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IWMI International Water Management Institute

RUAF Foundation

ASSESSING AND PLANNING CITY REGION FOOD SYSTEM

COLOMBO (Sri Lanka) Synthesis Report

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Food And Agriculture Organization Of The United Nations
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Foreword

Cities and their surrounding areas, known as 'city regions', are increasingly concerned about food security and how it is affected by urban growth, escalating urban poverty, food price hikes, climate change, changing consumption patterns and the rise in diet-related health problems. Of particular concern is urban growth, which creates increased demand for the same land and water that also provide vital food and ecosystem services. This challenge calls for integrated territorial development and balanced urban–rural linkages for the benefit of urban and rural population alike.

The city region food system (CRFS) perspective provides a platform on which to build concrete policy and offer investment opportunities to address these developmental issues with the objective to achieve better economic, social and environmental conditions in both urban and surrounding rural areas. Strategies and tools include: the promotion of peri-urban agriculture; the preservation of agricultural land areas and watersheds through land use planning and zoning; the development of food distribution systems and social protection programmes; support for short supply chains and the local procurement of food; and the promotion of food waste prevention, reduction and management.

Building a sustainable and resilient CRFS, however, requires political will – integrating available policy and planning instruments (e.g. infrastructure, logistics, public procurement, land use planning), involvement of various government departments and jurisdictions (local and provincial), and inclusive organisational structures at different scales (municipal, district, etc.). An effective CRFS offers a lens through which this integration and coherence can be addressed at a specific territorial level. CRFS can also operationalise linkages between Sustainable Development Goals: SDG 2 (food security, nutrition and sustainable agriculture); SDG 11 (inclusive, safe, resilient and sustainable cities); and SDG 12 (sustainable production and consumption).

CRFS implementation is in line with the recently adopted New Urban Agenda (October 2016)[1] that emphasises the need for cities to "strengthen food system planning" and recognises the vulnerability of long-distance food supply systems. The Milan Urban Food Policy Pact – the first international protocol, currently signed by more than 160 cities, including the cities in this series of reports – also calls for the development of more sustainable and resilient urban food systems. Signatory mayors from cities around the world pledged to develop actions and strategies to improve their urban food systems with strong urban–rural linkages.

FAO and RUAF Foundation partnered to support local institutions in understanding and operationalising a CRFS in seven cities selected from across the globe to represent their regions Lusaka and Kitwe (Zambia), Colombo (Sri Lanka), Medellín (Colombia), Quito (Ecuador), Toronto (Canada) and Utrecht (The Netherlands). All results presented here describe the experiences from each city in terms of planning and informed decision-making, prioritising investments and design of sustainable food policies and strategies to improve the resilience and sustainability of the entire food system. Combined, this CRFS knowledge culminates in a set of tools to support individual city regions around the world to assess and better plan their own food system.

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Director RUAF Foundation

1 http://habitat3.org/the-new-urban-agenda/

Preface

As one of the fastest developing countries in Asia, Sri Lanka is facing an important urbanization process, particularly in Colombo. The Sri Lankan Government has recently set up a dedicated ministry to implement Megapolis, a large-scale urban development initiative in the Western Province, where Colombo is located. The initiative plans to create a megacity that addresses in a well-planned manner the issues of mobility, waste, slums and environmental pollution, and generates economic growth and prosperity, good governance, job creation, social equity and harmony, as well as environmental sustainability.

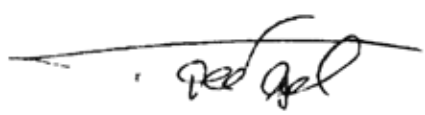
The Western Province's population is growing fast and the Government will have the responsibility to ensure appropriate levels of food security and nutrition in a sustainable manner. This requires long-term, integrated and holistic food polices and strategies that include all actors involved in the food system. However, food continues to be excluded in urban planning. At the national level, current policies and programmes on food systems are fragmented and sectorial, while attempts to achieve macro-level improvements are mostly disconnected and in isolation. At the local level, policies and programmes have not yet produced concrete results.

Colombo is the only city in Asia so far to be engaged on such an initiative. The introduced City Region Food System (CRFS) assessment and planning process represents a new and innovative concept, in which the food systems are reviewed within an urban/regional context giving due attention to micro-level diversities of food patterns. The CRFS process helps to position Colombo in a global context where it can benefit from international exposure and knowledge exchange. The city has signed the Milan Urban Food Policy Pact, an international protocol signed by 165 cities from all over the world that enables better collaboration and knowledge exchange in creating more sustainable, inclusive and resilient food systems.

In addition, the Colombo CRFS analysis, findings and recommendations will act as the basis for future FAO initiatives. They will directly contribute to the objective of the FAO Country Programming Framework (CPF) 2018–2022 to develop the capacity of government institutions to collectively implement vulnerability-sensitive measures in support of effective agriculture and food systems, food safety and improved nutrition. The CRFS assessment and planning process also feeds into the Rural-Urban Linkages (RUL) studies of the CGIAR Research Program on Water, Land and Ecosystems (WLE), led by the International Water Management Institute (IWMI), that offers, through a landscapes perspective, innovative ways to strengthen food security, while reducing the environmental footprint of urbanisation and agricultural intensification as part of the global sustainability agenda.

This report represents a joint effort of FAO and IWMI, in close consultation with the Colombo Municipal Council (CMC), and is the result of the implementation of the Colombo CRFS assessment and planning process. It describes in detail the results of the assessment as well as the outcomes generated by the policy recommendations and stakeholder dialogue.

Nina Brandstrup
FAO Representative in Sri Lanka



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Executive summary

Purpose of the CRFS assessment

This report is the result of the implementation of an assessment methodology for Colombo and its city region food system (CRFS).

Colombo stands as a unique city in Sri Lanka due to the complexity of its socio-demographic profile and the diverse food items that arrive through multiple channels. The busy and complex lifestyle of its inhabitants, together with the floating population of the city, creates a high demand for catering services that supply prepared food for direct consumption. In addition, the Colombo Municipal Council (CMC) acts as the national hub for imported food items and the regional hub for vegetable and fruit. As a result, Colombo has one of the most complex food systems in Sri Lanka.

The aims of the CRFS assessment include: to better understand the functioning the Colombo food system; to examine the current and future constraints on food security and safety, with respect to the challenges of urban growth, diversity, lifestyle and dynamics; to explore the sustainability and resilience of the Colombo CRFS; and to seek to improve the livelihoods of rural and urban dwellers now and in the future.

Assessment methodology

In order to promote local ownership, the assessment was conducted with the involvement of stakeholders that included government authorities, the business community, academia and non-state actors. The consultative and participatory process was given priority throughout the process. Specifically, it aimed to foster inclusive multi-stakeholder dialogue processes in order to support local government and other multiple stakeholders in taking informed decisions on food planning and to enhance synergies, reduce costs and prioritise investments. Key decision-makers were involved in steering the process throughout the study. The study consisted of three phases:

i. Situational analysis (Phase 1)[2]: a comprehensive scoping study on the food system was conducted using secondary data and expert interviews. The study areas were identified using stakeholder consultations.
ii. CRFS assessment (Phase 2): an in-depth study was based on specific measurable indicators. The locally important indicators were selected collaboratively via focal group discussions. Four priority areas for in-depth study were identified: i) food waste and losses; ii) food security and safety; iii) value chain management; iv) natural resource management and climate change.
iii. Policy support and planning: policy planning to improve the Colombo CRFS was conducted with the involvement of key stakeholders using a series of working groups.

The commodities selected for the detailed study were the most consumed food items in the Colombo City Region that also supplied the key macronutrients (carbohydrates, proteins, fat, etc.) and micronutrients (vitamins and minerals): rice for carbohydrate, fish and beans for protein, coconut for fat and fruit (bananas, papayas) and vegetables (beans, brinjals) for vitamins and minerals.

2 This corresponds to the CRFS Scan phase in the CRFS toolkit: http://www.fao.org/in-action/food-for-cities-programme/toolkit/introduction/en/

Defining the Colombo City Region

A city region is defined here as: "a larger urban centre or conglomeration of smaller urban centres and the surrounding and interspersed peri-urban and rural hinterland". A city region food system (CRFS) is defined as "all the actors, processes and relationships that are involved in food production, processing, distribution and consumption in a given city region".

The definition of the Colombo CRFS is based on the following set of criteria:

- **Built-up areas and population density** – the rationale is that less dense areas of the region would act as suppliers to the highly populated city of Colombo.
- **Jurisdictional and administrative boundaries** – these are the governing units that take policy decisions and use available data to make decisions.

From a geographical point of view, and based on the above factors, the Colombo Municipal Council (CMC) defines as the city and Colombo District defines the Colombo City Region.

The Colombo municipal area houses the commercial, transport and financial hubs of the country and is the wellspring of the Sri Lankan economy. It has a high population density and a floating population that is equivalent to the current residential population of the city (see section 3.1).

Agriculture production within Colombo District is negligible (two percent of total demand) and mainly for self-consumption. This means nearly all the food has to be brought to the city, resulting in a long supply chain involving multiple actors and high food miles.

Governance of the food system

Multiple government departments and authorities oversee the food system. They especially focus on the continuous supply of essential food items, retail prices of essentials and consumer protection (food safety and hygeine) of raw and prepared food items. Numerous entities have influence over one or several food commodities – for example, only the paddy marketing board has responsibility for rice. There is no single authority responsible for the food system.

Sri Lanka has three layers of governance – national, provincial and local. There are many gaps between the national and the local levels. In general, fragmentation of the institutional landscape has resulted in complexity at the national level, while the local and provincial levels have limited roles and responsibilities.

Actions and strategies on ensuring food security and nutrition in Sri Lanka are, in general, handled through the National Agricultural Policy of the Ministry of Agriculture, the National Nutrition Policy of the Ministry of Health, Nutrition and Indigenous Medicine, and several other policy documents and authorities. These latter are directly or indirectly addressing food processes, prices, security, safety and nutrition – for example, the Food Act regulates and controls food manufacturing, safety, importation, sale, distribution and inspections. Local authorities have been granted power as food authorities to enforce the Food Act, particularly with regard to safety and inspections.

Key challenges

The food consumption pattern of consumers in Colombo is changing from home-cooked meals to purchased meals. Prepared-food suppliers in the city vary from international franchised food outlets to mobile units that sell prepared food using vehicles and street food without quality and hygiene control and assurance. One third of the eateries in Colombo is unregistered, which means that food safety concerns of prepared food in the city remain unanswered.

Urban Sri Lanka shows signs of severe nutritional challenges. These include undernutrition, resulting in one of the highest 'wasting' figures in the world; but there is also an increase of

overweight and obese people. Food- and nutrition-related health issues are significant in the Colombo City Region. A high prevalence of anaemia is reported in Colombo District (40 percent) and authorities state anaemic levels within the CMC exceed that of the district level. Colombo District also reports the highest percentages of non-communicable diseases, such as high blood pressure (11.9 percent) and diabetes (11.2 percent). One third of the population in Colombo District consumes less than the prescribed calorie intake, thereby highlighting the food insecurity status.

Solid waste management in Colombo has become a major challenge. The waste quantity generated within the CMC exceeds 711 tonnes per day; approximately two-thirds of this is biodegradable. The mixed nature of the waste is the main barrier to the recovery of resources. The CMC does not have a sustainable waste management system at the moment.

Post-harvest losses in fruit and vegetable value chains are as high as 30 to 40 percent, which directly contributes to low earnings for farmers and the invariably higher market prices for consumers. Almost 75 percent of the total loss occurs during transportation and is mainly attributable to the use of improper packaging and storage. Lack of proper storage facilities, long supply chains and high food miles increase the waste along the value chain.

Food supply and distribution to the Colombo City Region has become a complex exercise with the involvement of many intermediaries and intermediate processes and activities, starting from food producers all the way to the final consumers. With vegetable prices doubling or tripling from farm gate to retail, wholesalers and commission agents are being accused of inflating prices to the disadvantage of farmers and poor consumers. While some intermediaries are required in these value chains, there are frequent calls for processes to be regulated.

Natural resource management is a vital prerequisite for sustainable agriculture. Sri Lanka is rich with sources of water, has a diverse climate that suits a diverse agriculture and farming, and has a high percentage of suitable land for agriculture. However, Sri Lanka faces issues and problems related to natural resource management, such as soil degradation, water pollution, air pollution and loss of biodiversity. Urbanisation, industrialisation, over-use of agrochemicals and improper waste disposal are some of the causal factors for the above issues.

Additionally, the impact of climate change has significantly affected water availability, rainfall, temperature, agro-ecological zone classification and soil ecosystem. Frequent floods, droughts and secondary disasters, such as landslides, reduce the cultivable area, impair the transport of commodities and adversely affect agriculture productivity.

Recommended policy interventions

Key policy interventions identified collaboratively to strengthen the Colombo CRFS can be identified as:

- **Facilitate a more holistic and territorial approach to food security and nutrition**

Existing structures and policies are fragmented and not aligned to address rapid urbanisation and related city region challenges. Align current policies with the other food security and nutrition-related policies and adapt the structure (e.g. of the Food Advisory Committee), allowing representation from the provincial councils with additional responsibilities for food system and security.

- **Develop physical and institutional capacity to reduce the vulnerability of the urban poor to food price fluctuations**

In the current situation, market chains are too long and unregulated to the disadvantage of rural producers and the urban poor. If, in addition, climate-related events hit the supply chains, the poor's suffering is doubled. Urban food reserves are needed to buffer shortcomings in food availability. Market supply chains have to be regulated and monitored to avoid price fluctuations that hit the poor.

- **Strengthen food safety across the Colombo CRFS**

There is a need for adequate human and laboratory capacity to address food safety issues, including additional food safety analysts for local authorities. Upgrade the existing public laboratory facilities, including provincial laboratories and regional laboratories, so they become authorised analysis centres. In addition, create a system introducing laboratory tests for specific foods in respective authorities (e.g. coconut at a coconut research institute).

- **Streamline the Municipal Solid Waste (MSW) sector with an empowered umbrella body that coordinates the integration and implementation of MSW management**

The vertical and horizontal complexity of the institutional landscape means that the implementation of regulations is detached from their management. A coordinating body at the national level needs to be appointed.

- **Create an enabling investment climate for private sector engagement in resource recovery and reuse (RRR)**

RRR businesses are relatively new to Sri Lanka so there could be further financial and regulatory incentives similar to the existing tax exemptions for the import of renewable energy equipment. Introduce financial schemes to attract and incentivise local entrepreneurs to enter RRR businesses, discourage food wastage in the retail sector and support waste valorisation processes.

- **Create an enabling environment at household level**

Currently, the CMC is attempting to adopt source separation for household and institutional waste but the buy-in to this scheme is limited. The CMC needs to improve on customer communication and awareness creation, and support schemes that offer refunds for bottles, impose fines for non-source-separating entities and add a price for plastic shopping bags.

- **Link food waste generators with potential users**

There is a demand for using food waste as animal feed, but the link between waste sources and the potential user (what, where, when) is missing. The CMC can be the moderator (e.g. low-cost, web-based platform/phone app) for facilitating direct producer–user linkages.

- **Introduce by-laws to encourage food waste reduction in canteens and catering**

A high percentage of food waste is generated by institutional canteens, in food courts and through event catering. Extend source segregation to all businesses, canteens of private and public schools, hospitals, food courts, etc. by: (a) capacity development in food waste reduction; (b) providing incentives (e.g. school ranking to create peer-pressure) and/or penalties; and (c) infrastructure support in public markets to keep food fresh.

List of Acronyms

AI: Agriculture Instructors

ARPA: Agriculture Research and Production Assistant

CMC: Colombo Municipal Council

CRFS: City Region Food System

DEC: Dedicated Economic Centre

EEZ: Exclusive Economic Zone

FAO: Food and Agriculture Organization

FCAU: Food Control Administration Unit

GN: Grama Niladari

HDDS: Household Dietary Diversity Score

IWMI: International Water Management Institute

LA: Local Authority

MC: Municipal Council

MOH: Ministry of Health

MSW: Management of Solid Waste

MT: Metric Ton (= tonne)

NFSA: National Food Security Assessment

NRMC: Natural Resources Management Centre

PHI: Public Health Inspectors

PS: Pradeshiya Sabaha

RRR: Resource Recovery and Reuse

RUAF: Resource Centre on Urban Agriculture and Food Security

SMS: Short Message Service

UC: Urban Council

1. Introduction

Commercialisation and industrialisation in cities lead to urbanisation by creating economic growth and job opportunities that draw people from rural areas. As a result, population densities in cities increase and land becomes a scarce resource. The limited lands available (Colombo District owns 676 square kilometres) are utilised for high-income generating activities whilst agricultural production within city limits remain minimal. City dwellers, commuters and tourists to a great extent (95 percent of supplies) depend on food supplies from outer regions. The food supply to a city should be varied enough to cater to diverse social, religious and ethnic groups. Moreover, the required quantities of different food items may vary depending on the season, climate, festivals, etc.

An established, sustainable and resilient city region food system (CRFS) is essential to achieve the expected sustainable development goals of a country. A clear understanding of the socio-demographic factors of a city is key to developing a resilient and sustainable food system. Colombo accommodates 561 314 residents who belong to multiple religious, ethnic and social groups. Additionally, a floating population as large as the resident city population commutes daily to Colombo for work and to access services. Colombo is one of the top tourist areas in Sri Lanka and is also home to immigrant workers, which creates an additional layer of complexity. As a result, the demand for prepared food is relatively high and about 950 eateries across Colombo cater to diverse needs. It is evident that socio-demographic factors have a great impact on the food system of the Colombo City Region.

Three elements – regulatory, institutional and social arrangements – form the foundation for a resilient CRFS. Policies and legislation on sectors related to the food system, such as agriculture, livestock, fisheries, water management, food import control and food safety, require evaluation in terms of their strengths and weaknesses in order to make necessary recommendations to improve the system's effectiveness. National level regulations apply equally to the CMC and other local governments. Furthermore, many government institutions at the national, provincial and local level are involved in various facets of the food system.

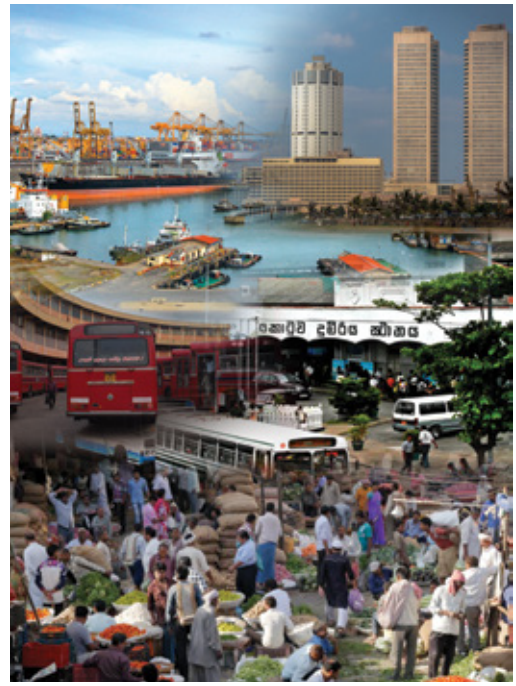


Figure 1:

Significant features of Colombo (Source: https://www.alamy.com/)

Private companies and international organisations also influence the Colombo CRFS, making it complex to analyse as a whole. Consequently, it will be discussed under identified categories, which are important in the

context of the CMC. National, regional and local level actors were considered during the CRFS assessment and planning process.

Food producers are farmers who cultivate crops or engage in animal husbandry, ranging from the small scale[3] to commercial-level enterprises. A strong food production sector ensures both food availability for the population and sustainability of the food supply. In Sri Lanka, diverse weather and soil conditions have created geography-specific food production systems that offer a diverse range of food items and these reach Colombo through diverse channels. Multiple marketing strategies are operational and their efficiency has an impact on food prices, the generation of waste and food security.

Food security and food safety are interrelated concepts and have a profound impact on the quality of life. Though quality control measures have been introduced by the government and international organisations, food quality and safety are still a concern. Changes in eating habits from home-cooked meals to outside meals has aggravated the situation. Many eateries, restaurants and snack bars within the city limits cater to the demand by city dwellers and commuters for prepared food and only two thirds of them are registered. Raw food items, such as vegetables, fruit, grains and pulses, have separate food safety issues, such as contamination with agrochemicals. The prevalence of non-communicable diseases among city dwellers is a concern requiring immediate attention among relevant authorities. This concern may potentially be linked to eating habits and/or related contaminants.

The project consisted of three phases. The first phase consisted of a descriptive assessment and appraisal of the local context and of the CRFS, primarily based on the analysis of secondary data, stakeholder interviews and consultations. The key issues identified during the Phase 1 were further examined during Phase 2 where in-depth assessment shed light on the priority areas identified by the stakeholders (areas are mentioned under the in-depth assessment section). Phase 3 identified the policy interventions needed to fill the prioritised gaps.

3 A farmer who operates on less than one hectare of land.

2. Project Methodology

The study was designed to establish an understanding of the whole food system and then narrow it down to focus on stakeholder priorities. The final aim is to introduce the relevant interventions (policy, institutional, etc.) based on the study's findings. The Colombo CRFS comprised of the following four components:

i. Phase 1/Situational analysis[4]: comprehensive scoping study on food system;
ii. Phase 2/CRFS assessment: in-depth study based on specific measurable indicators. In parallel with the Phase 2 assessment a capacity assessment and strategy formulation was conducted to identify the capacity development needs across the value chain;
iii. Phase 3/Policy support and planning: policy planning to improve the Colombo CRFS.

i. CRFS scan/Situational analysis

The situational analysis was conducted while defining the Colombo CRFS and aims to:

- understand its socio-demographic and food patterns;
- understand the local institutional, stakeholder, legal and policy context;
- compile relevant information on food consumption, supply, security, marketing channels and nutrition, and to identify health and safety issues and to evaluate strengths and vulnerabilities.

Required data and information were gathered from different sources – published and printed documents and published electronic sources, such as e-journals, institutional websites, web blogs, etc. Secondary data published by the Department of Census and Statistics, multiple secondary databases and expert interviews were used to fill the gaps.

A stakeholder consultation workshop on Phase 1 of the study findings of the CRFS for the city of Colombo was conducted to pave the way for Phase 2 of the study. Thirty-five public, private and civil society members participated in these sessions which created a platform for stakeholders to discuss different disciplines of the food system. Priority areas of food systems were selected by participants through a participatory process.

ii. CRFS assessment: in-depth study based on specific measurable indicators

The main objective of the in-depth study on the Colombo CRFS is to understand the positives and negatives of the food system, based on specific measurable indicators identified by the FAO global project. The study was narrowed down to priority areas identified by the situation analysis. If secondary data was not available, primary data collection was conducted. The selected priority areas were:

- Food waste and losses
- Food safety and security

4 This corresponds to the CRFS Scan phase in the CRFS toolkit: http://www.fao.org/in-action/food-for-cities-programme/toolkit/introduction/en/

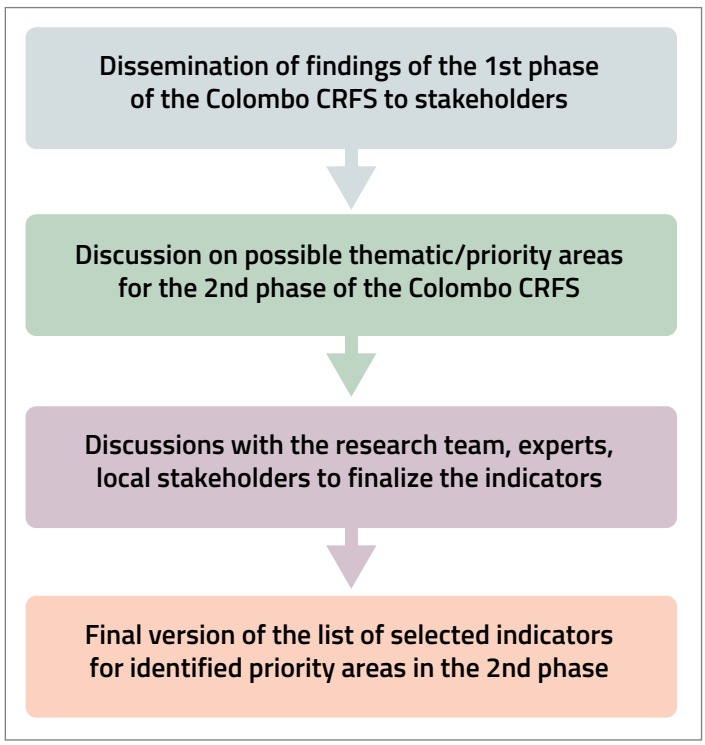
- Value chain management
- Climate change and natural resource management.

Once the priority areas were selected, multiple expert panel discussions and stakeholder review meetings were conducted to identify suitable indicators important in a local context for each priority area. The local stakeholders (including government agencies, private sector, local experts, non-state agencies and experts) at four focal group meetings (i.e. one focal group meeting was conducted for each priority area) further assessed and shortlisted the indicators specifically related to the trends, drivers and challenges in the local context[5].

Multiple criteria were considered for indicator selection: applicability of local context, availability of data sources, accessibility for primary and secondary data, and inherent cost, time and other resource constraints in obtaining data. After many brainstorming discussions, the final list of indicators and food commodities for the detailed study were decided. The figure below presents the whole process of selecting the indicators.

Figure 2:

Mechanism adapted to decide the final list of indicators for Phase 2 of the CRFS



a) Secondary data collection

The main secondary data sources are published databases, published reports, institutional databases, research papers and published websites.

b) Primary data collection

Certain indicators essential to explaining the CRFS do not have any related or sufficient secondary data sources. For such indicators, there was a need to conduct small sample surveys and expert interviews as well as engage in primary data collection (see

5 More details of the indicator framework can be found at http://www.fao.org/in-action/food-for-cities-programme/toolkit-old/crfs-assessment/indicator-framework/en/

Appendix 1 for further details). The main primary data collection tool is sample surveys with producers/farmers, sellers/wholesalers and consumers. Due to lack of data, many indicators needed primary data collection to fill gaps or assess the indicator.

iii. Capacity assessment

The efficiency of the Colombo CRFS is influenced by stakeholder capacity and requires building different types of capacity in multiple interlinked sectors. Assessing capacity needs and their context is the foremost step towards improving the capacity required to build a resilient food system. The capacity assessment was carried out through the application of mixed approaches, such as desk reviews, review of documents, key informant interviews, focus group discussions and observations.

a) Secondary data collection

Secondary data was collected from relevant stakeholders such as the Department of Census and Statistics, research institutes (Institute of Policy Studies, Hector Kobbekaduwa Agrarian Research and Training Institute and Colombo City Region Food Systems Phase I and Phase II Project). SWOT analysis was conducted to envision the gaps.

b) Primary data collection

Focus group discussions: these were conducted with farmers, agriculture instructors and agriculture research and production assistants;

Key informant interviews: officials of ministries, departments, authorities, private companies and distributors were interviewed to collect data and information to evaluate their capacity (see Appendix 2 for further details).

iv. Policy planning interventions for the Colombo CRFS

Phase 3 mainly stemmed from the findings of CRFS Colombo Phase 1 and Phase 2 studies. This Phase 3 study identified issues, gaps and policy concerns and were further analysed using a comprehensive literature review. The researchers then conducted a series of key informant interviews, engaging senior officers at the Food Control Administration Unit, legal officers from council and other key institutes, sectoral agencies, private sector, regulators, academia and certain other stakeholders (such as NGOs and development agencies). The next step in this process was the scenario-building exercise to evaluate the impact of policy interventions with selected drivers and trends. This was conducted with the aid of key informant interviews, focus group participation/consultation with 10 to 12 stakeholders from various key institutes. The results of this exercise enabled the researchers to identify and prioritise the policy interventions needed. Based on the priorities, three policy briefs were drafted on specific recommendations for strategic policy actions and further validated during stakeholder workshops.

