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Japan International Cooperation Agency

The Democratic Socialist Republic of Sri Lanka
Ministry of Plan Implementation, Ethnic Affairs and National Integration

**The Master Plan Study
For
Southern Area Development
In
The Democratic Socialist Republic of Sri Lanka**

Final Report

**Sector Report 1
Agriculture and Fishery**

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February 1997

**Nippon Koei Co., Ltd.
International Development Center of Japan
System Science Consultants Inc.**

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The Master Plan Study for Southern Area Development in the Democratic Socialist Republic of Sri Lanka

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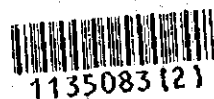
**Sector Report 1
Agriculture and Fishery**

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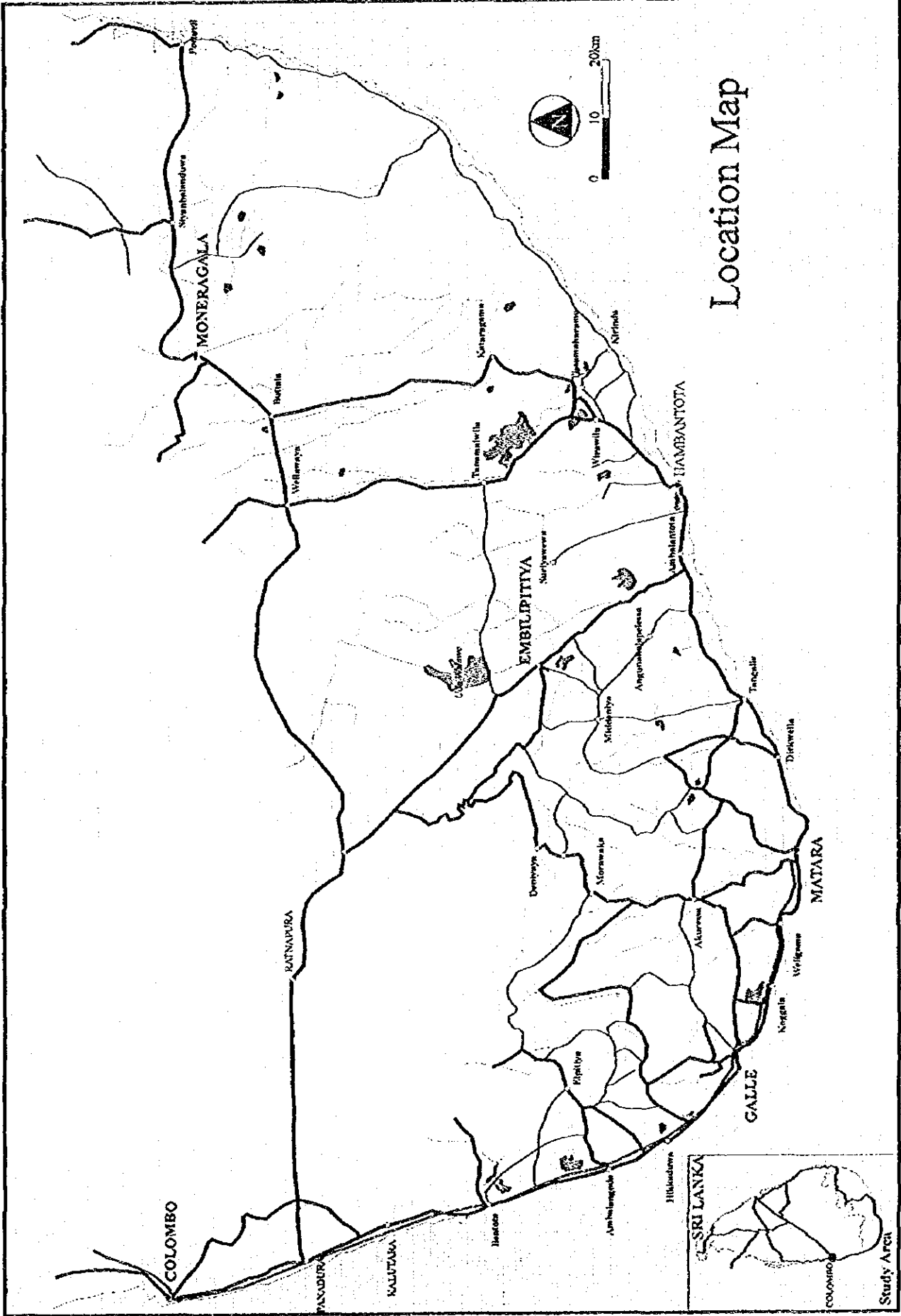


Exchange Rates

(As of November 1996)

US\$ 1 = Rs. 55

US\$ 1 = ¥ 110



Location Map

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ABBREVIATIONS

PART 1	AGRICULTURE
ADB	Asian Development Bank
CARP	Council for Agriculture Research Policy
CCB	Coconut Cultivation Board
CCC	Colombo Commercial Company
CFC	Ceylon Fertilizer Corporation
CWE	Cooperative Wholesale Establishment
DAPII	Department of Animal Production and Health
DAS	Department of Agrarian Services
DEA	Department of Export Agriculture
DOA	Department of Agriculture
FAO	Food and Agriculture Organization
FO	Farmers' Organization
GDP	Gross Domestic Products
GIS	Geographic Information System
GRDP	Gross Regional Domestic Products
IDA	International Development Association
IRDP	Integrated Rural Development Program
JDF	Janatha Estate Fertilizers
JICA	Japan International Cooperation Agency
KOISP	Kirindi Oya Irrigation and Settlement Project
MALF	Ministry of Agriculture, Lands and Forestry
MPCS	Multi-Purpose Cooperative Society
NCRCS	New Comprehensive Rural Credit Scheme
NGO	Non-Governmental Organization
NIRP	National Irrigation Rehabilitation Project
NLDB	National Livestock Development Board
O&M	Operation and Management/Maintenance
OFC	Other Field Crop
PCS	Department of Census and Statistics
PMB	Paddy Marketing Board
PSC	Pelwatta Sugar Company
SAPDA	Silk and Allied Products Development Authority
SDA	Southern Development Authority
SEDZ	South-East Dry Zone
SSC	Sevenagala Sugar Company
TSHDA	Tea Small Holder Development Authority
VRD	Veterinary Research Division
VRI	Veterinary Research Institute

PART 2 FISHERY

ADB	Asian Development Bank
CFC	Ceylon Fisheries Corporation
CFHC	Ceylon Fishery Harbour Corporation
CPR	Common Property Resource
DFAR	Department of Fisheries and Aquatic Resources
DFEO	District Fishery Extension Officers
EEZ	Exclusive Economic Zone
FI	Fisheries Inspector
FRP	Fibre-glass Reinforced
GNP	Gross National Product
GOBU	Government-Owned Business Undertaking
MFAR	Ministry of Fisheries and Aquatic Resources
MRI	Medical Research Institute
NARA	National Aquatic Resources Agency
NFDP	National Fisheries Development Plan
NORAD	Norwegian Agency for International Development
SLCDF	Sri Lanka Canada Development Fund

Abbreviation of Measures

Length

mm	= millimeter
m	= meter
km	= kilometer

Area

ha	= hectare
km ²	= square kilometer

Volume

l	= lit = liter
m ³	= cubic meter
MCM	= Mm ³ = million cubic meter

Weight

mg	= milligram
g	= gram
kg	= kilogram
t	= ton = MT = metric ton

Energy

kcal	= kilocalorie
TOE	= tons of oil equivalent
kW	= kilowatt
MW	= megawatt
kWh	= kilowatt-hour
Gwh	= gigawatt-hour
MVA	= megawolt-ampere
MMBFOE	= million barrels of fuel oil equivalent

Others

%	= percent
°C	= degree Celsius
cap	= capita
mil.	= million
no.	= number

Agriculture

SECTOR REPORT 1 AGRICULTURE AND FISHERY

PART 1 AGRICULTURE

CHAPTER 1 EXISTING CONDITIONS

1.1 National Agricultural Background

1.1.1 Sector overview

The agriculture sector (including fishery and forestry) is still the mainstay in Sri Lanka's economy, accounting for 24% of the gross domestic product (GDP), 22% of merchandise exports, and 41% of the active labour force in 1994. Roughly 75% of the Country's population live in rural areas and are engaged in agriculture-related activities. In addition, much of the manufacturing, transport, and service sector activities are related to the supply of agricultural input and to the marketing and processing of agricultural output.

The growth of agricultural sector, however, is rather depressed and unstable comparing to that of the GDP, as shown below.

Growth of Agricultural Value-Added and GDP of Sri Lanka, 1988-94

	1988 (Rs. million)	1994 (Rs. million)	Share (%)	Growth (%)
1) Agriculture	23,762	27,596	84.7	2.52
- Tea	2,926	3,116	9.6	1.05
- Rubber	770	688	2.1	-1.89
- Coconut	2,501	3,376	10.4	5.13
- Paddy	6,312	6,750	20.7	1.12
- Others	11,253	13,666	41.9	3.29
2) Forestry	1,943	2,147	6.6	1.68
3) Fishery	2,279	2,850	8.7	3.80
Total Agriculture	27,984	32,593	100.0	2.57
GDP	119,050	159,269		4.97

Note: GDP values are based on 1982 constant prices.

Plantation crop production (tea, rubber and coconut) has stagnated or declined. Paddy production increased to near self-sufficiency levels in the early 1980s, but despite continuing expansion of irrigated areas, production has stagnated during the last six years.

Sri Lanka is commonly divided into three agro-ecological zones based on climate, soil and vegetation: the dry, intermediate and wet zones. The dry zone covers the north, east, and southeast of the island occupying three quarters of the total country area. In the dry zone, rainfall is less than 1,900 mm annually or less than 500 mm for the Yala season. The wet and intermediate zones cover the central mountain region and southwest part of the Country. In the wet and intermediate zones rainfall exceeds the above limits. In the dry zone, major crops are paddy, sugarcane, and other subsidiary food crops grown mostly by small land holders. In the wet zone, tree crops or plantation crops such as tea, rubber, and coconuts are predominant. These are cultivated widely by large estates, although smallholders are now increasing their share in production. Animal husbandry is also practiced both in the dry and wet zones in an extensive manner.

The total area of agricultural land in Sri Lanka is estimated at around 2 million ha or about 30% of the total land area. Plantation crops account for about 0.8 million ha, paddy lands 0.5 million ha, subsidiary food crops (coarse grain, roots and tubers, pulses, oil seeds, spices, sugarcane, etc.) 0.2 million ha, and other crops, fruits and vegetables 0.1 million ha. In addition, an estimated 1 million ha are under slash and burn shifting cultivation, locally known as chena. Almost three-quarters of the agricultural land is occupied by around 2 million small holdings with the balance being estate lands. Of the small holdings, 64% have a farm size smaller than 0.81 ha while 27% are between 0.81 ha and 2 ha. In other words, over 90% of all small holdings are smaller than 2 ha.

According to Public Investment, 1995-1999, the livestock sector contributes about 1.2 % to the total GDP and 5.6% to the agricultural GDP. The same document estimates that about 670,000 small holdings are involved in livestock rearing either in combination with crop cultivation or solely as livestock farms. It is estimated that about two-thirds of small holdings are wholly devoted to cropping.

