SRI LANKA

Food Security Atlas

Livelihoods, Food Security, and Resilience

May 2015

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Acknowledgements

The first edition of the Food Security Atlas (Livelihoods, Food Security, and Resilience) of Sri Lanka was produced jointly by World Food Programme (WFP) and Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI) under the overall guidance of WFP Regional Bureau-Asia.

The aim of the food security atlas is to contribute to a better understanding of the spatial patterns of food security, poverty Livelihoods, and resilience in Sri Lanka in order to provide a solid basis for developing a comprehensive national food security plan to combat the hunger and extreme poverty in the country.

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Cover Picture: Single mother returning from farmland with her daughters.
Captured during WFP drought assistance programme at Kurunegala, Sri Lanka.

This Report has been made possible through contributions from C-ADAPT. C-ADAPT is a strategic global initiative that aims to strengthen the capacity of WFP and partners to deliver climate services to the most vulnerable and food insecure communities and build resilience to climate-related risks through effective climate risk analysis, adaptation planning, and risk management. C-ADAPT is funded by the Government of Sweden's fast-track climate finance.

SWEDEN
Made possible through

Map of Sri Lanka

Message from HARTI

Food security is a national priority of the Government of Sri Lanka and our goal is a fully food secure nation in which all Sri Lankans have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI) has been a leading socio-economic research institution in the agrarian and rural sector since it was founded in 1972 and continues to be the national model of the excellence in the field of food security analysis. In 1979, HARTI established the Market Research Unit within the institute with the objectives of collecting, analyzing and disseminating agricultural market information to monitor food security issues in the country.

HARTI works as a national focal point of disseminating knowledge and publishes weekly and monthly food commodities bulletins with price data and production information of food commodities to monitor commodity markets in relation to food security. HARTI has extensive experience in working with other Government institutes and UN organizations to conduct research and analysis on food security. In 2014, HARTI established a CoD monitoring system with the collaboration of WFP, which is working as a focal point in monitoring CoD in Sri Lanka. This report is also a collaborative product of HARTI with WFP. The report provides an exclusive analysis of the resilience, food and nutrition insecurity in Sri Lanka by using the livelihoods approach.

As the Director/ Chief Executive Officer of HARTI, I congratulate the research team specially World Food Programme for jointly publishing this report and thus providing important information and policy tools. I strongly encourage all decision makers to closely study the findings of the report. I believe that the findings of the report will be a policy guidance for the development of sustainable long-term food security policies.

Haputhanthri Darmasena
Director/ Chief Executive Officer
Hector Kobbekaduwa Agrarian Research and Training Institute

Message from WFP

The mission of the World Food Programme is to end global hunger. Hundreds of millions of people still suffer from chronic hunger and food insecurity despite sufficient levels of global food production. Every day, WFP works worldwide to ensure that no child goes to bed hungry and that the poorest and most vulnerable, particularly women and children, can access the nutritious food they need. WFP's Strategic plan for 2014-2017 has clearly identified the importance of improving the capacity of people, communities and countries to strengthen resilience to shocks, reduce disaster risks and adapt to climate change through food and nutrition assistance. WFP's unique network of food security analysts works closely with national governments, UN partners and NGO organizations to conduct research and analysis on food security. This network builds/informs/structures/identifies the policies and programmes that WFP and its partners adopt in order to fight global hunger.

Since the ending of the 27-year conflict in May 2009, Sri Lanka has demonstrated strong economic and social performances. The country transitioned to a middle-income country in January 2010 and performs currently beyond regional averages on many key health and education indicators, thanks to a history of universal healthcare and education policies. While more than three-quarter of the population resides in rural areas, livelihoods have diversified and specialized beyond crop production into areas such as processing, trading, retail, service, and others.

Despite the recent progress made, vulnerability to food and nutrition insecurity as well as low resilience to climate variability still exists in the country. This mostly affects the poorest households, leading to higher levels of malnutrition. WFP Sri Lanka prioritizes these issues in its country programme, based on the findings of the report. The report provides a unique analysis of the resilience, food and nutrition insecurity in Sri Lanka by using the livelihoods approach. The most important finding of the report is that that poor resilience is always driven by a high level of food insecurity as well as a low level of livelihood diversity.

As the representative of WFP Sri Lanka, I congratulate the research team specially Hector Kobbekaduwa Agrarian Research and Training Institute – the only national food security analysis institution in the country – for their collaborative effort to publish the Food Security Atlas of Sri Lanka.

I believe that this publication will contribute to the development of sustainable long-term food security policies as well as to solutions for the food insecure populations in Sri Lanka. I therefore take this opportunity to mention that WFP Sri Lanka will continue to fight food insecurity in the country, in close cooperation with the Sri Lankan government and other global partners.

Ismail Omer
Country Director
World Food Programme, Sri Lanka

List of Acronyms

BMI	Body Mass Index
CEPA	Centre for Poverty Analysis
DEC	Dedicated Economic Centers
DOA	Department of Agriculture
DCS	Department of Census and Statistics
DHS	Demography and Health Survey
DMC	Disaster Management Centre
DNP	Department of National Planning
DS	Divisional Secretariat (Division)
FCS	Food Consumption Score
GDP	Gross Domestic Product
GN	Grama Niladhari (Division)
HARTI	Hector Kobbekaduwa Agrarian and Research Institute
HIES	Household Income and Expenditure Survey
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFPRI	International Food Policy Research Institute
IYFC	Infant and Young Child Feeding
IPS	Institute of Policy Studies
JICA	Japan International Cooperation Agency
MDM	Ministry of Disaster Management
MED	Ministry of Economic Development
MFAR	Ministry of Fisheries and Aquatic Resources
MOH	Ministry of Health
MPCS	Multi-purpose Corporative Society
LBW	Low Birth Weight
OFC	Other Field Crops
PMB	Paddy Marketing Board
SWM	Southwest Monsoon
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
WFP	World Food Programme
WHO	World Health Organization

Executive Summary

Emerging from a 27-year conflict in May 2009, Sri Lanka has demonstrated strong performance both economically and socially. The country transitioned to middle income status in January 2010 and, owing in large part to a history of universal healthcare and education policies, performs beyond regional averages on many key health and education indicators. While more than three-quarters of the population reside in rural areas, livelihoods have diversified and specialized beyond crop production into areas such as processing, trading, retail, service, and others.