3. The Colombo City Region

3.1 The context of the Colombo City Region

The city of Colombo houses the commercial, transport and financial hubs of the country and is the wellspring of the Sri Lankan economy. Its population density is closer to 15 000 persons per square kilometre or forty times more than the country's average population density (325 persons per square kilometre). The Census of Population and Housing in 2012 estimates the total population of Colombo to be 561 314, or three percent of the total population of the country and 24 percent of the population of Colombo District[6]. The floating population is equivalent to the current residential population of the city (i.e. the population that commutes daily to Colombo for work is equal to the population of the city). The land area of the city is 37 square kilometres, which is 5.4 percent of the total landmass of Colombo District.

The Colombo City Region has two Divisional Secretariats[7] – Colombo and Thimbirigasyaya, which are divided into 35 and 20 Grama Niladari divisions[8] respectively. Significant disparities exist in the living standards, economic wealth and socio-cultural imbalance within the Colombo Municipal Council (CMC) area. Furthermore, there is significant ethnic and religious diversity within the region.

In comparison with other parts of Sri Lanka, Colombo contains important parts of the country's economic infrastructure. Colombo Harbour is the largest port in Sri Lanka and a significant feature of the city. One of the busiest ports in the world (it ranks among the top 30 container ports[9]), it handles 31.4 million tonnes of cargo annually. It is also one of the biggest artificial harbours in the world with a land area of 4.8 square kilometres. The city's manufacturing industries are based on the processing of raw materials exported through the port.

Colombo is the commercial centre of the island; the head offices of local and foreign banks, brokerage houses, government corporations and a number of state ministries are located here. Colombo is famous for open-air bazaars and markets. The on-going Colombo Port City and Megapolis projects[10] will further enhance the position of Colombo as the commercial hub of Sri Lanka. The Sri Lankan government has taken the initiative to transform Colombo Port City into an international financial centre, thus creating thousands of job opportunities for professionals and young people.

Colombo is growing fast due to significant infrastructure and construction investments and changes in macroeconomic policies. In 2012, the population of the Western Provincial Council area was around 5.8 million (approximately 30 percent of the population in Sri Lanka) living in six percent of the total land area. As a result of the Western Megapolis development programme the population within this same area is expected to increase

6 In Sri Lanka, districts are the second level of administrative divisions and are included in a province
7 Districts in Sri Lanka are divided into administrative sub-units known as divisional secretariats
8 Grama Niladari (GN) division is the sub-unit of a divisional secretariat
9 https://www.sagt.com.lk/Port_Of_Colombo.aspx?MnuId=3
10 https://megapolis.gov.lk/

up to nine million by 2030, which is close to half of the country's population. The Western Megapolis region is expected to become a vibrant shipping, aviation, tourism, industrial and technological hub.

Manning Market is the oldest open fruit and vegetable wholesale market in Colombo. It covers more than two hectares of land. At least 500 lorries enter Colombo daily from various parts of the country for the buying and selling of food items. In the Colombo city development plan, this market will be relocated to a 10-hectare site at Peliyagoda, where the wholesale fish market has been re-established in the northeast side of the city. Within the next few years Peliyagoda will be converted into an area for markets and trade. There are another 18 relatively large markets located within Colombo city limits.

Colombo is the centre of the railway and bus transport systems. Four rail corridors run from Colombo Fort to the main cities of the country through a number of urban, semi-urban and rural areas. However, there is a need for an integrated transport system in order to successfully fulfill emerging passenger needs and to address urban issues.

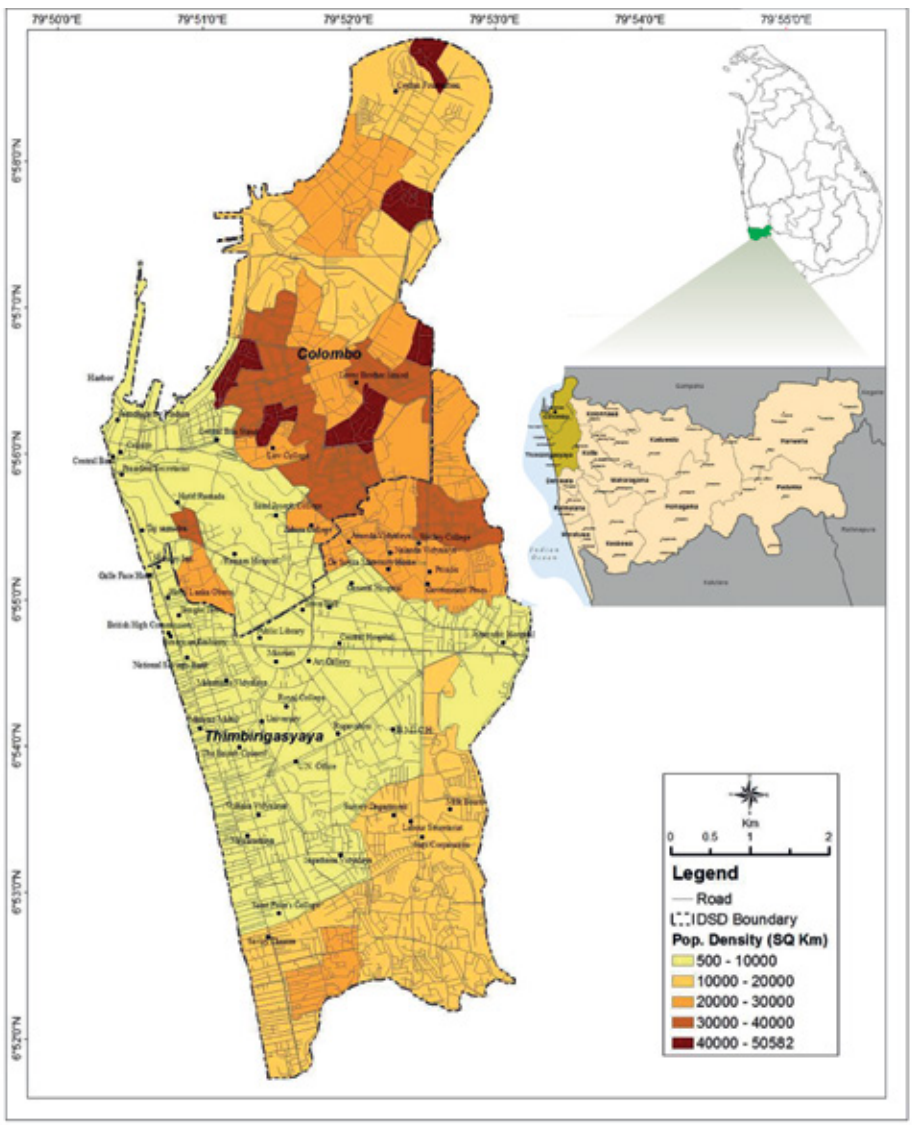


Figure 3:

Population density in the Colombo City Region (GN Level). (Source: Department of Census and Statistics, 2012)

The city is connected by a network of canals and bounded in the north by Kelani River and in the east by two canals – Kolonnawa Ela and Heen Ela. Beira Lake is located in the heart of the city. An inland water transport system is planned under the Megapolis Transportation Plan.

3.2 Demographic factors of the Colombo City Region

Social factors in the city greatly influence its residents' food habits, food consumption patterns, food security and nutrition. Age has an influence on food culture and different ages have different dietary needs, such as toddlers and the elderly (Table 1).

The highest percentage (24 percent) of city region residents is within the age group of 15–29 years.

Table 1:

Age and gender distribution of city dwellers. (Source: Department of Census and Statistics, 2012)

	LESS THAN 5 YEARS TODDLERS	5–14 YEARS CHILDREN	15–29 YEARS YOUTH	30–44 YEARS LATE YOUTH	45–59 YEARS MIDDLE-AGED	60–74 YEARS OLD-AGED	ABOVE 75 OLDER-AGED
Both sexes	7.4	15.7	24.8	21.8	18	9.6	2.7
Male	7.5	15.9	25.4	22.7	17.7	8.7	2.1
Female	7.4	15.5	24.1	20.9	18.3	10.5	3.3

Ethnic sub-cultures within society have unique traditions and practices that require particular food consumption patterns – food types, methods of food preparation, consumption quantities, seasonal consumption habits, etc. Ethnically, the CMC is highly diverse and the three main ethnicities are represented more or less in equal percentages (Table 2). In Sri Lanka, religion follows ethnicity (e.g. most Sinhalese are Buddhists, most Tamils are Hindus).

Table 2:

Ethnic composition of the population at the national and CMC level. (Source: Department of Census and Statistics, 2012)

ETHNICITY	NATIONAL %	CMC %
Sinhalese	74.9	36.7
Sri Lanka Tamil	11.1	29.8
Indian Tamil	4.1	1.7
Sri Lanka Moor	9.3	29.5
Burgher	0.2	0.5
Malay	0.2	1.0
Sri Lanka Chetty	0,0	0.1
Bharatha	0.0	0.1
Other	0.1	0.6

In parallel to ethnicity, religion has some control over food patterns. For instance, there is a significant divergence between vegetarians and non-vegetarians among people based on religious principles. Further, owing to religious practices, there are certain preferences in selecting or rejecting the livestock as a food item (e.g. Muslims and Hindus reject pork and beef respectively).

More than 70 percent of Sri Lanka's population follow Buddhism, though only 31 percent of people in the CMC area are Buddhists. A remarkable difference in religions exists within the Colombo and Thimbirigasyaya divisional secretariats. This religious diversity is expected to create complex food consumption patterns and food systems in the Colombo City Region.

The level of education can be important in helping people choose healthy and diverse foods. It is expected that people with higher education levels are more concerned with understanding the nutrient requirements of their diet as well as the side-effects of over-consuming certain foods. In Colombo District, 75 percent of the people have secondary or higher education qualifications whereas only nine percent have had no schooling. A quarter of the population in the Colombo divisional secretariat completed primary school education only, which is the worst ratio in the region; 67 percent has only limited secondary schooling and only 11 percent of the population has A/L or higher education. Figures for the Thimbirigasyaya divisional secretariat are better: 29 percent has A/L or reached a higher education level while 19 percent have primary or lower education.

Poor living conditions lead to frequent sicknesses and diseases, such as diarrhoea, that are likely to reduce the absorption of nutrients, while creating adverse impacts on nutrient security. Assessing the living environment standard is not straightforward. It was noted that access to sanitation facilities is higher than 99 percent in the CMC area (i.e. open defecation is less than one percent in the CMC), while pipe-borne water supply covers 100 percent of the city.

Other factors that affect the living environment include unsustainable management of food waste, hygiene of food preparation and hygienic practices. Housing structure seems a more acceptable indicator of the impact of urbanisation on the standard of living environment. More than 75 percent of households in Colombo own either a single-storey or a two-storey house. Land scarcity, fashion and high land prices might be encouraging high-rise housing complexes as the present trend. Line, row and shanty houses are the low standard houses in the CMC context. Remarkably, there are few shanties in CMC: 13 percent of houses in the Colombo divisional secretariat and six percent of houses in Thimbirigasyaya divisional secretariat have been identified as line or shanty houses.

The poverty head count index is the percentage of the population living below the poverty line, which is defined by the consumption bundle that includes food and non-food items. According to results of a mapping exercise designed to calculate the poverty head count index at Grama Niladari (GN) level, it is clear that there is a concentration of poor people across Colombo District (Figure 4).

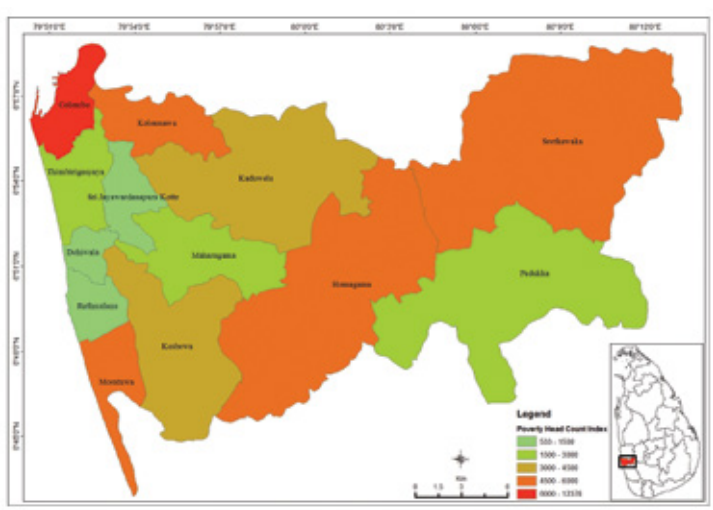


Figure 4:

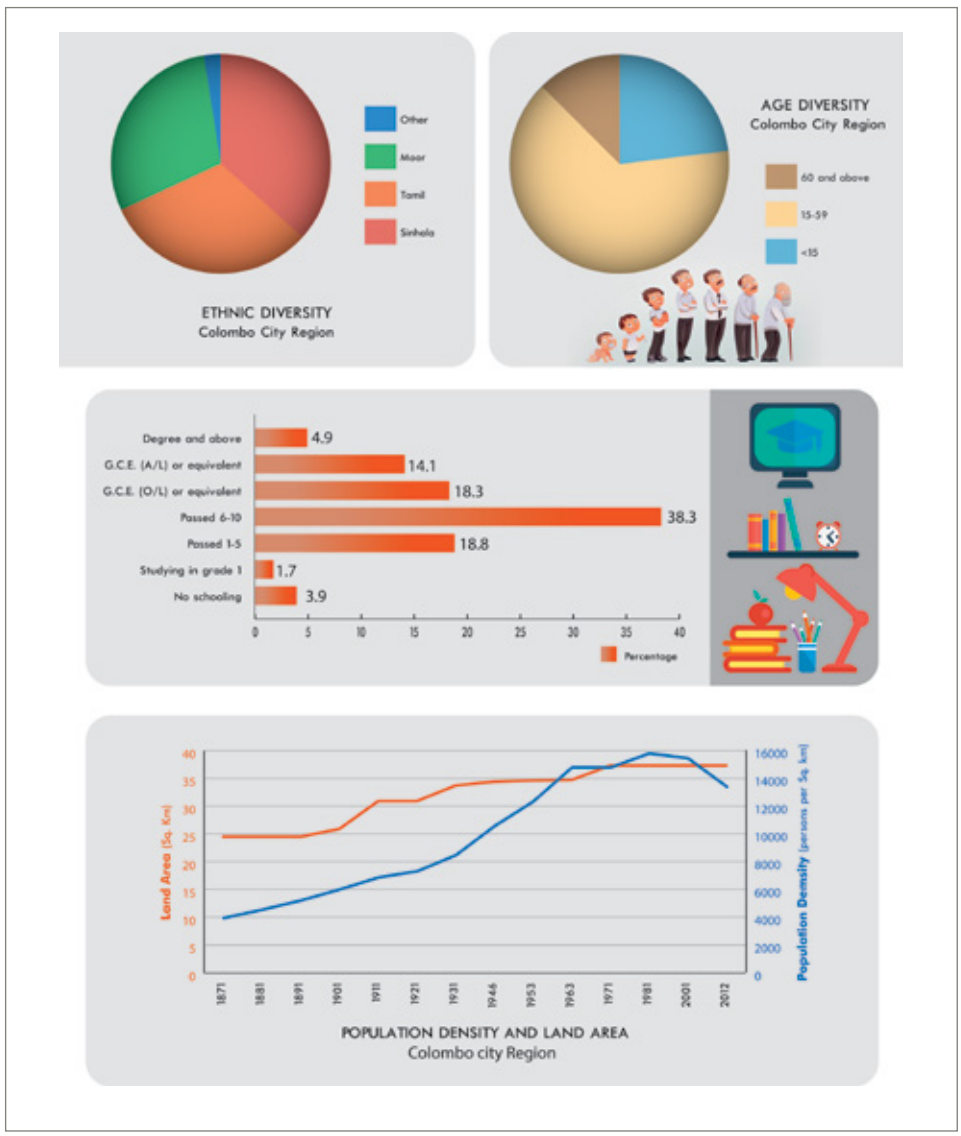
Poverty head count index in Colombo District. (Source: Household Income and Expenditure Survey, 2012/2013)

According to the latest census statistics, 50 percent of the population of working age in Colombo District is employed and only two percent have been considered as unemployed. The remainder of the population (48 percent) is categorised as economically inactive. In the CMC area, 47 percent are employed, three percent unemployed and 50 percent economically inactive. The city of Colombo, which consists of Colombo and Thimbirigasyaya divisional secretariats, has a less than 50 percent employment rate. In the Colombo divisional secretariat, 51 percent of people aged 15 years or above were economically inactive, which is the highest in the district. This is not a surprise as a considerable number of people travel into Colombo each day for their employment.

Significant disparities prevail in living standards, economic wealth and socio-cultural imbalances in the CMC (Figure 5). Even though Colombo is the heart of Sri Lanka, a significant proportion of marginalised people live in the area. In most cases, their living standard and poverty level seems to be much worse than those of the other regions in Colombo District.

Figure 5:

Socio-demographic information of the Colombo City Region



Land area belonging to the city of Colombo increased by 50 percent during the period of 1871 to 1971. However, it has remained unchanged at 37.5 square kilometres ever since. The population in the city of Colombo has increased at a higher rate, resulting in increased population density. The highest population density in Colombo was reported in 1981; during last four decades there has been a slight decrease, most probbaly due to high land prices and living costs.

3.3 Climatic factors of the Colombo City Region

Colombo is in the low country wet zone which receives rainfall from both the southwest and northeast monsoons. The average annual rainfall of Colombo during the last 30 years (1987–2016) was 2 373 millimetres. May and October are the wettest months of the year (Figure 6); the highest number of wet days are reported during these two months. The maximum and minimum temperatures of the Colombo City Region are 24.1 °C and 30.7 °C respectively. The agroclimatic zone of the area is Low Country Wet – WL3[11] and it has red-yellow podzolic soil with soft and hard laterite soil.

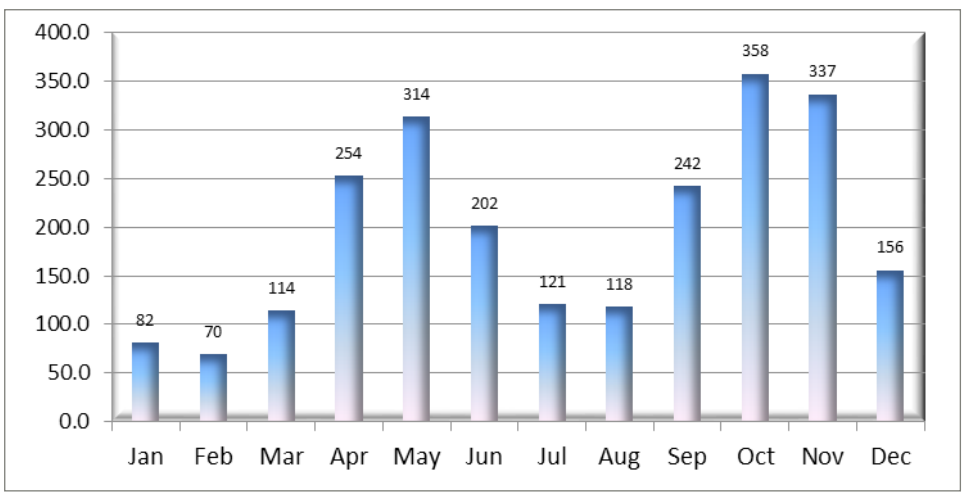


Figure 6:

Thirty-year monthly average rainfall distribution (1987–2016)[12]

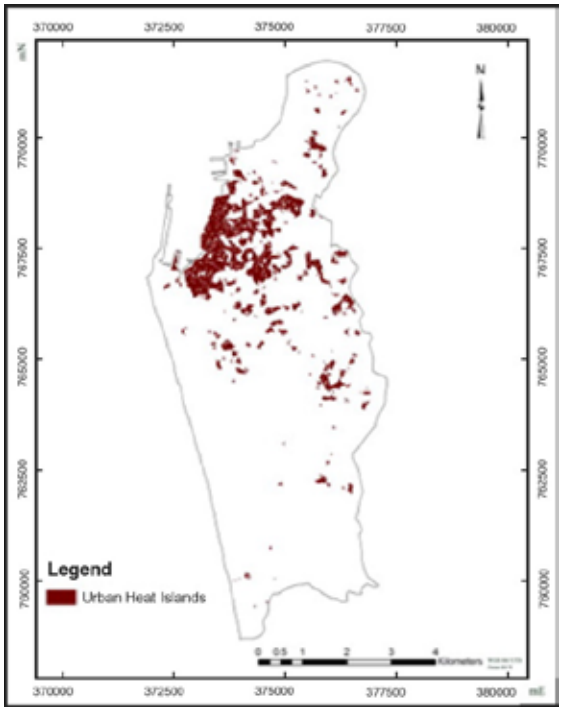
The temperature of cities is increasing due to such reasons as removal of vegetation, emissions from industries and power plants, and human and animal respiration. Metropolitan areas have higher temperatures than their surroundings and are termed 'urban heat islands'. Colombo has a number of these heat islands. Colombo Harbour is a heat island – its high temperature are said to be linked to its very low vegetation cover. Such situations may create adverse socio-environmental conditions.

11 Low Country Wet Zone – 3, >60 rainfall. Expects rainfall in March, April, May, June, July, October.

12 Source: Department of Meteorology, Sri Lanka.

Figure 7:

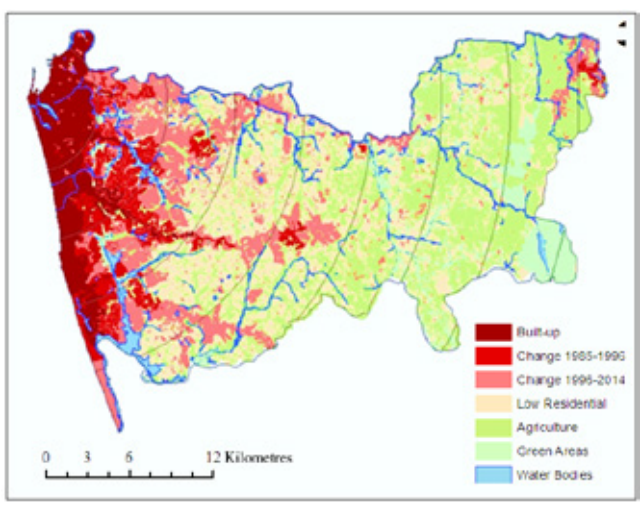
Distribution of urban heat islands in Colombo, Sri Lanka[13]



Within the last three decades, the agriculture areas and low residential areas in Colombo have fallen by 14 percent and 13 percent respectively, while 23 percent of the land area has become urbanised. Urban growth has spread in a concentric way that varies according to the distance from Colombo (Figure 8)[14].

Figure 8:

Colombo District land use pattern with distance



13 Senanayake I. P. *et al*. 2013. Assessment of Green Space Requirement and Site Analysis in Colombo, Sri Lanka – A Remote Sensing and GIS Approach. International Journal of Scientific and Engineering Research, Volume 4, Issue 12, December 2013.

14 Weerakoon, K. G. P. K. Analysis of Spatio-Temporal Urban Growth using GIS Integrated Urban Gradient Analysis. Colombo District, Sri Lanka.

3.4 The boundary of the Colombo City Region

Establishing the boundary for the city is not straightforward as there is not one single way to define a city region food system. A city region's boundary may need to be adjusted by considering the local context and interests. When defining a city region, many additional factors need to be considered, such as judicial boundaries already in place, administrative boundaries, data availability level, etc.

The Colombo CRFS has been defined on the basis of a set of criteria:

- **Built-up areas and population densities:** the basis for this scenario is that less dense areas of the region would act as suppliers to Colombo.
- **Judicial and administrative boundaries:** these describe the governing units for which data is available. Policy interventions can be introduced to these units.

When idnetifing the foodsheds: the supplies of food commodities that provide macronutrients and micronutrients (vitamins and minerals) to Colombo. In this case, rice for carbohydrate, fish for protein, coconut for fat, and fruit and vegetables for vitamins and minerals. When considering the food supply, foodsheds were identified as being the main production and supply areas to the CMC.

3.5 Political and institutional framework of the Colombo City Region

The Colombo Municipal Council (CMC) is the city of Colombo's legislative body which files legislations and enacts orders, ordinances and resolutions. The city council comprises the mayor and council members who are elected in local government elections. The council serves as the link between the citizens of Colombo and the Government. The Municipal Council Commissioner is a government-appointed chief administrative officer.

The Western Province is composed of three districts: Colombo, Kalutara and Gampaha (Figure 9). District secretariats, divisional secretatiats and GN divisions are part of the administrative structure while provincial and local councils act as governing structures.

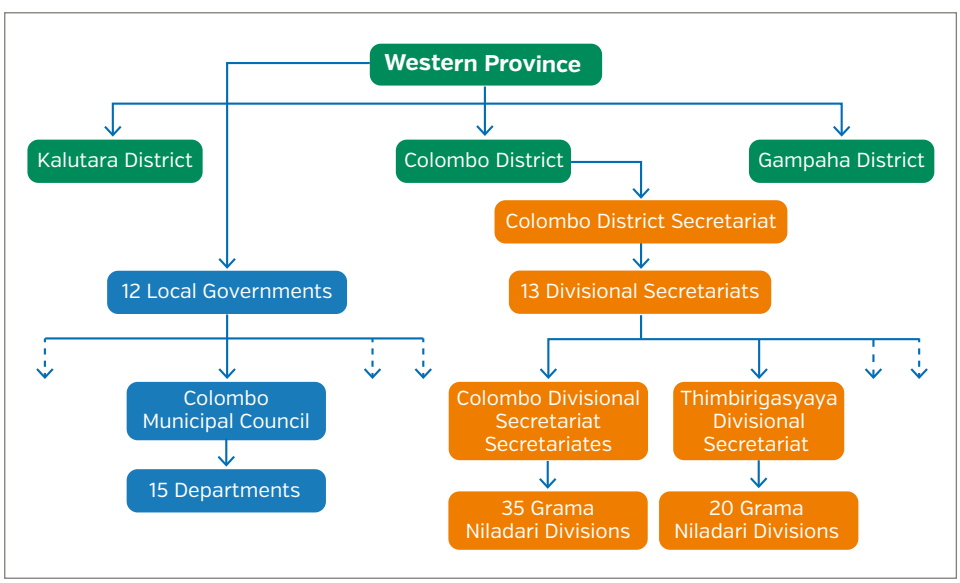


Figure 9:

Institutional framework of the Colombo City Region

Figure 10:

Stakeholder analysis showing gaps and links

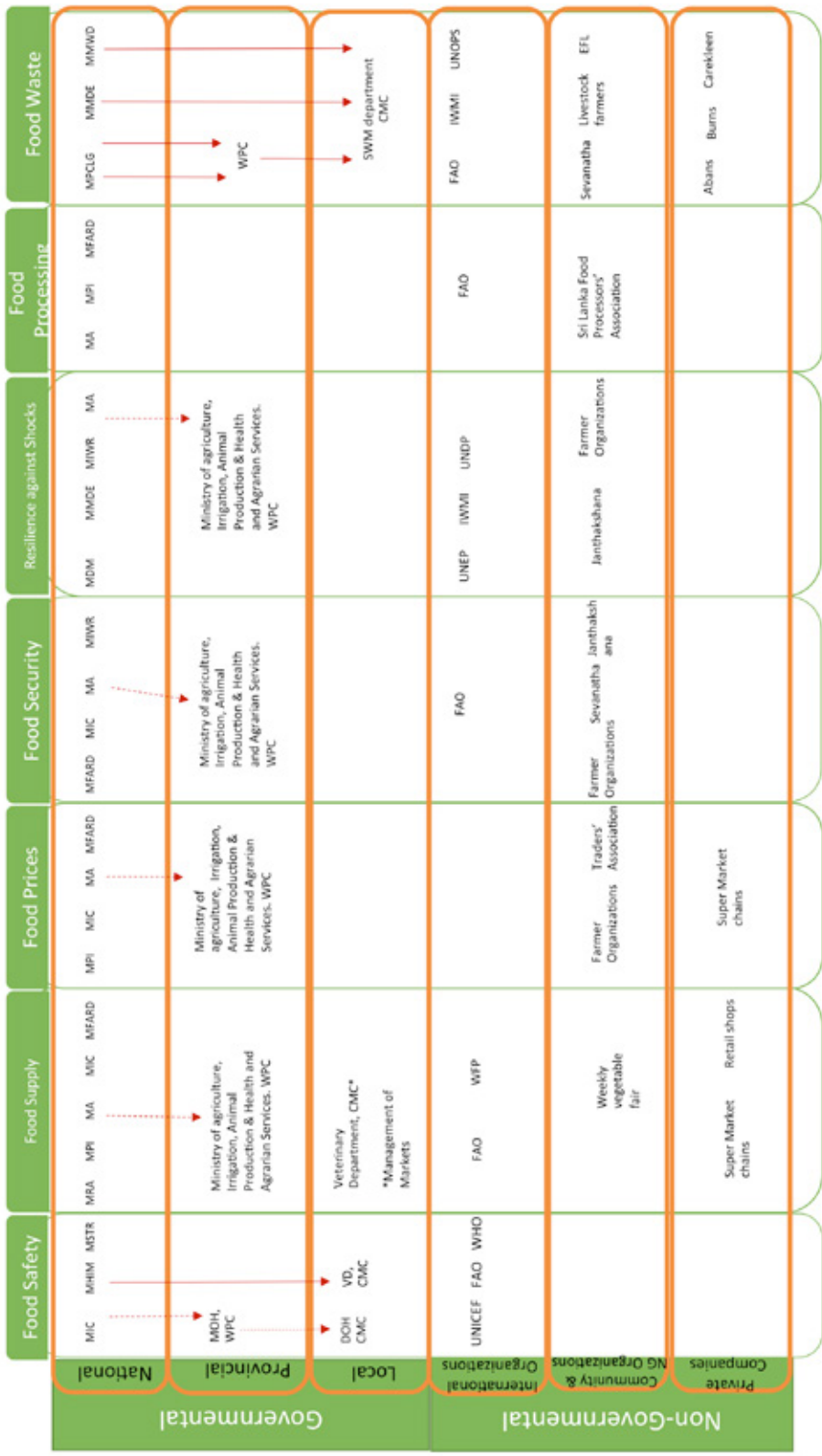


Figure 10 shows the institutional arrangement of the different components of the food system. It is clear that there are weak relationships in all three governance levels, creating institutional gaps that prevent the system functioning effectively.