1.1.2 Production characteristics

(1) Paddy

Paddy cultivation is carried out totally by small holdings. The Department of Agriculture (DOA) estimates that about 1.8 million farmers or 10% of the total population are engaged in paddy cultivation. Annual production of paddy is 2,433,000 tons (as 1991-1993 average), of which 1,625,000 tons or 67% are from Maha cultivation and 808,000 tons or 33% from Yala cultivation. The production is stagnant in recent years. For the last decade from 1983 to 1993, only 0.5% per annum increase was performed, while 6.6% per annum was attained during the 1974-1983 period. No significant increase was achieved both in the cultivation area and the yield during the 1983-1993 period. Annual total cultivation area was about 830,000 ha, although it fluctuated with changes in annual rainfall patterns. Paddy yields were more constant during the past decade: about 3.5 ton/ha in Maha and 3.3 ton/ha in Yala. As a result, Sri Lanka's rice import increased from 268,000 tons in 1985 to 349,000 tons in 1992 and 307,000 tons in 1993.

(2) Other field crops (OFCs)

OFCs include grain legumes (greengram, cowpea, blackgram and pigeon pea), coarse grains (maize and kurakkan), oil seeds (groundnuts, gingelly and soybean) and condiments (large onion, red onion and chillies). These crops are cultivated by small holdings in general. DOA roughly estimates that about 250,000 farmers are directly involved in the OFCs cultivation. The cultivation is made both in uplands and irrigable paddy lands. DOA also estimates that about 40,000 ha or 10% of the total irrigable paddy lands are diversified with OFCs, and another 40,000 ha is available for the further diversification with OFCs. National averages of crop yield levels are low in OFCs, e.g. about 0.8 ton/ha for greengram, 1.4 ton/ha for maize, 0.5 ton/ha for gingelly, and 10 ton/ha for chillies in 1993.

(3) Horticulture

Sri Lanka's horticulture is dominated by about 35 species of fruits and about 40 species of vegetables produced in approximately 100,000 ha and 90,000 ha respectively distributed across the Country in all agro-ecological zones. Small farm and home garden production predominates with a very small extent of fruits trees managed as small orchards or groves. Floricultural production is a recent development under intensive commercial cultivation for about 500 ha predominantly in the wet zone. Seasonality of production is most evident in

fruits, lesser in vegetables and least in floriculture. DOA estimates that the annual production value of fruits and vegetables is about Rs. 20 billion which is similar to that of paddy. Production of fresh fruits and vegetables is estimated at about 800,000 ton of which about 60% is consumed and 40% is lost through transport and wastage. A small quantity is exported.

(4) Plantation crops

Tea

The total area under tea is about 222,000 ha of which about 100,300 ha or 45% are smallholdings of less than 20 ha. The remaining 121,700 ha or 55% are owned by the state. Sri Lanka's annual production of tea is about 242,000 ton (in 1994). Productivity of tea holdings shows extremes. Government estate plantations, located mostly in the up and mid countries, have much lower productivity than private small holdings in the low country. The public estates' average yield was 1,270 kg/ha in 1991 which was almost half that of private holdings (2,442 kg/ha). Aiming at increase of productivity, 356 public tea estates covering 94,540 ha were handed over to private management companies in 1992. However, these companies are still wholly state owned, and only operational management has been handed to private companies. There have been little improvements in state plantations, because most of the fundamental problems such as low labor productivity, high cost of production and restrictions on marketing still exist.

Rubber

Rubber industry is dominated by private small holders, who produce two-thirds of the crop, the rest coming from state plantations. The total extent registered under rubber in 1993 was 194,900 ha of which 148,900 ha or 76% were under tapping. Since the 1950s, it has steadily lost market share to overseas competitors. Between 1952 and 1972, production increased by 1.8% per annum (from 98,000 to 140,000 tons), compared to world increase of 2.8%, due to reductions in cultivated areas, despite yield increases by 4.5 kg/ha. Rubber yields were 720 kg/ha in private holdings and 828 kg/ha in state estates in 1989. The highest yield of 1,050 kg/ha was recorded by state sector in 1983. This, however, is much lower than yields in competing countries such as Malaysia, Thailand and Indonesia where average yields generally exceed 1,400 kg/ha. Output from government estates fell an average of 2.3% per annum during the 1980-1992 period, compared to about 1.3% per annum in the private holdings. Growing internal demand reduced exports by 46% in 1970-1990.

Coconut

Almost 75% of coconut cultivation is in small holdings. The crop area has declined from 0.48 million ha in 1973 to a little over 0.41 million ha in 1991 due mainly to housing developments. Production has fluctuated widely. The annual average in the past 20 years is 2,345 million nuts. The highest harvest of 3,039 million nuts was achieved in 1986, but since then production has dropped to an almost all time low of 2,184 million nuts. The highest yields in the last ten years were recorded in 1985 and 1986, 7,331 and 7,607 nuts/ha, respectively. The main factors affecting yield are the age of palm trees and fertilizer use. Coconut production in Sri Lanka is driven largely by local demand, and exports are secondary. Internal demand has increased with the growing population. The present annual requirement estimated by the World Bank is 125 million nuts.

(5) Minor export crops

Sri Lanka exports a wide variety of agricultural produce, apart from the major commodities from tree crops such as tea, rubber and coconut. These are so called minor export crops or export agricultural crops, which include coffee, cocoa, cinnamon, pepper, cloves, cardamom, citronella, nutmeg, arcanut and betel. These crops are estimated to occupy a land area of about 67,500 ha, earning Rs. 5,800 million of foreign exchanges. This value of exports is higher than that from rubber and coconut.

(6) Livestock

Livestock are spread throughout all regions of the Country, with concentrations of certain farming systems in particular areas because of agro-climatic, market and/or cultural reasons. The Department of Animal Production and Health (DAPH) estimates that there are around 1.7 million cattle, 0.8 million buffalo, 0.6 million goats, 90,000 pigs, and 9.3 million poultry in the Country. Cattle and buffalo raising is generally distributed throughout all the regions. In the hill and mid-country, cattle keeping is primarily for milk. In the wet zone, cattle and buffalo form an integral part of paddy production by providing draft power and manure, as well as being used for milk production. In the dry zone, these species are regarded as a source of insurance by small holders as they provide a store of wealth and access to cash by way of animal sales and milk.

Goats are found largely in the dry zone and are popular in the north where they are kept for meat. More recently, the rearing of goats for milk purposes has become popular in urban

areas. Pigs are concentrated in the western "pig belt". Broiler production is concentrated around Colombo.

1.1.3 Trade of agricultural products

(1) Imports

According to FAO Trade Yearbook, the total imported value of agricultural, fishery and forestry products in Sri Lanka is about US\$ 634 million as an averaged figure of the 1991-1993 period (Table 1.1). The agricultural products including livestock products account for US\$ 530 million or 83.6% of the total imports of agricultural, fishery and forestry products, followed by fish and fish products (US\$ 52 million or 8.3%) and forest products (US\$ 51 million or 8.1%). Among the agricultural products, commodities showing significant shares in the imports are cereals (US\$ 177 million or 27.9% of the total), sugar and honey (US\$ 107 million or 16.9%), dairy products (US\$ 60 million or 9.5%), and fruits and vegetables (US\$ 54 million or 8.5%). Major commodities which show a tendency to increase imports are fruits/vegetables, tobacco, and fish/fishery products.

(2) Exports

The Sri Lanka's exports of agricultural products are stagnant, although total merchandise trade shows a considerable performance making its value doubled during the 1988-1993 period. The total export value of agricultural, fishery and forestry products is about US\$ 604 million (1991-1993 average) (Table 1.1). The commodities which have comparatively large shares in the exports are coffee/tea/cocoa (60.1%), natural rubber (9.1%), and fruits and vegetables (9.8%). However, the exports of these commodities show a declining trend in the former two commodities and stagnancy in the latter one. Among the exports of agricultural commodities, only tobacco showed comparatively higher increase during the 1988-1994 period.

1.1.4 Present agricultural policies and strategy

(1) Agricultural policies

Major goals of the agricultural sector in the medium term are the following (Public Investment 1995-99):

- 1) to transform the traditional farming sector into the one with high productivity and high returns,
- 2) to improve processing, marketing and other related activities particularly for non-traditional crops,
- 3) to create an exportable surplus of agro-products for diversification of the economy and strengthening of the balance of payments,
- 4) to increase the productivity of the tree crop sub-sector,
- 5) to generate more employment opportunities in rural areas, and
- 6) to stabilize and reduce the cost of living and to provide an adequate diet at affordable prices especially for the poor.

(2) Basic strategy

The strategy to achieve these goals as stipulated by the Government is comprehensive. Basic strategy components are macro-economic policy reform for liberalization and internationalization, devolution, further privatization and competition, and increased farmers participation and organization. Other specific components include the following:

- 1) reorganization of the agricultural research system to make it more responsive to the needs of producers and the market,
- 2) rehabilitation of existing irrigation and other agricultural infrastructure facilities,
- 3) removal of restrictions on the leasing of land in agricultural resettlement schemes,
- 4) rationalization of tree crops, integrated farming, animal husbandry and other related activities, and
- 5) streamlining of rural credit facilities.

1.1.5 Existing agricultural institutions and support facilities

(1) Agricultural research

Crops

Agricultural research for major crops in Sri Lanka is carried out by DOA and the Department of Export Agriculture (DEA) under the Ministry of Agriculture, Lands and Forestry (MALF) which have the responsibility for organized research in food and horticultural crops and in minor export crops. Research on tea, rubber, coconut, and sugarcane is handled independently by the Tea Research Institute (located at Thalawakelle in Nuwara-Eliya

district), Rubber Research Institute (Agalawatta in Kalutara district), Coconut Research Board (Puttalam district), and Sugarcane Research Institute (Ratnapura district), respectively.

DOA was restructured by the end of 1994 with the establishment of three commodity research and development institutes for rice, other field crops (OFCs) and horticultural crops. Although specific crops for research are not yet clearly designated in each responsible station at the field level, major research stations under DOA in Southern Area are as follows.

Rice Research and Development Institute

- Labuduwa branch in Galle district (paddy and horticulture crops research)
- Telijawila branch in Malimbada division in Matara district (paddy breeding)
- Ambalantota sub-station in Hambantota district (paddy and horticulture research)

Field Crop Research and Development Institute

- Anguniakolapelessa research station in Hambantota district (field crops research in dry and intermediate zones)
- Weerawila sub-station in Hambantota division in Hambantota district

Horticultural Crop Research and Development Institute

- Weerapana research station in Pitabeddara division in Matara district (multiplication of high value horticultural crop seeds)

In the South, DOA operates a cinammon research station in Matara district. The Sugarcane Research Institute is located within Southern Area at Uda-Walawe (Ratnapura district). In addition, plantation factories also undertake sugarcane research, mainly on adaptability trials of cane varieties.