Despite the progress, vulnerability to food and nutrition insecurity and low resilience to climate variability persist around the country, affecting the poorest households the most. This Report provides a unique analysis of resilience and food and nutrition insecurity using a livelihoods approach.

Based on a collaborative, government-led exercise for livelihood mapping and zoning, 20 rural livelihood zones were delineated around the country where among the poorest populations similar livelihood patterns can be observed. These zones provide a basis from which to assess the resilience of these vulnerable households according to their relative status of food security, livelihood diversification and climate sensitivity of income.

Key Findings

RESILIENCE:

The least resilient of the poor households in Sri Lanka are found in the south-eastern rain-fed paddy farming & other field crops (OFC) zone that includes much of Monaragala and half of Ampara, as well as in the up-country tea estate zone that covers Nuwara Eliya, half of Badulla, and up-country parts of Kandy and Ratnapura. Poor resilience in these zones is driven by high levels of food insecurity and low levels of livelihood diversity.

FOOD & NUTRITION SECURITY:

- Chronic food insecurity persists amongst poor households in the up-country tea estate and south-eastern rain-fed paddy farming & OFC zones. Reliance on wage labour with low wages, limited household production of own food resulting in higher dependence on the market for food, yet faced with poor physical and financial access to food from these markets are the driving factors of chronic food insecurity in the zone.

- Seasonal food insecurity is highest in the northern zones and zones in the southern region. In the north, limited water supply for irrigation during Yala (May to September), often due to destruction or damage of tanks during the conflict, restricts year-round production potential. As households work to rebuild livelihoods, taking on loans is common and financial access is further limited by resulting indebtedness.

- Malnutrition remains a major challenge in Sri Lanka, particularly in terms of acute malnutrition (wasting). Wasting rates are exceptionally high, with the highest prevalence found in the eastern and northern regions. Destruction and slow rehabilitation of key infrastructure including health, water and sanitation facilities may be a driving factor underscoring these higher rates. By contrast, chronic malnutrition (stunting) is low compared to prevalence rates seen around the region. The highest prevalence in Sri Lanka is found in the up-country tea estates and is likely due to poor food insecurity, lower education levels and low access to improved water supply. Most communities in these areas rely on water from mountain springs and rivers. In addition, a Cost of Diet analysis demonstrates that many households do not spend enough on a diverse diet to achieve the required daily intake of micronutrients.

VULNERABILITY:

Sri Lanka is increasingly vulnerable to climate variability. Long-term projections predict increasingly erratic rainfall particularly during the Northeast Monsoon (NEM) period. In addition, a westward movement in rainfall from the Southwest Monsoon (SWM) can be observed resulting in a shrinking of the intermediate and wet climatic zones. The dry zone is a major source of food production for the country and a collapse of the NEM would present a major threat to food security throughout the country. Retreat in the SWM would particularly impact rain-fed paddy farmers in the southeast. Coastal hazards such as tsunamis, sea level rise, soil salination as well as storm hazards present additional climate change-related threats for many livelihood groups and households along Sri Lanka's coastline.

Contents

1 INTRODUCTION

Using a livelihoods approach, this Report provides a spatial and temporal analysis of chronic food and nutrition insecurity in Sri Lanka.

LIVELIHOODS:
The capabilities, assets and activities required for a means to a living.

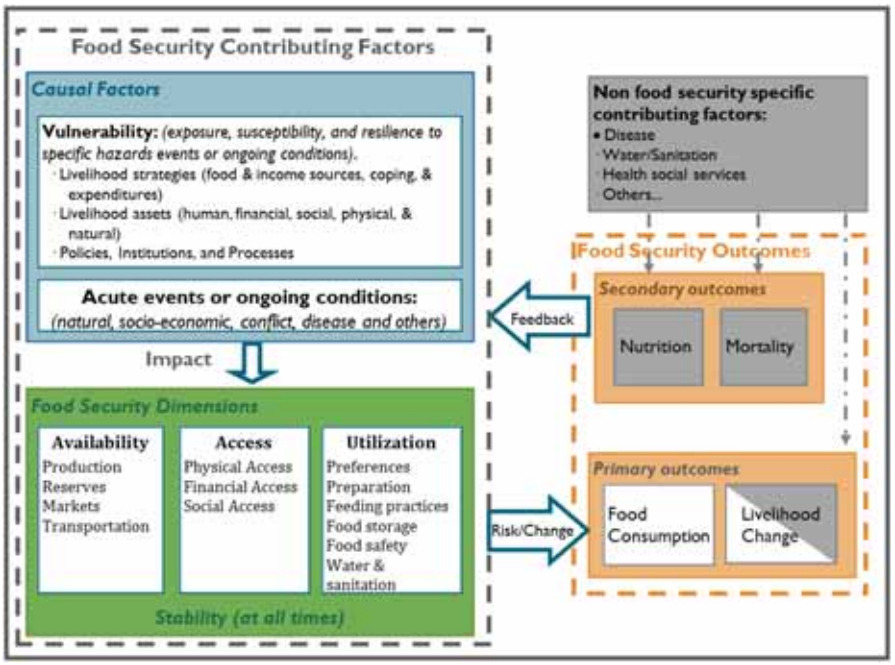
Within specific geographic areas, distinct patterns of livelihood activities often emerge, influenced by commonalities such as topography, agro-ecology, climate, population density and infrastructure development, amongst others. Households with common livelihood patterns are similarly vulnerable to hazards and shocks, and often to food and nutrition insecurity. Livelihood mapping provides a useful lens through which to assess this vulnerability and to inform design of programmatic interventions.

LIVELIHOOD ZONES:
Geographic areas in which people broadly share a similar pattern of livelihoods.

However, the status of food and nutrition security, whether at national, livelihood zone, or household level, is not easily measured. Multiple factors interact to form a complex web of determinants, each one linked to the other. To facilitate analysis, proxy indicators of food and nutrition insecurity are typically grouped according to their relationship to three dimensions of food security: availability, access and utilization of food (Figure 1).

Figure 1. Food and Nutrition Security Conceptual Framework

FOOD AND NUTRITION SECURITY:
Exists when all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life.



Availability of food is defined as the physical presence of food through own production, reserves, and imports.

Access to food relates to the ability of a household to acquire sufficient food to meet its needs through a variety of mechanisms including own production, hunting and gathering, purchasing, bartering, gifts, and food aid.