Strong relationship ⟶ Weak relationship - - -⟶

MIWR: Ministry of Irrigation and Water Resources Management of **Sri Lanka**

MDM: Ministry of Disaster Management

MA: Ministry of Agriculture

MFARD: Ministry of Fisheries and Aquatic Resources Development

MPI: Ministry of Plantation Industries

MHIM: Ministry of Health, Nutrition and Indigenous Medicine

MIC: Ministry of Industry and Commerce

MMDE: Ministry of Mahaweli Development and Environment

MOA: Ministry of Agriculture, Irrigation, Animal Production & Health and Agrarian Services (Western Province)

MOE: Ministry of Environment (Western Province)

MPCLG: Ministry of Provincial Councils and Local Government

MMWD: Ministry of Megapolis and Western Development

MRA: Minister of Rural Economic Affairs

MF: Ministry of Finance

WMA: Waste Management Authority

SWMD: Solid Waste Management Department

DOH: Department of Health

VD: Veterinary Department

CMC: Colombo Municipal Council

WP: Western Provincettt

4. Characterisation of the Colombo CRFS

4.1 Food production in the Colombo City Region

Production is the starting point of a food value chain. The quality and quantity of food production and supply affect the food security, nutrient security and food safety of consumers. Crop cultivation and animal husbandry are the major components of food production. Sustainable agriculture ensures production of healthy food without compromising the ability of future generations to produce food. According to the generic food culture in Sri Lanka, the major commodities consumed by people are rice, fish/meat, vegetables and fruit. Geographically unequal food production can be observed in Sri Lanka due to economic, social and climatic factors.

Crop cultivation within the city of Colombo is negligible. Except for urban home gardens there are no cultivated lands within the city limits. Small-scale livestock management, including cattle, buffalo, goat, pig and poultry, is reported in the Colombo divisional secretariat. Peri-urban and rural areas of Colombo District produce paddy, coconut, cinnamon, vegetables and fruit. Rain-fed paddy cultivation occurs on 11 percent of the land area in the district. Home gardens are very common in rural and peri-urban areas and account for 26 percent of the district's land area (Table 3).

Table 3:

Land use pattern in Colombo District, 2010. (Source: Department of Land Use Planning)

LAND USE	EXTENT (HA)	PERCENTAGE (%)
Non-agricultural Lands		
Built-up areas	18 792.96	27
Agricultural Lands		
Home gardens	18 276.39	26
Plantation crops (rubber, coconut)	17 925.86	26
Paddy	7 658.38	11
Other field crops	378.12	1
Forest Lands	2 340.79	3
Water bodies	2 162.86	3
Other	2 276.55	3

In Colombo District, there are 124 estates (agricultural lands of more than eight hectares) covering 6 295 hectares and 53 564 smallholdings[15] (less than eight hectares) covering 28 201 hectares[16]. Four different agro-climatic conditions have been identified in the Western Province (WL1, WL2, WL3, WL2a), enabling people to grow multiple crops. The

15 19 402 smallholders having less than 8 hectares and more than 0.1 hectare of land area.
16 Summary report on agricultural activities, Economic Census 2013/14.

Department of Agriculture has recommended the most suitable crops for each region. Apart from these selected crops, several vegetables and fruits are expected to be cultivated in Colombo City Region in lesser extents.

According to the National Food Production Development Programme 2016, the Ministry of Agriculture identified the Western Province as a significant contributor to national food production targets. The programme aimed for 58 855 hectares of paddy farming to obtain 157 976 tonnes of harvest in the year 2016. This was considered as 3.1 percent of the total production of the country. The programme aimed for 11 460 hectares of vegetable production to obtain 117 723 tonnes and for 433 hectares to produce 46,082 tonnes of fruit during the 2016 (Ministry of Agriculture, 2015). The Western Provincial Council has already showed interest in the local food concept as part of its urban and peri-urban agriculture policy.

4.2 External food supply to the Colombo City Region

A CRFS is understood as a given geographical region that includes the surrounding peri-urban and rural hinterland, across which people, food, resources/inputs for food production and ecosystem services are moving. The physical boundaries of the city region need to be determined by considering multiple dimensions. Since the concept of CRFS is fairly new, there is no clear-cut methodology to identify a city region so its boundaries need to be defined by the individual city context.

Owing to the increasing complexities in social, economic and demographical differences, as well as traditions at a local level, there is a global trend of analysing the problems from a micro-level, geospecific perspective rather than from a macro perspective. This allows researchers and decisionmakers to narrow their focus and provide location-based solutions. Recent publications on food security have highlighted the importance of understanding the issue from a micro-level perspective (Berry, E M; Dernini2, S; Burlingame, B; Meybeck, Alexandre; Conforti, P, 2014). Following this trend, the city region food system approach is expected to analyse the actors/players and relationships in the food system of a certain city, while considering its relationship with the peri-urban and rural surroundings.

In order to assess the characteristics of the food system through major commodities (Table 4), a few representative food items were selected by considering which contributed to the nutrient input most (both macronutrients and micronutrients). The food items were prioritised through a multistakeholder and expert consultative process.

Table 4:

Major nutrient suppliers

NUTRIENT	MAJOR NUTRIENT SUPPLIER
Carbohydrate	Rice
Fat	Coconuts
Protein	Fish, beans
Micronutrients	Vegetables – beans, brinjals Fruit – bananas, papayas

4.3 Key food commodities relevant for the Colombo CRFS

Through an expert and multi-stakeholder consultative process, the key food commodities relevant for the Colombo CRFS were prioritised. The commodities selected for the detailed study were the most consumed food items in the Colombo City Region that also supplied the key macronutrients (carbohydrates, proteins, fat, etc.) and micronutrients (vitamins and minerals) – rice for carbohydrate, fish and beans for protein, coconut for fat, and fruit (bananas, papayas) and vegetables (beans, brinjals) for vitamins and minerals.

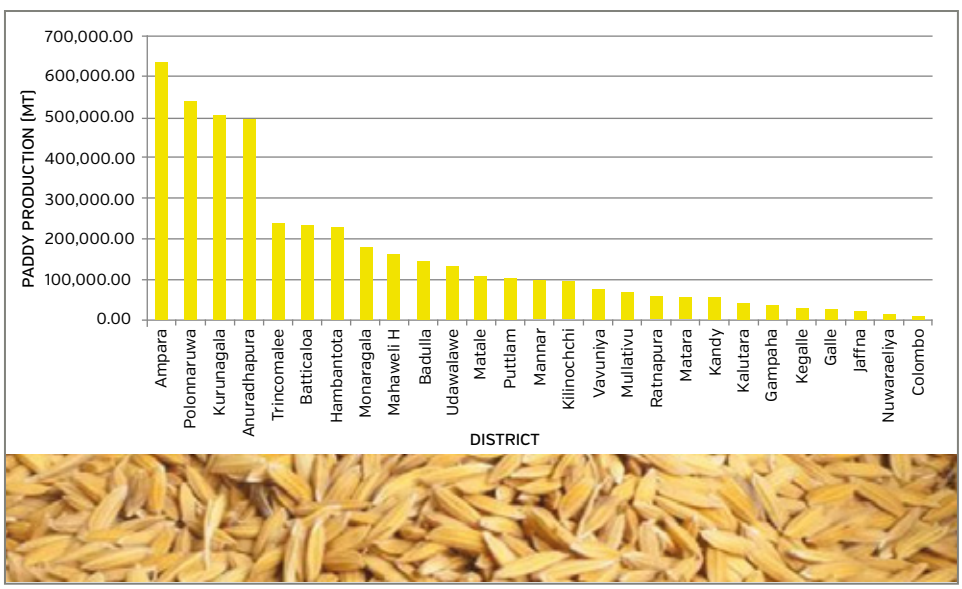
4.3.1 Paddy rice

Rice is the staple food in Sri Lanka. It is a seasonal crop cultivated twice a year in the two monsoon seasons. The Maha season starts by September and ends by March; the Yala season starts by May and ends by August. The Maha season provides more rain, hence more yield. Paddy production in Sri Lanka in 2016 was 4.4 million tonnes. Colombo District produces the least paddy, contributing 0.3 percent of total national production. Production according to district can be found in Figure 11 and supply to Colombo can be found in Figure 12.

A large proportion of the rice produced in Sri Lanka's districts comes to Colombo. The rice requirement of the residents of Colombo was estimated as 38 183 tonnes and the supply was 86 520 tonnes, which is 126 percent over supply compared to the requirement. It can be assumed that the balance has been distributed via Colombo.

Figure 11:

District-wise paddy production in Sri Lanka, 2016. (Source: Paddy Statistics Report 2016, Department of Census and Statistics.)



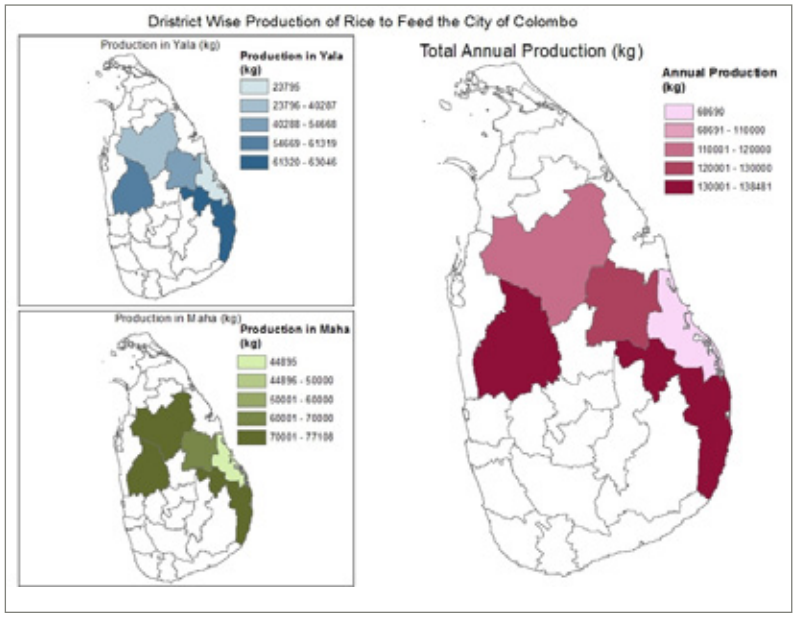


Figure 12:

Paddy supply to Colombo

4.3.2 Coconuts

Coconut is grown mainly in the North Western and Western provinces of the country [Figure 13]. Almost 99 percent of the coconut growers are classified as smallholders[17] and the total land extent under smallholdings is 81.9 percent of the total cultivated land.

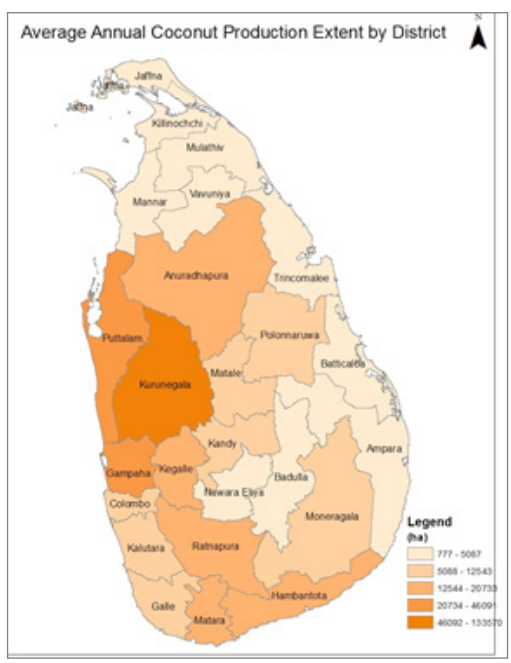


Figure 13:

Coconut production in Sri Lanka. (Source: Coconut Research Institute)[18]

17 Farmers cultivating land of less than 8 hectares.

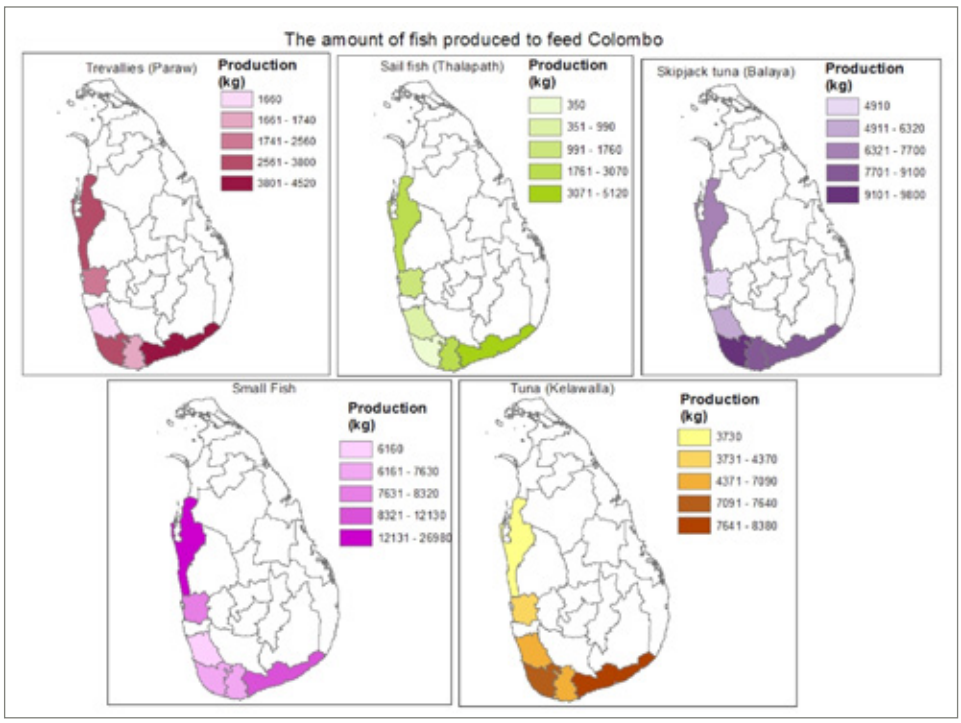
18 http://www.cri.gov.lk/web/images/stories/statistics/satistics_on_coconut_oil_palm.pdf)

4.3.3 Fish

Marine fish fulfill more than 90 percent of the country's fish requirement and also most of the fish requirement in the Colombo City Region. Deep sea fishing falls during periods of stormy weather, which can last approximately six months, because fishermen are discouraged by the conditions. Fish production in Sri Lanka can be found in Figure 14.

Figure 14:

Amount of fish produced to feed Colombo. (Source: Annual Report 2015, Ministry of Fisheries and Aquatic Resources Development.)



Five major types of fish[19] are available in the Colombo City Region, with a different level of demand and supply in a given period. Fishermen in the southern coastal areas are the highest producers in Sri Lanka. Excess fish harvest is salted and dried as a cottage industry. Local dried-fish production is not sufficient to meet the demand and about 70 percent of dried fish is imported (Appendix 3).

4.3.4 Brinjals

Brinjal is one of the most consumed vegetables in Sri Lanka. It is a low-country vegetable that can be grown in very dry areas and even with minimum irrigation facilities. According to the commission agents at Manning Market and Narahenpita Dedicated Economic Centre (within the CMC), the main brinjal supply to Colombo comes from the southern part of the country.

19 Trevallies, sail fish, skipjack tuna, yellowfin tuna and small fish.

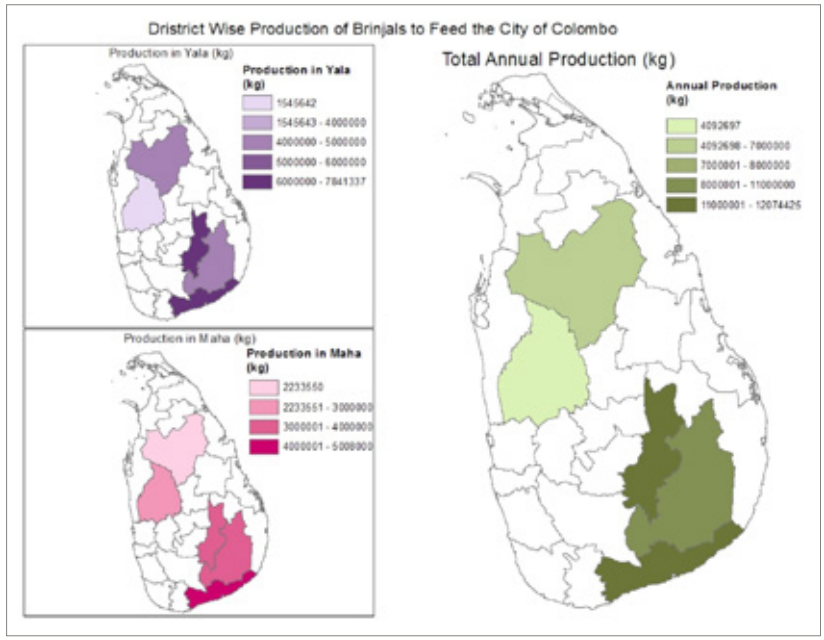


Figure 15:

District-wise production of brinjals. (Source: Ministry of Agriculture Statistics, 2015)

4.3.5 Beans

Beans are a highland crop that demands chilled weather to grow. According to the sellers at Manning Market, Colombo receives large quantities of beans from up-country (the central part of Sri Lanka).

Production of beans is, on average, highest in the Yala season in Matale District, even though the cultivated area is less compared to other districts, except for Monaragala.

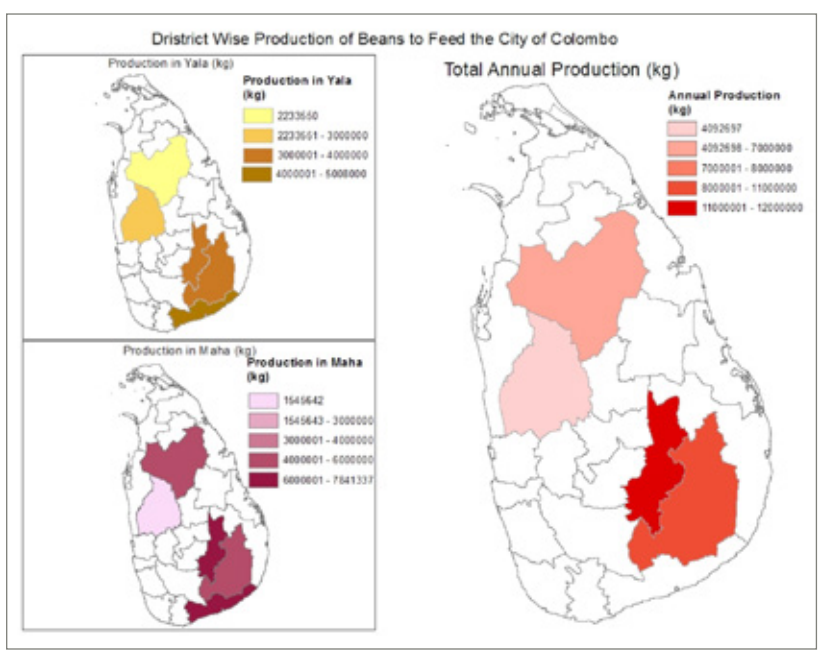


Figure 16:

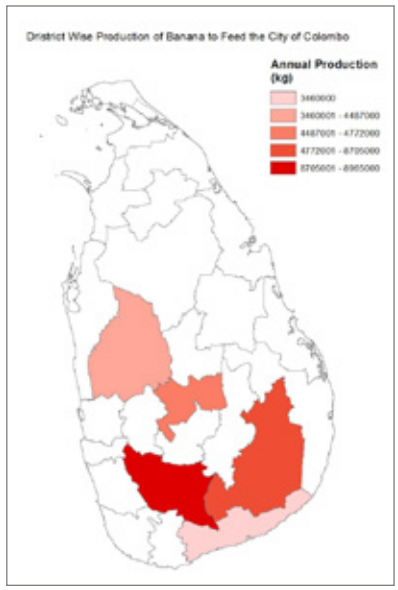
District-wise production of beans. (Source: Ministry of Agriculture Statistics, 2015.)

4.3.6 Bananas

According to the sellers at Narahenpita Dedicated Economic Centre (located within the CMC area), Colombo markets receive large quantities of bananas from southern part of the country (Figure 17).

Figure 17:

District-wise production of bananas. (Source: Ministry of Agriculture Statistics, 2015.)

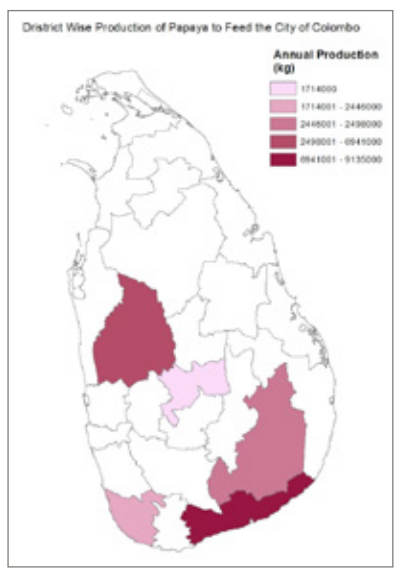


4.3.7 Papayas

Papayas are grown in the dry and intermediate zones of Sri Lanka. Five main districts supply Colombo with papayas. Embilipitiya Dedicated Economic Centre is the hub for papaya supply to Colombo as it connects the two top producers – Monaragala and Hambantota districts (Figure 18). Annual papaya supply to Colombo is 8 347 tonnes. Ring spot virus is the main disease that affects the yield adversely.

Figure 18:

Top five papaya-producing districts that mainly feed Colombo. (Source: Ministry of Agriculture Statistics: 2015.)



4.3.8 Vegetables and fruit

Manning Market is located in the Colombo City Region and is the oldest vegetable and fruit wholesale market in Sri Lanka. The main objective of establishing Manning Market was to accumulate all vegetable and fruit harvests throughout the country in order to distribute them easily and to eradicate the inability of harvest selling by farmers. There are more than 1 400 commission agents and sellers involved in buying and selling vegetables and fruit on a daily basis. The CMC owns the premises and each stall is rented to commission agents. The market is virtually open for 24 hours a day as lorries filled with vegetables and fruit arrive from various parts of the country from early morning. According to the business process, farmers and their agents bring the harvest to selected commission agents in Manning Market for an agreed price. Then the commission agent collects the vegetable and fruit stocks and resells them to wholesale and retail customers, while keeping a margin.

Most vegetable and fruit farmers are smallholders without adequate quantities or capacity to transport their harvest by themselves to economic centres. In such a case, from farm gate to economic centre, many intermediaries may be involved – local collectors, local wholesale buyers, local transporters, etc. At each step of the value chain, every actor aims to make a profit which means the vegetable and fruit prices escalate. The business process chain involves farmers, farmers' agents and intermediate collectors/local wholesalers, who bring the harvest to the economic centre.

The economic centres should function as open markets for farmers with plenty of negotiating power. However, in reality, this is not the case. Instead, wholesalers decide the prices of the products, not the farmers. Without any negotiating power, a farmers' presence makes little difference. In fact, farmers rarely come to the economic centres. Usually, truck drivers transport and deliver the vegetables collected from farmers. It is a tragedy that the hidden market mechanism has pilfered the negotiation power either completely or to a great extent from the farmer. Making the situation even more alarming, most farmers supply (or are bound to supply) only to a particular, predetermined wholesaler. Often, they obtain financial loans for fertiliser and other expenses during the cultivating season from these wholesalers and agree to sell their products to them. However, the harvest is purchased at a very low price later on, which makes the farmer highly vulnerable and keeps them stuck continuously in a debt trap.

4.4 Food processing and manufacturing for the Colombo City Region

The Government of Sri Lanka has given a high priority, with a number of fiscal reliefs and incentives, to encourage value addition to agricultural produce and to minimise post-harvest wastage, generate employment and increase export growth.

The different regions of Sri Lanka are home to diverse food-processing companies, such as mills, fruit preservation companies, slaughterhouses and meat processers, bakeries and confectionaries.

Note: Ceylon Grain Elevators (CGE), Bairaha Farms PLC, Maxies & Company (Pvt) Ltd., Delmo Chicken and Agro (Pvt) Ltd., Keells Food products and Nel farms are some of the leading meat and meatbased product manufacturers in Sri Lanka. Wheat-based products, especially biscuits, are mainly manufactured by Maliban Biscuit Manufactories Limited, Ceylon Biscuits Ltd, Cargills Ceylon PLC and Luckyland biscuit manufacturers. The National Livestock Development Board, a government entity, is a leading milk and dairy-based products manufacturer, while Pelwatte Dairy Industries, Lucky Lanka Milk Processing Company, Kotmale Holdings and Fonterra Lanka are privately owned companies that significantly contribute to the dairy industry.

Chocolate and many cocoa-based products are manufactured by several private companies aiming at both local and foreign markets. Ceylon Chocolate Limited, Edna Chocolate (Cey) Ltd., Diana Chocolates Private Ltd. and Daintee Limited are some of the leading companies in the chocolate manufacturing industry and they have also become successful in the export market.

Facilities for vegetable and fruit processing and product manufacturing are not available around Dambulla, Meegoda and Narahenpita economic centres. Manning Market in Colombo is a more appropriate location to establish such facilities, as the wastage of vegetables and fruit due to oversupply is common here.

Demand for processed and convenience food is increasing constantly due to urbanisation and the busy lifestyles and changing food habits of people. The complex socio-demographic profile of the population has revealed the diverse needs for prepared food. This complexity has paved the way to a well-established prepared food supply chain in Colombo, where all the segments can satisfy people's needs. The most common way to get prepared food is from hotels and restaurants, ranging from five-star hotels to small-town hotels and from restaurants to street-food outlets. These hotels and restaurants are widely available in the city, providing households, workers and the floating population with easy access to prepared food.

Colombo has five major types of prepared-food supplier. First, the international franchised food suppliers, such as McDonalds, KFC, Pizza, Dominos and Subway. Second, local suppliers, such as Perera & Sons, Fab, Steam Boat, Sen-saal, etc. Third, the institutional food providers who provide prepared food for schoolchildren, university students, armed forces, hospital patients, prisoners, etc. Fourth, and the most common form of prepared-food supply in Colombo, are standalone hotels and restaurants, which target different income segments of the population. Fifth, the static small-scale food stores that sell their prepared food. Finally, there are mobile units that sell prepared food from vehicles.

