and regional levels.
- Create a favourable environment for agricultural diversification.
- Co-ordinate marketing activities at national and regional levels and ensure a fair price and sustainable income for farmers.
- Develop the cottage level, medium- and large-scale industries for utilizing crops produced from agricultural diversification.
- Implement strategies for the sustainable development of diverse agriculture to ensure food security, food diversification, nutritional security and poverty alleviation.

11. Conclusions and Recommendations

The drive for rice self-sufficiency in the past by successive governments has resulted in less attention on agricultural diversification, particularly the production of CGPRT crops. The liberalized trade policies introduced in the early 1990s and inconsistent tariff policies adversely affected the production of most CGPRT crops. Domestic production of most crops was not competitive with world market prices due to the high cost of domestic production. As a result, there have been increasing trends in imports while production has declined of most CGPRT crops during the last decade. The producer price and profitability from the cultivation of rice as well as most CGPRT crops have declined. This has affected food security, employment and income in the agricultural sector, leading to poverty, mainly in the rural sector where 80 per cent of the population lives.

At present, domestic production of CGPRT crops is inadequate to meet local demand for human consumption as well as the animal feed industry. About 80 per cent of the maize and the total requirement of soy meal are imported to meet the demand from the animal feed industry. The demand for most CGPRT commodities is expected to increase further with population growth and a rapidly expanding poultry industry.

Hence, future policies concerning food crop production should be three pronged: maintain a high degree of self-sufficiency in rice, encourage agricultural diversification in potential areas, and develop agro-based industries to ensure household food security, nutritional security, employment and enhance the income of farmers leading to poverty alleviation and improvement in the quality of life. These objectives can be achieved through a proper integration of policies, appropriate technologies and the development of infrastructure facilities in the country. Some of the policy options recommended for the development of sustainable diverse agriculture based on CGPRT crop production are summarized below.

Government policies on domestic food production, consumption and trade

- Amendments should be made to the national tariff structure in order to restrict the import of CGPRT crops and ensure better producer prices to domestic products for motivating the rural farmers towards diversified agriculture. The tariffs on maize and soybean imports should be maintained at an appropriate level for sustaining growth in the animal feed industry as well as increasing domestic production of these crops.
- A national policy should be formulated and implemented to develop and utilize uncultivated rice lands available under rainfed, major and minor irrigation schemes for agricultural diversification, with the objective of achieving sustainable food security and increasing farmer income. Consistent and continuous commitment on the part of the government is important in promoting the cultivation of CGPRT crops.
- A national programme should be formulated and implemented to achieve nutritional security through food diversification, particularly in rural areas.
- A national agricultural diversification authority should be established to formulate and implement policies for the sustainable development of diverse agriculture for poverty alleviation.

Research and development

- Appropriate reforms should be made to the technological development and dissemination systems towards successful agricultural diversification with an emphasis on related socio-economic, cultural and environmental aspects. More investment is needed in research and development programmes related to CGPRT crops.
- Action should be taken at the national level to promote the adoption of recommended technology packages by farmers to enhance CGPRT crop productivity and to be competitive in the world market.
- Strengthen the regional specialization in CGPRT crop production in order to facilitate technology dissemination, marketing and processing of these commodities.

Input supply and infrastructure development

- Develop a system to encourage all stakeholders engaged in the production of seeds and planting material pertaining to all CGPRT crops to ensure adequate availability of quality stocks of high yielding varieties to the farmers at the village level.
- Collective farmer group participatory programmes should be formulated and implemented for the cultivation of CGPRT crops within larger land tracks (Yaya) to facilitate production and marketing activities.
- State assistance should be provided to encourage the cultivation of CGPRT crops with irrigation through agro-wells and under minor irrigation systems.
- It is necessary for the state to provide incentives to the private sector, farmer organizations, farmer companies and other stakeholders to motivate them toward undertaking the production of selected CGPRT crops on a commercial basis in order to assist in meeting the requirements of industries and export markets.

Marketing system

- The intervention of the state is necessary to strengthen the marketing and storage systems for CGPRT crops, particularly at the village level.
- The forward sales contract system (FSC) should be expanded to overcome marketing constraints of CGPRT crops.
- A crop production and market price forecasting system should be established to assist the CGPRT crop farmers, traders and processors.
- Strategies should be developed to promote the exportation of identified CGPRT crops in demand.

Processing and value addition

- Develop agro-based industries at the cottage level as well as at the large-scale commercial level through incentives and concessions to stakeholders.
- An appropriate system to ensure easy access to the imports and the use of processing machinery and equipment should be developed.

Regional cooperation

- Collaborative programmes with regional countries should be implemented to enhance the processing and trade of CGPRT crops.

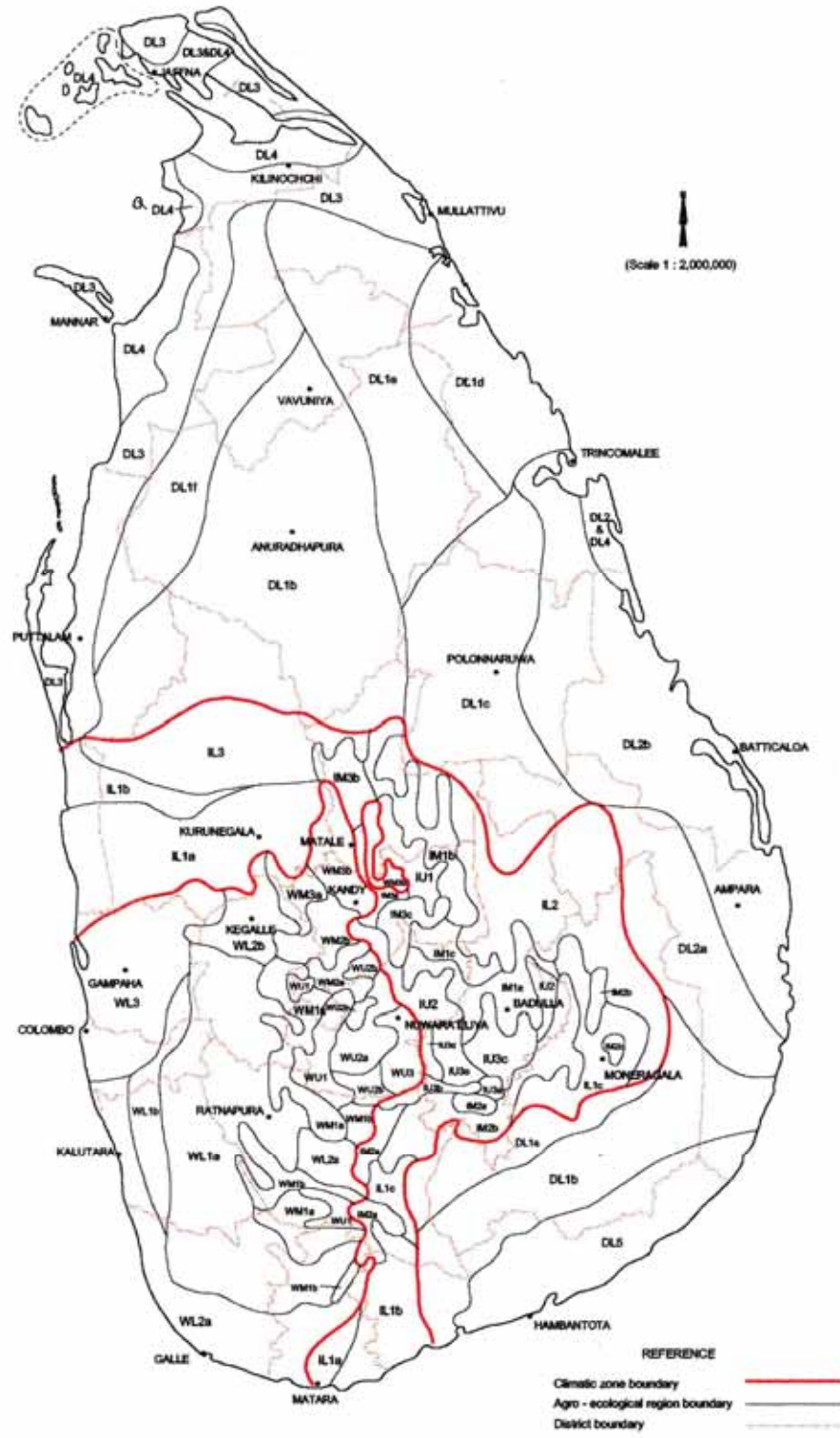
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Annex 1. Agro-ecological regions of Sri Lanka



Compiled by Natural Resources Management Centre.