Utilization of food refers to the ability of members of a household to make use of the food to which they have access. This includes household food preferences and modes of storage and preparation, as well as the ability of individuals to absorb nutrients from the food. The safety of water and presence of improved sanitation facilities, practice of hygienic behaviors, and access to health care facilities all play a role in the utilization of food.

Vulnerability, a function of the extent of exposure to risks and the capacity to cope with that exposure, permeates the analysis of food and nutrition security as status that can shift rapidly in the event of a disaster based on household's livelihood strategies and assets, and the political, institutional and programmatic environment in which it lives.

In the event of a disaster, **acute food and nutrition insecurity** can occur, with the most visible outcomes being rapidly deteriorating food consumption patterns and nutrition outcomes and shifting livelihood activities that reflect the adoption of unsustainable coping strategies. The outcomes can occur immediately and the change is often dramatic.

In situations of **chronic or transitory food insecurity**, often related to the cyclical patterns of production and food prices, the same visible outcomes may exist, but the process of an eroding asset base, shifts in livelihoods, deteriorating food consumption patterns and poor nutritional status are more subtle and may manifest over a longer period of time.

This Report on Livelihoods, Food Security, and Resilience applies a livelihoods lens to the analysis of chronic food and nutrition insecurity in rural areas of Sri Lanka. Through a collaborative livelihood zoning and profiling exercise, 20 zones with similar patterns of livelihood activities were delineated in Sri Lanka. Details on the methodology and profiles for each zone can be found in the accompanying document, Consolidated Livelihood Exercise for Analyzing Resilience (WFP & MED, 2104).

As no data is currently available at the livelihood zone level, food and nutrition security data presented in this Report is first mapped according to administrative boundaries and then overlaid with the livelihood zone boundaries in order to explore generalizable patterns for different dominant livelihoods.

The Report begins by exploring the underlying context and elements that shape livelihood zones (chapter 2) and describing the livelihood zones of Sri Lanka (chapter 3). Chapters 4, 5 and 6 then explore food and nutrition security outcomes, the driving factors, and underlying vulnerability to climate risk taking a livelihoods approach. Chapter 7 concludes with an assessment of overall resilience.

2 CONTEXT

Geographically-defined livelihood patterns typically emerge based on the interaction of a number of factors related to the geography and topography of the land, the climate, demographic patterns, and infrastructural development.

AGRO-ECOLOGY AND CLIMATE

Sri Lanka is a small (65,610 km2) but diverse island nation located in the Indian Ocean off the south-eastern coast of India. Administratively, it has nine provinces, 25 districts, 325 divisional secretariats (DS), and over 14,000 Grama Niladhari (GN) divisions, or village clusters, with the capital city of Colombo located in the Western Province.

Distinct topographic, geographic and climatic characteristics around the country overlap to create a mosaic of agro-ecological areas that then inform livelihoods patterns. At the broadest level, three agro-ecological zones (wet, intermediate, and dry) are defined by the prevailing climate and rainfall patterns (Fig. 2). Altitudinal differences (highland, upland, and lowland) serve to further delineate within these major zones, while soil type narrows the areas even further to a total 46 sub-agro-ecological zones.

Approximately 64 percent of the country's land mass can be found in the dry zone, which extends over the northern, north-central, and eastern regions. This zone receives less than 1,250 mm of rainfall per year that falls mostly during the North East Monsoon, between December and February.

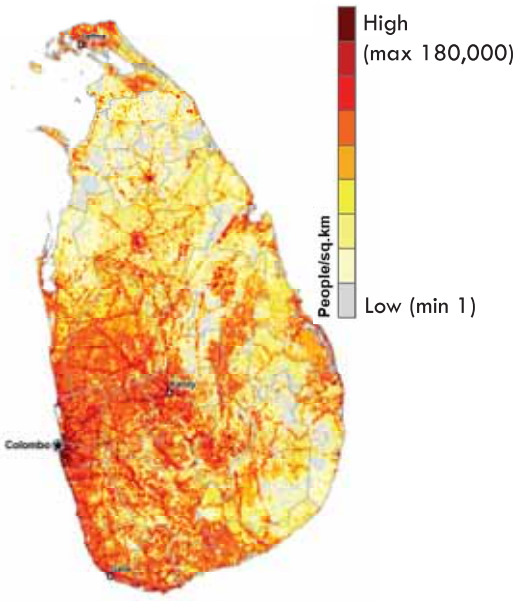
The mountainous wet zone in the south-central region accounts for 24 percent of landmass while the intermediate zone spanning between the wet and dry zones accounts for the remaining 12 percent. In a typical year, the wet zone receives more than 2,500 mm of rainfall spanning through two monsoonal periods, the South West Monsoon (SWM) occurring between May and September, and the North East Monsoon (NEM).

DEMOGRAPHY

As of 2014, the total population of Sri Lanka is estimated at 20.7 million (DCS, 2014). The majority of the population currently resides in the Western province (29 percent), with approximately 12 percent living in the Central, Southern and North-western provinces, and less than 10 percent of the population in each of the other five provinces. As can be seen in Figure 3, population density is highest in and around the urban centres of Colombo, Kandy and Galle. Population density thins substantially in the more rural areas of the north and east with the substantially in the more rural areas of the north and east with the exception of Jaffna in the far north. Around the country, people tend to live close to roads, resulting in a pattern of high population density that tracks the major road networks.

Figure 2. Agro-ecological zones

Figure 3 Population density



Source: Landscan 2013

Despite high population density in the urban areas, the country remains predominantly rural: 78.5 percent live in rural areas, 6.3 percent of whom live on estates mostly in the central highlands, and 21.5 percent in urban areas (DCS 2012). With the majority living in rural areas, agriculture continues to play a central role in livelihoods of most Sri Lankans. While formal statistics indicate that 30 per cent of the population is employed in the agriculture sector, many people are engaged in activities indirectly related to agriculture such as trade and retail of farm products and informal employment in agriculture-related activities. It is estimated that approximately 85 percent of total agriculture sector jobs (informal and formal) stem from the informal sector (DCS 2013c).