Livestock and poultry

The Veterinary Research Division (VRD) of the Department of Animal Production and Health (DAPH) has the sole responsibility for livestock research, although it also maintains facilities for disease diagnosis and vaccine production. The Veterinary Research Institute (VRI) at Gannoruwa is the parent body with several affiliated units. These are the Central Veterinary Investigation Center which is the central diagnostic laboratory for animal disease, Poultry Service Unit, Animal Virus Laboratory at Pologolla and Poultry Breeding Unit at Kundasale. VRD manufactures livestock vaccine in separate units designated for specific vaccines. VRI's research works are mainly on animal production and health and animal/poultry disease investigation.

The National Livestock Development Board (NLDB) is also responsible for livestock development. Main functions of NLDB are (i) development of the livestock industry by the establishment and maintenance of animal breeding stations, (ii) establishment and maintenance of animal husbandry farms, (iii) distribution of quality stock to livestock farmers, (iv) import and supply of livestock requisites such as breeding stock, drugs, feed additives and machinery, and (v) execution of any other business which will be of economic advantage of the Board.

Coordination

Activities of the different organizations involved in agricultural research are coordinated by the Council for Agricultural Research Policy (CARP). Established in 1987, its role in the formulation of national agricultural research policy and planning of national agricultural research programmes has contributed to rationalizing agricultural research and has minimized constraints and costs of uncoordinated programme planning. Membership of CARP includes representatives of institutions carrying out research on perennial crops, annual crops, livestock, forestry and fisheries.

(2) Agricultural extension

There are various institutions responsible for the agricultural extension in the Country. The major institutions established in this sector are:

- Department of Agriculture (DOA) for food and horticultural crops,
- Department of Animal Production and Health (DAPH) for livestock,
- Department of Export Agriculture (DEA) for export agricultural crops,
- Coconut Cultivation Board (CCB),
- Tea Small Holders Development Authority (TSHDA),
- Rubber Development Department,
- Cashew Corporation,
- Silk and Allied Products Development Authority (SAPDA), and
- Mahaweli Authority (MA) in Mahaweli project area including Uda-Walawe reservoir command area.

The Government's new extension policy is to introduce an integrated extension system with the involvement of farming communities from goal setting and planning. Such a system would better ensure financial sustainability of extension services. The system is being implemented under the Second Agricultural Extension Project funded by IDA.

The private sector is also engaged in agricultural extension and related support activities. A common form of private enterprises' engagement is contract farming, through which a package of services are provided including improved seed, fertilizer and qualified extension staff for in-field supervision of farmers. Sugar factories provide a package of extension services mainly for their small holding outgrowers. These include supply of seedlings, farm input with credit, training on farming practices, and marketing services. The Ceylon Tobacco Company has established an effective extension service for tobacco small holders, and the free extension extends also to other crops such as soybean.

Extension services to small holders of tea, rubber, coconut and export agricultural crops are linked to the provision of government subsidies. These subsidies cover new planting, replanting, infillings, and in case of coconut, inter-cropping and under-planting.

(3) Input supply

Seed and planting materials

Historically, paddy seed production has been handled mainly by DOA which produced, at its peak, about 15,000 tons in the mid-1980s. In recent years, however, DOA produces only about 4,000 tons or less than 5% of total gross needs, although about 20% of all paddy seed planted each year should be certified seed to maintain purity. The use of certified seed is therefore far below the optimum level. Private business has been allowed to participate in seed paddy production since 1990, particularly in the production of certified seed from registered seed. However, the rate of growth has been limited and private production of certified seed is unlikely to exceed 1% of total seed in 1994/95. As the main reason for such a slow development, inadequate government seed pricing policies have been pointed out. For vegetable seeds, the market is largely controlled by the private sector through agents and sub-agents in districts, and comparatively well functioning.

Fertilizer

About 95% of the Country's requirements of inorganic fertilizer is presently imported. Fertilizer imports are handled by three public sector organizations, i.e. the Ceylon Fertilizer Corporation (CFC), Janatha Estate Fertilizers (JDF) and Colombo Commercial Company (CCC), as well as private sector organizations. With the increase in private sector participation in the fertilizer trade, fertilizer imports by CFC declined from 39% in 1989 to 29% in 1993. About 54% of the total wholesale fertilizer storage capacity is owned by CFC. In October, 1994, the Government reintroduced the fertilizer subsidy scheme which was removed in 1990. A 30% subsidy was first provided on retail prices for major

fertilizer ingredients such as urea, SA, MOP and TSP; this has been later to apply different rates for fertilizer varieties.

Agro-chemicals

Import and distribution of agro-chemicals are handled entirely by the private sector. The network of retail outlets is well established to cater for farmers' needs effectively.

(4) Agricultural credit

The supply side of Sri Lanka's rural credit market comprises three types of institutions, i.e. formal, semi-formal and informal. Formal sources consist of the two state-owned banks (Bank of Ceylon and People's Bank with 287 and 327 branches, respectively), the Rural Credit Department of the Central Bank, and four private commercial banks (the Commercial Bank of Ceylon, the Hatton National Bank, Sampath Bank and Ceylon Bank). The total loan amount is about Rs. 10 billion annually, about 12% of which goes to agriculture for both plantation and non plantation crops, livestock and fisheries. Semi-formal sources include two government controlled institutions, 17 Rural Regional Development Banks and Cooperative Rural Banks, and some 150 independent NGO's who engage in financial intermediation to varying degrees. Informal sources of credit are mostly village based and quite amorphous. They include full-time and part-time money lenders, traders and family lenders. Crop production loans from the banking sector are provided by formal sources, primarily from the Bank of Ceylon and Peoples Bank. On-going major rural credit schemes are outlined below. Interest rates of these schemes are concessional rate of 16% per annum, as compared with prevailing market rates of around 24% per annum.

New Comprehensive Rural Credit Scheme (NCRCS)

The Government introduced in 1986 a cultivation loan scheme called the New Comprehensive Rural Credit Scheme (NCRCS). Guarantee of 75% recovery of loans and interest subsidy by the Central Bank led to many defaulters, and the Government suspended the scheme. Commercial banks have continued the loan scheme without the recovery guarantee. The scheme covers paddy, potato, chilli, red onion, soybean, greengram, cowpea, groundnut, blackgram, maize and pole bean.

Agricultural Trust Fund

The Agricultural Trust Fund, initiated in Maha 1990/91, caters to credit needs of small owner-cultivators with less than 1 ha of land. At present, disbursements are limited to the

provision of seed and fertilizer in kind for the cultivation of paddy and other crops under rainfed conditions or minor irrigation schemes.

Perennial crops credit scheme

The Perennial Crop Development Project under MALF has recently extended their credit facilities to the Uda-Walawe project area. The horticultural crops covered by this scheme are banana, passion fruit, cashew, citrus, pineapple and mango. It also provides loans up to Rs. 5 million for processing of horticultural produce.

(5) Support services for livestock

DAPH provides extension and training services to livestock farmers. Breeding stock improvement, disease control and other aspects are covered by DAPH programs with its outreach facilities down to the grassroots level. Veterinary services are organized nationwide with a hierarchical system. Each province has a local veterinary service center with small stations operating at the district level. The artificial insemination program operated from the Central Artificial Insemination Center near Kandy has limited impact as it suffers from shortages of skilled technicians, limited budget, and constraints on transport and communication.

There are 22 chick hatcheries throughout the Country supplying day-old chicks to poultry farmers. In Southern Area, these hybrid chicks are available through feed dealers or middlemen.

The feed industry, particularly the poultry feed sector, has been expanding rapidly after it was vested to the private sector in 1991. Sri Lanka imports several feed ingredients. Frequent price fluctuations of the imported gradients cause unstable and high feed prices.

(6) Farmer's organizations

Under the Agrarian Services Act no. 4 of 1991 (Amendment), farmers' organizations (FOs) have become legal entities with a properly constituted mandate. FOs are now empowered to undertake a wide range of activities. They include (i) area-wide planning, (ii) village level construction, repair and maintenance of minor irrigation works, (iii) distribution of agricultural input, (iv) cooperation with relevant institutions, and (v) implementation of related projects subject to a prior approval by the Commissioner of Agrarian Services.

Amendments to the Irrigation Ordinance have facilitated functioning of FOs. They empower FOs to collect operation and maintenance fees from beneficiaries of irrigation schemes and also to define legal powers of the Project Management Committees for the management of major schemes. FOs are expected to take responsibilities for operation and maintenance of tertiary systems in major irrigation schemes and entire systems of minor schemes.

(7) Marketing

Marketing organizations

Market outlets for agricultural products are provided by "pola", cooperatives, processing factories and others. The pola is a place where farmers, traders and consumers gather on one or two scheduled days every week to trade locally grown fruits, vegetables and other products. All major polas are owned by relevant Provincial Councils and come under the direct supervision of their local bodies.

The Cooperative Wholesale Establishment (CWE) handles both buying and selling of agricultural products, operating seasonal buying centers in selected locations. In addition, cooperative networks are operational including the Cooperative Marketing Federation at the apex, multi-purpose cooperative societies (MPCSs) at the electoral level and primary societies at the village level. Milk producer cooperative societies organized under the state-owned Milk Industries Lanka Company collect milk through collecting points established in rural areas.

Marketing channels

Local collectors, millers and wholesalers are the principal buyers of paddy in production areas. Purchase of paddy by the Paddy Marketing Board (PMB) has declined during the past decade, and in 1993, its purchases accounted for less than 2% of the national production. MPCSs also purchase paddy through their primaries for processing at own mills and the rice is channelled to consumers through primaries in non-producing areas.

The marketing channels of tea, rubber and export agricultural crops are well established. The products eventually find their way to Colombo auctions for sale through brokers on behalf of large scale suppliers.

A typical system for milk marketing involves a group of farmers organizing a central collection center to deliver their milk either directly or through an agent or a middleman.

The milk, bulked into 40 litre cans, is delivered to a chilling center and transported in insulated trucks to processing facilities at Kandy and Nuwara Eliya.

Sales of livestock and its products are usually through a middleman who is either a licensed livestock trader or a butchery owner. In Southern Area, every district except Moneragala has a public slaughterhouse for cattle and goats. However, a high percentage of livestock is slaughtered in unregistered small backyard facilities.

1.2 Existing Conditions of Agriculture in Southern Area

1.2.1 Agro-ecological zones

Southern Area has all the three climatic zones: the wet (W), intermediate (I), and dry (D) zones (Figure 1.1). Differentiation in the wet zone into agro-ecological regions is governed primarily by rainfall and elevation: the up-country (U) above 900 m, mid-country (M) between 300 and 900 m, and low-country (L) below 300 m. In the dry zone, the nature of soil largely determines the identity of each agro-ecological region.

The wet zone covers the western part of Southern Area, approximately one third of the Area. Administratively, Galle and Matara districts come under this zone. The wet zone is further divided into five agro-ecological regions, i.e. WU1, WM1, WL1, WL2 and WL4 from the north to the south. In the northern part of the wet zone, annual rainfall exceeds 3,000 mm in WU1, while it is about 2,000 mm in the coastal area under WL4.

The intermediate zone occupies comparatively small area covering the central part and northern part of Southern Area. Administratively, the western part of Hambantota district, the southern part of Ratnapura district and the north-western part of Moneragala district belong to this zone. In the intermediate zone, there are six agro-ecological regions in Southern Area, i.e. IM2, IL1, IL2, IL1&IL2, and IL1&IL3. The intermediate zone receives a mean annual rainfall between 2,500 mm to 1,750 mm with or without rain shadow effect.