Annex 2. Area planted, production and average yield of coarse grains

Annex 2a Area planted, production and average yield of maize, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	30,802	31,073	1.01	1,792	1,478	0.82	32,594	32,551	1.00
1994	29,826	30,056	1.01	1,671	1,622	0.97	31,497	31,678	1.01
1995	34,455	33,340	0.97	1,483	1,496	1.01	35,938	34,836	0.97
1996	29,391	31,430	1.07	1,504	1,533	1.02	30,895	32,963	1.07
1997	23,824	23,630	0.99	1,972	2,059	1.04	25,796	25,689	1.00
1998	27,531	31,451	1.14	2,259	2,423	1.07	29,790	33,874	1.14
1999	26,822	29,284	1.09	2,082	2,187	1.05	28,904	31,471	1.09
2000	26,344	28,540	1.08	2,302	2,512	1.09	28,646	31,052	1.08
2001	23,734	26,661	1.12	1,978	2,094	1.06	25,712	28,755	1.12
2002	20,329	23,244	1.14	3,084	3,173	1.03	23,413	26,417	1.13
2003	23,448	25,745	1.10	3,760	4,136	1.10	27,208	29,881	1.10

Source: Department of Census and Statistics.

Annex 2b Area planted, production and average yield of finger millet, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	8,417	5,912	0.70	1,898	1,127	0.59	10,315	7,039	0.68
1994	7,985	5,696	0.71	1,465	990	0.68	9,450	6,686	0.71
1995	6,208	4,088	0.66	1,231	788	0.64	7,439	4,876	0.66
1996	5,306	3,401	0.64	823	505	0.61	6,129	3,906	0.64
1997	4,734	2,994	0.63	828	506	0.61	5,562	3,500	0.63
1998	5,091	3,797	0.75	951	588	0.62	6,042	4,385	0.73
1999	5,566	4,220	0.76	917	587	0.64	6,483	4,807	0.74
2000	5,667	4,285	0.76	877	564	0.64	6,544	4,849	0.74
2001	4,986	3,774	0.76	650	422	0.65	5,636	4,196	0.74
2002	4,830	3,663	0.76	647	408	0.63	5,477	4,071	0.74
2003	6,233	4,542	0.73	1,079	699	0.65	7,312	5,241	0.72

Source: Department of Census and Statistics.

Annex 3. Area planted, production and average yield of pulses

Annex 3a Area planted, production and average yield of mungbean, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	17,877	15,540	0.87	7,231	5,536	0.77	25,108	21,076	0.84
1994	16,040	13,139	0.82	6,407	5,193	0.81	22,447	18,332	0.82
1995	12,405	11,353	0.92	5,692	4,660	0.82	18,097	16,013	0.88
1996	12,934	12,112	0.94	5,327	4,473	0.84	18,261	16,585	0.91
1997	11,680	10,960	0.94	4,956	4,040	0.82	16,636	15,000	0.90
1998	13,487	12,240	0.91	4,022	3,406	0.85	17,509	15,646	0.89
1999	11,705	10,671	0.91	3,657	3,154	0.86	15,362	13,825	0.90
2000	9,716	8,904	0.92	3,253	2,791	0.86	12,969	11,695	0.90
2001	8,438	7,589	0.90	2,627	2,127	0.81	11,065	9,716	0.88
2002	8,501	7,881	0.93	2,747	2,443	0.89	11,248	10,324	0.92
2003	9,603	8,560	0.89	2,394	2,022	0.84	11,997	10,582	0.88

Source: Department of Census and Statistics.

Annex 3b Area planted, production and average yield of black gram, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	11,646	8,071	0.69	399	329	0.82	12,045	8,400	0.70
1994	11,052	7,691	0.70	385	318	0.83	11,437	8,009	0.70
1995	10,997	7,541	0.69	456	401	0.88	11,453	7,942	0.69
1996	7,602	5,442	0.72	1,463	1,921	1.31	9,065	7,363	0.81
1997	7,034	4,718	0.67	1,748	2,126	1.22	8,782	6,844	0.78
1998	9,323	7,290	0.78	848	759	0.90	10,171	8,049	0.79
1999	7,738	5,872	0.76	920	858	0.93	8,658	6,730	0.78
2000	6,013	4,807	0.80	690	613	0.89	6,703	5,420	0.81
2001	5,642	4,476	0.79	719	651	0.91	6,361	5,127	0.81
2002	5,492	4,185	0.76	992	909	0.92	6,484	5,094	0.79
2003	6,245	4,959	0.79	989	1,039	1.05	7,234	5,998	0.83

Source: Department of Census and Statistics.

Annexes

Annex 3c Area planted, production and average yield of soybean, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	405	349	0.86	479	547	1.14	884	896	1.01
1994	507	453	0.89	449	521	1.16	956	974	1.02
1995	1,270	988	0.78	1,089	1,379	1.27	2,359	2,367	1.00
1996	665	540	0.81	184	186	1.01	849	726	0.86
1997	298	229	0.77	199	189	0.95	497	418	0.84
1998	261	193	0.74	380	406	1.07	641	599	0.93
1999	352	277	0.79	470	520	1.11	822	797	0.97
2000	310	234	0.75	384	414	1.08	694	648	0.93
2001	285	224	0.79	362	398	1.10	647	622	0.96
2002	179	146	0.82	1,078	1,010	0.94	1,257	1,156	0.92
2003	355	291	0.82	2,462	2,882	1.18	2,817	3,173	1.13

Source: Department of Census and Statistics.

Annex 3d Area planted, production and average yield of groundnut, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	6,579	3,322	0.5	3,134	2,131	0.68	9,690	5,453	0.56
1994	7,342	3,492	0.48	3,094	2,142	0.69	10,436	5,634	0.54
1995	7,393	4,172	0.56	2,503	1,740	0.70	9,896	5,912	0.60
1996	6,628	3,719	0.56	2,165	1,401	0.65	8,793	5,120	0.58
1997	6,460	3,596	0.56	2,717	1,662	0.61	9,177	5,258	0.57
1998	7,289	4,500	0.62	2,817	1,757	0.62	10,106	6,257	0.62
1999	7,592	4,862	0.64	2,684	1,678	0.63	10,276	6,540	0.64
2000	7,688	5,137	0.67	2,846	1,928	0.68	10,534	7,065	0.67
2001	7,655	5,207	0.68	2,027	1,254	0.62	9,682	6,461	0.67
2002	7,155	4,564	0.64	1,960	1,173	0.60	9,115	5,737	0.63
2003	8,982	5,173	0.58	2,443	1,451	0.59	11,425	6,624	0.58

Source: Department of Census and Statistics.

Annex 3e Area planted, production and average yield of cowpea, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	16,790	14,693	0.88	5,423	4,694	0.87	22,213	19,387	0.87
1994	15,597	13,393	0.86	5,379	4,814	0.89	20,976	18,207	0.87
1995	13,224	11,742	0.89	4,881	4,368	0.89	18,105	16,110	0.89
1996	13,182	11,887	0.90	5,702	5,110	0.90	18,884	16,997	0.90
1997	12,389	10,495	0.85	3,820	3,476	0.91	16,209	13,971	0.86
1998	10,086	9,131	0.91	4,741	4,268	0.90	14,827	13,399	0.90
1999	9,336	8,564	0.92	3,813	3,542	0.93	13,149	12,106	0.92
2000	9,347	8,673	0.93	3,600	3,448	0.96	12,947	12,121	0.94
2001	7,762	7,098	0.91	3,030	2,741	0.90	10,792	9,839	0.91
2002	8,828	7,868	0.89	2,948	2,568	0.87	11,776	10,436	0.89
2003	10,128	9,129	0.90	3,934	3,894	0.99	14,062	13,023	0.93

Source: Department of Census and Statistics.