ECONOMIC & SOCIAL INDICATORS

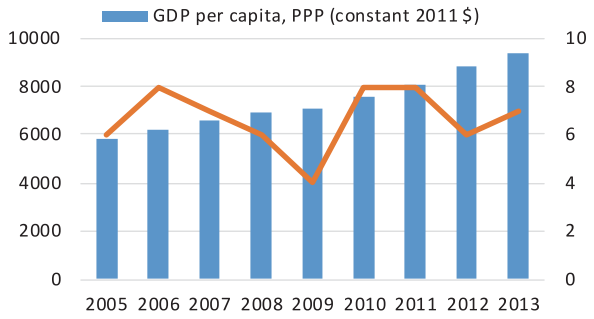
Since emerging from the 26-year protracted conflict in May 2009, Sri Lanka has made important strides in many key development indicators: In January 2010, Sri Lanka transitioned to the category of middle-income countries and in the same year was declared on target for achievement of nearly all Millennium Development Goals by 2015.

The Sri Lankan economy (measured in Gross Domestic Product) has grown at a rate of about 7 percent per year in the last few years. At the same time, poverty has declined by 9 percent, from 15.7 percent in 2007 to 6.5 percent in 2013, and human development, as measured by the Human Development Index (HDI), has improved from 0.620 in 1990 to 0.750 in 2013, placing the country in the category of high human development (UNDP 2014).

National-level improvements in the areas of health and education have also been notable. Life expectancy has increased from 69 in 1995 to 74 in 2011, child mortality has declined from 19 per 1,000 births in 2000 to 10.9 in 2009, and maternal mortality has reduced from 47.5 per 100,000 live births in 2001 to 33.3 in 2010. In terms of education, Sri Lanka offers free universal education up to 9 years and as a result has achieved general literacy for 97 percent of the population and a completion rate (of basic education grades 1 to 9) of 91 percent (DNP 2010). Overall the quality is widely considered as high (ranked 44 out of 131 countries in terms of quality of the education system).

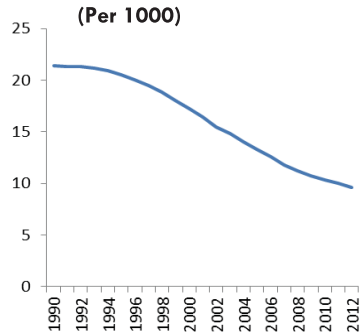
Figure 4. Trends in selected indicators 1990-2012

(a) economic growth



Source: WB 2014

(b) Under-five mortality

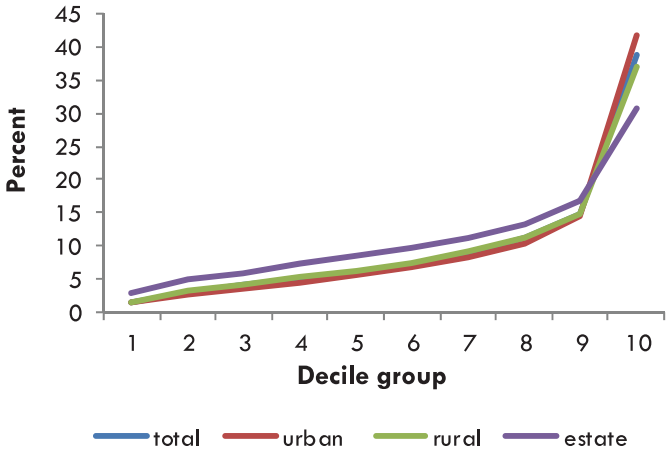


Source: UNICEF 2013

Despite the progress, Sri Lanka faces the challenge of achieving equitable economic and social development across the country. Nationally, the Gini coefficient has lingered around 0.50 for the past several years, and the richest quintile in the country control over half of the income (54 per cent), compared to 4.4 percent among the poorest quintile (DCS 2013b). By decile-group, the top 10 percent of households captures 38.7 percent of the total household income, while the bottom three decile groups' captures less than 10 percent of the national income (Figure 5a). The disparity in income earning capacity is most prominent across urban and rural households as compared to households in the estate sector (Figure 5b).

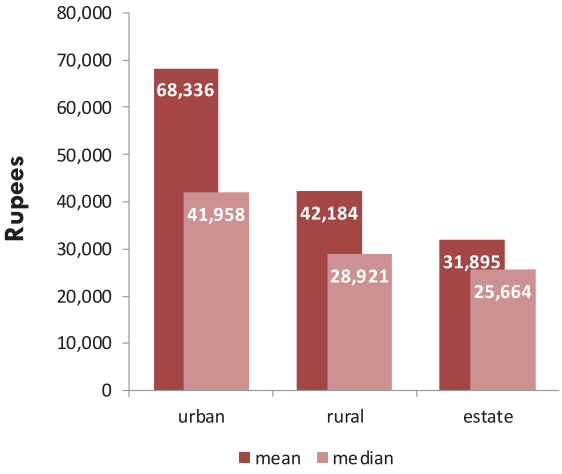
Figure 5. Income distribution indicators 2012/13

(a) share of income to total household income by



Source: DCS 2013b

(b) mean and median monthly



Source: DCS 2013b

Poverty rates, while coming closer together, remain divided. Historically, poverty has been highest in the estate sector, but the sector has seen a substantial reduction in poverty, declining from 38.4 percent in the mid-1990s to 6.2 percent in 2012. However, many households depending on the estates for their livelihood, have income levels just above the national poverty threshold and remain extremely vulnerable (see section on "Economic Access" on page 15).

Urban poverty head count is lowest at 2.4 percent compared to rural poverty at 7.5 percent. According to 2009/10 data, poverty was highest in the Eastern, Uva and Northern Provinces (14.8, 13.7 and 12.8 percent respectively). Poverty rates by district are provided in Figure 16 on page 15 of this Report.

3 LIVELIHOODS

While highly diverse, rural livelihoods in Sri Lanka fall broadly into 20 geographically distinct livelihood zones. Within these zones the pattern of activities are similar, influenced by common agro-ecological, topographical, climatic, demographic, and infrastructural features.

THE ZONES

Nearly 80 percent of Sri Lankan population is considered rural. While engaged in diverse activities, livelihoods are nonetheless closely intertwined with agricultural industries, whether as producers, processors, traders, retailers, or elsewhere in the market chain. As such, livelihood zones in Sri Lanka are defined in large part by the agricultural activities that dominate the landscape.