The dry zone extends over the eastern part of Southern Area occupying about two third of the Area, covering the eastern part of Hambantota district and southern part of Moneragala and Ampara districts. The agro-ecological regions in the dry zone are DL1, DL2 and DL5. The dry zone receives a mean annual rainfall of less than 1,750 mm with a pronounced dry season. The dry zone receives the major rainfall during the northeast monsoon period (Maha

season). In the DL2 region, the Maha rains extend into January which is as wet as December. Within the dry zone, a bimodal pattern of rainfall distribution is seen as in the intermediate zone, but the dry season is long and more prominent. The rainfall pattern in this region indicates a long Maha crop than a Yala crop. During the Yala season, rainfall alone would not satisfy the crop water requirement within the dry zone. In all the zones, annual precipitation varies widely year by year; in Hambantota, for instance, it varied between 603 mm (in 1992) and 1,284 mm (in 1991) according to the records during 1982-93.

1.2.2 Present land use

Present land use has been analyzed using a geographical information system (GIS) (Table 1.2 and Figure 1.2). The total agricultural land in Southern Area, including forest area, is 1,045,000 ha or 95% of the total land area. The forest land occupies the largest area accounting for 30% of the total land area, followed by sparsely used and other crop lands (26%), homesteads (15%), paddy lands (10%), tree and other perennial crop lands (9%), and scrub and grass lands (6%). According to the GIS information, the intensively cultivated crop lands including homesteads are estimated at about 369,000 ha or 34% of the total land area.

In the wet zone (Galle and Matara districts), homesteads and tree crops occupy more than 50% of the total land area. In the dry and intermediate zones (other Southern Area districts), however, these lands occupy only about 10% of the total land area. Proportion of sparsely used lands and scrub and grass lands is comparatively large in the dry and intermediate zones, which indicates a considerable land development potential in the dry and intermediate zones.

1.2.3 Land tenure and holdings

The land tenure system in Sri Lanka is complicated as characterized by the following.

- 1) Land ownership is not clear in wet zone regions developed earlier;
- 2) Five different laws govern land tenure and inheritance;
- 3) Encroachment is common in irrigation systems, and illegal chena (shifting cultivation) is widely practiced;
- 4) In traditional crop cultivation systems, called "tattumaru" and "kattimaru," land is treated as a common property of a certain group of small holdings; and

- 5) In major irrigation systems newly developed, the Government is usually the land owner and settlers only with cultivation rights cannot sell land or use it as a collateral.

There are two different land holding systems in Southern Area, i.e. small holdings and estate. According to the Census of Agriculture 1982, about 20% to 40% of agricultural land in the wet zone districts are occupied by the estate sector, i.e. 26% in Galle and 22% in Matara. The number of estate holdings, however, accounts for less than 1% of the total holdings. In the dry and intermediate zones, the percentage of lands belonging to the estate sector is comparatively small at about 9% in Hambantota, 15% in Moneragala and 14% in Ampara. The average holding size is smaller in the wet zone and larger in the dry and intermediate zones both in the small holdings and the estate sectors. In the small holdings sector in the wet zone, the average holding size is 0.6 ha in Galle, and 0.65 ha in Matara, while that in the dry and intermediate zones is 0.99 ha in Hambantota, 1.36 ha in Moneragala, 0.78 ha in Ratnapura and 0.91 ha in Ampara. The average holding size of small holdings sector is smaller than that of national average of 0.8 ha in Galle and Matara districts (Tables 1.3 through 1.5).

Other characteristics on land holding and land tenure prevailing in Southern Area according to the Census of Agriculture 1982 are summarized as follows.

- 1) The number of landless farmers categorised as "not owning any land" is considerably large in Hambantota (22% of the total small holdings), Ratnapura (18% of the same) and Moneragala districts (15% of the same). They are probably chena cultivators or encroachers.
- 2) In all the districts related to Southern Area, about 40% to 45% small holdings own only home gardens, except for Hambantota district where the percentage is 30%.
- 3) The majority of small holdings are crop farmers accounting for more than 80% of the total small holdings: 87% in Galle, 85% in Ratnapura, 80% in Matara and Hambantota.
- 4) The number of livestock small holdings who do not cultivate any crops is considerably small in all the districts related to Southern Area ranging from 0.8% to 1.7% of the total small holdings, except for Ampara (7.9% of the total small holdings).
- 5) In the wet zone, about 75% to 80% of the paddy land small holdings cultivate paddy in small land sizes of 0.1 to 0.8 ha,
- 6) Average holding size of paddy land in small holdings is small in the wet zone, 0.45 ha in Galle and Matara districts. In the dry zone, that is 0.89 ha in the

Hambantota, 0.62 ha in Moneragala and 1.30 ha in Ampara.

- 7) Average holding size of tea small holdings is about 1.1 ha in Galle, Matara and Ratnapura districts.

The land holding characteristics mentioned above are presented in Table 1.6, prepared based on the Census of Agriculture 1982. It is considered that these conditions had changed considerably in Southern Area after the 1982 census. Most probably, the average land sizes of small holdings have become smaller due to fragmentation through generation changes.

1.2.4 Crop production

(1) General

Agricultural production data on food crops, plantation crops and livestock for the 1992/93 crop season are compiled for 50 divisions in Southern Area based on data from the Department of Census and Statistics (DCS). These divisional level data are summed up for each district as shown in Tables 1.7 and 1.8. According to the tables, the production of major crops in Southern Area as percentages of the national total production is summarized as follows.

Contribution of Major Crops Production in Southern Area to National Production

Crop	Production %	Crop	Production %
Kurakkan (millet)	30	Groundnut	29
Green gram	46	Low country vege.	28
Cawpea	25	Sugar cane	50
Sweet potatoes	22	Tea	33
Gingerly	23	Cinnamon	84

Note: 1992/93 crop season

The production share of the crops listed above all exceed the percentage of Southern Area population in the national population (about 15%). Since agricultural production systems are completely different between the dry and wet zones in Southern Area, the production share of these crops in each agro-ecological zone is considered to be more remarkable. Agricultural products which contribute significantly to the regional economy are rubber in

Galle district, paddy and buffalo milk in Hambantota district, and low country vegetables in Hambantota, Moneragala and Ratnapura districts.

(2) Paddy

The production of paddy in Southern Area accounts for 12.5% of the total national production in the 1992/93 crop year. The production increase during 1989-1993 period is 2.7% per annum, lower than the national average of 3.5%. The average yield in Southern Area is 3.6 tons/ha in Maha and 3.1 tons/ha in Yala season. The yield in Maha is slightly higher than the national average (3.5 ton/ha), but that in Yala is lower than the national average (3.1 ton/ha). Paddy yields are considerably lower in the wet zone than in the dry zone. Maha and Yala yields in Galle district are 2.67 ton/ha and 1.89 ton/ha, respectively. These yield levels are only 55% and 39% of those in Hambantota district.

(3) OFCs

A range of grain legumes, cereals and root crops as well as chilli and onion are cultivated in Southern Area. Production of grain legumes (greengram, cowpea, groundnut and soybean), gingelly, maize, chilli and onion are largely confined in the dry to intermediate zones of Hambantota and Moneragala districts. Yields of most OFCs are higher in Southern Area than the national average, but their production has not been increasing.

(4) Vegetables

The intermediate to dry zones in Southern Area produce low-country vegetables consisting of bean, tomato, gourds, okra and pumpkins. Up-country vegetables produced in Southern Area are minimal. Southern Area produces 28% of national production of low-country vegetables with considerably higher yields.

(5) Sugarcane

Moneragala district has emerged as the major sugarcane growing area in Sri Lanka. The total cane production of 790,000 tons in Southern Area is mainly from two plantations located at Sevenagala and Pelawatta. Moneragala district within Southern Area alone produces about 50% of the national sugarcane production. The average yield is about 60 tons/ha. The Sevenagala Sugar Company (SSC) is government-owned and operated. The Pelawatta Sugar company (PSC) has both private and public investment holdings,

though its operation is wholly private. Sugarcane for PSC is produced through three production systems, i.e company's direct operation of a nucleus estate, settlers who rent the land from the Sri Lanka Sugar Corporation, and registered outgrowers. Cane production within the settlement areas is carried out on a contract basis. Each settler cultivates 1.75 ha of cane, and an additional 0.25 ha of home garden.

(6) Tobacco

Rainfed tobacco is cultivated mainly in Moneragala district by small holdings under contract agreements with a private tobacco company. The tobacco produced in Southern Area has a share of 15% in the national production. The yields of 0.53-0.85 tons/ha are low as compared with the national average (0.98-1.22 ton/ha).

(7) Plantation crops

Plantation crops consisting of tea, rubber and coconut are grown mostly in the wet zone by both the estate sector and the small holdings sector. The small holdings sector constitutes a significant component contributing to the national production.

Tea

The production of tea in Southern Area accounts for about 33% of the national production. Tea is classified into high, mid and low grown teas according to the elevation at which it is produced. Southern Area produces only low grown tea, contributing to 74,100 tons or 70% of the national production of this type of tea. The national level data show the average yield of low grown tea is 1.7 ton/ha, which is three times higher than mid grown tea and 1.8 times higher than high grown tea. Exports are expanding particularly for low grown tea.

Rubber

Annual production of rubber in Southern Area is estimated at 11,810 tons or 11% of the national production. Galle and Matara districts produce about 94% of the production in Southern Area. The productivity of the rubber small holdings tended to decline over recent years due to senility of the trees and reduction in fertilizer use.

Coconut

Coconut produced in Southern Area is about 350,000 nuts or 13% of the national production. Coconut lands in Southern Area are largely held by small holders growing it as a mixed

garden crop. The majority of products are consumed locally. Average yield of coconut in Southern Area is estimated at 6,300 nuts/ha.

(8) Export agricultural crops

Export agricultural crops or minor export crops comprising spice, condiment and beverage crops are generally grown in small holdings mostly as mixed garden crops. Cinnamon is the most commonly cultivated in Southern Area, and about 75% of the national production come from Galle and Matara districts. Although reliable data are not available, citronella is widely cultivated in the intermediate zone of Southern Area. The crop is cultivated extensively on hill slopes, by private individuals, and the processing of citronella oil assumes importance.

(9) Other crops

Many kinds of fruits are produced in Southern Area. These include banana, mango, papaya, citrus, wood apple and pine apple. In addition, cashew is expanding its area mainly in the dry zone. For these crops, however, reliable data on area extent and production are not available for each division. According to the district level data, as an average of the six related districts, production increase during the 1989-1993 period was realized by mango (11.3% p.a.), orange (2.3% p.a.) and cashew (21.0% p.a.).

1.2.5 Irrigation

(1) Existing facilities

In Southern Area, there are 1,957 irrigation schemes covering a total area of 76,500 ha, consisting of 43,100 ha anicut systems and 33,400 ha tank systems according to the irrigation scheme inventory obtained from the Southern Province Development Project (Water Resources Inventory for Southern Area of Sri Lanka) (Table 1.9). In the wet zone, anicuts are commonly used to regulate and divert water. In the dry zone, water storage tanks are built to collect water to supplement limited rain water.