Annex 4. Area planted, production and average yield of roots and tubers

Annex 4a Area planted, production and average yield of potato, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	3,532	40,154	11.37	3,454	37,982	11.00	6,986	78,136	11.18
1994	3,623	41,147	11.36	3,586	38,246	10.67	7,209	79,393	11.01
1995	3,842	42,764	11.13	3,586	38,893	10.85	7,428	81,657	10.99
1996	4,430	66,236	14.95	3,495	34,519	9.88	7,925	100,755	12.71
1997	3,946	40,995	10.39	2,523	25,489	10.10	6,469	66,484	10.28
1998	1,437	16,403	11.41	891	9,496	10.66	2,328	25,899	11.13
1999	1,119	11,759	10.51	1,052	15,412	14.65	2,171	27,171	12.52
2000	2,039	26,599	13.05	1,603	21,810	13.61	3,642	48,409	13.29
2001	2,060	26,785	13.00	2,186	30,896	14.13	4,246	57,681	13.58
2002	3,156	40,330	12.78	3,449	48,379	14.03	6,605	88,709	13.43
2003	3,410	35,947	10.54	2,904	35,797	12.33	6,314	71,744	11.36

Source: Department of Census and Statistics.

Annex 4b Area planted, production and average yield of cassava, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	19,906	181,008	9.09	14,327	127,987	8.93	34,233	308,995	9.03
1994	19,391	174,836	9.02	14,040	123,601	8.80	33,431	298,437	8.93
1995	18,989	167,647	8.83	13,861	121,281	8.75	32,850	288,928	8.80
1996	18,039	160,329	8.89	12,876	110,267	8.56	30,915	270,596	8.75
1997	16,641	143,418	8.62	12,214	106,361	8.71	28,855	249,779	8.66
1998	17,565	151,027	8.60	12,499	106,126	8.49	30,064	257,153	8.55
1999	17,310	145,444	8.40	12,122	106,069	8.75	29,432	251,513	8.55
2000	17,392	146,165	8.40	12,150	102,945	8.47	29,542	249,110	8.43
2001	15,925	135,512	8.51	11,376	98,067	8.62	27,301	233,579	8.56
2002	15,035	130,094	8.65	11,345	94,892	8.36	26,380	224,986	8.53
2003	15,710	137,657	8.76	10,692	90,098	8.45	26,402	227,755	8.63

Source: Department of Census and Statistics.

Annexes

Annex 4c Area planted, production and average yield of sweet potato, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	4,137	24,584	5.94	4,073	32,458	7.97	8,210	57,042	6.95
1994	5,024	31,917	6.35	4,030	30,186	7.49	9,054	62,103	6.86
1995	5,105	32,506	6.37	4,036	29,387	7.28	9,141	61,893	6.77
1996	4,969	31,086	6.26	4,065	27,731	6.82	9,034	58,817	6.51
1997	5,052	31,029	6.14	3,913	23,100	5.90	8,965	54,129	6.04
1998	4,663	28,798	6.18	3,993	23,691	5.93	8,656	52,489	6.06
1999	4,724	29,006	6.14	3,659	22,586	6.17	8,383	51,592	6.15
2000	4,543	27,012	5.95	3,720	24,797	6.67	8,263	51,809	6.27
2001	4,132	25,253	6.11	3,721	23,290	6.26	7,853	48,543	6.18
2002	4,153	25,240	6.08	3,549	22,223	6.26	7,702	47,463	6.16
2003	4,199	24,054	5.73	3,348	19,886	5.94	7,547	43,940	5.82

Source: Department of Census and Statistics.

Annex 5a Food balance sheet, 1995

Commodity	Production, foreign trade and availability					Distribution						Per capita availability					
	Prodn.	Change in stock	Gross exports	Gross imports	Available supply	Animal	Seed	Manu- facture	Waste	Food gross	Extraction rate	Food net	Kgm per Yr	Gms per day	Calories per day	Prot. GMs per day	Fat Gms per day
Cereals																	
Rice (paddy)	2,809.89	69.85	68.02	13.89	2,685.91		94.36		161.15	2,430.40	68	1,652.67	91.25	249.99	864.97	16.50	1.12
Kurakkan and Meneri	5.14				5.14		0.08		0.15	4.90	90	4.41	0.24	0.67	2.19	0.05	0.01
Maize	34.84	0.00		80.06	114.89	65.00	0.70		3.45	45.74	90	41.17	2.27	6.23	22.54	0.59	0.25
Sorghum	0.22				0.22	0.00	0.00		0.01	0.21	90	0.19	0.01	0.03	0.10	0.00	0.00
Wheat flour		-0.14		782.47	782.61				7.04	775.57		775.57	42.82	117.32	408.26	12.90	1.06
Total cereals															1298.07	30.05	2.44
Roots and tubers																	
Potato	81.66	-0.48		1.00	83.14		17.72		8.31	57.11		69.77	3.15	8.64	8.38	0.14	0.01
Manioc	288.77				288.77	0.00			86.63	202.14		202.14	11.16	30.58	48.01	0.21	0.06
Sweet potato	61.82				61.82				18.55	43.28		43.28	2.39	6.55	7.86	0.08	0.02
Total roots and tubers															64.24	0.43	0.09
Pulses and nuts																	
Green gram	16.01	0.45			15.56		0.41		0.47	14.69		14.69	0.81	2.22	7.73	0.54	0.03
Soybean	2.37	-13.68		2.67	18.72	0.00	0.19		0.56	17.96		17.96	0.99	2.72	11.74	1.17	0.53
Cowpea and lentil	16.14	7.70			75.22	0.41		2.26	72.55			72.55	4.01	10.97	36.61	2.62	0.12
Groundnut	5.91				6.21		1.33		0.19	4.70		4.70	0.26	0.71	4.03	0.18	0.28
T.V.P.	2.31				4.20					4.20		4.20	0.23	0.64	2.35	0.32	0.02
Total pulses and nuts															62.46	4.83	0.98

Annexes

Annex 5b Food balance sheet, 2000

Commodity	Production, foreign trade and availability					Distribution							Per capita availability				
	Prodn.	Change in stock	Gross exports	Gross imports	Available supply	Animal	Seed	Manu- facture	Waste	Food gross	Extraction rate	Food net	Kgm per Yr	Gms per day	Calories per day	Prot. GMs per day	Fat Gms per day
Cereals																	
Rice (paddy)	2,859.90	16.57	2.95	21.84	2,862.23	0.19	90.54		171.73	2,599.77	68	1,767.84	95.73	262.27	907.47	17.31	1.18
Kurakkan and Meneri	4.97				4.97		0.07		0.15	4.75	90	4.28	0.23	0.63	2.08	0.05	0.01
Maize	31.05			123.11	154.16	89.92	0.56		4.62	59.05	90	53.15	2.88	7.88	28.54	0.75	0.32
Sorghum	0.12				0.12		0.00		0.00	0.11	90	0.10	0.01	0.02	0.05	0.00	0.00
Wheat flour		85.37		660.32	574.95	0.02			5.17	569.76		569.76	30.85	84.53	294.16	9.30	0.76
Total cereals															1,232.30	27.41	2.26
Roots and tubers																	
Potato	48.41	0.09		116.45	164.77		7.31		16.48	140.98		140.98	7.63	20.29	20.29	0.33	0.02
Manioc	249.11				249.11				74.73	174.38		174.38	9.44	25.87	40.62	0.18	0.05
Sweet potato	51.81				51.81				15.57	36.27		36.27	1.96	5.38	6.46	0.06	0.02
Total roots and tubers															67.36	0.58	0.09
Pulses and nuts																	
Green gram	11.69	0.00		6.77	18.46		0.29		0.55	17.62		17.62	0.95	2.61	9.10	0.64	0.03
Soybean	0.64			2.97	3.61		0.05		0.11	3.45		3.45	0.19	0.51	2.21	0.22	0.10
Cowpea and lentil	12.12	-0.74		80.37	93.23	0.10	0.29		2.80	90.04		90.04	4.88	13.36	44.56	3.18	0.15
Groundnut	7.07			4.44	11.51		1.42		0.35	9.75		9.75	0.53	1.45	8.20	0.37	0.58
T.V.P.	1.75	0.01		0.58	2.32					2.32		2.32	0.13	0.34	1.27	0.17	0.01
Total pulses and nuts															65.35	4.58	0.87

Source: Department of Census and Statistics.