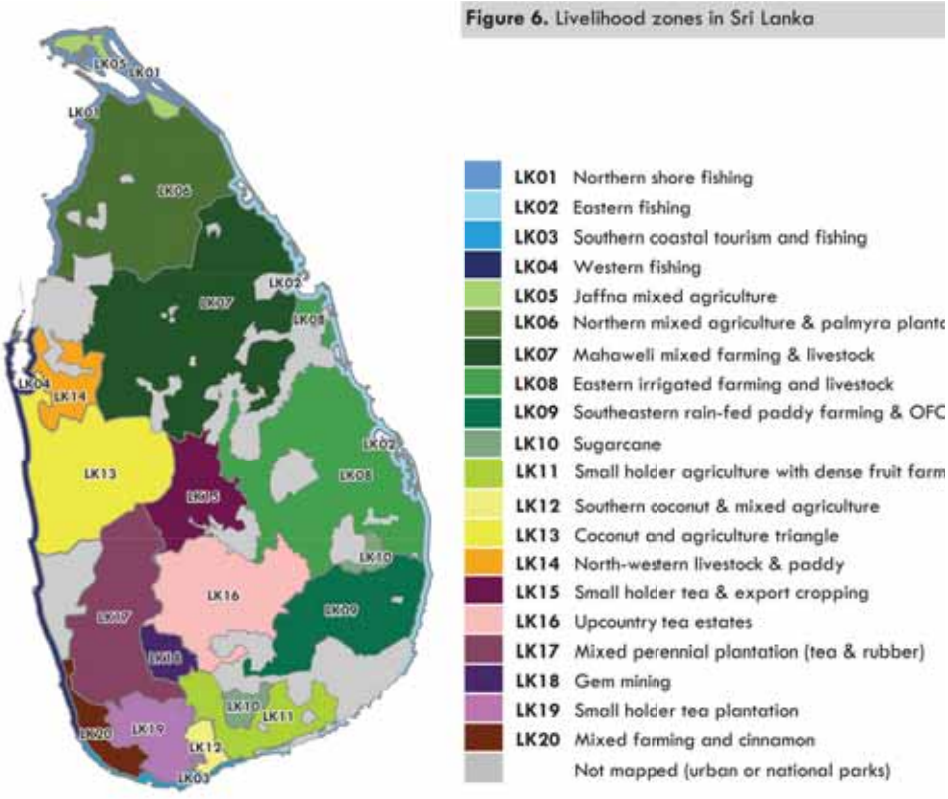


Figure 6. Livelihood zones in Sri Lanka

Source: WFP, 2014

dry zones (LK05-11, LK14)

Many households in the 'Dry Zone' of the country are traditionally engaged in paddy farming, made possible by the extensive irrigation network of over 11,000 micro-tanks fed basically from rain waters and rivers (including Mahaweli). The tanks have been well maintained throughout the north-central area, in the Mahaweli mixed farming & livestock (LK07) zone and in much of the Eastern irrigated farming & livestock (LK08) zone. By contrast, the prolonged conflict in the north and eastern regions caused many of the tanks in the Northern mixed agriculture & palmyra plantation (LK06) zone to fall into disrepair, making year-round agricultural production more difficult. As a result of this disruption to traditional livelihoods, unskilled daily wage labour has emerged as a major source of income (WFP, MED, & HARTI 2012).

However, as reconstruction and rehabilitation of much of the infrastructure in the north and east continues, households are increasingly returning to agriculture and year-round cropping of paddy, vegetables and other field crops is expected to expand. In addition, the production of palmyra, a palm similar to coconut in its cultivation needs but with a different fruit and by-products, is increasing as investment in the industry expands; production patterns are shifting from the current ad-hoc production to plantation-style production with important implications for livelihood diversification.

In the Northwestern livestock and paddy (LK14) zone, the irrigation tanks are historically smaller and also provide less opportunity for year-round paddy cultivation. As a result, households in this zone have slowly diversified into livestock rearing and export cropping. Large-scale industrial poultry farming has taken root in this area and is growing at a rapid pace, although involvement of the poorer households in this industry is limited.

The more densely populated northern area, the Jaffna mixed agriculture (LK05) zone, differs from its southern neighbouring zones in that agricultural production is reliant on shallow ground water aquifers instead of tanks and farming households, typically grow high value cash crops such as tobacco, potato, vegetables and fruits. Tourism is also expanding in this area and many households are well-positioned to take advantage of it.

The south-eastern region of Sri Lanka is one of the more isolated areas in terms of interior road access and has generally lower population density. Livelihoods in the southeastern rain-fed paddy and OFC (LK09) zone are centered around small-holder paddy production that often utilizes slash-and-burn techniques and is largely dependent on rainfall. The zone crosses two climatic regions (dry and intermediate), which impacts the vulnerability of households dependent on rainfall for production. There has been little diversification of agricultural livelihoods in this area that includes highly commercial crop cultivation such as maize.

Benefiting from two separate large reservoirs in the area, the sugarcane (LK10) zones are, as one would expect, largely centered around industrial production of sugarcane. Poorer households engage mostly as daily wage labourers with small homesteads while wealthier households own the processing plants and much of the land in the area.

Straddling the dry and intermediate zones, the small holder agriculture with dense fruit farming (LK11) zone benefits from more predictable rainfall. Households tend to farm small plots and engage in diversified fruit farming, although the most common mixed farming system is paddy together with banana.

intermediate & wet zones (LK12-13, LK15-19)

Livelihoods in the intermediate and wet climatic zones are largely differentiated according to topography. In flatter regions, households typically rely on coconut plantations, such as in the southern coconut and mixed agriculture (LK12) zone and the coconut and agriculture triangle (LK13) zone. However, households in the coconut and agriculture triangle tend to have more diversified livelihood profiles than in the southern coconut zone, benefiting from greater proximity and road connectivity to urban areas in and around Colombo and from more extensive irrigation system for paddy, vegetable, fruit, and export cropping. In the southern coconut zone, plots tend to be smaller and production outside of coconut plantations is largely for household consumption.

The mid- and up-country areas of the country have optimal conditions for perennial plantations such as tea and rubber. In the up-country tea estates (LK16) zone, the more vulnerable households depend almost exclusively on daily wages earned from estate farming. While large estates are present in the mixed perennial plantation (LK17) zone, a greater proportion of households own their own small plantations. Rubber plantations are increasing in this area given its perceived profitability. In both these zones, production of paddy or vegetables is very limited with some homesteads producing for household consumption.