In addition, there are 13 flood protection schemes and three salt water exclusion schemes in Southern Area. The total command area under flood protection schemes in the wet zone is 12,900 ha. Salt exclusion schemes cover a total paddy area of 7,340 ha.

Four main government agencies are involved in the irrigation sector. The Irrigation Department is responsible for major (over 400 ha) and medium (80-400 ha) schemes, and the Department of Agrarian Service (DAS) for minor schemes (under 80 ha). Provincial Councils are now in the process of taking over the control of irrigation schemes from DAS. The Mahaweli Authority manages major irrigation schemes of Uda Walawe.

(2) Operation and management (O&M)

The O&M performance of existing schemes in Southern Area has been poor especially in minor schemes. Maintenance work is not carried out regularly causing deterioration of facilities and wastage of water resulting in loss of production. In principle, O&M is expected to be done by beneficial farmers. However, maintenance is rarely done due to poor farmer participation and insufficient budget allocations resulting in malfunction of the facilities. Poor operation of systems often result in wastage at the head of canals and shortage at tail ends.

(3) Cropping intensities

The main crop under irrigated agriculture system is paddy. Cropping intensity varies depending on water availability in individual schemes. Assuming that only paddy is cultivated in the irrigation schemes, average cropping intensity is estimated for each district as shown in the tabel below (1991-1993 average).

Cropping Intensity in Southern Area and Sri Lanka

	Major Scheme	Minor Scheme	Rainfed	Total
Galle	-	179	173	173
Matara	177	184	178	179
Hambantota	164	136	140	159
Moneragala	135	120	102	123
Ratnapura	166	192	176	184
Ampara	197	200	100	191
Sri Lanka	165	142	157	157

Note: 1) The figures in the table show the intensity in the harvested area.

2) In the table, the major schemes are classified as these with larger than 80 ha, and the minor schemes smaller than 80 ha.

Source: Statistical Abstract, 1994, DCS

The average cropping intensity by district varies between 135% in Moneragala and 197% in Ampara for major irrigation schemes, and between 120% in Moneragala and 200% in Ampara for minor schemes. In general, the cropping intensity in the dry zone is lower than that in the wet zone both in the major and minor schemes due to less water availability. In the dry zone, field crops are grown in Yala season instead of paddy under irrigation. This is another factor contributing to lower cropping intensities in the dry zone.

(3) Planned and on-going projects

A large number of irrigation schemes in Southern Area are in the process of rehabilitation under different projects. These projects are the National Irrigation Rehabilitation Project (NIRP), the Southern Province Regional Development Project, and the Moneragala Irrigation and Community Development Project. The IRDPs in Matara and Hambantota also cover rehabilitation of some irrigation schemes. Rehabilitation of some minor schemes is covered by the National Trust Fund.

A feasibility study for three priority irrigation schemes (Liyangastota, Muruthawela Reservoir, and Badagiriya schemes) with about 11,000 ha rehabilitation area is nearly completed by JICA and proposed for its implementation. The Walawe Left Bank Irrigation Upgrading and Extension Project is at detailed design stage and expected to rehabilitate 2,900 ha of existing irrigation facilities and expand 6,400 ha of new irrigation area.

There exist several project proposals for water resources development involving irrigation in Southern Area. In-basin development is planned for Nilwara Ganga and Gin Ganga. Inter-basin water transfer schemes proposed include the diversion of Mau Ara to Malala Oya, the Menik Ganga diversion, the Uma Oya diversion to Kirindi Oya, the Weli Oya project to divert water from Walawe to Monaragala district, and the three basin project to divert water from the wet zone to the dry zone. New irrigation development for 2,400 ha is planned in Moneragala within Southern Area through restoration of 20 tanks. The Lahugala tank augmentation project is planned to increase cropping intensity of existing 1,200 ha land.

The major planned and on-going projects for rehabilitation, in-basin new development and river diversion are listed in Tables 1.10 through 1.12.

1.2.6 Livestock

Cattle and buffalo are the most important livestock in Southern Area particularly in the dry zone. Hambantota district alone has 93,300 heads of cattle or 5.4% of the national cattle population, and 95,900 buffaloes or 11.5% of the national buffaloes (Table 1.13). According to the Census of Agriculture 1982, small holdings in Hambantota raise on an average 9.8 heads of livestock (cattle and buffaloes), which is more than double the national average of 4.6 heads.

Cow milk and buffalo milk produced in Southern Area account for 9% and 22% respectively of the national production (Table 1.14). Slaughtering of cattle and buffalo is somewhat constrained by the socio-cultural and dietary habits as well as government regulations. There is no organized beef cattle farming system in Southern Area, and beef for consumption is obtained predominantly from surplus male stock in herds and culled stud bulls.

Land availability for livestock grazing has been reduced in Southern Area. This is due to increased population density, increased area under settlements, extension of chena in formerly uncultivated areas, and increase of area under paddy with higher cropping intensities under irrigation particularly after the Kirindi Oya Irrigation and Settlement Project (KOISP).

Poultry for both meat and egg production is becoming increasingly important in Southern Area. The number of chickens in Southern Area accounts for 12% of the national total, but it increased at 3.5% per annum in the six constituent districts during 1989-1993. Egg production increased at 4.9% per annum during 1989-1993, higher than the national average of 3.5% per annum. The poultry sector is undertaken mainly by the private sector managing large scale farms both for meat and eggs. To support the expanding poultry industry, large quantities of feed ingredients are imported such as maize, soybean and fish meal.

1.2.7 Value-added from agriculture sector in 1995

(1) Value-added from crops

Estimate of crop cultivation areas

Crop cultivation areas for paddy and perennial crops are estimated based on GIS information on land use for 1995 (Table 1.2). Some adjustments for crop areas is made by applying

another land use data from secondary sources as shown in Table 1.15. For other crops such as OFCs, banana, cashew, 1991-93 average or 1993 figures from secondary sources (DCS) are directly used as 1995 land use figures.

Estimate of crop yields

For crop yields, 1991-93 average or 1993 figures from secondary sources (DCS) are assumed as 1995 yields.

Estimate of production cost and labor requirement

Crop production cost and labor requirement are estimated based on data from DOA for most crops. Field information obtained from extension officers is also used mainly for plantation and minor export crops. For some crops, for which no reliable data are available, these figures are estimated by the JICA Study Team mainly for OFCs.

Estimate of crop budgets

Budget for each crop is prepared using the above estimated figures and price information obtained from statistics (Price and Wage Statistics, 1992/93) and extension officers of the relevant supporting agencies. The 1992/93 prices in the statistics are adjusted as 1995 prices by applying a GDP deflator (10% per annum). Estimated crop budgets for major crops are presented in Tables 1.16.

Value-added from crops in 1995

The value-added from crops in 1995 in Southern Area is then estimated at Rs. 12,468 million (of which 47% from the wet zone and 53% from the dry and intermediate zones) as shown in Table 1.17.

(2) Value-added from livestock

Estimate of livestock production

Livestock production is estimated based on data from DCS as shown in Table 1.14. It is assumed that 1993 production is the same as 1995 production.

Estimate of production cost

Since reliable data on production costs are not available, all the costs including labor costs are estimated based on field information collected by the JICA Study Team. Price information is obtained both from statistics (Price and Wage Statistics, 1992/93) and

livestock development instructors in the field. In the case of statistics, 1992/93 prices are adjusted to 1995 prices by applying the GDP deflator mentioned above.

Value-added from livestock in 1995

The value-added from livestock in 1995 in Southern Area is then estimated at Rs. 603 million (of which 43% from the wet zone and 57% from the dry and intermediate zones) as shown in Table 1.18.

(3) Value-added from agricultural sector in 1995

The above estimates show that the value-added from crop agriculture and livestock in 1995 is about Rs. 13,071 million. This value is about 67% of the estimated agricultural gross regional domestic products (GRDP) in Southern Area (Rs. 19,552 million as 1995 prices or Rs. 4,658 million as 1982 constant prices). The balance of Rs. 6,481 million or 33% of the agricultural GRDP is considered to be a value-added from fishery and forestry subsectors or other values which are not evaluated in the estimate, e.g. values from some other crops not involved in the estimate, or most probably some errors encountered in the estimate and assumptions. The agricultural value-added including fishery, forestry and others are summarized as follows.

Agricultural Value-Added in Southern Area and Sri Lanka

	Southern Area 1995 Value-added		Sri Lanka 1991 GDP ^{a/}	
	(Rs. MIL)	(%)	(Rs. MIL)	(%)
Paddy	2,938	15.0	20,949	17.4
Plantation crops	3,329	17.0	24,819	20.6
Minor export crops	1,969	10.1	4,132	3.4
Other crops	4,232	21.6	44,335	36.8
Livestock	603	3.1	6,811	5.6
Fishery/forestry /others	6,481	33.2	19,534	16.2
Total	19,552	100.0	120,580	100.0

^{a/}; adjusted as 1995 value

As a characteristic of Southern Area, the share of value-added from minor export crops is considerably large, and that from livestock and other crops are small in the GRDP comparing to those in the GDP.

CHAPTER 2 CONSTRAINTS AND POTENTIALS

2.1 Constraints to Agricultural Development

Based on the assessment made in Chapter 1 on the present agriculture, constraints to agricultural development are evaluated as follows.

(1) Water maldistribution

The most fundamental constraint facing Southern Area, particularly its agricultural sector, is the maldistribution of water resources both geographically and seasonally. The wet zone suffers from flooding and other problems related to excess water particularly in downstream areas of major rivers. In the dry zone, rainfall is scarce and unreliable, and the total annual precipitation varies considerably year by year. To rectify the situation, various trans-basin water diversion schemes have been proposed. Most of them involve the construction of large dams and a long water conveyance system. Viability of these schemes has been disputed not only from economic and technical points of view but also from the viewpoints of environmental effects and social implications.

An associated problem is the salt water intrusion in coastal areas in the wet zone and also limited areas in Hambantota. The saline intrusion into rivers and on coastal lands has caused considerable damages to paddy fields, and affected the intake of domestic water supply.

A solution to problems of water maldistribution may create new problems. Some trans-basin water diversion schemes may inundate large areas of productive land. Another typical case is the problem of acid sulphate soil in the Nilwara Ganga downstreams caused by over-drainage of marshy paddy land.

(2) Soil erosion and degradation

Soil erosion and land degradation have become severe constraints to the plantation sector particularly in the northern part of Galle and Matara. This is due largely to the lack of knowledge on basic soil conservation techniques and measures such as construction of bunds and provision of drainage facilities. Baring land in tea plantations is another reason for soil erosion. Increase in chena cultivation practiced illegally in forest areas is also reported as a cause of soil erosion. In the dry zone, maintaining vegetation cover on land is more difficult. Intense rainfalls after an extended dry period cause severe erosion.

High soil acidity due mainly to acid sulphate soil in some parts of the Nilwara basin causes iron and aluminum toxicity and phosphorus deficiency. Soil salinization is another form of land degradation in coastal areas and inland lowlands.

(3) Land constraints

Agricultural land in the wet zone has been almost fully occupied. Land availability may even be decreasing due to urbanization, coastal erosion and saline intrusion, soil erosion and related factors.