Annex 5c Food balance sheet, 2002

Commodity	Production, foreign trade and availability					Distribution							Per capita availability				
	Prodn.	Change in stock	Gross exports	Gross imports	Available supply	Animal	Seed	Manu- facture	Waste	Food gross	Extraction rate	Food net	Kgm per Yr	Gms per day	Calories per day	Prot. GMs per day	Fat Gms per day
Cereals																	
Rice (paddy)	2,859.48	-14.32	3.16	139.85	3,010.49	0.13	87.91		180.63	2,741.82	68	1,864.44	98.09	268.75	929.86	17.74	1.21
Kurakkan and Meneri	4.14				4.14		0.06		0.12	3.96	90	3.56	0.19	0.51	1.68	0.04	0.01
Maize	26.41			94.59	121.00	22.78	0.46		3.63	94.13	90	84.72	4.46	12.21	44.21	1.16	0.49
Sorghum	0.15				0.15		0.00		0.00	0.14	90	0.13	0.01	0.02	0.06	0.00	0.00
Wheat flour		1.63	733.54	731.91	62.41				6.59	662.91		662.91	34.88	95.55	332.53	10.51	0.86
Total cereals															1,308.34	29.45	2.56
Roots and tubers																	
Potato	88.71	00.1		38.00	126.70		13.28		12.67	100.76		100.76	5.30	14.52	14.09	0.23	0.01
Manioc	224.98				224.98				67.49	157.49		157.49	8.29	22.70	35.64	0.16	0.05
Sweet potato	47.46				47.46				14.24	33.22		33.22	1.75	4.79	5.75	0.06	0.01
Total roots and tubers															55.47	0.45	0.07
Pulses and nuts																	
Green gram	10.32	-0.03		7.12	17.47		0.25		0.52	16.70		16.70	0.88	2.41	8.37	0.59	0.03
Soybean	1.16			3.51	4.67		0.09		0.14	4.44		4.44	0.23	0.64	2.72	0.28	0.12
Cowpea and lentil	10.44	-0.20		106.67	117.31	3.93	0.26		3.52	109.59		109.59	5.77	15.80	52.70	3.76	0.18
Groundnut	5.73			5.68	11.41		1.23		0.34	9.84		9.84	0.52	1.42	8.04	0.36	0.57
T.V.P.	2.55	0.05		1.42	3.92					3.92		3.92	0.21	0.57	2.09	0.28	0.02
Total pulses and nuts															73.97	5.27	0.92

Source: Department of Census and Statistics

Annex 6 Area planted, production and average yield of paddy, 1993-2003

Year	Maha season			Yala season			Annual		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	545,689	1,691,850	3.52	288,604	878,190	3.48	834,293	2,570,040	3.51
1994	581,066	1,670,210	3.44	348,562	1,013,490	3.39	929,628	2,683,700	3.36
1995	566,648	1,761,040	3.60	348,371	1,048,840	3.43	915,019	2,809,880	3.53
1996	498,930	1,331,290	3.53	249,814	730,250	3.48	748,744	2,061,540	3.51
1997	472,997	1,457,060	3.67	256,811	782,309	3.53	729,808	2,239,369	3.62
1998	573,849	1,781,048	3.56	274,418	911,287	3.81	848,267	2,692,335	3.64
1999	546,586	1,735,775	3.61	345,467	1,121,338	3.75	892,053	2,857,113	3.67
2000	549,246	1,781,219	3.80	328,748	1,078,672	3.96	877,994	2,859,891	3.86
2001	478,987	1,612,982	3.86	319,273	1,082,094	4.10	798,260	2,695,076	3.95
2002	510,403	1,773,669	3.99	339,126	1,085,804	3.74	849,529	2,859,473	3.89
2003	601,584	1,894,695	3.79	381,033	1,176,511	3.794	982,617	3,071,206	3.76

Source: Department of Census and Statistics.

Annex 7a Total area planted and production of vegetable crops, 1993-2003

Year	Maha season		Yala season		Annual	
	Area (ha)	Production (mt)	Area (ha)	Production (mt)	Area (ha)	Production (mt)
1993	37,673	284,383	31,758	223,989	69,431	508,372
1994	36,109	264,308	31,586	220,872	67,695	485,180
1995	38,595	282,231	31,456	215,893	70,051	498,124
1996	40,425	289,070	31,005	215,384	71,430	504,454
1997	40,237	291,474	31,632	212,445	71,869	503,919
1998	40,293	293,332	32,444	230,091	72,737	523,423
1999	41,452	312,110	32,693	240,072	74,145	552,182
2000	43,033	326,747	33,776	253,298	76,809	580,045
2001	41,793	313,130	30,553	227,559	72,346	540,689
2002	41,635	310,305	31,393	232,353	73,028	542,658
2003	43,181	314,221	31,086	238,165	74,267	552,386

Source: Department of Census and Statistics.

Annexes

Annex 7b Area planted and production of vegetable crops, 1993-2003 maha season

Year	Ash Plantain			Ash Pumpkin			Bandakka			Beans			Beetroot			Bittergourd		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	7,294	49,296	6.76	898	6,334	7.05	4,000	22,118	5.53	3,260	13,698	4.20	681	7,120	10.46	1,971	11,749	5.96
1994	6,371	37,158	5.83	684	5,347	7.82	3,804	21,293	5.60	3,206	12,870	4.01	674	6,317	9.37	1,830	11,114	6.07
1995	7,116	41,557	5.84	651	5,464	8.39	4,075	22,565	5.54	3,323	13,554	4.08	659	6,137	9.31	2,141	12,870	6.01
1996	7,444	43,172	5.80	523	4,234	8.10	3,841	20,960	5.46	4,020	15,809	3.93	770	6,844	8.89	1,949	10,909	5.60
1997	6,929	40,826	5.89	532	4,200	7.89	3,848	21,128	5.49	3,877	16,709	4.31	1,007	9,346	9.28	1,922	10,894	5.67
1998	7,227	44,712	6.19	622	4,671	7.51	4,116	21,645	5.26	3,731	15,668	4.20	781	7,579	9.70	1,901	11,430	6.01
1999	7,300	43,526	5.96	549	4,136	7.53	4,088	23,469	5.74	3,542	17,462	4.93	940	9,156	9.74	1,968	11,319	5.75
2000	7,670	46,630	6.08	509	3,767	7.40	4,171	24,100	5.78	3,539	17,338	4.90	963	9,520	9.89	1,965	11,319	5.76
2001	7,451	44,319	5.95	495	3,535	7.14	3,932	21,644	5.50	3,266	15,610	4.78	988	9,691	9.81	1,927	10,647	5.53
2002	6,944	41,291	5.95	577	4,276	7.41	3,860	21,733	5.63	3,482	17,620	5.06	907	8,612	9.50	2,063	11,088	5.37
2003	6,367	39,827	6.25	524	3,866	7.36	3,995	22,210	5.56	3,315	16,841	5.08	868	7,940	9.15	2,432	12,186	5.01

Year	Brinjal			Cabbage			Capsicum			Carrot			Cucumber			Knolkhol		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	5,235	37,892	7.24	1,386	19,249	13.89	1,409	6,606	4.69	1,133	12,799	11.30	1,122	11,035	9.84	623	5,511	8.85
1994	4,993	36,975	7.41	1,424	19,816	13.91	1,328	5,547	4.18	1,151	11,510	10.00	1,176	9,858	8.38	630	5,571	8.84
1995	5,314	39,905	7.51	1,429	19,263	13.48	1,343	5,417	4.03	1,155	11,869	10.28	1,345	11,334	8.43	631	5,562	8.81
1996	5,686	42,272	7.43	1,646	23,365	14.20	1,394	5,531	3.97	1,208	12,111	10.03	1,272	10,372	8.15	729	6,123	8.40
1997	5,378	39,407	7.33	1,677	24,778	14.78	1,551	6,271	4.04	1,428	14,689	10.29	1,248	9,963	7.98	720	6,143	8.53
1998	5,381	40,443	7.52	1,793	29,796	16.62	1,454	5,777	3.97	1,091	11,640	10.67	1,380	11,112	8.05	673	6,334	9.41
1999	5,930	44,290	7.47	1,997	31,482	15.76	1,438	6,020	4.19	1,178	12,614	10.71	1,371	11,550	8.42	753	7,098	9.43
2000	6,017	44,785	7.44	2,002	32,176	16.07	1,432	6,074	4.24	1,169	12,175	10.41	1,416	11,555	8.16	748	7,317	9.78
2001	5,773	42,300	7.33	2,066	31,845	15.41	1,474	6,149	4.17	1,219	12,470	10.23	1,414	11,139	7.88	809	7,949	9.83
2002	5,999	42,879	7.15	1,945	29,372	15.10	1,458	5,968	4.09	1,299	13,402	10.32	1,459	11,322	7.76	808	7,655	9.47
2003	6,593	46,024	6.98	1,925	28,898	15.01	1,639	7,378	4.50	1,205	12,382	10.28	1,995	14,408	7.22	793	7,795	9.83

Source: Department of Census and Statistics.