Further south, the rolling hills are again dominated by tea production, but the farming system is typically that of small holders (Small-holder tea plantation zone– LK19). With increasing population density in the area, land has become more fragmented resulting in small plots and greater risk of soil degradation. The quality of the tea grown in this area tends to be less than that of the up-country estates.

Cultivation of cash crops, such as cinnamon and other spices, is also possible in these agro-climatic zones. Many households in the small holder tea & minor export cropping (LK15) zone engage in spice production, while in the cinnamon and mixed farming (LK20) zone, cinnamon production dominates. Other activities, primarily related to the gem mining industry, are mostly concentrated in a small area around Rathnapura, which translates as the 'Gem City', and as result forms the gem mining (LK18) zone. Poorer households in this zone are primarily the mine labourers while the wealthier households own the mines. Ad-hoc mining does occur in other zones on a limited basis.

coastal zones (LK01-04)

In coastal areas, households are mostly engaged in activities related to fishing, including fish catching and drying. The drying industries are particularly concentrated in the lagoons found all around the coastal perimeter. Fishing activities are influenced by seasonal patterns – during the respective monsoon periods, poorer fisherfolk are unable to fish along the coast and engage in other activities depending on their location (tourism services, paddy farming, or informal labour) in order to make ends meet. By contrast, in the south, tourism around Galle has grown substantially and impacted local fishermen's livelihood patterns, resulting in the delineation of a separate zone, southern coastal tourism and fishing (LK03).

In the eastern fishing (LK02) and western fishing (LK04) zones, deep sea and multi-day fishing is possible while in the northern shore fishing (LK01) zone, fishing is mostly restricted to coastal excursions given the proximity to Indian waters.

The supplemental publication, Consolidated Livelihood Exercise for Analysing Resilience (CLEAR), provides detailed profiles of each livelihood zone.
A digital copy is available at http://www.wfp.org/content/sri-lanka-consolidated-livelihood-exercise-analysing-resilience

4 FOOD & NUTRITION SECURITY

Despite of the general economic growth, the regional disparities of poverty has further increased and the geographical coverage of poor areas still wider and scattered.
Poverty Head Count ratio in Northern, Eastern and Uva Provinces was reported as higher in particular Mullaitivu, Moneragala, Mannar, Batticaloa, Killinochchi and Badulla districts are the poorest districts in Sri Lanka.
Malnutrition still remains as major challenge in Sri Lanka, particularly in terms acute malnutrition. National Global Acute Malnutrition (GAM) rate was reported above as critical levels according to the WHO public health significance standards.

FOOD SECURITY

Household food consumption, in terms of both dietary quantity and quality, is a key outcome indicator of food security. In Sri Lanka, the typical pattern of consumption is at least three meals a day, often with large morning and evening meals and a smaller mid-day meal. Meals tend to be heavily based on rice, the staple grain throughout the country, and accompanied by a variety of coconut-based vegetable, meat and/or fish curries.

Nationally, the average food energy consumption is 2,094 kilocalories, which falls just above the threshold for 'low' daily energy consumption based on International Food Policy Research Institute (IFPRI) guidelines as well as the Sri Lankan minimum daily dietary energy requirement of 2030 kcal (Mayadunne & Romeshun 2013).

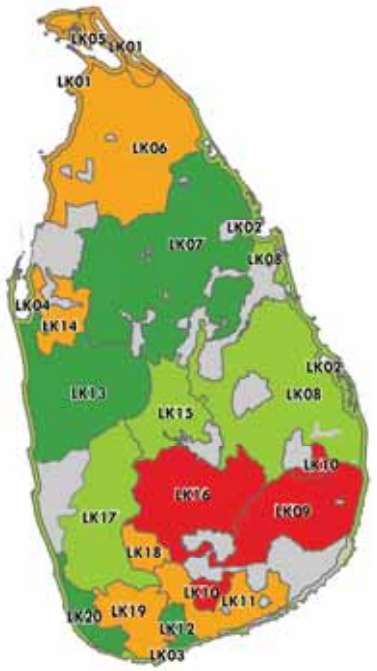
Dietary diversity in the country is considered to be quite poor. Although not nationally representative, results from a 2009 study on Nutrition and Food Security conducted jointly by the Ministry of Health, UNICEF and WFP and covering 9 districts in the country, found that 64 percent of the surveyed households was estimated to have less than optimal dietary diversity. While approximately 75 percent of households consumed vegetables at least 5 days in the previous week, only about half consumed food rich in animal-source protein, less than a quarter consumed foods rich in plant-based protein (nuts/pulses), and less than a third of households consumed fruit five days in the week (MRI, UNICEF, & WFP 2010).

Disaggregated data on food security outcomes in Sri Lanka is limited. Therefore, as part of the livelihood mapping exercise undertaken in January 2014, a qualitative evaluation of relative food security at the livelihood zone level was conducted using historical food security information. Considering the poorest households in each livelihood zone, the zones were ranked as either food secure, food insecure in a bad year, seasonally food insecure, or chronically food insecure.

As a result of this exercise, the poor households in the up-country tea estates (LK16), southeastern rain-fed paddy farming & OFC (LK09) and sugarcane (LK10) zones are considered to be chronically food insecure. In the up-country tea estate and sugarcane zones, poor households have little livelihood diversification and depend heavily on wage labour for income at low daily rates. They may maintain small homesteads for limited household food production, but mostly depend on markets to purchase sufficient food for the household. In the southeastern rain-fed paddy farming & OFC (LK09) zone, many of the poorer households continue to rely on slash-and-burn rain-fed paddy production with limited productivity and low yields. As a result, they also depend heavily on market purchases to satisfy household needs.

Road access and thereby access to larger and more diverse daily markets is poor in these zones, contributing further to the status of chronic food insecurity for the poorest households that tend to be the most isolated.1 Lack of roads also impedes access to key education and health facilities that negatively impacts the utilization of nutrients in food.

Figure 7. Relative food security status amongst the poorest households



Food Secure

Food Insecure in a bad year

Seasonally Food Insecure

Chronically Food Insecure

Not mapped (urban or national parks)

Source: WFP, 2014

Three zones in the south and four zones in the north are considered as seasonally food insecure: Small-holder agriculture with dense fruit farming (LK11); Small-holder tea plantation (LK19); North-western livestock & paddy (LK 14); Northern mixed agriculture & palmyra plantation (LK06); Jaffna mixed agriculture (LK05); and Northern shore fishing (LK01). Poor households in these zones tend to experience lean season food insecurity, especially during the period of November to January, although the factors driving food insecurity differ between the north and the south.