Land tenure situations constitute another major constraint to increasing agricultural productivity. Unclear or unestablished land titles and ownership discourage farmers to make investments on lands they cultivate. Also, poor maintenance of irrigation systems due to unclear land titles is reported.

Land fragmentation in small holdings is another constraint. In 1982, the average size of paddy fields of small holding was only 0.45 ha in Galle and Matara districts. Farm incomes from small size farms are now becoming small, and farmers need to get off-farm incomes.

(4) Marketing constraints

Markets are not well established for various field crops, and prices fluctuate considerably both seasonally and annually particularly for minor export crops and field crops including vegetables. These are constraints to crop diversification. Farmers continue to cultivate paddy dominantly despite its low profitability.

Poor condition of rural roads in Southern Area poses another constraint to marketing agricultural products. It makes transportation costs higher particularly in the Maha season. Production losses are also high for fresh products such as green leaves of tea, banana and vegetables.

Poorly managed post-harvest handling, storage and processing of produce both by farmers and traders increase harvest losses. Packaging practices for marketing of agricultural produce are poor, and this also increases losses. DOA estimates that 20-40% of local agricultural produce are losses due to post-harvest wastage.

(5) Constraints to livestock development

The traditional production system is a major constraint that hinders better utilization of farm animals. Farmers keep growing numbers of animals, but pay little attention to the condition of animals and their productivity. Feed shortages coupled with imbalanced ratios of feed ingredients have led to low reproduction and high mortality rates.

Increasing conflicts with crop cultivation constitute another major constraint for livestock farmers especially in Hambantota, where grazing lands are decreasing due to settlements. Many farmers keep livestock, but allow them to graze freely, resulting in crop damages. In the dry zone, use of crop residues and by-products for feeding is not a common practice, although those are available to a certain extent in and around the livestock regions.

The ban on slaughtering of female cattle and buffalo (unless certified unproductive) is ineffective and contributes to the development of an illegal, unlicensed and unsupervised slaughtering. Animal prices always become lower for small holders particularly in the dry zone where supply of animal exceeds the demand in general.

(6) Institutional constraints

Agricultural research facilities are relatively well arranged in Southern Area, but most of them suffer from shortages of research officers. Research works for rainfed agriculture are limited compared to those for irrigated agriculture. The Angunakolapelessa research station responsible for research on dry zone agricultural development covers only a few fruit crops, in spite of their higher production potential both for domestic and international markets.

Agricultural instructors (or field extension workers) are well distributed among districts in Southern Area except Ampara, but their activities are constrained by inadequate transportation and other facilities. Most villages covered by the Participatory Social Survey reported that they receive almost no agricultural extension services.

Credit allocated to the agricultural sector is only 8.5% of the total lending, and dominant portions are directed to the public sector and to marketing and processing activities. Credit availability from formal sources is particularly limited for small holders. Also reported as constraints are high interest rates derived from high administrative costs of financial institutions, delay in lending process which prevents timely use of farm input, and less attention paid to loan repayment by both lenders and borrowers.

At present, no irrigation fee is collected from farmers even for operation and maintenance of irrigation systems. This results in low irrigation efficiencies and undermines the sustainability of any irrigation system relying on limited government supports. Present government policy is to charge farmers' organizations for the operation and maintenance at the tertiary level. This may encourage crop diversification in existing paddy fields, but structured supports in this direction are still largely lacking.

One area where such supports has been particularly lacking is irrigation technology. Conventional designs adapted by the Irrigation Development for water delivery do not meet actual needs at the farm level for new farming practices for various crops under irrigation. What is needed is a system to allow flexible water management capabilities at low O & M costs with high water use efficiency.

Production systems in Southern Area suffer from lack of varieties for paddy, vegetables and other field crops suited to local conditions and insufficient planting materials. Profitability of crop cultivation has been undermined by high costs of input such as fertilizer and pesticides as well as low yields.

2.2 Potential for Agricultural Development

2.2.1 Land resources development potential

(1) General

According to the GIS information, about 263,400 ha of lands in gross are available for new development. The net availability of new lands is then estimated at 194,000 ha assuming that 65% of gross prime lowlands and 75% of gross prime and marginal uplands have a potential for agricultural use. These estimates are presented in Table 2.1 and summarized below.

New Land Development Potential in Southern Area

Land Use Category	Wet Zone		Dry & Intermediate		Total	
	(ha)	(%)	(ha)	(%)	(ha)	(%)
Gross Area						
1. Prime lowlands (3b)	1,541	(5.1)	34,746	(14.9)	36,287	(13.8)
2. Prime uplands (4b)	0	(0.0)	157,885	(67.7)	157,885	(59.9)
7. Marginal uplands (5b)	28,794	(94.9)	40,467	(17.4)	69,261	(26.3)
Total	30,335	(100.0)	233,098	(100.0)	263,433	(100.0)
Net Area <i>a/</i>						
1. Prime lowlands (3b)	1,002	(4.4)	22,585	(13.2)	23,587	(12.2)
2. Prime uplands (4b)	0	(0.0)	118,414	(69.1)	118,414	(61.1)
7. Marginal uplands (5b)	21,596	(95.6)	30,350	(17.7)	51,946	(26.8)
Total	22,597	(100.0)	171,349	(100.0)	193,946	(100.0)

Source: GIS information, JICA Study Team

The distribution of these lands by agro-ecological region is also clarified based on the GIS information as shown in Table 2.2.

(2) Wet zone

New lands for agricultural use are limited in the wet zone (Galle and Matara districts). Availability of prime lowlands and uplands is negligible and there are only about 1,000 ha scattered over the wet zone districts. Although about 22,000 ha of marginal lands are available, majority of these lands are hilly and steep and located at the upper river basins of Gin, Nilwala and Walawe Ganga. It is therefore evaluated that the agricultural development in these lands would be infeasible economically and environmentally. Reforestation measures would be needed for these lands under on-going and planned watershed management programs.

(3) Dry and intermediate zones

Availability of new potential lands is considerable in the dry and intermediate zones: 22,000 ha of prime lowlands and 118,000 ha of prime uplands. In most of these lands, however, agricultural development would be difficult without supply of irrigation water, particularly for the lands belonging to DL5 agro-ecological region (about 17,000 ha in net, mostly in Hambantota district). In these lands, potential for rainfed agriculture development is low and risky even for tree crops, because droughts occur frequently in this region. To develop these lands with rainfed agriculture, a prerequisite would be a supply of domestic water which should firstly be undertaken for the development. The lands having less potential for domestic water supply would also have less potential for agricultural development. In the production system to be introduced, crop cultivation

would be combined with livestock raising to reduce a risk from droughts. Provision of access to off-farm income sources would be another option for the development.

In the lands belonging to other agro-ecological regions (DL2 and DL1), agricultural development potential is basically the same with that in DL5, and stable production would be difficult without irrigation water supply. In these lands, however, rainfed agriculture would be more promising, particularly in the lands available along borders with the intermediate zone which occupies about one-thirds of DL1 lands in Moneragala district (about 35,000 ha in net). In the similar lands, rainfed sugarcane is now under cultivation, obtaining considerably higher yields. A production system having a higher potential for the development would be an integrated farming system in which tree crops, field crops and livestock are combined. Expansion of sugarcane or other crops with an outgrower system would be another option. However, less availability of domestic water would also restrict the agricultural development in these lands.

Rainfed agriculture would be more reliable in the potential lands in the intermediate zone (22,000 ha in net, mostly in Moneragala district). These lands would have higher potential for rainfed agriculture with a wide range of crops including fruits, cashew, vegetables, sugarcane and minor export crops. For annual crops, however, irrigation water supply would be required during the Yala season. Availability of domestic water would also be a primary factor for the agricultural development, even in the intermediate zone.

The marginal uplands available for about 30,000 ha would have less potential for agricultural development due to their inferior soil and topographic conditions. These lands belonging to the intermediate zone would require certain measures for land conservation, and those in the dry zone would need vegetation recovery. Some of these lands, however, would have potential for grass lands development for livestock grazing.

2.2.2 Water resources development potential

The water balance study made for all river basins in Southern Area clarified the potential for future irrigation development. In sum, new water resources to be exploited would meet the following requirements:

- 1) current shortages in existing irrigation schemes,
- 2) requirements in the planned projects, i.e. Walawe Left Bank and Kirindi Oya Left Bank Extension, and

- 3) full development of prime lowlands which have potential for irrigation development.

The future cropping intensity would be nearly 200% in the existing irrigation schemes with an additional supply of water and diversified cropping patterns (subsection 2.3.1). Irrigated agriculture would be expanded in the newly available prime lowlands for about 22,500 ha (net harvested area) with also nearly 200% cropping intensity. For irrigation development in the prime uplands, however, exploitable water resources would not meet the requirements.

2.2.3 Potential for increasing cropping intensity

There is a potential to increase cropping intensity in existing irrigation schemes through rehabilitation works and introduction of proper O&M practices. If all the proposed rehabilitation projects are implemented, about 20,000 ha of annual harvested areas would be obtained as shown in Table 1.10. Introduction of proper O&M through farmer participation would bring additional increase of cropping intensity through effective use of water resources. In general, irrigation rehabilitation together with introduction of proper O&M is better than new irrigation development in terms of economic return and environmental soundness.

Rainfed agriculture would have less potential for increasing cropping intensity, particularly in the dry zone. In such areas, reliable Yala cultivation with annual crops is difficult as already mentioned. However, increase of total cropping intensity would be achieved by expansion of integrated farming in which tree crops such as fruit, forage, and even timber trees are combined with drought tolerant annual crops for Maha cultivation. Potential crops for area expansion would include oil seeds crops (sesame, sunflower, castor, soybeans, groundnuts, etc.), cereal crops (krakkan, maize, sorghum, etc.) and legumes (cowpea, blackgram, etc.). In the wet and intermediate zones, there is a potential for expansion of cocoa, root crops, ginger, pineapple, mulberry, legumes, etc. under coconut and rubber trees. Area expansion of pepper and coffee would also have potential combining with tea plantation.

2.2.4 Potential for increasing crop yields

Data on potential yields for major crops have been obtained mainly from DOA as summarized in Table 2.3. The expected crop yields at farm level are also presented in the table as anticipated crop yields in Southern Area. According to the data, potential yields of

major crops are considerably high, e.g. 6.8 ton/ha for paddy, 1.5 ton/ha for rubber, and 46 ton/ha for banana. In general, however, present yield levels in Southern Area are notably lower than the potential yield levels, e.g. 3.0-3.4 ton/ha for paddy, 0.66 ton/ha for rubber, and 15.4 ton/ha for banana.

If about 80% of potential yield (5.5 ton/ha) of paddy were achieved in all the existing paddy lands in Southern Area, annual production of paddy would become 656,000 tons with the present cropping intensity. The incremental production would be 252,000 tons, equivalent to 86% of Sri Lanka's annual paddy imports in recent three years (1989-93). Moreover, with this increment, the regional annual share of paddy in the national production would increase to 25% from the present level of 13-16%.

To achieve the potential yields for all the crops, prerequisites would include improved farming practices and better management of farm lands and irrigation facilities. Proper supporting services including extension, farm input supply and credit both from the public and the private sectors would also be needed.