Continued...

Annex 7b Area planted and production of vegetable crops, 1993-2003 maha season (continued)

Year	Leeks			Raddish			Red Pumpkin			Snakegourd			Tomato		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	555	7,484	13.48	1,150	10,543	9.17	3,423	36,937	10.79	1,470	12,070	8.21	2,063	13,942	6.76
1994	541	7,367	13.61	1,109	10,313	9.30	3,798	38,224	10.06	1,342	11,173	8.33	2,045	13,854	6.77
1995	539	6,758	12.54	1,060	9,512	8.97	4,158	44,573	10.72	1,428	11,273	7.89	2,228	14,618	6.56
1996	652	8,036	12.33	1,164	10,551	9.06	4,187	42,007	10.03	1,380	10,249	7.43	2,560	16,525	6.46
1997	785	10,595	13.50	1,202	11,808	9.82	4,310	40,019	9.29	1,362	10,240	7.52	2,461	14,458	5.87
1998	680	9,007	13.25	1,371	12,073	8.81	3,940	34,305	8.71	1,386	9,951	7.18	2,766	17,189	6.21
1999	794	10,607	13.36	1,428	13,657	9.56	4,081	36,718	9.00	1,357	9,884	7.28	2,738	19,122	6.98
2000	902	12,258	13.59	1,477	14,704	9.96	4,424	40,749	9.21	1,484	10,559	7.12	3,145	21,721	6.91
2001	890	13,009	14.62	1,486	13,363	8.99	4,205	39,063	9.29	1,466	9,974	6.80	2,932	20,423	6.97
2002	840	12,256	14.59	1,359	13,160	9.68	4,402	40,198	9.13	1,525	10,327	6.77	2,708	19,146	7.07
2003	744	10,222	13.74	1,298	12,024	9.26	4,333	37,851	8.74	1,802	11,151	6.19	3,352	23,218	6.93

Source: Department of Census and Statistics.

Annexes

Annex 7c Area planted, production and average yield of vegetable crops, 1993-2003 yala season

Year	Ash Plantain			Ash Pumpkin			Bandakka			Beans			Beetroot			Bittergourd		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	5,482	32,621	5.95	369	2,935	7.95	3,236	15,738	4.86	3,170	14,330	4.52	829	8,251	9.95	1,677	9,910	5.91
1994	5,530	32,900	5.95	327	2,490	7.61	3,243	16,408	5.06	3,194	13,315	4.17	860	8,345	9.70	1,605	9,592	5.98
1995	5,772	33,102	5.73	323	2,410	7.46	3,211	16,048	5.00	3,137	13,164	4.20	835	7,470	8.95	1,569	9,171	5.85
1996	5,344	32,306	6.05	301	2,203	7.32	3,152	16,060	5.10	3,088	13,122	4.25	717	6,475	9.03	1,618	9,401	5.81
1997	5,468	31,678	5.79	316	2,311	7.31	3,108	15,607	5.02	3,153	13,439	4.26	690	5,415	7.85	1,562	8,689	5.56
1998	5,337	34,273	6.42	367	2,433	6.63	3,290	16,835	5.12	2,945	13,019	4.42	850	7,384	8.69	1,606	9,126	5.68
1999	5,336	35,541	6.66	260	1,975	7.60	3,106	16,258	5.23	3,056	14,062	4.60	806	7,326	9.09	1,640	9,228	5.63
2000	5,553	37,591	6.77	268	2,022	7.54	3,159	16,623	5.26	3,284	17,308	5.27	854	7,722	9.04	1,814	9,477	5.22
2001	4,412	27,115	6.15	275	2,098	7.63	2,775	14,261	5.14	3,087	15,281	4.95	892	8,045	9.02	1,502	7,675	5.11
2002	4,287	27,026	6.30	269	2,086	7.75	3,092	15,932	5.15	3,074	15,028	4.89	896	7,888	8.80	1,809	9,790	5.41
2003	4,494	29,556	6.58	408	3,354	8.22	2,894	14,737	5.09	2,976	14,847	4.99	848	7,601	8.96	1,522	7,999	5.26

Year	Brinjal			Cabbage			Capsicum			Carrot			Cucumber			Knolkhol		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	3,820	24,949	6.53	1,521	14,774	9.71	1,717	5,988	3.49	824	11,822	14.35	939	7,278	7.75	787	6,919	8.79
1994	3,838	25,703	6.70	1,602	15,006	9.37	1,516	5,177	3.41	848	11,928	14.07	967	7,999	8.27	758	6,427	8.48
1995	3,784	25,243	6.67	1,622	15,212	9.38	1,423	4,888	3.43	908	12,590	13.87	931	7,607	8.17	804	6,764	8.41
1996	3,722	25,381	6.82	1,596	16,754	10.50	1,418	4,850	3.42	962	12,249	12.73	924	7,630	8.26	696	5,940	8.53
1997	3,941	27,388	6.95	1,679	12,735	7.58	1,342	4,937	3.68	1,037	10,420	10.05	1,000	8,284	8.28	740	6,380	8.62
1998	3,985	28,410	7.13	1,732	17,589	10.16	1,448	5,754	3.97	1,187	13,497	11.37	1,014	7,969	7.86	829	7,687	9.27
1999	4,146	30,153	7.27	1,857	20,954	11.28	1,411	6,052	4.29	1,216	14,054	11.56	1,030	7,865	7.64	806	7,947	9.86
2000	4,449	31,737	7.13	1,824	21,243	11.65	1,336	6,171	4.62	1,144	13,767	12.03	1,085	8,572	7.90	791	7,672	9.70
2001	3,640	25,109	6.90	1,870	22,090	11.81	1,240	5,280	4.26	1,335	15,954	11.95	941	7,312	7.77	810	8,372	10.34
2003	3,942	27,929	7.08	1,792	23,319	13.01	1,169	5,106	4.37	1,281	14,828	11.58	1,258	10,047	7.99	605	6,456	10.67

Source: Department of Census and Statistics.

Continued...

Annex 7c Area planted, production and average yield of vegetable crops, 1993-2003 yala season (continued)

Year	Leeks			Raddish			Red Pumpkin			Snakegourd			Tomato		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	1,047	15,424	14.73	2,148	20,251	9.43	5,784	60,489	10.46	2,825	22,353	7.91	4,244	30,933	7.29
1994	1,056	15,607	14.77	2,102	19,953	9.49	6,010	58,327	9.70	2,560	20,851	8.14	4,405	31,775	7.21
1995	1,015	13,905	13.70	2,057	18,300	8.90	6,287	64,232	10.22	2,699	21,027	7.79	4,492	31,494	7.01
1996	1,139	15,227	13.37	2,241	19,830	8.85	6,370	60,964	9.57	2,581	19,293	7.48	5,079	35,067	6.90
1997	1,342	18,730	13.96	2,307	21,606	9.37	6,649	60,487	9.10	2,540	19,017	7.49	4,878	32,442	6.65
1998	1,285	17,568	13.67	2,559	22,139	8.65	6,347	54,301	8.56	2,549	18,197	7.14	5,257	36,435	6.93
1999	1,448	19,827	13.69	2,665	24,843	9.32	6,406	56,296	8.79	2,549	18,100	7.10	5,353	39,579	7.39
2000	1,581	21,969	13.90	2,742	26,039	9.50	6,810	62,309	9.15	2,727	19,121	7.01	5,787	43,946	7.59
2001	1,665	24,189	14.53	2,727	24,327	8.92	6,427	58,529	9.11	2,606	17,376	6.67	5,328	40,378	7.58
2002	1,594	23,152	14.52	2,468	22,426	9.09	6,622	59,578	9.00	2,859	19,388	6.78	5,413	41,238	7.62
2003	793	12,198	15.38	922	8,048	8.73	2,539	23,397	9.21	1,070	6,994	6.54	2,573	21,749	8.45

Source: Department of Census and Statistics.