In the northern mixed agriculture & palmyra plantation (LK06), northern shore fishing (LK01) and Jaffna mixed agriculture (LK05) zones, the conclusion of the conflict, resettlement and steady but slow rehabilitation of infrastructure continue to negatively impact households' livelihoods, making them more vulnerable to seasonal food insecurity during the Yala growing season (June and July). While conditions are reportedly improving, many households remain relatively pessimistic about their livelihood recovery. Indebtedness is a major concern, perpetuating the cycle of seasonal food insecurity as households are forced to take loans with high interest rates to obtain sufficient food in the lean season (WFP, MED & HARTI 2012).

In the southern zones of small holder agriculture with dense fruit farming (LK11) and small holder tea plantations (LK19), seasonal food insecurity is driven by the limited own production of food and low profits from small scale agricultural production, despite the production of some higher value crops. In the small holder tea plantation zone, the quality of the tea is poorer than in the upcountry areas and generates less profit; in the dense fruit farming zone, limited road access affects profitability from sale of the fruit.

The mixed perennial plantations (LK17), small-holder tea & minor export cropping (LK15) and eastern irrigated farming & livestock (LK08), as well as three of the four coastal zones (eastern fishing-LK02, western fishing-LK04 and southern tourism and fishing-LK03) are considered food insecure only in a bad year. For example, in the fishing zones, a major storm or climate-related hazard such as the tsunami in 2004 can devastate livelihoods and cause food insecurity to rise.

Relatively, the most food secure zones are the Mahaweli mixed farming & livestock (LK06), coconut & agriculture triangle (LK13), southern coconut & mixed agriculture (LK12), gem mining (LK18) and mixed farming & cinnamon (LK20) zones. Despite being in the center of the dry zone, households in the Mahaweli mixed farming & livestock zone remain relatively food secure during the dry season due to the extensive network of large tanks that facilitate year-round agricultural production. Owning livestock is also common in this area providing an additional source of nutritious food.

Households in the coconut and agriculture triangle (LK13) and southern coconut and mixed agriculture (LK12) are also considered to be amongst the most food secure zones based on year-round profitability of coconuts and relatively stable own production of food on homestead plots. Access is good in both areas as road networks extend from Colombo and Galle respectively.

NUTRITION SECURITY

Nutrition outcomes, particularly of women and children less than five years of age, are the primary indicators of household nutrition security. Stunting, or shortness for age, is a measure of chronic malnutrition and results from prolonged lack of adequate nutrition, repeated infections, or both. Wasting, or low weight for height, is a measure of acute malnutrition resulting from more sudden deprivation of nutrients and/or severe infections. Underweight, or thinness for age, is an indicator that reflects a combination of acute and chronic malnutrition.

1 Road density is higher in the up-country tea estate zone compared to the southeastern rain-fed paddy farming & OFC zone as well as the sugarcane zone, but quality of the roads is low and many are dirt tracks.

In Sri Lanka, child malnutrition remains a major challenge. Rates have shown little improvement over the past decade, fluctuating around 15 percent stunted and wasted respectively and 25 percent underweight (Figure 8a). While the prevalence of stunting is quite low nationally as compared to other countries in the region, wasting is much higher than other countries and well above the threshold for an emergency.

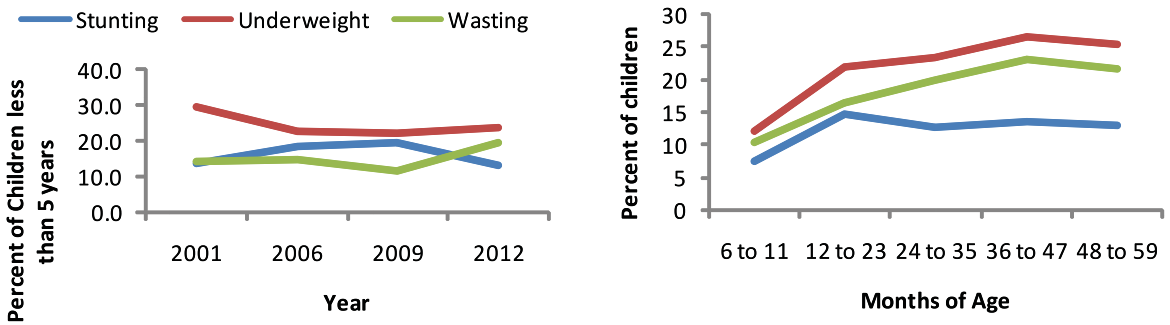
The most critical period for the onset of child malnutrition is during the 1,000 day window from conception to two years of age. During pregnancy and while breastfeeding, the health and nutritional status of the mother is critical: In infancy and young childhood, the practice of optimal feeding and care practice drives child nutritional status.

The prevalence of child malnutrition in Sri Lanka rises rapidly between six months and two years as complementary foods and liquids are introduced, a trend which follows a common international pattern. After two years, the prevalence of stunting slows and begins to level off, reinforcing the notion that the vast majority of chronic malnutrition occurs within the 1,000 day window. By contrast, the prevalence of underweight and wasting continue to increase into the fourth year of life suggesting on-going acute nutritional assaults (Figure 8b).

Figure 8b also reveals that a large proportion of children are already malnourished by the time they reach six months of age. Indeed, nearly one in five infants (17.9 percent) in Sri Lanka is born weighing less than 2.5 kg, the threshold for low birth weight (MOH & UNICEF 2012). Low birth weight in Sri Lanka has been closely associated with heavy labour demands of agriculture, particularly for women, in areas dependent on agriculture (Rajapaksa et al 2012). As women engage in strenuous activities throughout pregnancy and fail to get adequate sleep and nutrition, the risk of having low birth weight babies increases, translating into increased risk of malnutrition in young childhood.

Figure 8. Nutrition trends in Sri Lanka

(a) Malnutrition over time, 2001-2012 (b) Malnutrition by age



Source: MOH & UNICEF 2012

Women engaging in strenuous agricultural labour is also associated in many countries with higher incidence of poverty. In Sri Lanka, the prevalence of low birth-weight was highest in the poorest wealth quintile (23 percent) and lowest in the wealthiest quintile (15 percent) (MOH & UNICEF 2012). By livelihood zone, prevalence is highest in the up-country tea estate zone and in the southeastern zones, as well as in the eastern and northern zones (Figure 9). These areas tend to have higher levels of poverty as well.