4.5 Food supply chains

Apart from food items sold via supermarkets, almost all other food items are channelled through main value chains. However, direct value chains are also getting popular and can become a competitive value chain in the future.

In some value chains, the number of actors involved could be up to six; even though some actors may not add any value to the supply chain, their involvement further increases price levels. Such 'self-serving' intermediates in the main value chains do not provide any benefit to farmers or consumers, but simply cause unjustified price increases. Present average price increases from wholesaler to consumer are estimated to be 300 percent. Farmers receive only a small portion of the wholesale price despite their expenditure on resources, labour and time.

However, there are alternative supply chains that are shorter, with less actors involved, that can deliver the harvest to the final consumer in a more favourable manner for farmers, providing them with a 30 percent mark-up.

4.5.1 Value chains and distribution channels

Paddy rice

More than 26 percent of the country's rice production is sent to the market by mill owners. Owners of large mills buy paddy from farmers or collectors, and also from the Sri Lanka Paddy Marketing Board. Large-scale mills send their product to wholesalers, supermarkets and some retailers. Rice from small-scale mills is sent to wholesalers and retailers.

Mill owners supply two forms of rice to the market: relatively cheap, unbranded rice (20–25 percent) and expensive, high-quality, branded rice (75–80 percent). Twenty-six percent of rice farmers sell their harvest to paddy collectors or small-scale mill owners; 46 percent of farmers do not sell their harvest but use it for self-consumption. Twelve percent of farmers sell their harvest directly to retailers. A significant price increase of at least 120 percent occurs when the rice comes through the value chain due to the value addition from milling, branding and storing (Figure 19).

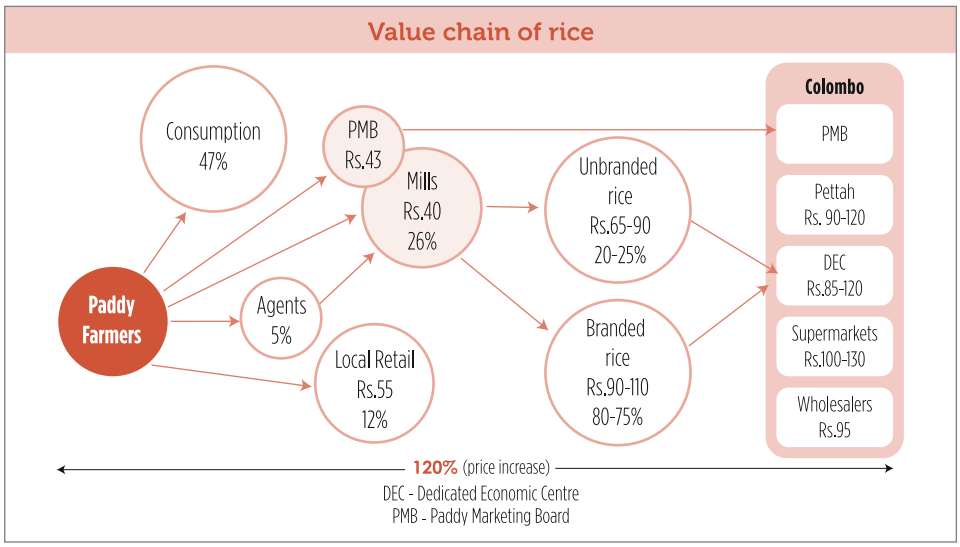


Figure 19:

Value chain of rice. (Source: FAO, IWMI, RUAF (unpublished))

Coconuts

More than 57 percent farmers sell their coconut harvest through large-scale collectors, who send coconuts to auctions in Kuliyapitiya and Colombo. A quarter (25 percent) of farmers sell their harvest at their coconut fields while 12 percent sell their harvest through agents. More than half of the coconut harvest is handled by collectors. Nearly a third is auctioned and 30–40 percent of the product is collected by wholesalers from farmers, local markets and agents. Retailers in Colombo buy coconuts from coconut auctions and wholesalers (Figure 20).

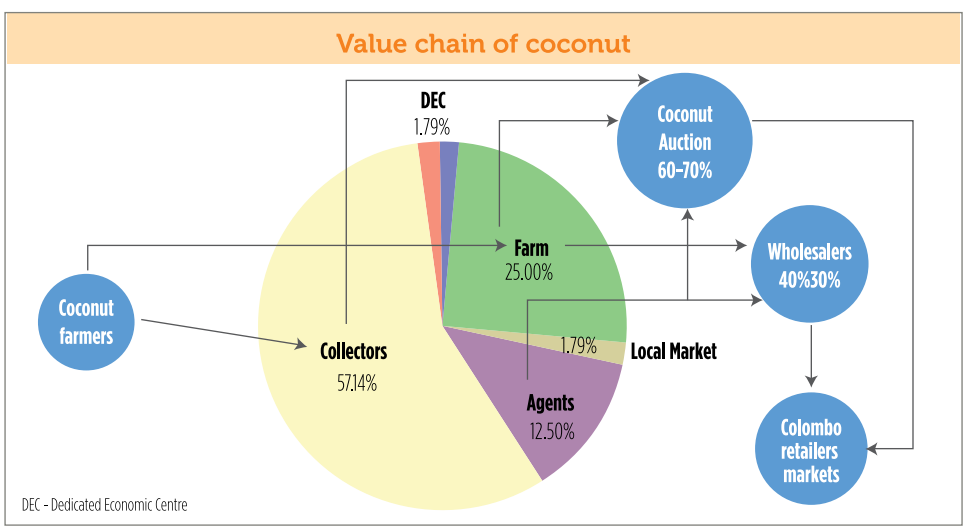


Figure 20:

Value chain of coconuts. (Source: Detailed Assessment, CRFS Phase 2.)

Fish

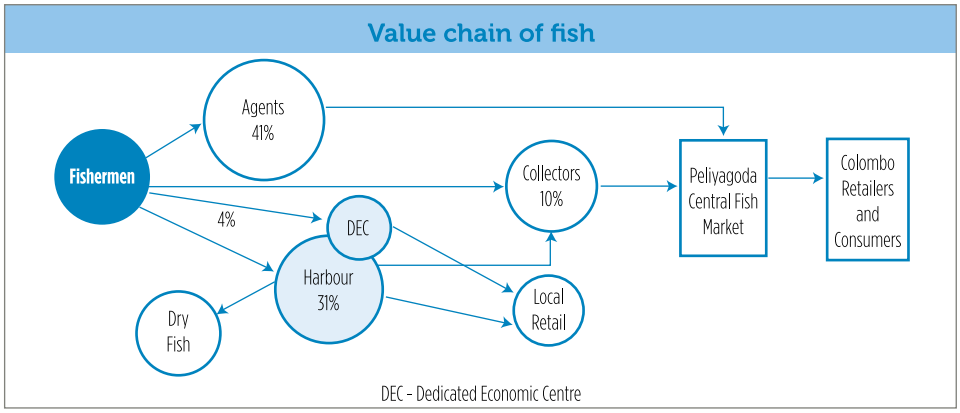
Fish is supplied to Colombo from both the southern region and Negambo. Panadura, Mutwal, Beruwala and Dickovita are fishing harbours close to Colombo and they supply fish to Colombo District. There are different supply chains for fish.

As per the survey findings, the highest percentage (40.82 percent) of fish is sold at the harbour to agents who in turn sell it at the Peliyagoda Central Fish Market, the main fish distribution centre in Colombo. Local retailers or collectors buy about a third of the fish (30.61 percent) at the harbour, while only four percent of the fish harvest is sold at Dedicated Economic Centres (Figure 21). Fish wholesalers buy fish either from the Peliyagoda Market or directly from harbours.

Supermarkets, the Ceylon Fisheries Corporation outlet and a number of retail fish outlets are located within Colombo's city limits. Supermarkets have registered suppliers supplying fish according to quality standards stipulated by the management. Part of the fish harvest that is damaged or low in quality is sent to be processed as dry fish.

Figure 21:

Value chain of fish. (Source: Detailed Assessment, CRFS Phase 2.)

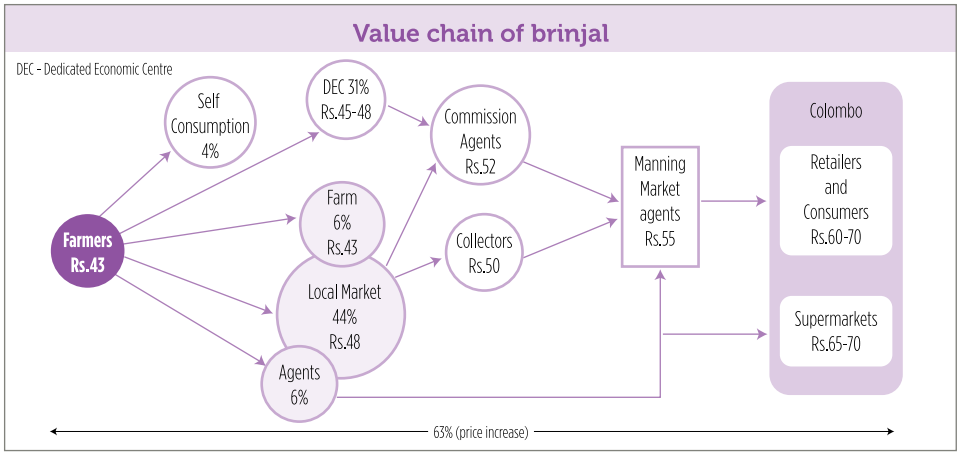


Brinjals

As per the survey findings, 96 percent of the brinjal harvest arrives at the market. Of the total production, 44 percent is sold by farmers at vegetable markets in the same locality, while 31 percent is sold at a nearby Dedicated Economic Centre. Six percent of the production is sold at the farm and the same percentage is sold to agents. Commission agents at a Dedicated Economic Centre and collectors supply brinjals to Manning Market in Colombo. Supermarkets receive brinjals through their agents, who buy directly from farmers. Along the value chain there is a 63 percent price increase.

Figure 22:

Value chain of brinjals. (Source: Detailed Assessment, CRFS Phase 2.)



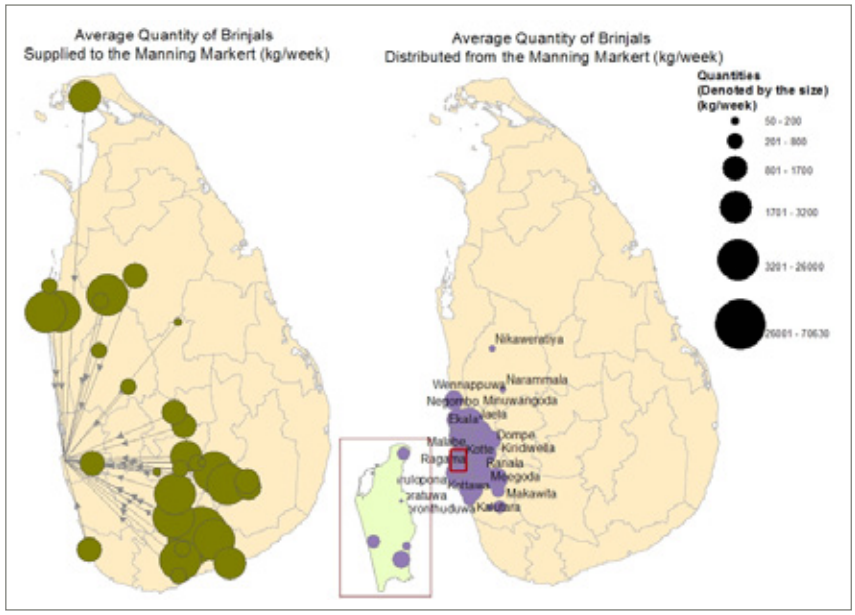


Figure 23:

Brinjal inflow and outflow

The brinjal supply to Colombo comes from many locations around the country (Figures 22 and 23). When areas are closed to production, then supplies may come from longer distances. Manning Market acts as a regional hub, distributing vegetables to the suburbs. Some brinjal supplies travel back towards the production areas, which confirms a lack of coordination and inefficiency of the supply chain.

Beans

The distribution channel data revealed that 17.31 percent of farmers send their beans to a Dedicated Economic Centre (DEC) and 13.46 percent sell them to retailers. A relatively significant percentage of farmers (11.54 percent) sell their products to both DECs and supermarkets. Along the value chain, the price of beans increased by at least 30 percent; in some reported cases, the retail price increased to more than 50 percent of the farmers' price.

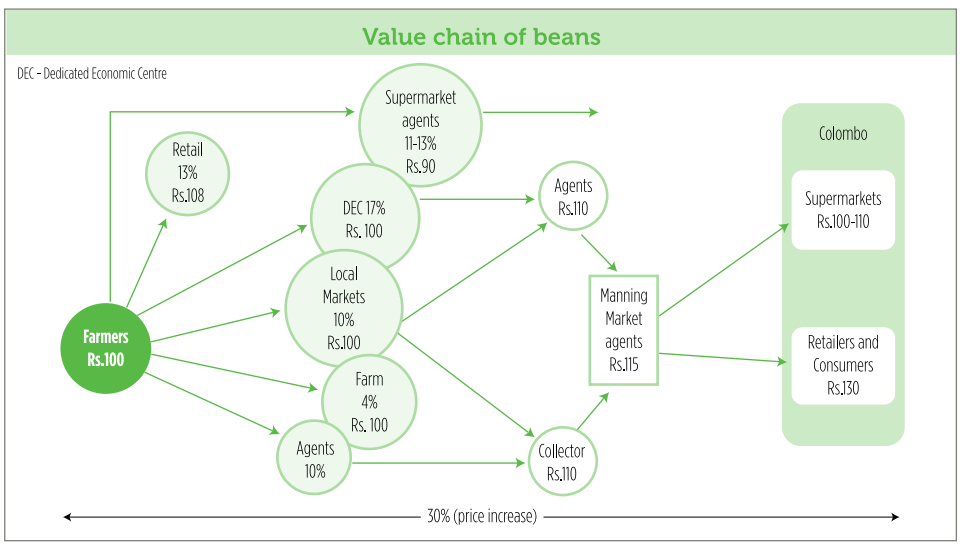
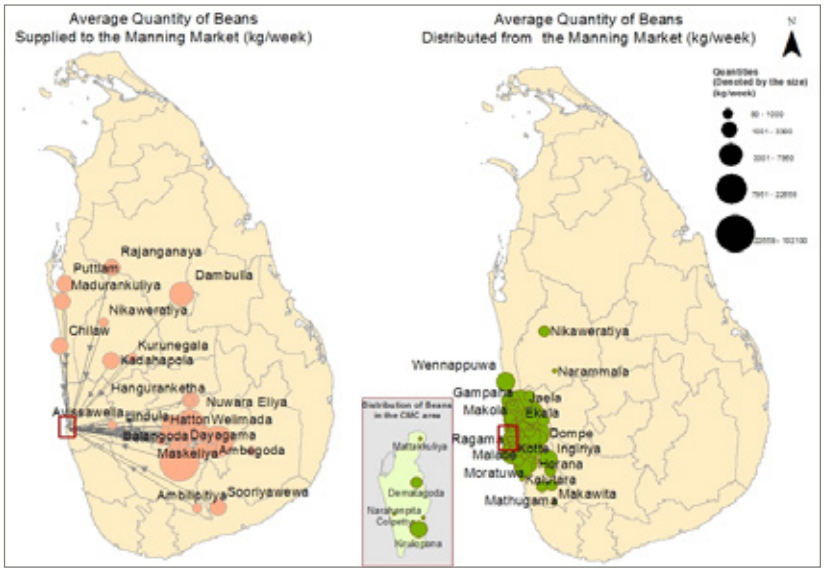


Figure 24:

Value chain of beans. (Source: Detailed Assessment, CRFS Phase 2.)

Figure 25:

Beans inflow and outflow



The bean supply comes mainly from the middle of the country, which is where the climatic conditions are best for the crop (Figures 24 and 25). A small part of the production comes from other parts of Sri Lanka. The inefficiency of the inflow and outflow of beans is similar to the brinjal supply.

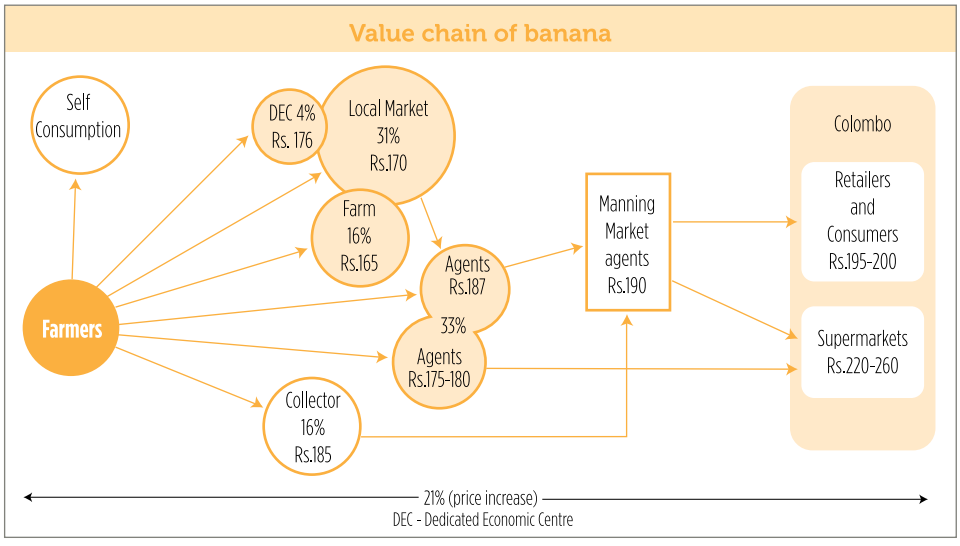
Bananas

The data recorded on the distribution channels indicated that local markets sell the highest percentage of the banana harvest (31 percent). Around 16 percent of the total yield is sold to collectors. Farmers sell their bananas at the farm itself (16 percent) and only four percent of the harvest is sold at a Dedicated Economic Centre.

Retailers in Colombo District buy bananas from Manning Market. Supermarkets get their supply from agents who buy directly from farmers and from Manning Market. The increase in price of bananas along the value chain is 21 percent.

Figure 26:

Value chain of bananas. (Source: Detailed Assessment, CRFS Phase 2.)



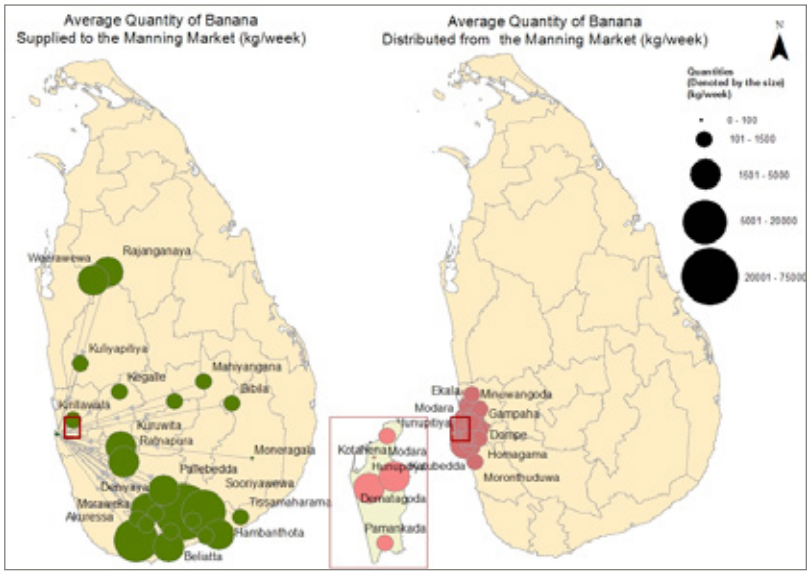


Figure 27:

Banana inflow and outflow

Bananas are cultivated in most parts of the country, with many commercial farmers in the southern part of Sri Lanka (Figures 26 and 27). The southern expressway, which has created an excellent channel of transport to Colombo, may be the reason for the concentrated supply from the south. However, the supplies seem to be absorbed by the suburbs.

Papayas

The distribution channels for papaya production indicate that 33.33 percent is sold at markets. It was also found that 16.67 percent of the papaya production is sold to agents and a similar percentage of papaya yield is distributed to markets, agents and the DECs. The study results revealed the price of papayas increases by at least 70 percent along the value chain.

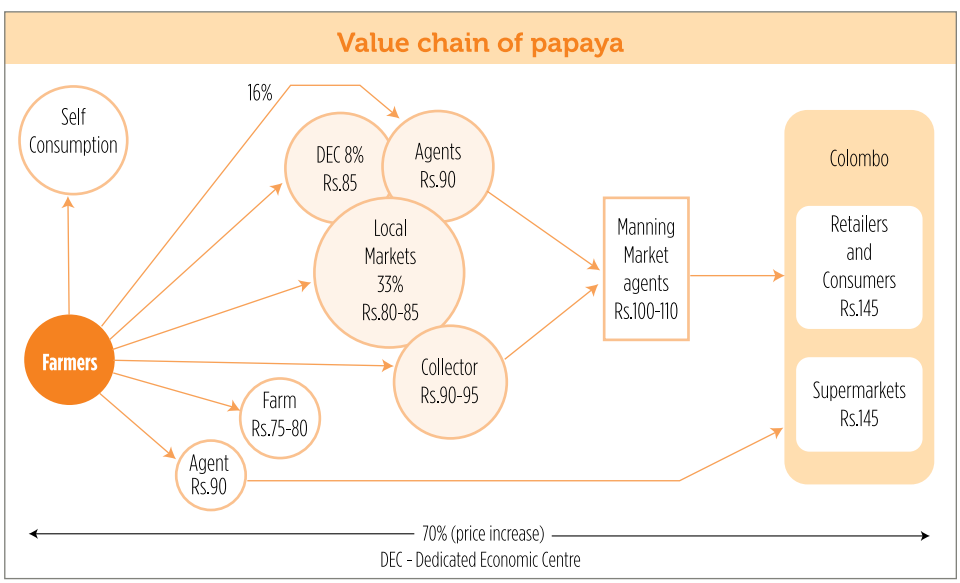
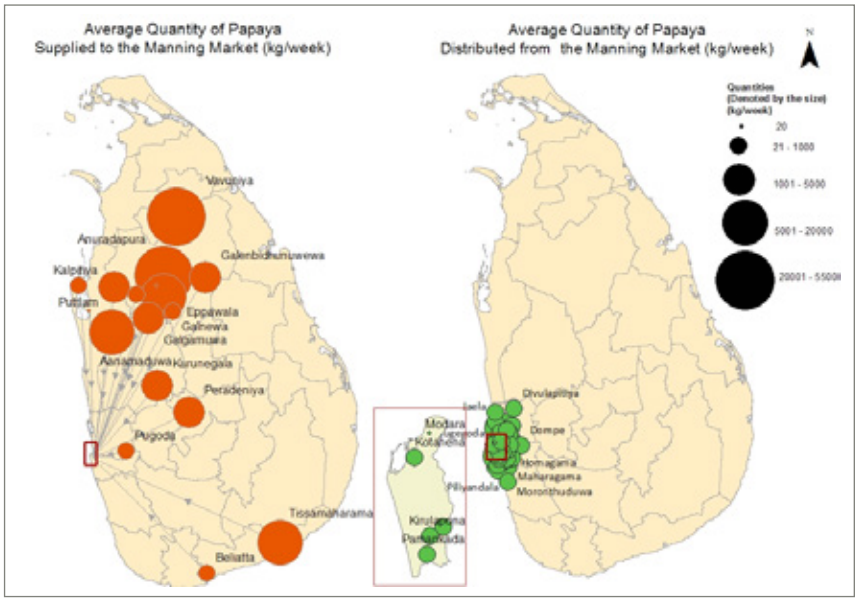


Figure 28:

Value chain of papayas. (Source: Detailed Assessment, CRFS Phase 2.)

Figure 29:

Papaya inflow and outflow



Papayas are cultivated in the dry zone of the country. There are long food miles from distant production areas despite closer production areas being available. However, the supplies seem to be absorbed by the suburbs without sending papayas back towards production areas, as with the brinjal value chain (Figures 28 and 29). There is room to optimise the supply chain to Colombo.

4.5.2 Wholesale markets: Dedicated Economic Centres

Currently, the 12 Dedicated Economic Centres (DECs) in Sri Lanka (Table 6 and Figure 30) that act as wholesale markets are: Dambulla, Thambuththegama, Nuwaraeliya, Kappetipola, Kurunduwaththa, Welisara, Veyangoda, Narahenpita, Embilipitiya, Meegoda, Piliyandala and Rathmalana. Each centre has a range of specialised crops that are grown in that area. The Dambulla DEC is centrally located and operates on a 20 percent commission basis[20]. Farmers or collectors from almost all areas of Sri Lanka bring their products to this economic centre. There are 104 outlets or shops in the economic centre and these sell, on average, 26 500 tonnes each week.

Table 5:

Economic centres established at crop-producing and marketing points. (Source: http://www.mtdec.gov.lk/en/economic-centers/dambulla-dec.html)

ECONOMIC CENTRE	OBJECTIVE	SPECIALISED CROP
Dambulla	A wholesale market for vegetables and fruit	All types of vegetable and fruit
Thambuththegama	A wholesale market for vegetables and fruit, especially as a collecting centre	Low-country vegetables, especially pumpkins, kekiri, ash pumpkins, watermelons, brinjals, long beans and bitter gourds
Nuwaraeliya	A wholesale market for vegetables and fruit, especially as a collecting centre	Up-country vegetables, e.g. Nuwara Eliya potatoes, Chinese cabbages,bell peppers, minchi & salad leaves

20 20 percent of commission is paid to the shop owner of the DEC by the buyer and seller.

Table 5 (continued)

ECONOMIC CENTRE	OBJECTIVE	SPECIALISED CROP
Kappetipola	Exchange centre of vegetables and fruit.	Potatoes, beans, cabbages
Kuruduwatte	Purchasing facility of other foods items	It is expected to provide facilities as collecting centre of minor export crops, especially spices
Veyangoda	Distribution centre of farm products	Up-country and low-country vegetables and fruit
Welisara	Distribution facilities for fresh vegetables, fruit and other food items to traders in Gampaha District	Up-country and low-country vegetables
Narahenpita	Supplier of quality food and consumer items at fair prices for consumers living close to the capital city	Wholesale and retail supply of all agro-products and essential food items, including vegetables and fruit grown with cattle manure
Ratmalana	Supplier of quality food and consumer items at competitively reasonable prices and introduce market opportunities for local producers and importers	Wholesale and retail supply of all agro-products and essential food items, including vegetables and fruit grown with cattle manure
Meegoda	A wholesale market for vegetables and fruit, especially as a collecting centre	Up-country and low-country vegetables and fruit
Embilipitiya	A distribution centre/wholesale and retail trading centre to provide fair prices for the produce of farmers	This economic centre facilitates cultivators/farmers to sell their produce directly to banana traders

Figure 30:

Economic centres in Sri Lanka. (Source: http://www.mtdec.gov.lk/)

4.5.3 Commercial-scale farming entities directly selling food in Colombo

A trend is emerging where enterprises in food production and processing are directly transporting to Colombo by their own channels. Many food producers in the rice industry (e.g. local mills, such as Nipuna and Araliya), agrarian companies (eg. CIC, NLDB) and poultry farms (e.g. local commercial farms, such as Pussellawa and Maxies) sell their products directly from production centres to either retailers or final consumers through their dedicated channels.

4.5.4 Small-scale farmers sell their products in fairs (small marketplaces) in Colombo

Small-scale farmers bring their harvest – using small vehicles or via public transport – to informal retail markets operating in Colombo. Many retail business people and individual customers visit these markets to buy fresh and rare vegetables and fruit at reasonable prices.

4.5.5 Supermarkets in Colombo

Cargills Food City and Keells, two well-established, branded supermarket chains that operate in Colombo, have created their own innovative vegetable and fruit supply chains. They have their own purchasing centres in production areas and their own distribution centres. They use food safety protection measures that reduce food wastage and maintain food quality. These supermarkets offer relatively high prices to their registered farmers. Though the farmers have to transport their products, they are willing and able to do so due to the higher prices offered. The cold transportation fleet owned by supermarkets enables them to supply high-quality commodities to customers. Price inflation due to intermediaries is absent in these supply chains, which provide a good value for food producers and the right price levels for customers.