Annexes

Annex 7d Area planted, production and average yield of vegetable crops, 1993-2003 annual

Year	Ash Plantain			Ash Pumpkin			Bandakka			Beans			Beetroot			Bittergourd			
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	
1993	12,776	81,917	6.41	1,267	9,269	7.32	7,236	37,856	5.23	6,430	28,028	4.36	1,510	15,371	10.18	3,648	21,659	5.94	
1994	11,901	70,058	5.89	1,011	7,837	7.75	7,047	37,701	5.35	6,400	26,185	4.09	1,534	14,662	9.56	3,435	20,706	6.03	
1995	12,888	74,659	5.79	974	7,874	8.08	7,286	38,613	5.30	6,460	26,718	4.14	1,494	13,607	9.11	3,710	22,041	5.94	
1996	12,788	75,478	5.90	824	6,437	7.81	6,993	37,020	5.29	7,108	28,931	4.07	1,487	13,319	8.96	3,567	20,310	5.69	
1997	12,397	72,504	5.85	848	6,511	7.68	6,956	36,735	5.28	7,030	30,148	4.29	1,697	14,761	8.70	3,484	19,583	5.62	
1998	12,564	78,985	6.29	989	7,104	7.18	7,406	38,480	5.20	6,676	28,687	4.30	1,631	14,963	9.17	3,507	20,556	5.86	
1999	12,636	79,067	6.26	809	6,111	7.55	7,194	39,727	5.52	6,598	31,524	4.78	1,746	16,482	9.44	3,608	20,547	5.69	
2000	13,223	84,221	6.37	777	5,789	7.45	7,330	40,723	5.56	6,823	34,646	5.08	1,817	17,242	9.49	3,779	20,796	5.50	
2001	11,863	71,434	6.02	770	5,633	7.32	6,707	35,905	5.35	6,353	30,891	4.86	1,880	17,736	9.43	3,429	18,322	5.34	
2002	11,231	68,317	6.08	846	6,362	7.52	6,952	37,665	5.42	6,556	32,648	4.98	1,803	16,500	9.15	3,872	20,878	5.39	
2003																			

Year	Brinjal			Cabbage			Capsicum			Carrot			Cucumber			Knolkhol			
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	
1993	9,055	62,841	6.94	2,907	34,023	11.70	3,126	12,594	4.03	1,957	24,621	12.58	2,061	18,313	8.89	1,410	12,430	8.82	
1994	8,831	62,678	7.10	3,026	34,822	11.51	2,844	10,724	3.77	1,999	23,438	11.72	2,143	17,857	8.33	1,388	11,998	8.64	
1995	9,098	65,148	7.16	3,051	34,475	11.30	2,766	10,305	3.73	2,063	24,459	11.86	2,276	18,941	8.32	1,435	12,326	8.59	
1996	9,408	67,653	7.19	3,242	40,119	12.37	2,812	10,381	3.69	2,170	24,360	11.23	2,196	18,002	8.20	1,425	12,063	8.47	
1997	9,319	66,795	7.17	3,356	37,513	11.18	2,893	11,208	3.87	2,465	25,109	10.19	2,248	18,247	8.12	1,460	12,523	8.58	
1998	9,366	68,853	7.35	3,525	47,385	13.44	2,902	11,531	3.97	2,278	25,137	11.03	2,394	19,081	7.97	1,502	14,021	9.33	
1999	10,076	72,415	7.19	3,854	52,436	13.61	2,849	12,072	4.24	2,394	26,668	11.14	2,401	19,415	8.09	1,559	15,045	9.65	
2000	10,466	76,522	7.31	3,826	53,419	13.96	2,768	12,245	4.42	2,313	25,942	11.22	2,501	20,127	8.05	1,539	14,989	9.74	
2001	9,413	67,409	7.16	3,936	53,935	13.70	2,714	11,429	4.21	2,554	28,424	11.13	2,355	18,451	7.83	1,619	16,321	10.08	
2002	9,905	70,634	7.13	3,633	49,339	13.58	2,636	11,139	4.23	2,543	28,160	11.07	2,643	20,994	7.94	1,452	14,240	9.81	
2003																			

Source: Department of Census and Statistics.

Continued...

Annex 7d Area planted, production and average yield of vegetable crops, 1993-2003 annual (continued)

Year	Leeks			Raddish			Red Pumpkin			Snakegourd			Tomato		
	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)	Area (ha)	Production (mt)	Yield (mt/ha)
1993	1,602	22,908	14.30	3,298	30,794	9.34	9,207	97,426	10.58	4,295	34,423	8.01	6,307	44,875	7.12
1994	1,598	22,973	14.38	3,212	30,266	9.42	9,809	96,551	9.84	3,902	32,024	8.21	6,451	45,629	7.07
1995	1,554	20,663	13.30	3,117	27,812	8.92	10,445	108,805	10.42	4,127	32,300	7.83	6,720	46,112	6.86
1996	1,791	23,263	12.99	3,405	30,381	8.92	10,557	102,971	9.75	3,961	29,542	7.46	7,639	51,592	6.75
1997	2,127	29,325	13.79	3,509	33,414	9.52	10,959	100,506	9.17	3,902	29,257	7.50	7,339	46,900	6.39
1998	1,965	26,575	13.52	3,930	34,212	8.71	10,287	88,606	8.61	3,935	28,148	7.15	8,023	53,624	6.68
1999	2,242	30,434	13.57	4,093	38,500	9.41	10,487	93,014	8.87	3,906	27,984	7.16	8,091	58,701	7.26
2000	2,483	34,227	13.78	4,219	40,743	9.66	11,234	103,058	9.17	4,211	29,680	7.05	8,932	65,667	7.35
2001	2,555	37,198	14.56	4,213	37,690	8.95	10,632	97,592	9.18	4,072	27,350	6.72	8,260	60,801	7.36
2002	2,434	35,408	14.55	3,827	35,586	9.30	11,024	99,776	9.05	4,384	29,715	6.78	8,121	60,384	7.44
2003	1,537	22,420	14.59	2,220	20,072	9.04	6,872	61,248	8.91	2,872	18,145	6.32	5,925	44,967	7.59

Source: Department of Census and Statistics.

Annex 8. Area planted, production and average yield of fruits

Annex 8a Total area planted and production of total fruit crops, 1993-2003

Year	Area (ha)	Production (mt)
1993	147,262	580,085
1994	147,857	674,350
1995	145,678	634,303
1996	142,204	576,243
1997	141,904	553,153
1998	140,964	533,776
1999	141,562	533,730
2000	141,995	541,665
2001	137,830	518,470
2002	144,049	539,051
2003	147,673	555,526

Source: Department of Census and Statistics.

Annex 8b Area planted, production and average yield of fruit crops, 1993-2003

Year	Banana			Lime			Mango		
	Area (ha)	Production (mt)	Av.yld (mt/ha)	Area (ha)	Production (mt)	Av.yld (mt/ha)	Area (ha)	Production (mt)	Av.yld (mt/ha)
1993	51,277	420,048	8.19	6,773	4,677	0.69	27,442	86,453	3.15
1994	51,900	509,436	9.82	6,894	5,252	0.76	27,216	89,120	3.27
1995	50,403	463,884	9.20	6,656	4,954	0.74	26,088	86,552	3.32
1996	46,554	413,784	8.89	6,691	4,543	0.68	25,763	80,817	3.14
1997	47,406	404,820	8.54	6,854	4,087	0.60	25,758	70,611	2.74
1998	47,019	384,864	8.19	6,803	3,472	0.51	25,946	77,993	3.01
1999	48,075	397,272	8.26	6,955	3,530	0.51	25,800	71,150	2.76
2000	48,686	403,404	8.29	7,337	3,879	0.53	25,780	71,123	2.76
2001	45,809	366,900	8.01	6,999	3,952	0.56	25,728	75,733	2.94
2002	47,850	380,628	7.95	7,629	3,240	0.42	27,071	80,393	2.97
2003	49,255	393,384	7.99	8,788	4,576	0.52	28,407	82,417	2.90

Source: Department of Census and Statistics.

Continued...

Annexes

Annex 8b Area planted, production and average yield of fruit crops, 1993-2003 (continued)

Year	Orange			Papaw			Passion fruit		
	Area (ha)	Production (mt)	Av.yld (mt/ha)	Area (ha)	Production (mt)	Av.yld (mt/ha)	Area (ha)	Production (mt)	Av.yld (mt/ha)
1993	3,265	3,385	1.04	2,992	25,323	8.46	591	1,311	2.22
1994	3,352	3,441	1.03	2,951	24,338	8.25	525	1,170	2.23
1995	3,379	3,428	1.01	3,000	23,458	7.82	522	1,202	2.30
1996	3,703	3,402	0.92	2,953	21,590	7.31	441	767	1.74
1997	3,535	3,037	0.86	3,195	20,486	6.41	392	640	1.63
1998	3,500	3,137	0.90	3,123	17,789	5.70	388	491	1.26
1999	3,464	3,000	0.87	3,476	17,468	5.03	425	527	1.24
2000	3,607	3,328	0.92	3,250	15,806	4.86	507	872	1.72
2001	3,530	3,331	0.94	3,093	14,711	4.76	457	601	1.32
2002	3,914	3,510	0.90	3,564	17,102	4.80	403	1,139	2.83
2003	3,951	3,367	0.85	4,076	18,730	4.60	325	454	1.40

Source: Department of Census and Statistics.