2.2.5 Potentials for livestock development

Potentials for increasing cattle and buffalo milk production are generally low in Southern Area. Hot and humid climate prevailing in the region restricts the development of highly productive pastures and milk cows. Due to the climatic disadvantage, European-type dairy breeds do not perform their higher productivity like they are doing in temperate countries. In the case of buffalo, their population would be decreased owing to expansion of farm mechanization and crop lands encroaching present grazing lands; buffalo population in the region decreased by about 30% during 1990-93. This would thus bring decrease of buffalo milk production. Even under such circumstances, productivity of milk could be improved to a certain extent with proper supply of breeds, feeds and health care which are insufficiently available at present in Southern Area. According to an ADB report, the Second Livestock Development Project, 1996, Sahiwal cows produce about 5 litter/day or 1,250 litter/lactation, and Nili-Ravi buffaloes produce 1,700 liters per lactation with higher level management system in low-wet zone.

Increase of meat production from cattle and buffalo would have higher potential in Southern Area, particularly in the dry zone where large number of these animals are raised with a certain proportion of unproductive animals. Through establishment of proper meat processing and marketing system, decrease in large herds size is expectable. Present

constraint of shortage in grass lands would be solved to a certain extent through development of new lands around abandoned tanks which may keep soil moisture longer than other rainfed areas even in the dry season. For potential tanks, therefore, some renovation works would be required. Expansion of tree forages would also support increased supply of livestock feed. Production of tree forages would be integrated into the present rainfed agriculture.

Goats rising would be adaptable mainly to the dry and intermediate zones integrating them into the present crop production system of small holdings. Commercial poultry farming for both meat and eggs would have higher potential for expansion. This would be carried out by the private sector.

2.3 Value-added from Agriculture Sector in 2015

2.3.1 Value-added from agriculture crops

(1) Estimate of crop cultivation area

The future crop cultivation area in 2015 is estimated based on the development potential evaluated above together with some assumptions made for the possible future conditions as described below.

Irrigated agriculture

- 1) In the wet zone, lands for new irrigation development are not available and irrigated agriculture is not expanded. While in the dry and intermediate zones, 22,500 ha of all potential prime lowlands are irrigated.
- 2) The future cropping pattern is diversified and intensified both in the existing and new paddy lands as follows.

Possible Future Cropping Patterns and Intensities

Crop	Maha	Yala	Total
(Unit: %)			
Wet zone			
Paddy	100	80	180
OFCs	0	20	20
Fruits	0	0	0
Total intensity	100	100	200
Dry and intermediate zones			
Paddy	70	50	120
OFCs	20	40	60
Fruits	10	10	10
Total intensity	100	100	190

- 4) Area allocation for each of OFCs and fruits is made by applying the present proportion of each crop area.
- 5) The estimated cropping area based on the above is presented in Table 2.4. Since cropping patterns are diversified, increase of paddy harvested area is comparatively small: from 119,200 ha in 1995 to 132,600 ha in 2015. On the contrary, OFCs and fruits areas are increased significantly from the present negligible level to 45,600 ha and 6,600 ha respectively in 2015.

Rainfed agriculture

- 1) In the wet zone, lands for new rainfed agriculture are not expanded. Although some improvements are expected in the existing tree crop lands through intensive use of home gardens and introduction of inter-cropping, those are not taken into account in the value-added estimate, since the total rainfed lands in the wet zone are foreseen to be decreased due to urbanization. In the dry and intermediate zones, however, rainfed agriculture is expanded to a certain extent through the development of potential prime uplands. The estimated land area for the future rainfed agriculture development in the dry and intermediate zones are presented in the table below.

Estimated Land Area for Future Rainfed Agriculture in Dry and Intermediate Zones

Agro-ecological Region	Net Area (ha)	Development Ratio (%)	Rainfed Agriculture Area (ha)
Prime Uplands + DL5	15,183	0	0
Prime Uplands + DL2	3,617	50	1,800
Prime Uplands + DL1	80,410	25	20,100
Other prime uplands	19,219	90	17,300
Total	118,429		39,200

Note: The selected lands for rainfed agriculture have better conditions than non-selected lands in terms of precipitation and soil.

- 2) Two different types of production systems are introduced in the new lands for rainfed agriculture. One is sugarcane cultivation under the outgrower system, and the other is integrated farming under small holdings. Sugarcane area is developed for 30,000 ha mainly in Moneragala district where new sugar factories are proposed for establishment. Integrated farming is developed in the remaining 9,200 ha. Crops to be introduced in this system are fruit trees including cashew for 50% of the area, OFCs including vegetables for only Maha for 25%, and fallow for 25% in order to avoid soil-borne diseases due to continuous cultivation of vegetables. To a certain extent, cattle and goats are also combined with this farming in an area having a potential for grass land development.
- 3) Area allocation for each of OFCs and fruits is made proportionally according to the present distribution of each crop area.

(2) Estimate of crop yields

The anticipated crop yields presented in Table 2.3 are directly adopted to the value-added estimate.

(3) Estimate of production costs and labor requirements

Basically the same methodology mentioned in subsection 1.2.7 is applied to the estimate of future production costs and labor requirements for all the crops as shown in Table 2.5.

(4) Value-added in 2015 from agriculture crops

The value-added from agriculture crops in Southern Area in 2015 is estimated at Rs. 25,667 million (of which 41% from the wet zone and 59% from the dry and intermediate zones) as shown in Table 2.6.

2.3.2 Value-added from livestock

(1) Estimate of livestock production

The livestock population in 2015 is estimated based on the following assumptions established according to the past trends.

- 1) Cattle including milk cow is decreased by 25% in the wet zone and 20% in the dry and intermediate zones;
- 2) Buffalo is decreased by 40% in the wet zone and 30% in the dry and intermediate zones;
- 3) Goat and sheep are increased by 20% in the wet zone and 40% in the dry and intermediate zones;
- 4) Pork is increased by 28% in all the regions; and
- 5) Poultry both for broiler and layer is increased by 65% in all the regions.

A certain increase is expected for the livestock productivity with better conditions in the future for livestock: larger percentages of high genetic potential animals, improved production and management systems, improved veterinary services and increased supply of good quality feeds. The expected productivity increase is as follows.

- 1) Cow milk: Average milk yield is increased by 40%, from 1.42 liter/day in 1995 to 2.0 liter/day in 2015.
- 2) Buffalo milk: Average milk yield is increased by 30%, from 1.82 liter/day in 1995 to 2.35 liter/day in 2015.
- 3) Cattle, goats and sheep meat: Unit meat production is increased by 25%.

(2) Estimate of production cost

Basically the same methodology mentioned in subsection 1.2.7 is applied to the estimate of future production cost.

(3) Value-added in 2015 from Livestock

The value-added from livestock in 2015 in Southern Area is estimated at Rs. 1,420 million (of which 35% from the wet zone and 65% from the dry and intermediate zones) as shown in Table 2.7.

2.3.3 Value-added from agriculture sector in 2015

The value-added from crop agriculture and livestock in 2015 is estimated at about Rs. 27,087 million. This value is about 73% of the Southern Area agricultural GRDP in 2015 estimated at Rs. 8,900 million in 1982 constant prices or Rs. 37,300 million in 1995 prices. The balance of Rs. 10,213 million or 27% of the agricultural GRDP is considered to be a value-added from fishery and forestry subsector or other values uncovered in the estimate. Estimates including fishery, forestry and others are summarized as follows.

Estimated Value-added in Southern Area in 1995 and 2015

Land Use Category	1995		2015		Increase Rate (% p.a.)
	(Rs. mil.)	(%)	(Rs. mil.)	(%)	
1. Paddy	2,938	(15.0)	5,201	(13.9)	2.9
2. Plantation crops	3,329	(17.0)	5,773	(15.5)	2.8
3. Minor export crops	1,969	(10.1)	3,226	(8.6)	2.5
4. Other crops	4,232	(21.6)	11,467	(30.7)	5.1
5. Livestock	603	(3.1)	1,420	(3.8)	4.4
6. Fishery/forestry/others	6,481	(33.1)	10,213	(27.4)	2.3
Total	19,552	(100.0)	37,300	(100.0)	3.3

Source: JICA Study Team

The results of the estimate shows that the higher growth is expected from other crops including OFCs, vegetables and fruits crops followed by livestock. Contribution to the GRDP will be lower for traditional crops such as paddy, plantation crops and minor export crops in 2015.

CHAPTER 3 OBJECTIVES AND STRATEGY

3.1 Objectives for Agricultural Development

Objectives for agricultural development address to social, economic and environmental aspects. The social objectives of agriculture refer specifically to farmer incomes and farmer organizing/empowerment. They are expressed as follows.

- 1) To increase farmer incomes by enhancing agricultural productivity through (i) improvement of crop yield levels, (ii) crop diversification, (iii) utilization of proper level farm input, (iv) intensive use of agricultural land such as inter-cropping and multi-storey cropping, and (v) mixed and integrated farming combining crops with livestock/poultry;
- 2) To stabilize farmer incomes by providing supportive measures such as irrigation and drainage facilities, reliable market information, improved farm to market roads, and post-harvest facilities;
- 3) To diversify farmer income sources and raise the labor productivity through effective use of indigenous resources in sustainable manner; and
- 4) To create commercially viable farmers through strengthening of village level farmer organizations, each of them having production specific commercial activities.

The economic objectives of Southern Area agriculture represent concerns for food self-sufficiency, export earnings and support for agro-industries. They are spelled out as follows.

- 5) To produce proper level of food crops for increasing regional and national population, and raise production of export oriented crops to increase export earnings; and
- 6) To supply sufficient quantity and quality of raw materials to agro-based industries.

The environmental objective of Southern Area agriculture is established as follows.

- 7) To promote environmentally sound and sustainable agricultural practices such as agro-forestry, organic agriculture, and various forms of integrated farming, multi-storey farming and paddy-based mixed farming.

3.2 Strategy for Agricultural Development

3.2.1 Basic strategy

The basic strategy is established related to three important components of agricultural production: land, water and human resources.

(1) Land resources

About 142,000 ha of unused or sparsely used prime lands are available mainly in the dry zone. However, rainfed agriculture is not always promising in these lands. The land development should therefore be carried out in parallel with water resources development. Even for the lands with better conditions for rainfed agriculture, provision of domestic water supply should firstly be carried out as a prerequisite for the development. Production system introduced to the rainfed agriculture should be an integrated one in which tree crops, annual crops and livestock are combined. In the existing agricultural lands, land should be more intensively used in both the irrigated and rainfed agriculture so as to increase land and labor productivity.

(2) Water resources

Losses in existing irrigation schemes should firstly be minimized through rehabilitation and introduction of proper O&M for effective utilization of limited water resources. New irrigation development using exploitable water resources should also be carried out in the dry zone where water supply is extremely short, paying attention to environmental aspects. The water resources development should be a balanced one in which water supply to other sectors (e.g. industry and domestic use) is taken into account, and should be economically feasible and environmentally sound. Certain measures should be taken against floods which hinder the agricultural production mainly in the low-lying land of the wet zone.

(3) Human resources

New education and training programs should be provided to farmers to make them commercially viable. Trainers in the public sector including extension workers should also be trained to upgrade their technical ability and improve skills in farmer training. Private sector involvement in farmer training programs should be encouraged mainly in the field of technology transfer related to farming practices and marketing of products.