4.6 Imported food items

Colombo Port is the main international harbour in Sri Lanka. Food items, such as wheat flour, sugar, onions, lentils, potatoes, palm oil, dried milk, soybeans, dried fish, canned food and fruit (apples, grapes, oranges), arrive via Colombo Port and are distributed throughout the country. There are many private small- and medium-scale wholesale shops and storages for imported food items in the CMC area. The country's entire wheat and red dhal requirement is met through imports. In 2013, the imported quantity of wheat and dhal was 934 596 tonnes and 151 129 tonnes respectively. The CMC acts as the national wholesale market for imported food items in Sri Lanka. At the same time Sri Lanka exports food items such as coconut, fish, vegetables and fruit, such as plantains, avocadoes and pineapples, to other countries. It is estimated that Sri Lanka spends around Rs.200 billion annually to import foods items (Figure 31).

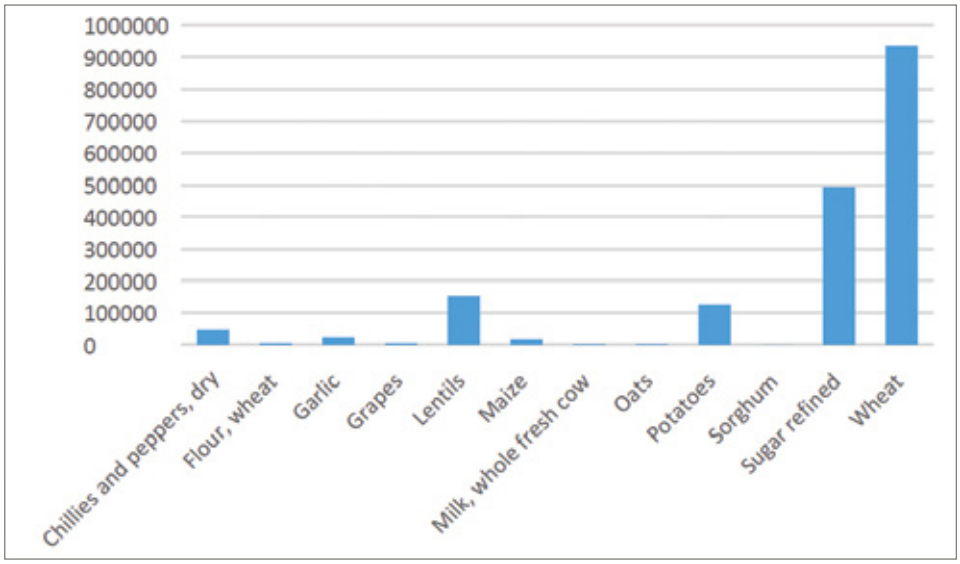


Figure 31:

Imported food items in 2013. (Source: http://www.fao.org/faostat/en/#data/TP.)

4.7 Food marketing and retail

Demand for food in the city of Colombo depends on the number of residents and commuters, and on socio-economic factors of the population. In order to fulfill this demand in sufficient quantities and with preferable food items, a proper food marketing system needs to be established. Colombo has a range of marketplaces that cater to this diverse population with affordable food items that match their requirements. Marketplaces operating in Colombo range from supermarkets to roadside stalls.

As well as the two branded supermarket chains, Cargill's Food City and Keels (see 4.5.5 above), there are 18 other relatively large markets located in Colombo's city limits. These markets are involved in the retail business of selling vegetables and fruit purchased from Manning Market. They operate under the CMC whose Department of Veterinary Service supervises them to ensure they adequately maintain food safety standards.

Small-scale marketplaces operate throughout the city of Colombo. They started informally and gradually became well-established with a significant number of customers – both retailers and individual consumers – who buy fresh and rare vegetables and fruit at reasonable prices. There are also 27 daily and weekly markets that function outside Colombo. Farmers and food producers in the Colombo City Region bring their small-scale harvest to all these markets. There is one Dedicated Economic Centres within Colombo (Narahenpita), and four within Colombo District and five in Western Province.

Roadside vegetable, fruit and prepared-food stalls are common in Colombo, particularly in densely populated residential areas. Flexibility in the minimum quantity of food that can be bought here, combined with relatively low prices, mean that these stalls attract low-income earners.

4.8 Food demand and supply in the Colombo City Region

Colombo CRFS analysis has identified seven major food items – rice, beans, brinjal, banana, papaya, coconut and fish – that are sources of nutrients. The latter include

carbohydrate (rice), protein (fish), vitamins (vegetable and fruit) and fat (coconut). Based on one week's purchasing quantities of these items (using a typical week without any seasonal variations), monthly and annual consumptions were estimated. For example, rice is the main carbohydrate source in Sri Lankan meals and the main staple food: the average weekly household consumption is recorded as six kilograms, or 312 kilograms annually. Since there are 122 381 households in Colombo's city limits, a minimum of 38,183 tonnes of rice is needed each year. With the floating population of 500 000 people, who would also get their meals from Colombo, this demand increases significantly. Consumption of the other major commodities can be Figure 32.

Annual supplies of selected food items were calculated using the weekly supply (obtained via primary data collection) and extrapolating in a linear way to monthly and then annual figures. Figure 32 depicts the estimated annual supply of selected food items. The supplies to Colombo are higher than the consumption requirement of the residential population. This can be explained by huge floating population and food outflows to the suburbs of Colombo.

As Colombo is highly dependent on the food-producing regions of the country and acts as a marketing hub for food items, it is essential to ensure the supply of food items to the city matches the city's demand. However, as depicted in Figure 32, there is an over-supply for all seven food items. The supply of rice (126 percent) and fish (578 percent) exceeds demand by more than 100 percent. The supply of coconut exceeds demand by 60 percent.

Figure 32:

Comparison of demand and supply of selected food items in the Colombo City Region. (Source: Estimations based on Questionnaire Survey findings.)

FOOD	OVER-SUPPLY % COMPARED TO RESIDENTIAL CONSUMPTION NEED
Rice	126%
Beans	62%
Brinjal	5%
Banana	13%
Papaya	30%
Coconut	60%
Fish	578%

4.9 Food safety in the CMC

Consumers' consumption patterns in Colombo tend towards changing from home-cooked meals to prepared meals outside the home. Therefore, the nutrition qualities of food safety concerns of the prepared-food industry have been an emerging issue that needs resolving. Not all the eating houses and restaurants in Colombo are registered. The highest percentages of household responses showed they were very rarely affected by food-related diseases, which could indicate that the public is unaware of the food safety issue.

There are 895 registered eateries, which include 483 eating houses, 121 restaurants and 90 snack bars (Table 6). According to the Medical Officer of Health (MOH) at the CMC, there are many unregistered eating places where the CMC has no control whatsoever. It is believed the number of unregistered eating houses is approximately 400, and thus some of the food safety concerns of prepared food in Colombo remain unanswered.

REGISTERED CONSUMER FOOD SERVICES IN COLOMBO	
TYPE OF FOOD SERVICE	**NUMBER OF ENTITIES**
Bakery	35
Canteen	4
Catering services	1
Club	5
Coffee shop	8
Eating house	483
Food manufacturer	1
Guest house	34
Hotel	35
Juice bar	1
Lodging house	8
Night club	2
Restaurant	121
Snack bar	90
Star hotels	7
Uncategorised	20
Vegetarian café	7

Table 6:

Registered consumer food services in Colombo. (Source: Database, Trade Licence 2016, Eating House and Restaurants: CMC.)

All catering services and food outlets in the CMC have to obtain a certificate to initiate a catering service and then renew their certificate annually after an inspection. Before issuing the certificate, the CMC has to conduct a thorough review. After issuing the certificate, the CMC continues random and scheduled inspections throughout the year to confirm catering food safety. As of 2014, there were 901 catering food traders and 303 had not been registered, i.e. they operated informally without having any approval by the CMC (Table 7).

	REGISTERED	NOT IN TRADE LIST
Eating Houses	598	303
No. of prosecuted cases	434	
No. of convicted	167	

Table 7:

Eating houses in the CMC

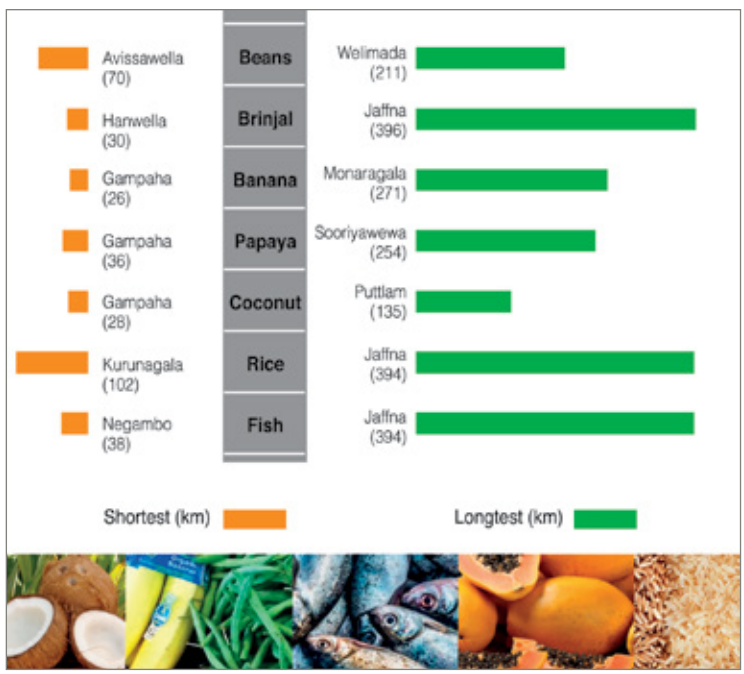
4.10 Food miles

The findings of the study revealed that selected vegetables and food items travel long distances to reach Manning Market (Figure 33). The shortest distance that a food item (banana) travels is 26 kilometres, whereas the longest distance is 396 kilometres. The longer distances can be reduced substantially by channelling commodities from closer supply areas and by promoting the CRFS concept.

It is evident that part of the requirement for selected vegetables and fruit is fulfilled by foodproducing areas in the city region. Therefore, an increase in the production capacity of these will bring positive results in terms of food security, employment generation, nutrient security and food prices for the city of Colombo.

Figure 33:

Comparison of the shortest and the longest food miles in relation to selected food items



4.11 Urban poverty and access to food

Physical accessibility to food is not an issue in Colombo. Almost all low-income settlements are situated in well-urbanised areas so people have easy access to major food markets. Low-income earners in Colombo can reach a retail shop within 20 minutes; in fact, more than 50 percent can reach a shop within 10 minutes.

More than 80 percent of respondents have retail shops within walking distance and eight percent of them use three-wheelers. Even though the supermarket concept is becoming more popular, lowincome city dwellers are not attracted to it. Only one percent of them regularly buy their food items from supermarkets while 75 percent buy from a marketplace or fair. Food prices may influence their choice of retail shop. It is clear that accessibility is not an issue but affordability may be.

The wage-earners' daily food-purchasing pattern is highly adjusted to their earning pattern. Very few houses have refrigerators that allow them to store a weekly inventory of food items. Only 16 percent of households do inventory purchasing,

where they purchase food items only once a week. All other households in the sample had to purchase once every one to two days, as shown in Figure 34. Since all food-purchasing places are open daily, shopping for food is not a problem. In any desperate situation, shops located inside low-income settlements can be accessed at any time of the day, with or without cash on hand. Hence, residents have close access to food in their neighborhood.

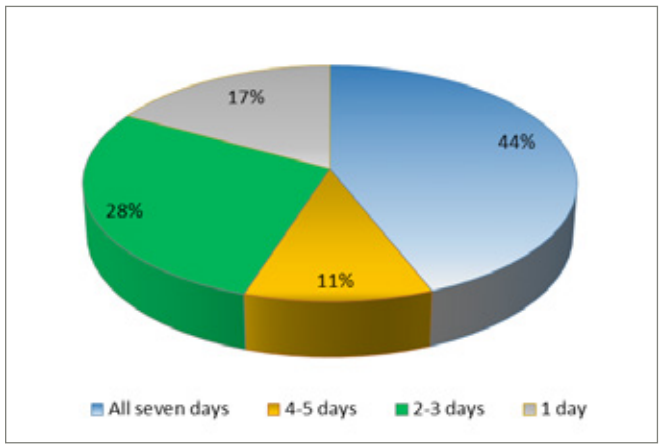


Figure 34:

Percentage of low-income earners purchasing food items at different frequencies in a week. (Source: Questionnaire Survey findings.)

The poverty head count ratio of Colombo illustrates a considerable diminishing pattern over the period of 1990–2010 – it fell from 16.2 percent in 1990/91 to 3.6 percent in 2009/10. However, daily dietary energy intake is lower than the prescribed amount for more than 50 percent of the population in the Colombo City Region. As per the Household Department of Census and Statistics (2016) findings, the average monthly household food expenditure of Sri Lanka is 34 percent of monthly income, whereas in Colombo it is reported as 29 percent. All three districts in Western Province have a lower percentage of household food expenditure compared to the national figure. This shows that the expenditure on non-food items in Colombo is the highest in Western Province (Table 8).

SECTOR/DISTRICT	TOTAL EXPENDITURE	FOOD EXPENDITURE		NON-FOOD EXPENDITURE	
Sri Lanka	54 999	19 114	34%	35 885	65%
Western Province	4				
Colombo District	90 670	26 066	29%	64 604	71%
Gampaha District	64 563	20 392	32%	44 171	68%
Kalutara District	64 268	19 521	30%	44 747	70%

Table 8:

Average monthly household expenditure (in Rs.), food expenditure and non-food expenditure at national level and district level for the Western Province. (Source: Department of Census and Statistics, 2016.)

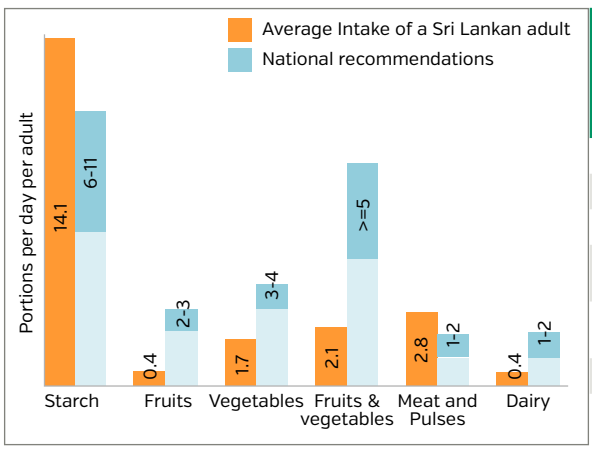
Monthly income of middle- and high-income residents ranges from Rs.25 000 to Rs.250 000 while the average income is reported as Rs.75 810. An average of 22 percent of income is spent on preparing three main meals a day. As per the survey findings, more than 50 percent of middle- and high-income residents spend over Rs.1 000 a day on preparing main three meals.

4.12 Food consumption

Adequate food consumption and intake of multiple food types are important to maintain a healthy life. An appropriate number of portions per adult from each food group has been recommended by the health authorities of Sri Lanka. Studies (Jayawardena *et al.*, 2014) found that consumption of starchy food by an average Sri Lankan adult exceeds the recommended level and that of fruit, vegetables and dairy are less than the recommended level. Consumption of meat and pulses slightly exceeds the recommendation. Even though it is recommended to consume a low amount of sugar, an adult's daily average intake is 3.6 portions. Consumption of large amounts of starchy food and sugar may lead to a number of health issues; eating too little fruit and vegetables may result vitamin and micronutrient deficiencies (Figure 35).

Figure 35:

Comparison of average food intake of a Sri Lankan adult with the national recommendation. (Source: Jayawardena *et al.*, 2014.)



FOOD GROUP	AVERAGE INTAKE OF SRI LANKAN ADULT (PORTIONS/ DAY)	NATIONAL RECOM-MENDA-TIONS (PORTIONS/ DAY)
Starch	14.1	6-11
Fruits	0.4	2-3
Vegetables	1.7	3-4
Fruits and Vegetables	2.1	>=5
Meat and pulses	2.8	1-2
Dairy	0.4	1-2
Added sugar	3.6	Low

There is an increasing trend in organic food consumption in the city, especially among high-income groups. Two years ago, a small weekly market named "Good Market" offering regional organic products was set up in Colombo. A sample survey shows more than half of respondents prefer to consume organic food because of health issues related to non-organic food consumption. It indicates that respondents are well aware of the health benefits of organic products. Environmental friendliness regarding organic crop cultivation was taken into consideration by 30 percent of respondents who consumed organic foods often. Even though people are willing to consume organic food there is limited production and little access to it. Only ten percent of respondents have identified that organic products are readily available. When comparing the prices of organic and non-organic foods (Figure 36) it is clear that organic food items are relatively expensive; the difference in unit prices is double or more for most items. Research is needed into ways to lower the production cost of organic foods, so that their market price can fall.

According to studies by Willer H. & Julia L. (2015) there are 62 560 hectares of certified organic farmland in Sri Lanka covering 2.4 percent of total agricultural cultivation. Under organic certification in Sri Lanka, 223 food exporters, 141 food processors and 524 food producers have registered their products. Though sellers claim their products are organic, there is no formal certification in the country, which is a gap that needs to be addressed.

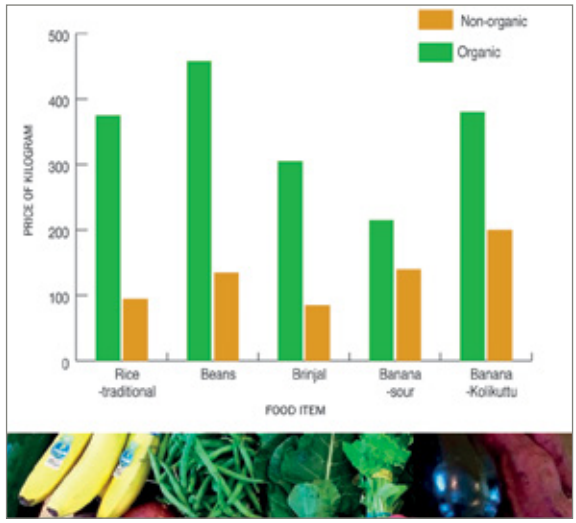


Figure 36:

Prices of organic and non-organic food items. (Source: Questionnaire Survey findings, CRFS Phase 2.)

4.13 Food catering

Colombo is the most urbanised city in Sri Lanka, with people living busy lives and wanting fast food. There is a relatively high intake of bread, wheat flour products and prepared food outside the home, and most of these are carbohydrate-based. As per the survey findings, an average family spends 18.4 percent of their total food expenditure on prepared food. An average rice, curry and fish/meat meal costs Rs.100–250. Many franchised food outlets are located in Colombo. Upper middle- and highclass people eat from these places, where the minimum cost per meal is Rs.600–700. Canteen and cafeterias in hospitals, universities, government offices and schools have relatively low prices for a meal (Figure 37).

As revealed from survey findings, the majority of respondents spend comparatively less money on their breakfast and more on their lunch and dinner. The main reason for this is the food culture in Sri Lanka.

Figure 37:

Expenditure on preparing food for three meals. (Source: FAO, IWMI, RUAF (unpublished))

4.14 Heath issues related to food habits

Food consumption habits have challenged community health significantly. Non-communicable diseases, such as diabetes and high cholesterol, are more prevalent among the local urban community. Diabetes among Sri Lankans is considered as silent epidemic in the country. Diabetes affects 366 million people worldwide – 2.1 million are Sri Lankans, which is 10 percent of the country's population. To visualise the scale of the issue, 8.2 percent of urban youth under 20 years of age and 22.1 percent between 20 and 40 years of age have an abnormal glucose tolerance level, while 60 percent have abnormal lipids that could lead to diabetes if left uncorrected.

Obesity prevalence among boys (4.3 percent) was higher than in girls (3.1 percent). The prevalence of thinness (wasting) was 24.7 percent in boys and 23.1 percent in girls. Approximately five percent of boys and 5.2 percent of girls are stunted. Underweight among girls and boys is 7.0 percent and 6.8 percent respectively. The majority of obese children (66 percent) and 43.5 percent of overweight children belong to the high-income category (who have a monthly family income of more than Rs.20 000).

4.15 Overview on food loss and waste

The percentage loss of food on farms varies significantly as per the commodity (Table 9): paddy (two to five percent), beans (four percent) and banana (three percent). However, there have been reports of a 20 percent loss of the brinjal harvest due to various pest attacks (Jayathunge *et al*., 2011) and a high proportion of fish loss (Ganegama Arachchi *et al*., 2000).

Food losses of the selected seven commodities were assessed along the value chain (Table 9). As per the results of the assessment, it is evident that there is an increase in crop losses at the farm gate compared to previous research findings. Extreme climatic conditions and different types of disease may be reasons for these increases in crop loss.

Table 9:

Average percentage of losses at farm gate. (Source: FAO, IWMI & RUAF (unpublished))

COMMODITY	AVERAGE PERCENTAGE OF LOSSES AT FARM GATE	REASONS
Papaya	22%	Droughts, fungal diseases
Banana	20%	Droughts, extreme weather conditions (heavy rain or droughts, or strong wind)
Brinjal	3–50%	Pest attacks
Beans	14%	Fungal, pests and other diseases (now 40 percent due to ongoing fungal disease)
Coconut	19%	Pests, droughts, floods, wild animals, and Mite disease
Paddy	9–30%	Heavy rains and drought
Fish	2–30%	Overload, damage, lack of cooling facilities

During this study, food waste and food losses were defined as shown in Figure 38. Food waste and losses occur along the stages of a supply chain, such as production, processing, storage, retailing and consumption. The decrease of food before it reaches a retailer is food loss, while food discarded by a retailer or a consumer is food waste. Problems in harvesting, storage, packing, transport, infrastructure and institutional and legal frameworks may lead to food loss and food waste.

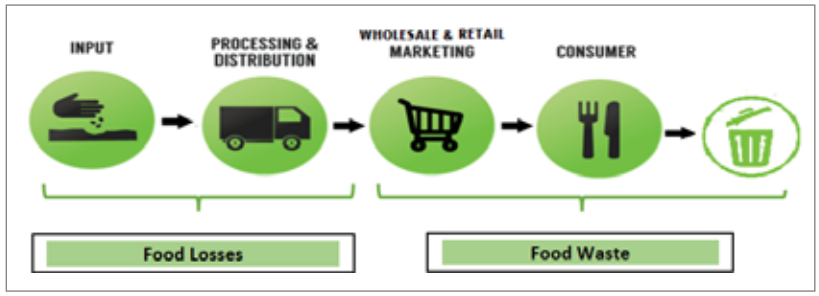


Figure 38:

Food losses and food waste

Food loss along the value chain varies for each commodity. The vegetable and fruit loss along the value chain (from farm to consumer) has been estimated at between 20–40 percent, depending on which vegetable or fruit is involved. Of this, nearly 75 percent of the total loss occurs during transportation, mainly due to the use of improper packaging. Overall visual quality from farmer to consumer changes from excellent to poor in most cases, which is not assessed in detail. The Institute of Post-Harvest Technology (IPHT) in Anuradhpura has completed a cost-benefit analysis on transporting vegetables in plastic crates and has found that it is profitable in the long term, though farmers cannot see encouraging results in the short term. Farmers who directly supply vegetables and fruit to supermarkets, restaurants and hotels pack the harvest in plastic crates before transporting. However, main supply chain members do not use crates except for a few kinds of vegetable, such as tomatoes.

Based on the findings of the survey, the estimated food loss at Manning Market is 25 tonnes per day. According to observations and discussions with commission agents and retailers, the food loss of beans at the wholesale market is less than four percent and that of brinjals is 2.5 percent. Bananas and papayas are more susceptible to mechanical damage during transportation as both fruits are sensitive to vibration. Food loss of bananas and papayas at the wholesale market is estimated as 10 percent and six percent respectively. Post-harvest loss of coconuts is two to five percent and a small amount of fish is lost as they are transported chilled in cooler vehicles and in rigid boxes.

At the retail business level, the loss of fruit (18 percent), vegetables (17 percent) and dry food (15 percent) is significantly high. The lowest food waste is reported for cooked food (four percent) and condiments (four percent), as shown in Figure 39.

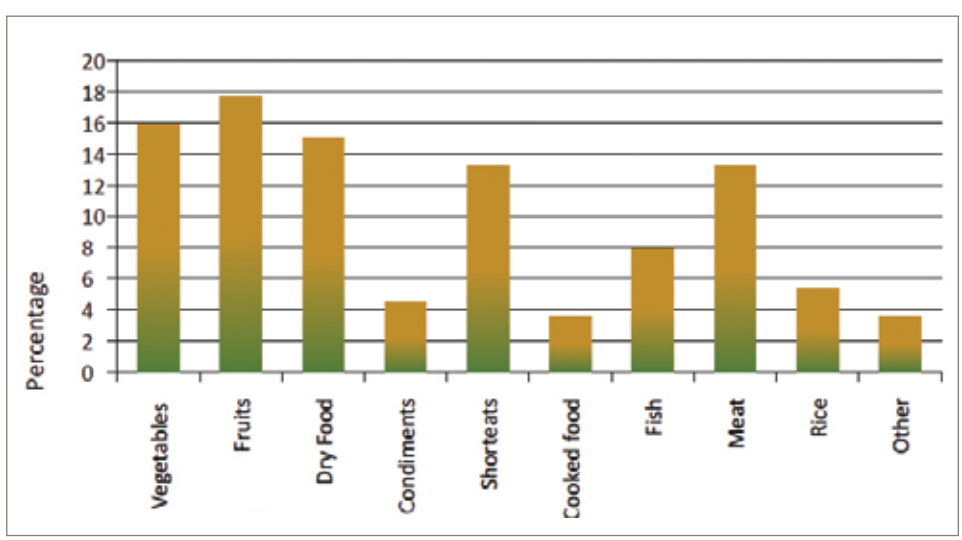


Figure 39:

Food losses and waste at retail shops. (Source: Questionnaire Survey findings, CRFS Phase 2.)

Supermarkets maintain their own supply chains which are shorter and more efficient than the main supply chains. Figure 40 explains the loss of selected food items at supermarkets; all losses were below ten percent, except for brinjal. Food losses at supermarkets are relatively low compared to other wholesale and retail businesses. The use of plastic crates to transport perishables, together with thorough sorting and grading at collecting centres and at outlets, results in less post-harvest losses. Further, supermarkets adopt multiple strategies to minimise economic losses due to damaged and poor-quality crops. Discount promotions, bargain sales and bundle offers for slowmoving food items are strategies they adopt. It is common to sell fruit products derived from partly wasted food items as eat-on-the-go type of foods, such as pickle, vegetable and fruit slices, and fruit salads.

Evidence shows that 25 percent of the economic value of vegetables is wasted before they reach the retailer. Total annual economic loss is accounted as 58 billion Rs. by considering the actual vegetable production from July 2015 to June 2016 (Figure 41).

Figure 40:

Food losses at supermarkets. (Source: Questionnaire Survey findings, CRFS Phase 2.)