Continued...

Annex 8b Area planted, production and average yield of fruit crops, 1993-2003 (continued)

Year	Pineapple			Jak		
	Area (ha)	Production (mt)	Av.yld (mt/ha)	Area (ha)	Production (mt)	Av.yld (mt/ha)
1993	4,411	38,888	8.82	50,511	2,547,584	50.44
1994	4,386	41,593	9.48	50,633	2,404,440	47.49
1995	4,363	50,825	11.65	51,267	2,179,952	42.52
1996	4,766	51,341	10.77	51,333	2,098,632	40.88
1997	4,680	49,473	10.57	50,084	2,208,024	44.09
1998	4,643	46,031	9.91	49,542	2,122,528	42.84
1999	4,774	40,783	8.54	48,593	2,174,896	44.76
2000	4,603	43,254	9.40	48,225	2,132,712	44.22
2001	4,832	53,243	11.02	47,382	2,160,216	45.59
2002	4,800	53,040	11.05	48,818	2,239,408	45.87
2003	4,925	52,599	10.68	47,946	2,206,344	46.02

Source: Department of Census and Statistics.

Annex 9 Trends in livestock production

	1992	1997	2002
1. Total contribution of livestock sector to GDP (per cent)		2.14	1.89
2. Total contribution of dairy sector to GDP (per cent)		0.77	0.14
3. Population			
Poultry (million)	32.00	50.00	60.00
Swine (million)	0.08	0.1	0.07
Goat (million)	0.52	0.52	0.49
Cattle (million)	1.90	2.40	1.90
4. Production			
Poultry egg production (million eggs)	794		954
Meat production (mt)	19,000	56,200	74,709
Swine (mt)	9,000	9,400	9,500
Cattle			91.9
Milk collection (million liters)	81	106.3	954
5. Per capita consumption			
Poultry eggs (eggs/year)	48	51	55
Meat (kg/year)	1.00	2.5	3.50
Swine (kg/year)		0.07	0.09
Goat (kg/year)	0.10	0.14	0.07
Cattle			
Milk (liters/year)	21.90	27.10	32.60
6. Price			
Poultry eggs (Rs/egg)	2-3	2-4	3-4
Chicken (Rs/kg)	68-70	60-90	72-86
Pork (Rs/kg)		130-140	120-185
Mutton (Rs/kg)	130	150-240	200
7. Imports			
Poultry chicken (mt)		1,400	1,571
Mutton (mt)		162	11.17
Milk and milk products (Rs billions)	2	5.61	10
Milk powder (mt)	35,850	40,397	56,000

Source: Department of Census and Statistics.
Department of Animal Production and Health.

Annex 10 Average farm gate price (Rs/kg) for rice, OFCs and CGPRT crops, 1993-2003

Products	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Rice	8.09	7.98	7.77	9.98	11.12	10.34	12.60	12.31	12.48	13.74	12.43
Kurakkan	10.77	10.78	14.15	16.80	18.76	21.78	25.40	25.45	28.08	27.20	26.53
Meneri	15.11		16.74	17.21	21.18	25.07	23.01	28.15	40.22	46.63	37.75
Maize	7.13	7.28	9.31	10.71	14.42	16.00	24.20	14.77	14.65	18.11	19.54
Sorghum	15.01	15.20	17.19	19.44		30.01		26.31	28.70	32.55	33.63
Green gram	23.46	23.51	28.28	32.90	36.46	35.84	36.94	37.94	48.68	48.92	44.27
Black gram	18.71	18.56	23.15	34.90	38.84	36.79	33.50	39.93	48.60	45.47	43.59
Cowpea	16.76	16.82	20.11	25.45	25.69	24.20	26.31	28.88	38.52	36.63	37.39
Gingelly	18.07	18.24		36.72	39.30	31.86	40.21	45.03	49.53	49.01	44.08
Groundnut	21.57	21.32	22.02	30.02	30.89	33.06	32.66	33.78	47.16	32.47	36.14
Manioc	6.77	6.89	7.56	9.93	9.77	9.26	9.54	9.55	10.29	10.71	11.25
Sweet potato	8.83	9.28	9.62	10.66	11.93	11.38	11.49	11.66	12.63	13.42	13.98
Potato	35.01	36.32	35.01	30.61	31.26	33.41	33.97	34.72	48.71	46.98	44.32
Dry chili	97.51	91.57	97.29	103.81	76.57	96.75	100.71	93.05	105.24	101.20	116.59
Green chili	24.76	29.22	31.21	32.61	32.21	40.47		38.46	36.24	36.70	39.43
Red onion	26.54	28.60	25.12	30.46	29.91	30.30	34.32	36.03	39.08	34.10	32.37
Big onion					20.23	33.71	25.80	23.04	21.78	24.64	24.11

Source: Department of Census and Statistics.

Annex 11 Average retail price (Rs/kg) of OFCs and CGPRT crops, 1993-2003

Product	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Dry chili-Grade 1	121.21	114.08	127.55	140.32	96.91	130.25	131.99	115.19	134.84	136.07	159.61
Dry chili-medium	111.12	104.11	117.42	130.34	86.77	120.30	121.55	105.18	124.89	122.44	156.03
Big onion	32.55	34.31	29.92	28.88	26.51	44.65	40.26	34.27	37.28	34.10	37.50
Cowpea	25.56	29.29	34.93	36.75	35.88	41.32	44.93	48.04		59.03	56.91
Mungbean	34.92	41.42	52.42	45.92	52.72	54.96	54.54	63.61	81.60	76.22	70.68
Manioc	10.31	11.87	11.81	12.68	15.24	14.43	15.98	17.19	17.06	18.95	
Potato (Nuwara Eliya)	46.32	55.96	50.48	44.95	40.06	59.38	46.07	48.30	66.94	62.88	63.66
Potato (Welimada)	40.57	48.64	42.93	45.92	31.43	50.13	35.76	40.39	61.37	56.33	58.83
Red onion (Sinnan)	39.29	54.67	32.26	37.97	36.63	53.10	47.78	55.95	59.12	50.56	44.68
Red onion (Vedalan)	38.76	51.56	41.76	49.37	50.23	69.63	61.91	68.63	70.72	60.31	54.32
Sweet potato	15.96	18.64	16.68	17.03	19.22	24.91	23.38	25.18	28.18	28.83	29.99

Source: Hector Kobbekaduwa Agrarian Research and Training Institute.

Annex 12. Cost of cultivation per acre (0.4 ha) of rice and selected CGPRT Crops

Annex 12a Cost of cultivation per acre (0.4 ha) of rice (irrigated), 2002-2003 maha season. Anuradhapura

Operation	Reporting %	Labour cost Rs/ac	Machinery and equipment cost Rs/ac	Material cost Rs/ac	Total cost Rs/ac
General land preparation	44	312.00			312.00
1 st , 2 nd and 3 rd plough with tractor	100		3,161.79		3,161.79
Plastering bunds	100	1,570.11			1,570.11
Leveling and broadcasting	100	946.86		1,161.80	2,108.66
Fertilizer application	100	268.32		2,705.60	2,973.92
Weed control with herbicides	94	201.40		649.55	850.95
Pest and disease control	58	75.00		344.39	419.39
Water management	58	1,222.50			1,222.50
Harvesting and drawing	100	3,104.56			3,104.56
Threshing with 4wt and winnowing with fan	100	1,644.97	1,018.00		2,662.97
Transport with tractor	72	175.00	339.77		514.77
Total including imputed costs		9,520.72	4,519.56	4,861.34	18,901.62
Total excluding imputed costs		4,007.07	4,058.01	4,618.69	12,683.77

Related information

Quantity and price of inputs

Input	Unit	Quantity	Unit price Rs
Broadcasting	Kg	54.57	21.29
Labour			
Hired labour	Md	15.32	261.56
Family labour	Md	21.08	
Total labour	Md	36.40	
Fertilizer	% Rep.		
V1	53	Kg	40.00
Urea	100	Kg	73.86
TDM	56		41.18

Yield and returns

Average yield (kg/ac)	1,837.00
Price of produce (Rs/kg)	11.68
Gross income (Rs/ac)	21,456.16
Profit including imputed costs (Rs/ac)	2,554.54
Profit excluding imputed costs (Rs/ac)	8,772.39
Per unit cost (including imputed costs Rs/kg)	10.29
Per unit cost (excluding imputed costs Rs/kg)	6.90

Note: wt = wheel tractor.