3.2.2 Phasing strategy

Agricultural development in Southern Area should emphasize different aspects over time. Another basic strategy for phasing the Southern Area agricultural development should be established as follow.

- 1) Short-term: improvement of indigenous agriculture,
- 2) Medium-term: increase of raw material supply to agro-based industries, and
- 3) Long-term: increase of high quality products for both domestic and export markets,

As the short-term strategy, present low level of productivity in traditional crops should be improved through continuation of on-going efforts. These will include, among others, irrigation system rehabilitation, replanting of tree crops, and expansion of sugarcane production. New or improved approaches to agriculture development should also be initiated at this stage. Paddy-based mixed farming should be further promoted in the irrigated agriculture expanding cultivation of OFCs and fruits. Rainfed agriculture should be converted to more reliable one through integrated farming. Home gardens should be rehabilitated for the production of high value commercial crops through multi-storey farming.

The medium-term strategy focuses on supply of raw materials for agro-based industries. Private sector investment should be encouraged in contract farming and outgrower systems for the production of raw materials. Proper support services should be provided to small holdings from both the public and the private sectors to create commercially viable farmers and FOs.

As the long-term strategy, all the production systems should be fully operational. FOs should be empowered for all related production activities including planning, O&M, farm input and credit supply, marketing, etc. A federation of FOs in the region should also be empowered up to a level of self-reliance in its management for marketing of farm input and products.

3.2.3 Specific strategy for agricultural development

Within the frame of the basic strategy, specific strategy is established for each subsector as follows.

(1) Paddy and OFCs

Paddy production should be increased at least upto a level of regional self-sufficiency. Production of OFCs should also be increased giving priority to selected crops which will have advantage for the production under area specific conditions in the region. The specific strategy components for paddy and OFCs are as follows.

- 1) Cropping intensity should be increased in existing irrigation schemes by continuation of on-going rehabilitation and O&M improvement projects/programs;
- 2) New irrigation and drainage systems should be expanded for production of these crops using improved water delivery systems;
- 3) Crop diversification should be promoted further;
- 4) Seed/seedlings supply system should be improved through more active involvement of the private sector in production and marketing;
- 5) Research works should be strengthened to develop better varieties and proper production systems which maximize crop yields and minimize production costs; extension service should also be strengthened to introduce better farming practices; more farmer training programs should be provided focusing on creation of commercially viable farmers;
- 6) Private sector involvement should be encouraged in research, extension, farm input supply and marketing services;
- 7) Farmer organizations should be strengthened to provide themselves marketing and irrigation O&M services; more marketing information should be provided to farmers in order to create an environment conducive to improving farmers marketing ability; and
- 8) Post-harvest losses should be minimized by providing improved facilities including development and introduction of improved packaging technology.

(2) Plantation and minor export crops

Since new land is limited for plantation and minor export crops, the most important issue is to improve lands and labor productivity. The strategy established is therefore focuses on this point as follows.

- 1) Crop productivity particularly in the small holdings sector should be further improved through expansion of subsidy and credit schemes for new planting, replanting, rehabilitation, and nursery development together with supply of extension services;

- 2) Multi-storey/ mixed farming systems should be promoted so as to increase land productivity and diversify farmer income sources; integrated farming combining crops with livestock and sericulture should also be promoted further;
- 3) Home garden farming should be rehabilitated through selection of proper crops and extension and farm input supply services;
- 4) Land tilling program should be continued covering small holder plantation crops to encourage them to invest for land improvement;
- 5) Rural roads should be improved by supporting self-help efforts of small holdings technically and financially; and
- 6) Private sector involvement in all production services such as research, extension, and input supply, and marketing should be encouraged also in these subsectors.

(3) Fruits and other crops

High value fruits production such as mango, citrus, pineapple, avocado and banana should be increased through strengthening of research and extension services. In research works, adaptability test should firstly be carried out covering fruits varieties available in other tropical countries/regions where the climate is similar to Southern Area. The private sector should be encouraged in production and distribution of seedlings in fruit crops.

Shift of present subsistence-level farmers to sugarcane and cashew production should be promoted further in the dry and intermediate zones. The outgrower production system should be expanded in the rainfed area available for sugarcane, and other potential crops such as pineapple.

The possibility of commercial growing of medicinal herb materials should be studied, since most of them are now grown in Southern Area under natural conditions, and imports constitute one-third of raw materials used. There is potential in Southern Area to increase tourists who have interest in "ayurvedic health care".

(4) Livestock and poultry

For cattle and buffalo, the development strategy should focus on reduction in size of large herds and increase in animal productivity. Private cattle breeding farms may be established. Cow milk production should be increased and stabilized for the present milk marketing channel. Buffalo milk production should also be increased and stabilized for SEDZ's famous curd processors who still have sufficient capacity for processing. Beef production

should be encouraged through private sector involvement in beef processing and marketing. For processing hides, the private sector would also have an opportunity to invest into leather and leather products manufacturing. In order to achieve higher productivity, animals with higher genetic potential should be used, proper health care should be supplied, and better feed supplying system should be established. Increased goat raising in the backyard by small holdings would enhance the raw material base for leather products industry.

Poultry industry both for meat and eggs should be further expanded to supply rapidly growing markets. For this, private sector investment should be accelerated.

Grazing lands should be improved into managed pasture. For this, FOs should be involved in grazing land management. Allocation of grazing lands to FOs should be carried out by establishing clear land use policy. A result of GIS assessment shows that potential lands for grazing land development would be available within 79,000 ha prime uplands and 30,000 ha marginal uplands in the dry zone. Local production of fodder crops such as maize and sorghum should be increased to supply feed ingredients for the feed industry, and decrease import of these products and save foreign exchanges. Proper utilization of by-products and crop residuals and planting of tree forage should be promoted particularly in the dry zone where use of these feed materials are limited.

(5) Marketing

Farmers' commercial ability should be enhanced by providing training on marketing aspects including cultivation practices for quality improvement (use of improved seed varieties, pest controls, etc.), post harvest and processing technologies, marketing structure and utilization of credit facilities.

Marketing facilities including storage facilities and road network should be further improved. Private sector investments for storage and transportation facilities should be promoted for marketing of high value crops both for export and domestic markets.

CHAPTER 4 MEASURES

4.1 Policy Directions for Agricultural Development

4.1.1 Land policy

Practically, all paddy lands in major irrigation schemes are owned by the Government. Original allottees alone have a right to cultivate a land, and lease out of their land is illegal, although this is practiced to a considerable extent. Thus it is difficult to increase land size for crop production, even if farmers are interested in large scale production. Lease contracts among farmers should be made free so that capable farmers can expand their cultivation area and farmers having less interest in agriculture can quit from farming. The regulation which restricts lease out of farm land should be terminated.

At present, land use policy is not clear for grass lands for livestock grazing, and free grazing is a predominant practice both for large and small herd owners. For the efficient use of limited grass lands, however, a certain system should be established which would regulate their utilization. One possible approach is to introduce a concept of communal land which is managed by selected farmer groups or organizations who take responsibility for the development and management of grazing lands. A clear policy needs to be established to regulate the grass land utilization.

The on-going land titling program should be extended to small holdings in the plantation sector, since many of them are encroachers and they have no land title deeds nor documents. Because of this, small holdings are not qualified for the on-going subsidy scheme for replanting and new planting of tree crops.

4.1.2 Water policy

There is no clear policy on water rights in Sri Lanka both for surface water and groundwater. At present, there are more than 30 government agencies handling activities related to water resources. Pressures on, and competition for, scarce water resources are rapidly increasing, and formal mechanism for water allocation needs to be established. To ensure the future private sector involvement in irrigation development, clear water policy should be established. On-going programs such as the Implementation of Action Plan for Comprehensive Water Resources Management funded by ADB, need to be given high priority in the future water sector development efforts.

4.1.3 Meat processing and marketing

Slaughtering of cows and buffaloes (unless certified non-productive) is banned in Sri Lanka. This tends to encourage the unlicensed slaughtering sector to undertake illegal slaughtering for which farmers usually bargain away their animals. Meat processed in the unlicensed sector is unhygienic in general. This ban is completely ineffective, and should be terminated.

4.1.4 Research and extension

(1) Research

Research priority is not clear at present in public research institutes. Many institutes established to take charge of specific crops are now carrying out research works following their own strategy. Although there is CARP responsible for national research policy, this Council is not well functioning. For efficient utilization of limited research budgets and human resources within the public research institutes, clear priority for research works needs to be established.

For the Southern Area agricultural development, research would be conducted focusing on the following works.

- 1) Development of lower cost technologies suitable for area specific conditions, such as dry or wet climate, water logging, acid soil and soil salinity, most economic use of chemical fertilizer and organic manure, least cost pest control including application of natural pesticide and biological methods, and use of less labor inputs;
- 2) Development of technologies for crop diversification in tree crops and rainfed agriculture including technologies for inter-cropping and/or multi-story farming practices, new high value crops and new varieties suitable for combination, potential for combination with livestock/ poultry and herbal medicine plants;
- 3) More experimental works for the selection of promising varieties of fruits, horticulture crops, local and exotic vegetables, experimental works to develop sorjan cultivation system having potential to expand in the coastal wet land; and
- 4) Special research works for the development of proper practices for protection of soil erosion in the wet zone and proper land use and crop cultivation technologies in problem soils with high acidity in the wet zone coastal areas.

Coordination and cooperation among research institutions will be needed for execution of these research works. The research institutes to be involved include Rice Research and Development Institute, Field Crop Research and Development Institute, Horticultural Crop Research and Development Institute, Department of Export Agriculture, Natural Resource Management Center, Regional Agricultural Research and Development Center, Sugarcane Research Institute, Rubber Research Institute, Coconut Research Board, Tea Research Institute, Cashew Corporation, Veterinary Research Institute and Central Poultry Research Station. In addition, the Faculty of Agriculture in the University of Ruhuna has a significant potential to undertake both laboratory and field oriented research works involving students and farmers. The Faculty has the advantage of flexibility in researches covering a wide range of crops.

(2) Extension

Agricultural extension service should be strengthened in the following manner.

- 1) The quality of advice given by extension staff depends on new technology generated by research, and therefore an effective research extension linkage is needed to identify problems of farmers and to provide feed back for research. It is desirable to link extension not merely to research but also to input supply functions including credit. Extension workers need to know that inputs are available in time to farmers and it is necessary to organize farmers into functional groups to increase their access to input and services. Dealing with farmer groups helps to increase the cost effectiveness of the extension system as individual contacts with farmers incur high cost.
- 2) Extension should become involved in managing farmer organizations. It can provide the necessary leadership and management training and advice to enhance the success of the groups. These leadership and training extension activities may be beyond the capability of field extension officers, but they can identify the groups that need assistance and then coordinate the provision of these services by extension specialists.
- 3) Extension staff should be qualified enough to carry out their responsibilities, since the quality of the extension delivery system is dependent on the capability of the extension staff and extension methods. Further, their knowledge and skills should be upgraded regularly with proper training programmes.
- 4) The role of the extension system is far wider than merely communicating technical messages received from the top. Its task is to comprehend and appreciate the relationship between production, financial resources available and technological practices. Limitations and difficulties faced by farmers have to be presented to the