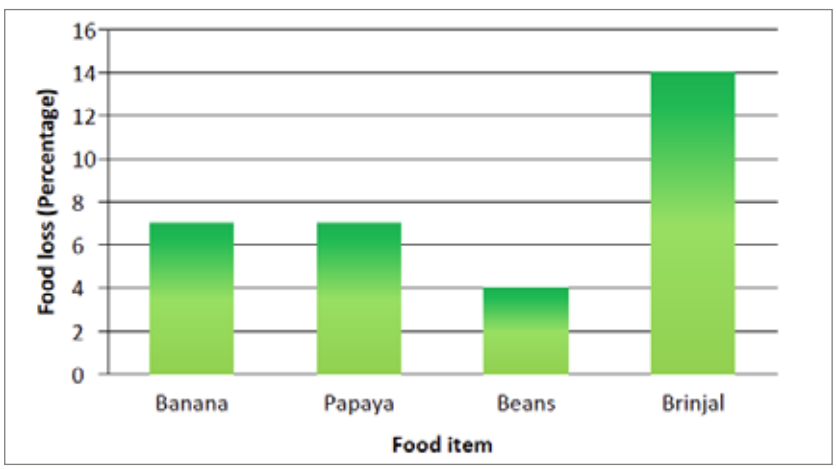
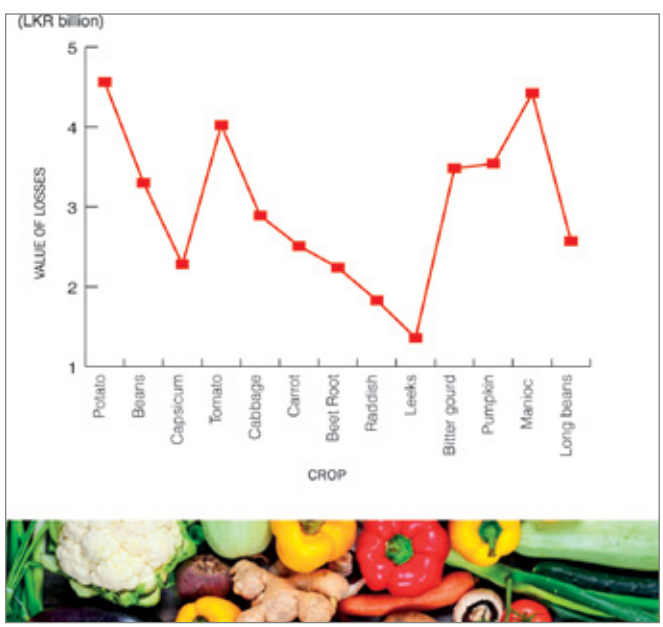


Figure 41:

Calculated economic loss due to post-harvest losses. (Sources: Production data – Ministry of Agriculture; Retail Prices – Department of Census and Statistics. Waste ratios: highly perishable vegetables have 30 percent losses and relatively low perishable vegetables have 20 percent losses.)



4.16 Policy, regulatory and institutional landscape of the Colombo CRFS

The Colombo CRFS is influenced by multiple stakeholders. Institutes at the national, provincial and local levels are involved in different processes of food production, food processing, marketing, distribution, food safety monitoring and food waste management. A number of state ministries, such as the Ministry of Agriculture, the Ministry of Irrigation and Water Resource Management, the Ministry of Mahaweli Development and Environment, and the Ministry of Fisheries and Aquatic Resources, significantly influence the food production of the country. The Ministry of Health, Nutrition and Indigenous Medicine develops policies to improve the level of nutrition of people of the country and to ensure food safety. The Ministry of Industry and Commerce is responsible for a sufficient and timely food supply to the country. Different organisations functioning under the above ministries are responsible for implementing policies and executing legislations.

The Department of Agriculture, the Department of Agrarian Service Development, the Hector Kobbakaduwa Agrarian Research and Training Institute, the Mahaweli Economic Agency, the Department of Irrigation, the Institute of Post-harvest Technology, the Consumer Affairs Authority, Food Control Administration and the National Livestock Development board are some of the public organisations that are operational within the country's institutional framework and that influence the country's food systems.

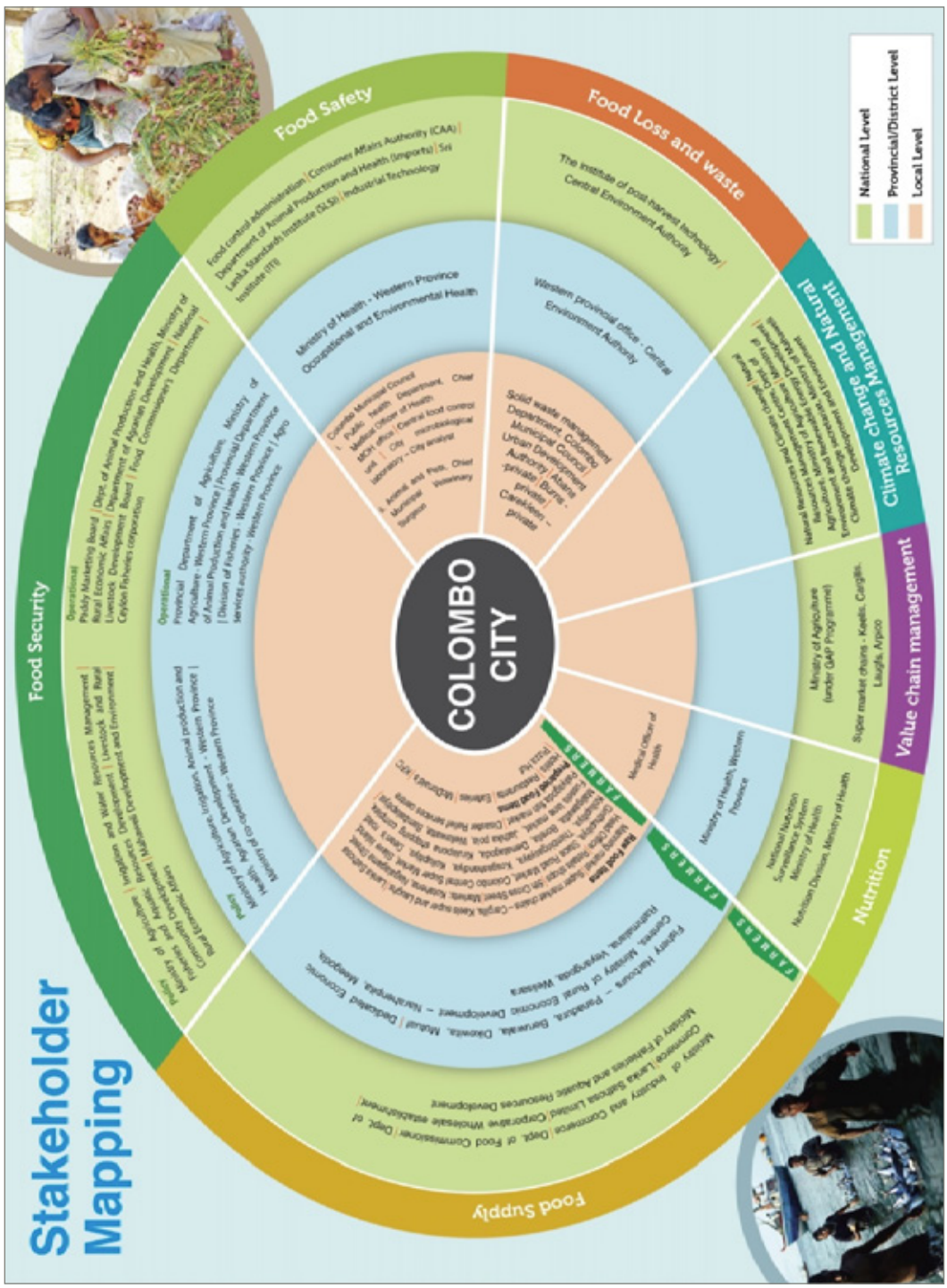
Private sector organisations also play a major role in food systems and they intervene in the country's agriculture sector from input supply to organic waste management. CIC, Bauer and Hayleys are the leading companies that supply agriculture inputs, while Keells, Cargills, Arpico and Laugfs are the widespread supermarket chains in Sri Lanka. Food processing and manufacturing is mainly done by private companies.

Provincial ministries, while not involved in national policy formulation, do plan and implement projects at the provincial level. Western Province, for example, is responsible for provincial operations that include the area of the Colombo CRFS.

The CMC is the local authority which regulates markets, food safety monitoring and food waste management within Colombo. The CMC manages virtually all the major food markets in Colombo and executes the requirements stated mainly in the Sri Lanka Food Act and other policy and legislations at the provincial level.

The legal framework of the agriculture sector is comprised of many acts, including the Seed Act No.22 2003, the Plant Protection Act No.35 of 1999, the Soil Conservation Act of 1996 and the Control of Pesticides Act No.6 of 1994. Most of these acts are implemented by different institutes that come under the purview of the Department of Agriculture. The Sri Lanka National Agriculture Policy was formulated by the Ministry of Agriculture's Agrarian Services (2007), with the aim of achieving the food and nutrition security of the nation as well as increasing the income opportunities and the income of farming communities through multiple means.

Figure 42:
Stakeholder mapping – the Colombo City Region Food System



5. Analysis of the Priority Areas of the Colombo CRFS

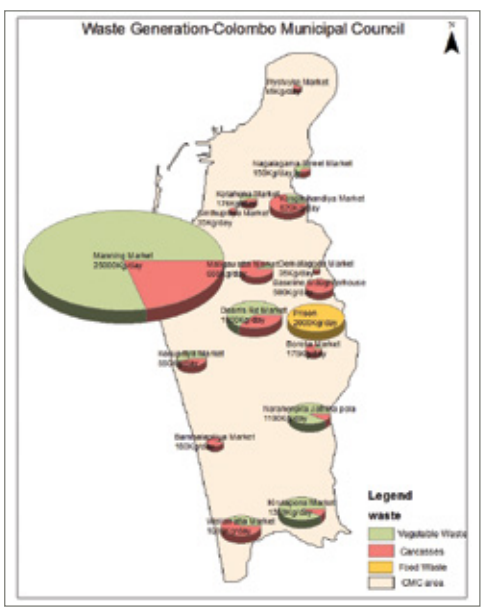
During the Phase 1 stakeholder consultation, four priority areas were selected. Three areas – food loss and food waste, food security and food safety, and climate change and natural resource management – are analysed below. The fourth is value chain management, which is a cross-cutting area, and is discussed under each priority area, where needed. The detailed description of value chains can be found in Section 4.

5.1 Food loss and food waste

Local government is responsible for the management of the solid waste (MSW) generated within its area. Approximately 1 663 tonnes of solid waste are generated daily from Western Province; in the city of Colombo the amount is 700 tonnes (FAO, IWMI and RUAF, 2016).

The CMC is responsible for managing the solid waste generated within city limits. The biodegradable solid waste is divided into two components based on the required time for its decomposition. Shortterm biodegradable waste (63.6 percent) produces a considerable proportion of food waste. Longterm biodegradable waste is most likely to be wooden waste, coconut shells, banana stems, etc. A very high portion of the short-term biodegradable waste and a portion of the long-term biodegradable waste consists of food waste.

The total amount of food waste can be estimated as 350 tonnes a day, which is half of the total waste generation, and 80 percent of short-term biodegradable waste is estimated as food waste. More than 40 percent of the total food waste generated in commercial establishments can be recovered as source-segregated food waste (Figure 43), which amounts to approximately 150 tonnes a day.



SOURCE	AMOUNT (TONNES/DAY)
Restaurants	110
Markets	25
Slaughterhouses and meat shops	9
Prisons	2
Average	146

Figure 43:

Source-segregated food waste. (Source: Colombo Municipal Council.)

Waste management is one of the main challenges for the CMC. Resource recovery from MSW in Colombo is on the lower side. Recently, the Meethotamulla dump site collapsed (on 14th of April 2017) and at least 19 people, including five children, died and at least 40 homes destroyed. Now the CMC dumps its waste adjacent to a national wetland called Muturajawela. The CMC is under huge pressure from the public and nationally to adopt a sustainable waste management system.

5.1.1 Food waste at household level

Primary data collection confirmed that low-income settlements produce a low level of food wastage (four percent). Sizable food waste generation can be evidenced from households in the middle- and high-income settlements. Almost 50 percent of the population wastes 10–20 percent of their food and four percent of the population wasted more than 30 percent. Respondents indicated that eating habits of residents are the main reason for such a high percentage of waste generation; the majority of households do not eat all the food prepared or purchased, and the excess is wasted. In lowincome settlements, people share extra food with their neighbours and whoever is in need, but this is not the case with high- and middle-income settlements. Among the food waste generated in middle- and high-income households, the highest percentage disposed is cooked rice (59 percent) followed by bread (20 percent). Of the respondents, only 14 percent and six percent indicated wastage of vegetables and fruit respectively. Food waste is mainly handed over to the municipal garbage trucks, a very few households bury them in a pit. Therefore, household level food waste in Colombo is dumped at an open dumping site.

Households normally prepare food once a day, which they eat fresh for lunch and then serve up the remainder for dinner, so there is less opportunity for food waste. The majority (73 percent) of lowincome households do not throw away food; 17 percent waste more than ten percent of their food, which serves as animal feed for livestock (e.g. chickens) and domestic animals.

5.1.2 Food losses along value chain

Previous studies revealed 20–40 percent losses (see section 4.15 for the adopted definition for food losses) along the main vegetable and fruit value chains (Wasala, 2015; Dissanayake, 2015). By assuming that highly perishable vegetables have 30 percent losses and relatively low perishable vegetables 20 percent losses, the total economic value of the losses were assessed. Evidence showed that 25 percent of the economic value of vegetables is wasted before they reach the retailer. Total annual losses are accounted as 58 billion rupees by considering the actual vegetable production from July 2015 to June 2016.

In 2014, GDP of Sri Lanka was estimated as USD 80.6 billion[21] whereas the contribution of the vegetable farming industry is 1.6 percent of GDP. Reducing the vegetable losses to five percent could increase the sector contribution to 2.1 percent of the total GDP of the country. The analysis can be found in Appendix 5.

Sri Lanka does not have a production plan for vegetables and fruit. Hence, the recurring mismatch of supply and demand creates high price fluctuations and waste of products (i.e. price of perishable items go down and surplus production is wasted). A production plan for fruit, vegetables and other field crops needs to be developed to reduce the surplus.

21 Source: http://www.tradingeconomics.com/sri-lanka/gdp

5.2 Food security and food safety

Nutrition indicators from Colombo District are poorer than national values. A high prevalence of anaemia is reported in Colombo District (40 percent)[22] and authorities state anaemic levels within the Colombo City Region exceed that of district levels. Additionally, the highest percentages of high blood pressure (11.9 percent) and diabetes (11.2 percent) patients are reported from Colombo District.

According to Jayawardena (2013), the Dietary Diversity Score (DDS) was defined as the total count of different food groups irrespective of the amount consumed by individuals over a 24-hour period. When measuring the DDS, all food items consumed by the subjects were categorised into 12 food groups: starch (cereals, tubers, roots and starchy vegetables, such as jackfruit), vegetables, green leafy vegetables (green salads and 'Mallum'), fruit, fish (including dried fish and seafood), meat (including poultry, eggs), legumes (including nuts and seeds except coconut), milk (including all dairy products), beverages (tea, coffee and fizzy drinks), oils and fats (coconut products were included), and sweets and miscellaneous (e.g. alcohol). Thus, results can be derived from FAO on Sri Lanka's dietary deficiency levels. Sri Lanka is improving as a country, with decreasing trends in undernourishment, food deficit and food inadequacy ratios.

Studies (Jayawardena, *et al*., 2014) found that when the dietary score increases the food consumption also increases in most food groups except starchy foods. Among the food groups of a dietary pyramid (all other groups except starch, sugar, meat and pulses), vegetables, milk and fruit were least frequent and lie below the national and international recommended levels.

Among the age group of 6–59 months, Colombo District's prevalences of stunting (eight percent), wasting (17 percent) and underweight (16.3 percent) are lower than the national prevalences of stunting (13.1 percent), wasting (19.6 percent) and underweight (23.5 percent), according to the National Nutrition and Micronutrient Survey (2012). Anaemia in the CMC is higher (27.8. percent) than in Colombo District (22.3 percent) among the children in the age group of 6–59 months (Jayatissa & Hossain, 2010). The same study identified that the percentage of children yet to achieve the target of dietary diversity was 59.3 percent in the CMC area and 54 percent in the rest of the district.

Among non-pregnant women aged between 15 and 49 years, 9.6 percent were underweight, 32.3 percent were overweight and 19.7 percent were obese in the CMC area, whereas for rest of the district, these figures were 12.1 percent, 27.1 percent and 7.9 percent respectively. Therefore, it can be concluded that the dietary deficiencies of non-pregnant women in the CMC area are better compared with rest of the district.

According to FAO, 1 810 kilocalories is the general Minimum Dietary Energy Requirement (MDER). However, in Sri Lanka, 2 030 kilocalories per capita is considered as the MDER when compiling the official poverty line. Mayadunne and Romeshun (2013) compared the district calorie intake and calculated the percentage proportion of the population under 1 810 kilocalories MDER and 2 030 kilocalories MDER between the periods of 2006/2007 and 2009/2010. Accordingly, 18.9 percent of the population in Sri Lanka does not receive 1 810 kilocalories MDER and more than a third of the population did not receive 2 030 kilocalories MDER level in 2009/2010. The situation is worse in Colombo District. Remarkably, more than a third of the population in Colombo has not achieved the 1 810 kilocalories level, whereas over half of the population in Colombo District has not reached the 2030 kilocalories MDER level. Colombo as the most urbanised district in the country also records the worst ratings for food insecurity among all districts.

However, according to the findings of the Household Dietary Diversity Score (HDDS) calculation, the average HDDS of the low-income settlements was 7.6. According to the

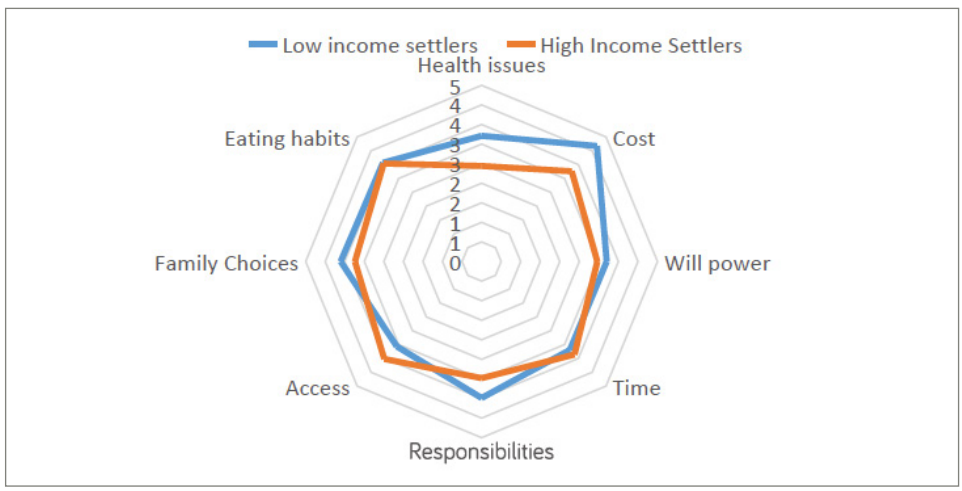
22 Source: Demographic and Health Survey, 2006–2007.

National Food Security Assessment (NFSA) 2009, the mean HDDS was 7.8 in Colombo District and in the CMC area it was the highest score (8.8) in the country. Analysing the HDDS among households revealed that 49.5 percent of households have eight or higher and more than ten percent of households have ten or more.

The previous results revealed that, even though people have very high awareness and the need to eat a healthy diet, the obstacles to achieving this are varied (Figure 44). It seems cost is the major obstacle for the low-income community. However, consumers have many choices to fulfill their nutrition requirements. Consumer knowledge on the nutrient value of different crops needs to be improved – for example, the less expensive but nutritious vegetables, fruit, grains and other field crops. Further, the nutrient value of harvested perishables deteriorates rapidly with time if proper storage facilities are not used.

Figure 44:

Obstacles to getting a healthy diet in Colombo. (Source: Questionnaire Survey findings, CRFS Phase 2.)



In Sri Lanka in recent years, there is a growing fear of food safety and quality risks. Though there are relatively fewer incidences reported, the density of issues probably tends to increase. Recently, chronic kidney diseases have spread through some parts of Sri Lanka, which is suspected to be due to agrochemical contamination of food and/or water. The overuse of agrochemicals in vegetable and fruit production is a serious issue for the authorities in the agriculture, health and environment sectors. Farmers disregard the withholding period after the application of pesticides. If market prices are high, farmers harvest the crop even one day after applying the pesticides, making the situation worse. Post-harvesting, fruit-ripening stimulants are widely used, but farmers fail to adopt recommended methods. Some traders use calcium carbide as a ripening agent, but this is discouraged in many countries due to its associated health hazards.

Members of middle- and high-income settlement areas do not often become victims of food-borne diseases. Only 18 percent of the respondents have said that their household members sometimes get food-related diseases and 30 percent said that it happens rarely. Most households are very rarely affected by food-related diseases. However, compared to low-income household responses where the majority had rarely been affected by food-related illnesses, the level of vulnerability towards food illnesses among high- and middle-income households seems relatively high. This was different to the expected situation. Perhaps people living in low-income households are better adapted to tough environmental and food conditions which people living in middle- and high-income households are not normally exposed to in their everyday life.

5.3 Climate change and natural resource management

Climate change and the deprivation of natural resources has been central in discussions on food systems. Currently, there are reported impacts on food systems due to climate changes, such as disrupted rainfall patterns and increases in temperature, and to the mismanagement of naturalresources. Climate change superimposes itself on existing trends, particularly in regions that already suffer from soils that are chronically deficient of organic matter – from water resource scarcity and exposure to climatic extremes, such as droughts and flooding. Many of these effects accelerate poverty and hunger.

From a food system perspective, there are limited studies with an in-depth analysis of the effects of climate change and natural resource mismanagement. In Sri Lanka, discussions of the causes and consequences of these issues have focused on the national or regional level rather than the area of the Colombo CRFS. Owing to the unavailability and inaccessibility of data, some indicators in this study were analysed at the national, provincial or district level, depending on the segregation of available data sources. This section of the report discusses the causes and consequences of climate changes and examines what is needed regarding natural resource management in the Colombo City Region and the areas supplying food to the CMC.

In addition, agriculture and activities related to food production are being identified as potential contributors to climate change acceleration and natural resource deprivation.

5.3.1 Natural resource management

Natural resource management is a vital prerequisite for sustainable agriculture. The rich stock of natural resources was the launching pad for a prosperous agriculture sector in Sri Lanka. The overuse of agro-chemicals, the absence of a proper cropping plan and farming malpractices have resulted in significant levels of soil degradation, water pollution and depletion of natural resources.

Sri Lanka is an island with a surface area of 65 610 square kilometres, including inland waters and forests; 4.4 percent of the total land area is under surface water and 25 percent of the land is covered by forests. Every country inherits different stocks of natural resources, which, when exploited for economic gain, tend to deplete. If this happens in an uncontrolled manner, it becomes a challenge for sustainability and environmental balance. It is highly important to assess natural resources of the country and city regions, to identify their status and environmental trends, and to explore the challenging concerns for sustainability. Owing to controllable and uncontrollable reasons, both human-driven and nature-driven, certain aspects of Sri Lanka's natural resources have been depleted, creating a number of negative consequences that affect the food systems in the country.

In 1990, forest cover in Sri Lanka was 36.4 percent of the total land area; over the subsequent 25 years, it has fallen to 33 percent, which is not such a huge decline compared to the scale of development activities that have taken place. However, soil degradation is one of the crucial environmental issues and immediate remedial issues are urgently needed. Over 44 percent of the soil in Sri Lanka is degrading in some way. Iron toxicity is an issue faced by wet-zone farmers. Soil erosion remains a highlighted issue. For example, soil maps have been developed by the Natural Resources Management Centre (NRMC) and these show that 68 percent of the area in Badulla District, 67 percent of Nuwaraeliya District and 74 percent of Kandy District are in the high to extremely high category of erosion potential. The Parliament of Sri Lanka amended the Soil Prevention Act No. 24 of 1996 to combat land degradation, improve conservation of water and watersheds, and prevent soil erosion.

Evidence shows that huge attention has been given to prevent soil degradation as it directly affects soil fertility, which directly influences crop yield. According to the soil fertility map of the Ministry of Agriculture, soil types in the Colombo City Region are good for cultivating tea, rubber, coconut, coffee, cocoa and cinnamon. Vegetables, fruit, cereals and pulses are also recommended for cultivation. So far, the majority of land in the Colombo City Region has been utilised for cultivating rubber, coconut and paddy, which are recommended crops for the general soil condition of the region. This soil type requires good management to grow these crops (Department of Agriculture, 2000). Hence, cultivating vegetables and fruit in the Colombo City Region do not bring the same competitive advantage as other parts of the country, which have more suitable soil for their cultivation.

Among the 25 districts in Sri Lanka, Colombo District is the smallest. It comprises 69 900 hectares of land surface, from which 62 705 hectares can be utilised for living and other human activities. With a population of 2 324 349, Colombo District has the highest population density in the country. In 2011, there were 323.16 people per hectare, an eight percent increase on 299.77 people per hectare in 2001. The land resources available for food production have rapidly declined and were pushed towards the outer border areas of the city. Food production from Colombo District can be considered as one of the lowest in the country.

The future situation in the Colombo City Region is more alarming than in other regions. Soon, the entire Western Province will evolve into a huge developed region (Ministry of Megapolis and Western Development, 2016), with limited regions allocated for agriculture. The proposed plan for the Western Megapolis allocates Avissawella, Mirigama and Horana for mainly plantation crops. However, a comprehensive plan to feed the increased population in Western Megapolis area is lacking.

Soil nutrient inputs for agricultural lands in Sri Lanka limits the application of synthetic fertilisers in most cases. Synthetic fertilisers can supply major nutrients, but they do not help to increase the micronutrients or organic content in soils. Chemical fertiliser usage in Western Province (Colombo District is part of Western Province) reveals gradual reduction in the use of fertiliser, most likely due to reducing agricultural activities in the region.

Soil erosion maps have been developed by the Natural Resources Management Centre (NRMC) for the Central, Uva and Sambaragamuwa provinces. According to the soil erosion maps for the Uva and Central provinces, 68 percent of the area in Badulla District, 67 percent of Nuwaraeliya District and 74 percent of Kandy District are in the high to extremely high categories for erosion potential. Soil erosion in Nuwaraeliya District is 1 000 tonnes per hectare per year. Soil erosion is a key issue.

As pest attacks are common in fruit and vegetables, farmers use chemicals in the early stage of cultivation to control its spread and avoid major economic losses. Overuse of agrochemicals is a major concern. Extension services need to be strengthened to provide required guidance to the farmers on fertiliser application, field sanitation and pest control.

Planting seeds of high quality is a key component in improving productivity. The majority of the seedsrequired for vegetable and fruit farming are imported to Sri Lanka and these are high-breed varieties, which need huge amount of nutrients to provide the determined yield. This is one reason for the heavy use of fertiliser and agro-chemicals in agriculture in Sri Lanka. According to the available statistical sources, 331 000 tonnes of fertiliser are used per year, which makes Sri Lanka the fifth highest country in the world for its fertiliser usage per hectare. Such overuse has already created environmental and health impacts.

5.3.2 Climate change

The Colombo City Region is in the wet zone, which is supposed to receive consistent rain throughout the year and an average annual figure of 1 500–3 500 millimetres. The pattern of rainfall has been irregular since 2005 and in the years 2010 and 2014, the annual average was above 2 500 millimetres, higher than the average rainfall between 1961 and 1990. However, the lowest rainfall in Colombo was recorded in 2011 and the annual average fell below 2 000 millimetres in 2012.

Climate change has brought long dry spells alternating with intense rainfall and flooding. Farmers on rain-fed land face difficulties – a lack of rain for their crops during dry periods and flood damage to their crops during intense rainy periods.

In 2014, the average annual air temperature in the Colombo City Region ranged from 26.7 °C–29.1 °C, with the minimum and maximum varying from 23.6 °C–27.1 °C and from 29.6 °C–32.2 °C respectively (Department of Census and Statistics, 2015). November to January and April to June are considered the coolest and hottest periods respectively. A slight increase in the average annual air temperature has occurred – it was 27.7 °C in 2007 but is now consistently 28 °C (Figure 45).