Md = man days.

Annexes

Annex 12b Cost of cultivation per acre (0.4 ha) of maize (rainfed), 2002-2003 maha season. Anuradhapura

Operation	Reporting %	Labour cost Rs/ac	Machinery and equipment cost Rs/ac	Material cost Rs/ac	Total cost Rs/ac
General land preparation	77	2,120.42			2,120.42
Seeding	100	1,510.00		247.38	1,757.38
Fertilizer application	50	542.25		733.70	1,275.95
Weeding and earthing up	77	2,072.25			2,072.25
Harvesting and drawing	100	1,832.50			1,732.50
Processing	85	1,212.50			1,212.50
Total including imputed cost		9,289.92		981.08	10,271.00
Total excluding imputed cost		252.93		928.85	1,181.78

Related information

Quantity and price of inputs

Input	Unit	Quantity	Unit price Rs
Broadcasting	Kg	6.65	37.20
Labour			
Hired labour	Md	1.11	227.86
Family labour	Md	39.66	
Total labour	Md	40.77	
Fertilizer (%) Rep.			
Basal (36)	Kg	(66.67)	(18.28)
Urea 46	Kg	51.20	14.33

Yield and returns

Average yield (kg/ac)	990.00
Price of produce (Rs/kg)	12.30
Gross income (Rs/ac)	12,177.00
Profit including imputed costs (Rs/ac)	1,906.00
Profit excluding imputed costs (Rs/ac)	10,995.22
Per unit cost (including imputed costs Rs/kg)	10.37
Per unit cost (excluding imputed costs Rs/kg)	1.19

Note: Md = man days.

Annex 12c Cost of cultivation per acre (0.4 ha) of mungbean (rainfed), 2002-2003 maha season. Hambantota

Operation	Reporting %	Labour cost Rs/ac	Machinery and equipment cost Rs/ac	Material cost Rs/ac	Total cost Rs/ac
Land prepn. with gramoxone	64	260.38		829.76	1,090.14
General land preparation	59	2,085.00			2,085.00
Dibbling	74	1,361.44		673.71	2,035.15
Weeding and earthing up	72	2,055.04			2,055.04
Pest and disease control	90	296.80		821.34	1,118.14
Harvesting and drawing	100	3,801.60			3,801.60
Processing with tractor	100	757.50	463.98		1,221.48
Total including imputed costs		10,617.76	463.98	2,324.81	13,406.55
Total excluding imputed costs		5,501.47	402.57	2,296.63	8,200.67

Related information**Quantity and price of inputs**

Input	Unit	Quantity	Unit price Rs
Dibbling	Kg	9.54	70.62
Labour			
Hired labour	Md	21.71	253.41
Family labour	Md	20.19	
Total labour	Md	41.90	

Note: Md = man days.

Annexes

Annex 12d Cost of cultivation per acre (0.4 ha) of black gram (rainfed), 2002-2003 maha season. Anuradhapura

Operation	Reporting %	Labour cost Rs/ac	Machinery and equipment cost Rs/ac	Material cost Rs/ac	Total cost Rs/ac
Pre-herbicide application	74			1,360.91	1,360.91
General land preparation	100	1,284.64			1,284.64
1 st and 2 nd plough manually	89	1,327.50			1,327.50
Seeding	100	1,510.00		444.49	1,954.49
Weed control manually	57	1,080.00		335.74	1,080.00
Pest and disease control	74	187.50			523.24
Harvesting and drawing	100	2,313.12			2,313.12
Threshing with 4wt	94	470.00	530.34		1,000.34
Cleaning with fan	92	355.00	220.76		575.76
Total including imputed costs		8,527.76	751.10	2,141.14	11,420.00
Total excluding imputed costs		1,618.95	704.32	2,045.30	4,368.57

Related information

Quantity and price of inputs

Input	Unit	Quantity	Unit price Rs
Seeding	Kg	8.21	54.14
Labour			
Hired labour	Md	6.58	246.04
Family labour	Md	28.08	
Total labour	Md	34.66	

Yield and returns

Average yield (kg/ac)	504.00
Price of produce (Rs/kg)	29.84
Gross income (Rs/ac)	15,039.36
Profit including imputed costs (Rs/ac)	3,619.36
Profit excluding imputed costs (Rs/ac)	10,670.79
Per unit cost (including imputed costs Rs/kg)	22.66
Per unit cost (excluding imputed costs Rs/kg)	8.67

Note: wt = wheel tractor.
Md = man days.

Annex 12e Cost of cultivation per acre (0.4 ha) of groundnut (rainfed), 2002-2003 maha season. Moneragala

Operation	Reporting %	Labour cost Rs/ac	Machinery and equipment cost Rs/ac	Material cost Rs/ac	Total cost Rs/ac
General land preparation	94	1,268.88			1,268.88
1 st , 2 nd and 3 rd plough 4wt	84		2,054.00		2,054.00
Seed processing	90	1,506.96			1,506.96
Seeding	100	2,239.38		2230.20	4,469.58
Weeding and earthing up	100	3,329.20			3,329.20
Harvesting and drawing	100	2,354.92			2,354.92
Processing	74	2,148.00			2,148.00
Total including imputed costs		12,847.34	2,054.00	2230.20	17,131.54
Total excluding imputed costs		1,748.88	2,001.33	674.25	4,424.45

Related information**Quantity and price of inputs**

Input	Unit	Quantity	Unit price Rs
Seeding	Kg	47.30	47.15
Labour			
Hired labour	Md	7.86	222.50
Family labour	Md	49.88	
Total labour	Md	57.74	

Yield and returns

Average yield (kg/ac)	551.00
Price of produce (Rs/kg)	33.18
Gross income (Rs/ac)	18,282.18
Profit including imputed costs (Rs/ac)	1,150.65
Profit excluding imputed costs (Rs/ac)	13,857.73
Per unit cost (including imputed cost Rs/kg)	31.09
Per unit cost (excluding imputed cost Rs/kg)	8.03

Note: wt = wheel tractor.

Md = man days.

Annexes

Annex 12f Cost of cultivation per acre (0.4 ha) of potato (irrigated), 2002-2003 maha season. Nuwera Eliya

Operation	Reporting %	Labour cost Rs/ac	Machinery and equipment cost Rs/ac	Material cost Rs/ac	Total cost Rs/ac
General land preparation	97	3,670.80			3,670.80
1 st and 2 nd plough manually	73	6,897.00			6,897.00
Preparation of beds and ridges	100	3,092.76			3,092.76
Seeding	100	3,306.32		87,754.70	91,061.02
Fertilizer application	100	5,981.05		30,677.92	36,658.97
Weeding and earthing up	80	3,493.98			3,493.98
Pest and disease control	93	3,839.16		8,196.63	12,035.79
Water management	97	3,592.14	44,23.75		8,015.89
Harvesting and drawing	100	6,787.20			6,787.20
Total including imputed costs		40,660.41	44,23.75	126,629.25	171,713.41
Total excluding imputed costs		32,524.24	44,23.75	126,629.25	163,577.24

Related information

Quantity and price of inputs

Input	Unit	Quantity	Unit price Rs
Seeding	Kg	797.48	110.04
Labour			
Hired labour	Md	111.45	291.83
Family labour	Md	27.88	
Total labour	Md	139.33	
Fertilizer	% Rep.		
Potato mix	87 Kg	605.53	20.10
Liqued fertilizer	57		3,186.43
Cowdung	80 LL	3.24	4,004.00
Lime	80 Bags	17.32	135.53

Yield and returns

Average yield (kg/ac)	5,958.00
Price of produce (Rs/kg)	48.32
Gross income (Rs/ac)	287,890.56
Profit including imputed costs (Rs/ac)	116,177.15
Profit excluding imputed costs (Rs/ac)	124,313.32
Per unit cost (including imputed costs Rs/kg)	28.82
Per unit cost (excluding imputed costs Rs/kg)	27.46

Note: Md = man days.