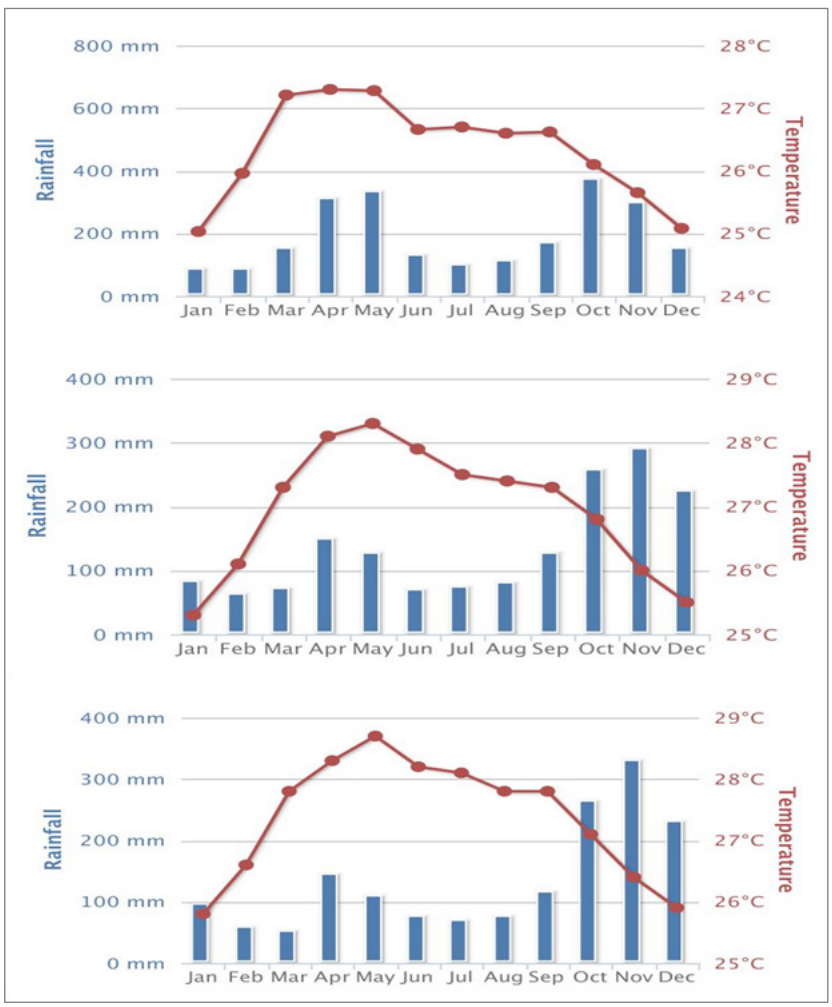


Figure 45:

Climate change in the Colombo City Region, 1930–2012

The Colombo City Region has not been recognised as a risky area in any of the published climate change vulnerability assessments relating to food production in Sri Lanka. It is the impact of climate change on the major food supply areas of the whole country that are of concern to the Colombo City Region, which produces negligible quantities of food (less than two percent of the region's requirement).

Three types of vulnerability have been identified as major concerns in Sri Lanka: droughts, floods and a rise in seawater. Their impact has been assessed in terms of irrigation water, agriculture production (especially paddy), livestock and other plantation sectors (Ministry of Environment, 2011). Water is a limited resource in the dry zone, which supplies a significant portion of the food required in the Colombo City Region. Cultivation in much of the dry zone depends on rainfall or on minor tanks managed by the Department of Agrarian Development. Variations in rainfall pattern and extreme climatic events, such as prolonged dry spells, adversely affect rain-fed agriculture. Methods of harvesting and retaining water as well as water-effcient irrigation methods, such as sprinker irrigation, can be encouraged. Adverse impacts on food production areas increases the vulnerability of the supply system to Colombo.

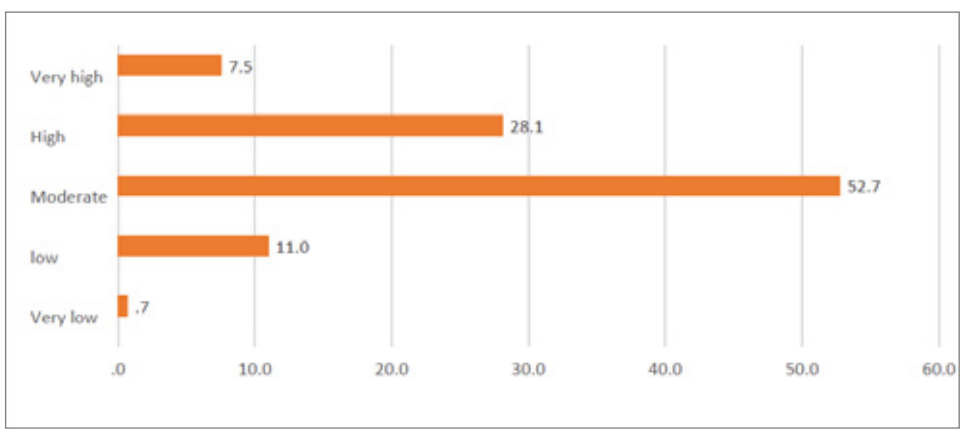
Climate change, particularly the rise in seawater levels, can have a significant impact on the fisheries sector in Sri Lanka. In the Colombo City Region, marine fish fulfill more than 90 percent of the fish requirement.

Food prices often rise in the cities after adverse weather-related incidents, which will become more frequent with climate change. An instance occurred during first two weeks of May 2016, for example, when high rainfall brought flooding to many parts of the country, including the Colombo City Region which saw its worst flooding in recent history.

This study assessed farmers' perceptions about climate change. More than a third stated the impact is high on their farming practices and 53 percent declared that climate change had a moderate influence (Figure 46). Hence, the majority of farmers have perceived climate changes in their localities and that these changes have some influence on their farming practices, in some cases forcing them to alter the timings of their cultivation.

Figure 46:

Farmers' perceptions on the impact of climate change on farming practices



6. Opportunites for Strengthening the Colombo CRFS

6.1 Strengths of the food system (beyond Colombo)

Diverse agro-climatic regions: Sri Lanka is blessed with diverse agro-climatic conditions ranging from semi-arid to humid and from coastal to mountainous regions. This increases its potential to grow a wide range of crops. Paddy, the staple food, is grown in most parts of the country by adapting different land preparation methods, such as contour cultivation and lowland cultivation, together with water management methods, such as rain-fed and irrigated agriculture. A wide range of vegetables, including such exotic vegetables as bell pepper and broccoli, and such low-country vegetables as snake gourd, bitter gourd and cucumber, are grown where suitable climatic conditions prevail. Pulses, oil seeds and different types of root crop are grown in areas where less water is available.

Stakeholder networks and their capacities: the Colombo CRFS is influenced by many stakeholders at national, provincial and local levels. Both public and private sector organisations contribute to varied aspects of the food system at different levels. The private sector has extended interests in specific activities of the food value chain, such as food processing, food safety, food security and pricing.

Public institutes are engaged in all aspects of the food system and are fully involved in policy making, human resource development, capacity building and monitoring and evaluation.

Training and advisory services: the Department of Agriculture and the Department of Agrarian Services work closely with farmers throughout the country. A network of agriculture extension officers attached to the Department of Agriculture and agriculture research and production assistants (ARPA) attached to the Department of Agrarian Development provide technical assistance to farmers whilst sharing new research findings and developments from the agriculture sector. The established network is immensely useful in making farmers aware of the demands of the rapidly expanding Colombo City Region and to encourage them to cultivate in-demand crops in sufficient quantities.

The Department of Agriculture and many research institutes such as the Coconut Research Institute, Sugarcane Research Institute, and Hector Kobbakaduwa Agrarian Research and Training Institute conduct several annual research studies to improve the agriculture sector of the country. The technical and functional capacity of these research institutes can be used to strengthen the Colombo CRFS.

Linking farmers and traders: Dedicated Economic Centres (DECs) have been established in cropproduction areas and market hubs, such as Meegoda and Narahenpita located within the Western Province. The development of linkages between farmers and collectors, wholesalers and distributors is facilitated through this initiative. Establishment of more economic centres at strategic locations will benefit the food system of the city region.

Strong legal framework: Sri Lanka has a comprehensive legal framework that regulates the food system in general. Gaps and outdated laws may require updates and amendments while strong implementation of existing regulation still needs to be practised. The summarised review of the legal framework can be found in Appendix 6.

Social capital: greater social capital exists when society has strong relationships among people. Networks and relationships enable the effective functioning of a society and volunteerism promotes a sense of community. Higher levels of social capital reduce costs, increase the probability of collective action and make cooperation more likely among individuals. The innate Sri Lankan culture of volunteerism, and sharing and helping people who are victimised, is a real societal asset and presents an opportunity to strengthen food systems.

Crop cultivation in Sri Lanka is a labour-intensive process, especially in the hill country where the possibility of using machinery is limited. Many farmers in Sri Lanka experience labour shortages, which can be solved by a labour exchange method practised at village level, particularly when land needs preparing and at harvest time. Exchanging seeds and harvested crops is also a help to farmers.

In urban areas, especially among low-income families, people commonly exchange food and this means that their organic waste is significantly less compared to that of middle- and high-income families. Additionally, in disaster situations people help the victims by supplying cooked food, water and dry rations before other agencies kickstart the response process. This strong relationships among households and communities provides an opportunity to build sustainable food systems.

6.2 Opportunities

Government policy of improving agriculture, fisheries and livestock: the Government of Sri Lanka recognises the importance of developing the country's agriculture, and that increasing food production and introducing post-harvesting industries would increase food supply. Details for the improvement the fisheries sector can be found in Appendix 7.

Market attractiveness: agriculture and livestock farming are rare in the city of Colombo, but it is an attractive business centre for agricultural and livestock farmers and middlemen. Many city residents have a relatively high income so actors in the supply chain view Colombo as the best place to get high prices for their products. At the same time, they bring enough food to supply the Colombo City Region.

Easy access to imports: the Colombo City Region has easy access to international food imports via the port and airport. All imported food items, such as pulses and canned fish, come to Colombo where they are distributed through Pettah Market.

Major suppliers of non-food products: Colombo is the main commercial hub in Sri Lanka. Supply chains of many commercial non-food products, such as cloths, garments, electronics, fertilisers, start from the city. Vehicles come to Colombo with food products from different parts of the country and then return with imported non-food commodities.

Resilience for disasters: despite Sri Lanka's increasing numbers of natural disasters – from droughts and floods to unpredictable weather patterns – Colombo is a resilient location as it receives food from multiple destinations, including imports.

Complementary industries: in Colombo, the massive wastage of vegetables and fruit from places such as Manning Market provides an opportunity to introduce complementary industries for making sauces, pickles, ketchups, cordials and jams.

Increasing demand for organic products: there is a tendency among residents in Colombo to consume organic foods; the demand means the prices of organic products

are relatively high. Therefore, peri-urban and rural areas of the Colombo City Region could cultivate more organic vegetables and fruit to fulfill the increasing demand.

Capacity building of farmers and food processors: in Sri Lanka, many public institutes conduct training to help build the capacity of farmers, transporters, collectors, shopkeepers and food processors. The Department of Agriculture and the Department of Agrarian Services provide training for farmers on different disciplines related to crop cultivation and natural resource management. These training institutes are well-equipped with the required physical resources and have experts who can advise on different aspects of value addition to crops and food processing. By utilising the resources at these training institutes in an optimum manner, the increased demand for value added and processed food products can be met while reducing the post-harvest losses of perishable foods.

Support to establish start-ups: the Ministry of Primary Industries has grant-and-loan schemes to help start up new businesses that provide value addition to agricultural products. The ministry provided up to 10 million rupees to start up a project giving advice on business management and technical expertise.

Infrastructure facilities: infrastructure facilities such as roads, power supplies and telecommunication networks have been significantly developed and improved within the last decade. These have helped farmers and consumers in various ways, such as reducing the quantities of post-harvest loss and providing access to timely market information through the internet and mobile phones. Used optimally, such facilities can benefit farmers and consumers and strengthen the Colombo CRFS.

Urban agriculture in the city of Colombo: between 2005 and 2010, the Ministry of Agriculture and the Western Province promoted urban agriculture in the city of Colombo with successful results. Their technical expertise, experience and human resources can be utilised to reimplement urban agriculture programmes and related projects. The Department of Agriculture has established plant nurseries in Dehiwala and Narahenpita in close proximity to the city to supply plants, fertiliser and the equipment needed for urban home gardening.

Use of unutilised lands: increased food production within the city region via cultivation of abandoned and unutilised lands will help to augment the city's food supply and reduce food mileage. The Western Province harbours high agriculture potential as large extents of land remain uncultivated. They can be utilised for cultivating paddy, vegetables and other field crops. If labour scarcity issues are correctly addressed and water supply systems are rehabilitated and restored, a higher percentage of the food requirement can be fulfilled from the city region itself. The resultant reduction in the time taken to transport food and the consequent decrease in food mileage will greatly reduce the quantity of post-harvest loss.

Access to food: there are 19 CMC-controlled food markets, including the main wholesale market, in the city of Colombo. The main fish market is located in Peliyagoda and there is a well-established bazaar for rice, potatoes, onions and fruit. A Dedicated Economic Centre with 117 stalls sells a variety of foods. There are more than 40 supermarket outlets and around 900 small-to-large-scale prepared food stalls. Hence, there is a satisfactory level of food distribution points in Colombo and everyone in the city has easy access to food.

Shorter value chains: there is an emerging trend in the Colombo City Region towards shorter food supply chains. Farmers from the region and neighbouring areas bring their harvests in small quantities. In addition, there are 27 daily and weekly markets outside the city but within Colombo District where farmers can take their produce. These short supply chains allow food producers within the Colombo City Region to directly sell their harvests to residents.

7. Proposed Recommendations

The CRFS study identified policy recommendations mainly covering four study areas. After analysing the policy recommendations collaboratively, key policy interventions to be implemented were prioritised and are listed in section 7.4.

7.1 Recommendations on food waste and losses

The laws and regulations in Sri Lanka have not identified food waste as a separate waste category and so it is mainly governed by municipal solid waste regulations. RRR from food waste is a good possibility. The main focus is on how to optimise the RRR from food waste and to identify what new regulatory interventions are needed.

According to the current legislation, there is no punishment for causing food loss and food waste in value chain, nor is there an incentive scheme for minimising it. If food operators store, distribute and exhibit their food in a way that increases the chance for food loss or food waste, they should be discouraged and, if possible, prohibited by law.

Food operators should be encouraged to give discounts or to use promotional activities to sell food items that reach their expiry date. The FCAU can conduct research to identify such slow-moving food items and to assess their expiration tendency; then food operators can be encouraged to sell these items at a discount rate or as bundle offers when they reach their expiry date.

Concerns about the safety and hygiene of secondary products made from waste food indicate that safety procedures and minimum standards and regulations should be established for waste food reuse and recycling at the commercial level.

Food waste is a resource and an additional income-earning opportunity for employees at food operators and for housewives, so they could be educated about the benefits from sorted waste. To achieve this, local authorities with financial assistance from provincial councils could design and conduct a national level promotional campaign.

The Western Province has a separate authority to manage its solid waste, but it is not seriously concerned about food loss and food waste, nor about the possibility of reusing and recycling of food waste. Therefore, it is recommended that the provisions of reusing and recycling of food waste be segregated to the provincial level in long run.

The CMC can pass by-laws to encourage eating houses to adopt waste-minimising business practices, because sometimes the ‘portion sizes’ or ‘food mix’ contributes to food waste. Therefore, instead of providing standard quantities, eating houses can further reduce the portion of food parcels and top them up only if needed. Another option is make the food when the customer asks for it, without keeping large quantities of food prepared without assessing the demand.

There is some demand for using non-mixed food waste, such as breads and buns and even for throwaway vegetables and prepared rice, as animal food. The CMC has to identify the animal farms inside the Colombo City Region and encourage the owners to use food waste as animal feed. Mixed food waste that is unsuitable as animal food can instead be used to generate biogas and compost. The CMC can provide technical assistance and reduce rates and licence fees in order to encourage business entities to reuse their food waste.

Social media and SMS campaigns can convey useful messages by developing content that shows the consequences of inadequate waste management at household level. The CMC can conduct seminars at schools in Colombo to convey the message to elders via children.

7.2 Recommendations for food security and safety

Food security and safety are areas lagging behind the rest of the food system in Sri Lanka. In 2018, Sri Lanka was identified as the second highest country for malnutrition in South Asia. Food safety in Sri Lanka is mainly governed by the Food Act that was enacted in 1980, with two amendments in 1991 and 2011 to alter the composition of the food advisory committee and to update certain terminologies. 'Food safety' has been recognised as an important term and has been regulated according to the Food Act.

The Food Act disseminates the execution powers to authorised officers, including public health inspectors (PHIs) attached to provincial councils and local authorities. Provincial council and local authority acts and by-laws do not have sufficient up-to-date provisions for food safety and hygiene. Therefore, the Food Act of Sri Lanka should be amended, along with provincial level and local level acts and by-laws, to provide authority and directions on specific roles in food control. All three administrative levels jointly should revise the Food Act and their respective by-laws to eliminate the bottlenecks and contradictions they are currently facing.

The Food Control Administration Unit is an independent body under the purview of the Ministry of Healthcare, Nutrition and Indigenous Medicine. However, the ministry does not seem to give food control administration in Sri Lanka sufficient significance. Therefore it is recommended to institutionalise an independent apex body for food control administration in Sri Lanka, which has sole responsibility and authority to act as the food authority of the country.

According to the Food Act, government analysts should analyse food samples and issue certificates to the food authority. Since their laboratories are not dedicated to food control administration, regular food sample testing has been kept to a minimum. Therefore, the Food Act should provide minimum standards for private sector laboratories to be recognised as approved analysts and should specify parameters they have to maintain to extend their licence each year. The burden on government analysts has been severe so there is a need to have at least one authorised analyst in each province to improve the quality of food control administration across Sri Lanka.

Regulations should clearly state that food operators who try to promote the functional qualities of food that have not been clinically proven should be denied a certificate.

Fines for violating the regulations of the Food Act are severely outdated so that food operators think they can carry on violating the rules with impunity. Hence, a revision of the punishment over offenders is needed for an effective controlling of food trade regionally. For example, as per the Public Health Inspectors' manual, an authorised officer has to inform a food operator about their inspection visit in advance, and get their consent for the date and time of the visit. This practice gives the food operator an opportunity to manipulate the actual situation and to pave the way for misconduct. Therefore, the authorised officer should have the full authority of an inspector with a specific guideline to enforce the food regulations (their role at present is more like an advisor).

The testing and regulation of imported food items should be strengthened so this trade can rapidly increase in the future. Therefore, imported food regulation should be

assigned to an established entity with state-of-the-art facilities to test food samples and empowered authorised officers to inspect imported food items.

Product certification schemes operate in Sri Lanka, but most are either complementary or simply not compulsory. Competition forces tend to keep the standards up in most cases, but mandatory standards could be imposed for key commodities to protect consumers.

7.3 Recommendations for value chain management

Supply and value chain management as well as the regulation of value chains are not wellestablished at the moment. Self-regulation by the industry cannot be expected as the value chains have not yet been standardised to a satisfactory level.

PHIs have no legal mandate to inspect the conditions of agricultural producers and their supplies. Further, the official inspection service under the Food Control Administration Unit (FCAU) has no satisfactory coordination and integration with other government agencies that are part of the local food chain. Therefore, a mandate should be provided to regulate control throughout the food value chain.

There is a need to introduce regulations that specify the terms and conditions for running an online food store in Sri Lanka.

In order to reduce the dependence of the city region on food supplies from the outer region, food production within the region needs to be increased – for instance, by cultivating high-value commodities such as vegetables, fruit and spices. Increased production within the city region reduces food miles, transport costs, logistics, the number of intermediaries and storage requirements. It further helps to maintain the quality of the produce and retain its nutrients.

7.4 Recommendations for natural resource managemnt and climate change

Climate change and natural resource management have significant impact on food systems. It has been identified that climate change would change bacteria and alter insect life-cycles, which would affect food safety and the hygiene of food. Since most food regulations were based on existing knowledge on food safety and hygiene, they have to be revised after conducting researches on the effects of climate change.

It is recommended that food administration institutions at the provincial level work together to conduct research on new crop varieties that are suitable for extreme weather conditions and other emerging climate conditions and on finding alternative agriculture techniques.

7.5 General recommendations

Most violations of existing regulations are due to lack of awareness. Educating today's children who will become consumers and food operators in the future on the Food Act, food regulations, standards and food waste would be a good investment to improve food safety and understand food waste management.

There should be a nationally recognised food control awareness certification programme for anyone interested in acting as a food operator, in starting up a business or becoming an employee of the food industry. The certification should be mandatory

for all food operators engaged in the food industry. If a food operator who has the certification becomes involved in violating food regulations, then punishment can be directly enforced.

If the FCAU can introduce a panic button number or a mobile app to let consumers report violations of food safety and hygiene, or unnecessary food loss and food waste generated by food operators, a central communication unit can trigger a response – an authorised officer investigates the complaint and takes the necessary action against food operators.

There are three types of local authority in Sri Lanka (MC, UC and PS) with significant differences between their respective laws and by-laws. Therefore, uniformity of food control at this lower level is needed. If there were provincial level food control administrative offices, the local authority could improve the communication and interconnectivity between provincial councils and local authorities.

It is recommended that provincial councils conduct a scenario-building exercise for their respective provinces to identify trends, uncertainties and emerging scenarios in the long-term future. This would improve the provincial resilience to cope with climate change and its impact on their food system.

Most of the CMC by-laws were enacted before 1978 and are not modern enough to manage current and future food systems in Colombo. Therefore, it is recommended to comprehensively revise these food control by-laws so the CMC can address its unique food system without having legal contradictions.

PHIs are supposed to play multiple roles (such as health issues, environmental issues, inspections, etc.). As a result, the opportunity them to dedicate their service as authorized officers of food control has been limited. Appointment of dedicated officers as food safety officers is a need.

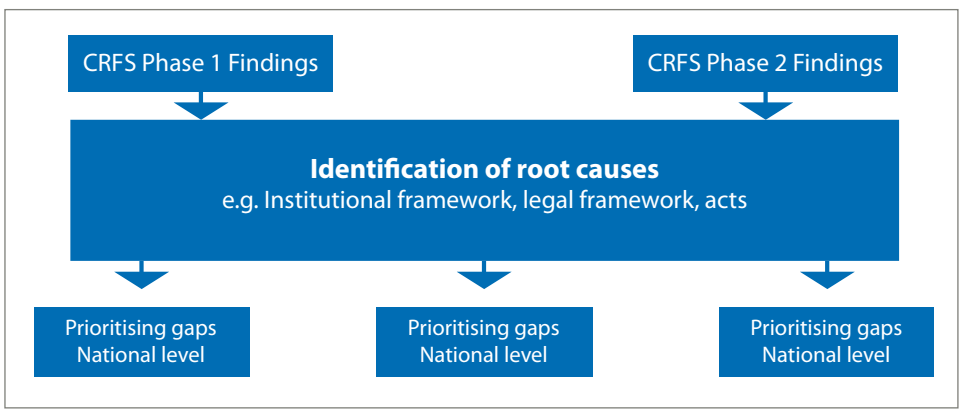
Cities within the nine provinces in Sri Lanka have inherent significance as either a food supplier or a consumer. Each province can identify the significant cities in its unique food value chain and evaluate and assess the situation regarding the challenges and future direction in the food system of the country as a whole.

8. Way forward: Prioritised Recommendations for Implementation

As shown in Figure 47, during the Colombo CRFS study analysed the legal and institutional framework of the Colombo food system. Based on the findings, a number of policy implications for the food control system in Sri Lanka (with special reference to the city of Colombo) was reported. During the scenario-building attempt of the present study, trends were placed into five categorised – policy/governance, economic, social, technological and environmental.

Figure 47:

Prioritising methodology used



Focus group discussions brought together a diverse range of experts in the area of food control to discuss the critical drivers of food system change and their implications, and to provide essential feedback on them. Following the identification of the initial drivers, there were individual interviews with relevant officers using semi-structured discussions. The prioritised interventions were validated at a stakeholder workshop.

8.1 Food waste

- **Streamline the management of the solid waste (MSW) sector with an empowered umbrella body that coordinates the integration and implemention of MSW management:**
  - There is a vertical and horizontal complexity of the institutional landscape so that implementation of regulations are detached from their management. Coordinating body to be appointed to act at higher level.

- **Create an enabling investment climate for private sector engagement in RRR:**
  - RRR businesses are relatively new to Sri Lanka and there could be further financial and regulatory incentives such as the existing tax exemptions for the import of renewable energy equipment. Introduce financial schemes to attract and incentivise local entrepreneurs to enter RRR businesses, discourage food wastage in the retail sector and support waste valorisation processes.

- **Create an enabling environment for food waste at household level:**
  - Currently, the CMC is attempting to adopt source-separation for household and institutional waste but the buy-in is limited. The CMC can improve on customer communication and awareness creation, encouraging RRR at household level (support a refund for bottles, fines for non-source-separating entities and a price for plastic shopping bags).
- **Link the food waste generator and user:**
  - There is a demand for using food waste as animal feed, but the link between the waste source and the potential user (what, where, when) is missing. The CMC can be the moderator (e.g. provide a low-cost, web-based platform/phone app) for facilitating direct producer–user linkages.
- **Introduce by-laws to encourage food waste reduction in canteens and catering:**
  - A high percentage of food waste is generated by institutional canteens, in food courts and through event catering. Extend source-segregation to all businesses, canteens of private and public schools, hospitals, food courts, etc. by (a) capacity development in food waste reduction; (b) providing incentives (e.g. school ranking to create peer-pressure) and/or penalties; and (c) infrastructure support in public markets to keep food fresh.

8.2 Food security and nutrition

- **Facilitate a more holistic and territorial approach to food security and nutrition:**
  - Existing structures and policies are fragmented and not aligned to address rapid urbanisation and the related city region challenges. Strengthen the Megapolis administration to facilitate pro-poor food legislations or, in general, the provincial councils. Align current policies with other food security and nutrition-related policies and adapt the structure of the Food Advisory Committee, allowing representation from the provincial councils with additional responsibilities in the food system and food security.
- **Develop physical and institutional capacity to reduce the vulnerability of the urban poor to food price fluctuations:**
  - In the current situation, market chains are too long and unregulated to the disadvantage of rural producers and the urban poor. If, in addition, climate-related events hit the supply chains, the poor suffer double. Urban food reserves are needed to buffer shortcomings in food availability. Market supply chains have to be regulated and monitored to avoid price fluctuations, which hit the poor.
- **Strengthening food safety across the Colombo CRFS:**
  - There is a lack of adequate human and laboratory capacity for addressing food safety issues, including additional food safety analysts for local authorities. Upgrade the existing public laboratory facilities, including provincial labs and regional labs, as authorised analysis centres. In addition, introduce a system of laboratory tests for specific foods by respective authorities (e.g. coconut at a coconut research institute).

9. Conclusions

The CRFS assessment and planning process was highly participatory and focused on local solutions to improve the food system that links Colombo with the surrounding region. As a local authority faced with fast-growing demands that need to be addressed, the CMC took the lead in coordinating the assessment and policy dialogues in an inclusive manner, and paved the way for local, regional and national authorities to communicate and discuss the food system and collaborative actions.

The CRFS assessment and planning process targeted local level policy interventions but the project findings triggered policy discussions beyond local level and spread into provincial (regional) and national level. It has created the basis to start visualising the importance of a territorial approach to food systems and the actions needed to offset the impacts of natural resource management, climate change and shocks on city regions. It has shed light on food safety, nutrient safety, value chain management and food waste and losses in relation to urban spaces.

At municipal level, the CRFS process helped the CMC and other institutions to understand the Colombo food system in its complexity, and has created the basis to build a common vision on a more sustainable and resilient city region food system. The process has identified the opportunities, challenges and needs to be addressed. It has signified the importance of looking at the food system from a micro-perspective and provided a better overview of the characteristics and inter-linkages of the local food system, as well its interconnections and flows across the urban–rural spectrum. As tangible policy outcomes, the CMC has already stepped in to act on some of the findings on food safety and food waste. In particular, the CMC will introduce a dedicated unit in the council for food safety within the health department and concentrate more on RRR from food waste.

The regional level authority (the Western Provincial Council) identifies the importance of the territorial approach in a food system, which is mostly beyond the control of local level authorities. The Western Provincial Council has already demonstrated an interest in urban and peri-urban agriculture in the city and the city region. In addition, the Ministry of Megapolis and Western Development has realised the importance of including the CRFS concept in its urban development planning process and is working with FAO and IWMI to obtain technical assistance and capacity-building support. The results of the CRFS assessment and planning will ensure the integration of food system sustainability in urban and territorial planning.

At national level it was clear that existing food policies needed to be evaluated and adjusted. This was well received by the national authorities, who are taking initial steps to integrate the results of the CRFS assessment into the National Food Act. However, concrete measures to align local, provincial and national strategies and action plans are still needed.

Overall, the CRFS assessment and planning process represents a remarkable learning experience for all stakeholders who have been engaged in the process.

References

- Abeygunasekara, S. 2009. *An overview of socio-economic impact of improper handling and transportation of vegetables in Sri Lanka.* Sri Lanka International Research Symposium on Engineering Advancements 2015 (RSEA 2015): SAITM, Malabe, Sri Lanka.
- Berry, E M; Dernini, S; Burlingame, B; Meybeck, Alexandre; Conforti, P. (2014). Food security and sustainability: can one exist without the other? Public Health Nutrition, 1-10.
- Central Bank of Sri Lanka, Annual Report. 2014. Colombo: Central Bank of Sri Lanka.
- Consumer Affairs Authority Act, No 3 of 2003. Parliament of Democratic Socialist Republic of Sri Lanka, March 21, 2003.
- Consumer Affairs Authority Act No 9 of 2003. Parliament of Democratic Socialist Republic of Sri Lanka.
- Coconut Research Institute (undated) Coconut statistics (http://www.cri.gov.lk/web/images/stories/statistics/satistics_on_coconut_oil_palm.pdf)
- Colombo Municipal Council (unpublished). Database on Trade License for Eating House and Restaurants 2016. Colombo Municipal Council
- Department of Census and Statistics. (2016). Household Income and Expenditure Survey (HIES) 2016. Colombo: Department of Census and Statistics.
- Department of Census and Statistics. 2015. Sri Lanka Labour Force Survey Annual Report 2014. Colombo: Department of Census and Statistics.
- Department of Census and Statistics. 2015. Summary report on agriculture activities economic census 2013–2014. Colombo: Department of Census and Statistics.
- Department of Census and Statistics. 2012. Census of Population and Housing. Colombo: Department of Census and Statistics.
- Department of Census and Statistics. 2014. Household Income and Expenditure Survey 2012/13. Colombo: Department of Census and Statistics.
- Department of Census and Statistics. 2016. Paddy statistics. Colombo: Department of Census and statistics.
- Department of Land Use Policy Planning. 2010. National Land Use Policy In Sri Lanka. Colombo: Department of Land Use Policy Planning.
- Essays, UK. 2013. The Sri Lankan Retail Market Marketing. Retrieved from https://www.ukessays.com/dissertation/literature-review/the-sri-lankan-retail-market-marketing.php?cref=1
- FAO, IWMI, RUAF (unpublished) City region food system situational analysis – Phase 2, Colombo, Sri Lanka

- FAO, IWMI, RUAF (2016) City region food system situational analysis – Phase 1, Colombo, Sri Lanka. Retrieved from http://www.fao.org/3/a-bl821e.pdf Food Production National Programme. 2016–2018. Presidential Task Force on National Food Production, Colombo.
- Ganegama Arachchi G.J., J MP K Jayasinghe J.M.P., Wijeyaratne M.J.P., Perera W.M.K., Jayasooriya S., and Hettiarachshi K. Handling practices and post-harvest losses of tuna catches from multi-day boats operating from fish landing site Negombo,; Sri Lanka Sri Lanka Journal of Aquatic Science 5(2000): 87-95
- Henegama H. P., Dayawansa N. D. K. and De Silva S,. 2013. *An assessment of social and environmental implications of agricultural water pollution in Nuwaraeliya.* Postgraduate Institute of Agriculture, Tropical Agricultural Research, Vol: 24(4) 304–316.
- IWMI, FAO, RUAF and CMC. 2017. *Colombo City Region Food System – Sri Lanka Phase 2 Report.* IWMI, Colombo.
- Jayawardena, R., Thennakoon, S., Byrne, N., Soares, M., Katulanda, P., & Hills, A. (2014). Energy and nutrition intakes among Sri Lankan adults. International Archives of Medicine, 7(34), 1-11.
- Jayathunge K.G.L.R., Wasala W.M.C.B., Rathnayake H.M.A.P., Gunawardane C.R., Samarakoon H.C., Fernando M.D. and Palipane K.B. (2011) Evaluation of different types of packages for handling and transportation of vegetables Agri food gateway, Department of horticulture Available at: https://hortintl.cals.ncsu.edu/articles/evaluation-different-types-packages-handling-and-transportation-vegetables. Accessed on 01.09.2016
- Jayatissa R. & Hossain S.M.M. (2009) Nutrition and Food Security Assessment in Sri Lanka – 2009. Medical Research Institute, Sri Lanka
- Legesse A., Tesfay G. and Abay F,. 2016. *Impact of Urban Home Gardening on Household Socio-economy.* Arts and Design Studies, vol. 39, 2016. Available at http://www.iiste.org/Journals/index.php/ADS/article/viewFile/27991/28736
- Malik, S. K., Singh P.B., Singh A., Verma A., Ameta N., and Bisht I.S.,. 2013. Community Seed Banks. Operation and Scientific Management, National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi.
- Mayadunne, G., & Romeshun, K. (2013). Estimation of Prevalence of Food Insecurity in Sri Lanka. Sri Lankan Journal of Applied Statistics, 14(1), 27-40.
- Medical Research Institute. 2009. Nutrition and Food Security assessment of Sri Lanka. Colombo: Unicef.
- Medical Statistics Unit. 2012. Annual Health Bulletin. Colombo: Ministry of Health.
- Ministry of Agriculture Development and Agrarian Services (2007). Sri Lanka National Agriculture Policy Ministry of Agriculture. Battaramulla. Development and Agrarian Services
- Ministry of Agriculture (2015). Statistics. Colombo: Ministry of Agriculture (http://www.agrimin.gov.lk/web/index.php/statistics)
- Ministry of Environment (2011) Second national communication on Climate Change. Colombo. Climate Change Secretariat
- Ministry of Fisheries and Aquatic Resources Development (2015). Annual Report 2015. Colombo: Ministry of Fisheries and Aquatic Resources Development

- Ministry of Healthcare and Nutrition. 2008. Policy guidelines for fortification of food in Sri Lanka. Colombo: Ministry of Healthcare and Nutrition.
- Ministry of Megapolis and Western Development. (2016) Western region megapolis master plan. Battaramulla. Ministry of Megapolis and Western Development
- National Nutrition Policy of Sri Lanka. (2010) Ministry of Healthcare and Nutrition, Suwasiripaya, Sri Lanka.
- National Policy and Strategy on Cleaner Production for Agriculture Sector. 2012. Ministry of Agriculture in collaboration with Ministry of Environment.
- National Policy on Protection and Conservation of Water Sources. 2014. Ministry of Land and Land Development, Battaramulla.
- Ogoshi, R., Balasubramanium, V. and Jones, M. August 2008. Integrated Crop Management, Implementing ICM Technology in Timor-Leste.
- Performance Report. 2013. Department of Agrarian Development, Colombo.
- Rupasena, L. P. 1999. *Food Supply and Distribution in Colombo.* Report of a workshop held in Colombo on 22 nd and 23 rd September 1999. Municipality of Colombo.
- Senanayake I. P., Welivitiya W.D.D.P. and Nadeeka P.M. 2013. *Assessment of Green Space Requirement and Site Analysis in Colombo, Sri Lanka – A Remote Sensing and GIS Approach*. International Journal of Scientific and Engineering Research, Volume 4, Issue 12, December 2013.
- Sri Lanka National Agriculture Policy. Ministry of Agriculture Development and Agrarian Services. Battaramulla
- Stamm A., Jost C., Kreiss C., Meier K., Pfister M., Schukat P., and Speck H.A., 2006. *Strengthening value chains in Sri Lanka's agribusiness – A way to reconcile competitiveness with socially inclusive growth.* Bonn. Deutsches Institut für Entwicklungspolitik DIE
- Statistical News Letter. 2015. Department of Census and Statistics, Ministry of Policy Planning and Economic Affairs.
- Victor Kaiya. 2014. *Post-harvest losses and strategies to reduce them.* ACF International.
- Weerasinghe R., Emitiyagoda GAMSS. Rice Productivity Enhancement in Sri Lanka; Yaya programme.
- Weerakoon, KGPK. 2017. *Analysis of Spatio-Temporal Urban Growth using GIS Integrated Urban Gradient Analysis.* Colombo District, Sri Lanka.
- Willer H. & Julia L. (Eds.) (2015) The world of organic agriculture. Statistics and emerging trends 2015. FiBL-IFOAM report. Research institute of organic agriculture (FiBL), Frick and IFOAM – Organics international, Bonn
- Wirasinghe S., and Emitiyagoda G.A.M.S.S. (2000) Rice Productivity Enhancement in Sri Lanka: Yaya (Tract) Programme. Sri Lanka. Annals of Department of Agriculture.
- The World Bank Group. (2016) Climate Change Knowledge Portal For Development Practitioners and Policy Makers. (available at http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_historical_climate&ThisCCode=LKA)

Appendix 1. Primary data collection details

TYPE OF SURVEY	SAMPLE SIZE	SAMPLE COMPOSITION	DATA COLLECTION METHOD
Consumer survey	143 households from Keselwatta, Maradana, Mattakuliya, Kirulapona and Narahenpita GN divisions	93 low-income settlements, 50 middle- and high-income settlements	Structured interview with head of the household
Food business survey	110 business entities in Pettah, Maradana, Mattakkuliya, Kochchikade, Dematagoda, Narahenpita, Kipulapona and Bambalapitiya areas	Vegetables (16%), fruits (18%), dry food (4%), condiments (13%), shorteats (13%), prepared food (4%), fish (8%), meat (13%), rice (5%) and other (4%)	Structured interview with owners and/or managers of business entities
Food supply survey at Manning Market	All vehicles arrived at Manning Market between 10th and 17th October 2016 from 11p.m. to 6a.m. (872 lorries)	586 vegetable lorries 286 fruit lorries	Structured interview with lorry drivers
Field visit to central fish market at Peliyagoda	All vehicles came to the fish market between 31st October and 4th November 2016	222 lorries	Incoming fish data from official inventory register from the manager between 31st October and 4th November 2016
Farmers' survey	150 farmers from Kurunagala, Ratnapura, Hambantota, Badulla	Covering crops; beans, brinjals, bananas, papayas and coconuts	Semi-structured questionnaire
Interviews with heads of households, commission agents, sellers, drivers	During field visits to Manning Market and fish market, many key informants were interviewed using unstructured interviews to get to know the qualitative aspect of food safety, nutrition and security concerns		

Appendix 2. Primary data collection for capacity-building assessment

FOCUS GROUP	AREA	SIZE OF THE GROUP	DISCUSSED POINT
Farmers	Embilipitiya Thunkama ASC Area	Seven male farmers engaged in banana, vegetable and paddy cultivation	agriculture inputs pest and disease attacks basis of selecting the crop access to price information
	Polonnaruwa Sewagama ASC Area	Five male farmers engaged in paddy cultivation and collection, vegetable cultivation	marketing problems faced by paddy and vegetable farmers -barriers to use new technology - fertilisers and pesticides - importance of extension services
Agriculture instructors (AIs)	Badulla Haliela ASC Area	Three female AIs	over-use of pesticides effect of climate change on agriculture (water availability)
Agriculture research and production assistants (ARPAs)	Badulla Atampitiya ASC Area	Four male ARPAs	- changes in rainfall pattern - potential markets and price fluctuations - ARPA responsibilities

Appendix 3. Production of major nutrient-providing commodities according to district

Top five rice-producing districts that mainly feed Colombo. (Source: Paddy Statistics Report 2016, Department of Census and Statistics.)

DISTRICT	YALA		MAHA		TOTAL YIELD IN 2016 (TONNES)
	PRODUCTION (TONNES)	PERCENTAGE (FROM TOTAL YIELD IN THE YEAR)	PRODUCTION (TONNES)	PERCENTAGE (FROM TOTAL YIELD IN THE YEAR)	
Ampara	291 520	46%	344 765	54%	636 285
Polonnaruwa	251 131	46%	291 274	54%	542 405
Kurunagala	174 599	34%	333 062	66%	507 661
Anuradhapura	131 995	27%	365 988	73%	497 983
Trincomalee	95 320	40%	145 279	60%	240 599
Colombo	869	**9%**	8381	**91%**	9,250

Cultivated extents of main coconut-supplying districts. (Source: Department of Census and Statistics, 2013.)

DISTRICT	CULTIVATION AREA (HA)
Gampaha	44 030
Kurunagala	126 446
Puttlam	50 892
Hambantota	24 959

Major fish harvest producing districts in Sri Lanka that mainly feed Colombo. (Source: Annual Report 2015, Ministry of Fisheries and Aquatic Resources.)

DISTRICT	FISH PRODUCTION (TONNES)					
	TRAVELLIES	SAIL FISH	SKIPJACK TUNA	YELLOWFIN TUNA	SMALL FISH	TOTAL
Negombo	2 560	1 760	4 910	4 370	8 320	21 920
Kalutara	1 660	990	6 320	6 930	6 160	22 060
Matara	1 740	2 880	8 650	7 090	7 330	27 690
Galle	3 800	350	9 800	7 640	7 630	29 220
Tangalle	4 520	5 120	9 100	8 380	12 130	39 250
Puttlam	2 740	1 910	4 320	2 110	13 120	24 200
Chilaw	870	1 160	3 380	1 620	13 860	20 890

Appendix 4. Production of micronutrient-providing commodities according to district

DISTRICT	MAHA			YALA		
	AREA (HA)	PRODUCTION (KG)	AVERAGE YIELD (KG/HA)	AREA (HA)	PRODUCTION (KG)	AVERAGE YIELD (KG/HA)
Hambantota	514	7 066 425	13 748	313	5 008 000	16 000
Kurunegala	368	1 545 642	4 200	472	2 547 055	5 400
Anuradhapura	648	4 678 900	7 221	373	2 233 550	5 988
Badulla	577	7 841 337	13 590	362	3 444 645	9 518
Monaragala	522	4 978 450	9 545	382	3 152 750	8 253
Colombo	**73**	**511**	**7**	**65**	**455**	**7**

Top five brinjal-producing districts in Sri Lanka. (Source: Ministry of Agriculture Statistics, 2015.)

DISTRICT	MAHA			YALA		
	AREA (HA)	PRODUCTION (KG)	AVERAGE YIELD (KG/HA)	AREA (HA)	PRODUCTION (KG)	AVERAGE YIELD (KG/HA)
Kandy	601	3 584 025	5 968	591	3 925 264	6 645
Matale	158	2 361 084	14 947	194	3 305 225	17 039
Nuwara Eliya	1 393	13 022 759	9 350	819	6 692 450	8 174
Badulla	1 919	13 048 858	6 800	1 424	12 247 900	8 601
Monaragala	19	205 600	10 598	17	186 000	10 941
Rathnapura	384	3 095 071	8 051	386	2 097 955	5 435

Top five bean-producing districts in Sri Lanka. (Source: Ministry of Agriculture Statistics, 2015.)

DISTRICT	YALA		
	AREA (HA)	PRODUCTION ('000 KG)	AVERAGE YIELD (TONNES/HA)
Kandy	3 166	4 772	2
Hambantota	3 534	3 460	1
Kurunegala	6 981	4 487	1

TTop five banana-producing districts that mainly feed Colombo. (Source: Ministry of Agriculture statistics, 2015.)

Monaragala	6 962	8 705	1
Rathnapura	7 471	8 965	1

Top five papaya-producing districts that mainly feed Colombo. (Source: Ministry of Agriculture Statistics, 2015.)

DISTRICT	YALA		
	AREA (HA)	PRODUCTION ('000 NO.)	AVERAGE YIELD ('000 NO./HA)
Kandy	419	1 714	4
Galle	519	2 446	5
Hambantota	820	9 135	11
Kurunegala	752	6 941	9
Monaragala	397	2 498	6

Appendix 5. The economic value of vegetables and their losses

(Sources: Production data – Ministry of Agriculture; Retail Prices – Department of Census and Statistics. Waste ratios: highly perishable vegetables have 30 percent losses and relatively low perishable vegetables have 20 percent losses.)

Crop	Maha 2015/16		Yala 2016		Total (Mt)	Waste (ratio)	Total after losses (Mt)	Retail price LKR	Value of total vegetables production LKR billion	Value of the losses LKR billion
	Extent (Ha)	Production (Mt)	Extent (Ha)	Production (Mt)						
Potato	3,880	65,662	3,193	61,097	126,759	0.2	101,407	180	23	4.56
Beans	5,269	45,667	4,077	36,741	82,408	0.2	65,926	200	16	3.30
Capsicum	2,596	17,073	2,151	13,353	30,426	0.3	21,298	250	8	2.28
Tomato	3,674	44,943	3,432	38,885	83,828	0.3	58,680	160	13	4.02
Cabbage	2,685	54,974	2,524	48,179	103,153	0.2	82,522	140	14	2.89
Carrot	1,741	27,472	1,630	24,858	52,330	0.3	36,631	160	8	2.51
Beet Root	1,478	26,697	1,522	26,542	53,239	0.3	37,267	140	7	2.24
Raddish	1,994	25,383	1,739	25,373	50,756	0.3	35,529	120	6	1.83
Knolkhol	738	7,394	869	9,589	16,983	0.2	13,586	120	2	0.41
Leeks	1,057	16,424	765	11,967	28,391	0.3	19,874	160	5	1.36
Long Beans	4,471	33,306	3,574	27,813	61,119	0.3	42,783	140	9	2.57
Bushitavo	979	9,928	661	6,518	16,446	0.2	13,157	140	2	0.46
Okra	4,441	38,174	3,435	34,464	72,638	0.3	50,847	100	7	2.18
Luffa	2,553	35,010	1,926	24,000	59,010	0.3	41,307	120	7	2.12
Snakegourd	2,107	27,723	1,858	23,292	51,015	0.3	35,711	140	7	2.14
Bittergourd	3,033	32,745	2,147	25,300	58,045	0.3	40,632	200	12	3.48
Cucumber	2,309	24,496	1,981	20,640	45,136	0.3	31,595	80	4	1.08
Pumpkin	8,086	95,525	6,390	81,569	177,094	0.2	141,675	100	18	3.54
Brinjal	6,015	68,571	4,538	55,737	124,308	0.3	87,016	140	17	5.22
Winged Beans	1,209	14,917	959	11,629	26,546	0.2	21,237	140	4	0.74
Ash Plantain	1,395	17,879	710	9,778	27,657	0.2	22,126	140	4	0.77
Leafy Vegetables	3,042	35,414	2,630	30,345	65,759	0.3	46,031	120	8	2.37
Murunga (Cul. Year)	622	9,209			9,209	0.2	7,367	160	1	0.29
Ind. Roots & Tuber	969	13,044	839	10,947	23,991	0.2	19,193	100	2	0.48
Manioc	6,979	143,005	3,727	78,033	221,038	0.2	176,830	100	22	4.42
Sweet Potato	1,604	23,638	1,310	16,148	39,786	0.2	31,829	100	4	0.80
				Total	1,707,070		1,282,056			
				Total LKR billion					231	58
				Total USD billions					1.7	0.4

Appendix 6. Review of the legal framework

The Sri Lanka Food Act No.26 of 1980 is the main legislative document covering food safety. The Food Act is basically implemented through the Director of Health Services and through local authorities and the Ministry of Health offices of the region. Twenty-seven regulations are issued under the Food Act to address different aspects of food and food safety.

The Consumer Affairs Authority Act No.09 of 2003 was designed to protect the interest of consumers and came into force with the establishment of the Consumer Affairs Authority under the purview of the Ministry of Cooperatives and Internal Trade. The import of food items is regulated by the Import Export Control Act No.1, 1969, the Food Regulations Act of 2001 and Customs Ordinance and Customs Regulations.

The legal framework of the agriculture sector comprises of the Seed Act No.22 of 2003, the Plant Protection Act No.35 of 1999, the Soil Conservation Act of 1996 and the Control of Pesticides Act No.6 of 1994. These acts are implemented by different institutes under the purview of the Department of Agriculture.

However, under the 13th amendment to the 1978 constitution, provincial councils are granted a variety of legislative powers in relation to the food system but they do not implement the authority vested in them for nutrition, markets, fairs, etc. Certain responsibilities to execute regulations related to food systems are given to the Colombo Municipal Council (CMC) through the Municipal Council Act and CMC by-laws (i.e. locally passed regulations on food systems using the power vested in the CMC by the Municipal Council Act and approved by higher authorities).

The CMC has been granted authority under the Municipal Council Act of 1980 to solve issues related to local food systems. The comparison of powers granted to the CMC by the Municipal Council Act and the actual power utilised by the CMC on CRFS highlights the space for improvement.

Polices and frameworks having an influence on the food system of Sri Lanka include the National Land Use Policy, the National Nutrition Policy, the National Food Safety Policy, the National Campaign to Motivate Domestic Food Productiona and the National Policy and Strategy on Cleaner Production for the Agriculture Sector. The Sri Lanka National Agriculture Policy was formulated by the Ministry of Agriculture and Agrarian Services

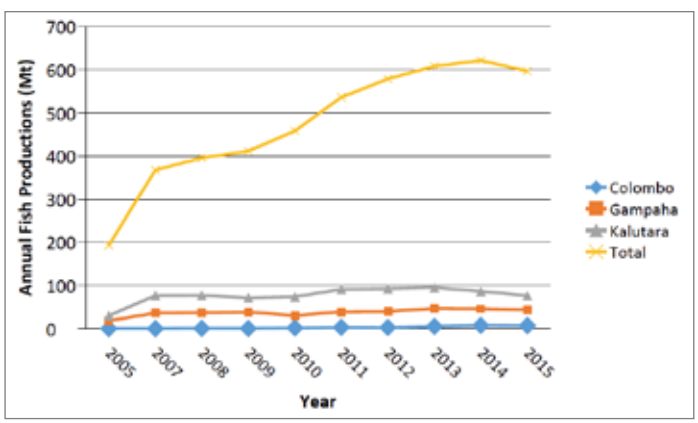
[2007], with the aim of achieving the food and nutrition security of the nation, and increasing the income opportunities and the income of farming communities through multiple means.

Appendix 7. Increasing trend of fish production and consumption

Almost 70 percent of animal protein in the diets of people in Sri Lanka are derived from fish. The marine fisheries sector contributes 86 percent to the country's total fish production while the inland fisheries sector contributes 14 percent. The Exclusive Economic Zone (EEZ)[23] of Sri Lanka covers 517 000 square kilometres; the continental shelf forms about 5.7 percent of the EEZ and has an average width of 22 kilometres. The waters of the continental shelf supply 50 percent of the fish production while the inland fishery sectors contribute the 15 percent of annual marine fish production.

It is noteworthy that fish production shows an increasing trend at the national level. Three districts in the Western Province shows constant production with minor up or downs (see figure below).

Annual fish production National and Western Province (Source: Annual Report 2015, Ministry of Fisheries and Aquatic Resources Development.)



Many fishing harbours are located within the Western Province while the main fish market is situated in close proximity to the city of Colombo.

(Source: Annual Report 2015, Ministry of Fisheries and Aquatic Resources Development.)

The per capita fish consumption of Sri Lanka has shown a slight increase within the three-year period from 2013 to 2015 (see table below).

YEAR	PER CAPITA FISH CONSUMPTION
2013	15.4 kg/year
2014	15.6 kg/year

23 An area of coastal water and seabed within a certain distance of a country's coastline, to which the country claims exclusive rights for fishing, drilling and other economic activities.

2015	15.8 kg/year

The increase in annual fish production at the national and provincial level is an opportunity to strengthen the food and nutrition security of city dwellers and commuters. Statistics on per capita fish consumption shows that fish is becoming a more popular source of animal protein in human diets.

FAO and RUAF Foundation partnered to support a City Region Food System Assessment and Planning process in seven cities selected from across the globe– Lusaka and Kitwe (Zambia), Colombo (Sri Lanka), Medellín (Colombia), Quito (Ecuador), Toronto (Canada) and Utrecht (The Netherlands). A synthesis report on each city as presented here, describes the experiences from each city in terms of planning and informed decision-making, prioritising investments and design of sustainable food policies and strategies to improve the resilience and sustainability of the entire food system.

This entire series of 7 reports will provide a full overview of the experience of those cities, and culminated in a set of tools to support city regions to assess and better plan their food system around the world. For a detailed description of the CRFS assessment process, city examples, tools and project outputs, please visit the FAO *Food for the Cities Programme* and RUAF *CityFoodTools* project websites.

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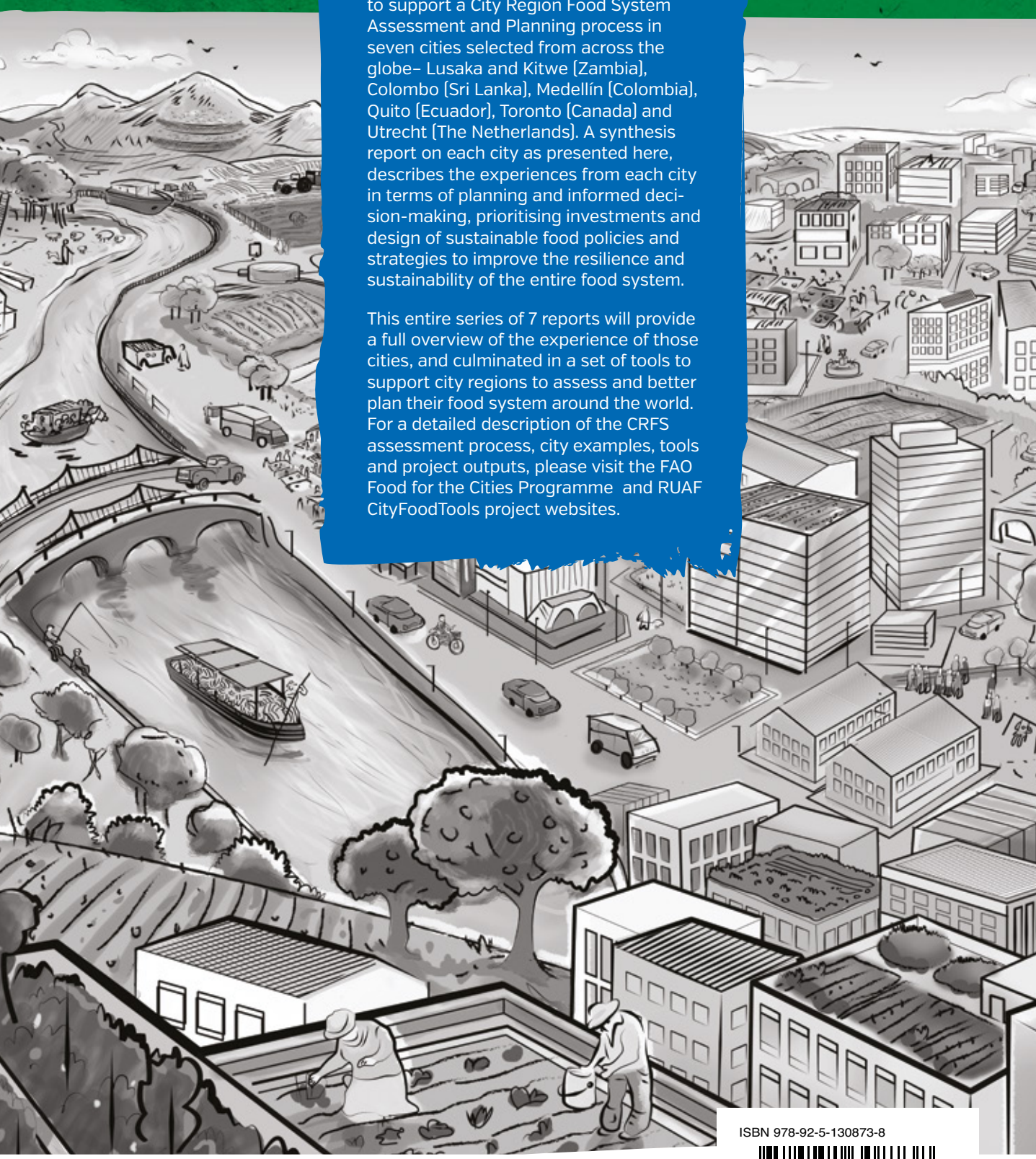

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