Interesting patterns emerge when the prevalence of stunting and wasting are disaggregated by maternal education and by spatial location. For stunting, as the mothers' education level increases, the prevalence of stunting declines, reinforcing the importance of maternal education (MOH & UNICEF 2012). Spatially, stunting is highest in the up-country tea estates area and in the northern zones (Figure 10). In both areas, water and sanitation are poor and access to good quality health services is lower (see section on Utilization).

For wasting, by contrast, the prevalence does not decline significantly as maternal education increases: amongst mothers with no education, 20 percent of children are wasted and amongst mothers with 11 to 13 years of education, 19 percent of children are wasted. Only when maternal education exceeds 13 years is a larger decline in prevalence of wasting seen (12 percent) (MOH & UNICEF 2012). Spatially, wasting is highest in the northern, eastern, and southeastern zones, and is lowest in the up-country tea estate areas, unlike stunting (Figure 11). More research is needed to understand the drivers behind the extent of wasting in Sri Lanka.

During young childhood, a number of factors interact to increase the risk of malnutrition before a child's second birthday. Among these, infant and young child feeding practices, child care practices, and exposure to good sanitation and water are key determinants, which are underscored by factors such as maternal education and work burden, influence of traditional practices, and household food security. International recommendations encourage early initiation of breast milk, exclusively breastfeeding of infants from 0 to 6 months of age, followed by the introduction of appropriate complementary foods at appropriate intervals while continuing to breast feed up to 2 years of age.

Figure 9. Prevalence of low birth-weight (percent)

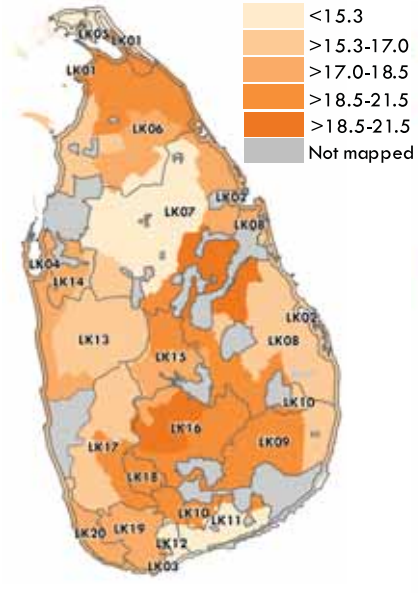


Figure 10. Prevalence of stunting (percent)

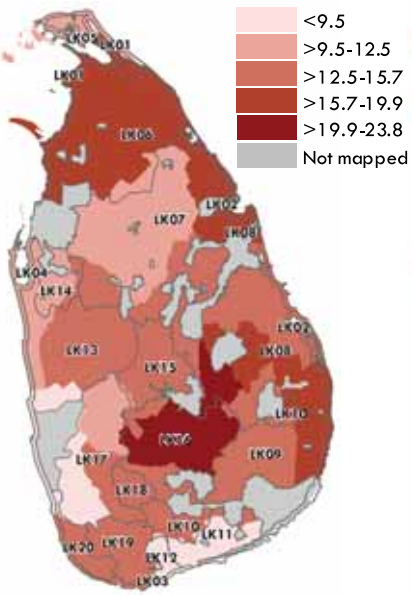
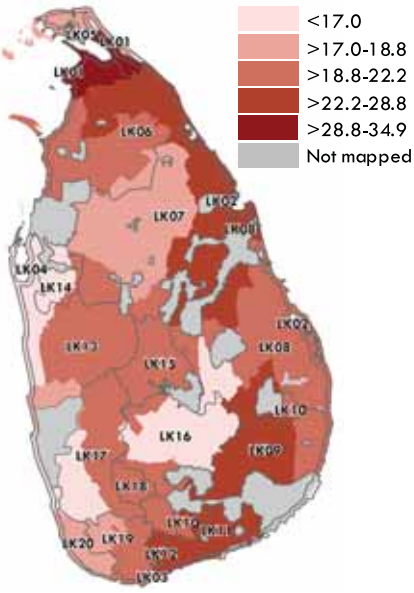


Figure 11. Prevalence of wasting (percent)



Source: MOH & UNICEF 2012, mapped at district level and overlaid with the livelihood zone boundaries.

The last available data on IYCF practices at national level in Sri Lanka is the Demographic Health Survey 2006/07, although northern districts were excluded given the security constraints at the time. According to the DHS, almost all (96.9 percent) of infants had received breast milk within the first day and 76 percent of infants 0 to 6 months were exclusively breastfed, with the median duration of exclusive breastfeeding at 5.1 months. However, when disaggregated by age intervals between 0 and 6 months, exclusive breastfeeding declined from 92.6 percent of infants in the first month to just over half (53.5 percent) by the fifth month (DCS 2009a).

Confirming this trend, a largely qualitative study on complementary feeding in 2008 found that most women breastfeed their children up to four months, at which point rice water and other liquids are introduced. This can have serious consequences for child nutrition status by providing a potential vector for disease. The study also found that infant and young children's diets lacked adequate dietary diversification, with particularly low supply of iron-rich foods leading to high rates of anemia in children (MOH & UNICEF 2008). Indeed, according to the 2012 Nutrition Survey, as many as one-third of children 6 months to a year and one-quarter of children between 1 and 2 years of age were anemic (MOH & UNICEF 2012). Exposure to good sanitation and water will be covered in the section on "Utilization" (see page 18).

5 DIMENSIONS

Availability, access, and utilization of nutritious foods together drive the experiences of food and nutrition insecurity. While production of food in Sri Lanka is high, distribution and access, both physically and financially, are major drivers of food and nutrition insecurity. Reliance on unimproved sources of water also remains a key challenge and a cause of poor nutrition outcomes.

AVAILABILITY

Availability of food is defined as the physical presence of nutritious food in the country through domestic production, reserves, and imports. Sri Lanka is self-sufficient in rice production and approaching self-sufficiency in many other food crops. However, production is concentrated in certain areas therefore necessitating transport of food sometimes over long distances. Distance and other market imperfections directly influence prices of food and, as such, the ability of households to financially access food (see section on Access).

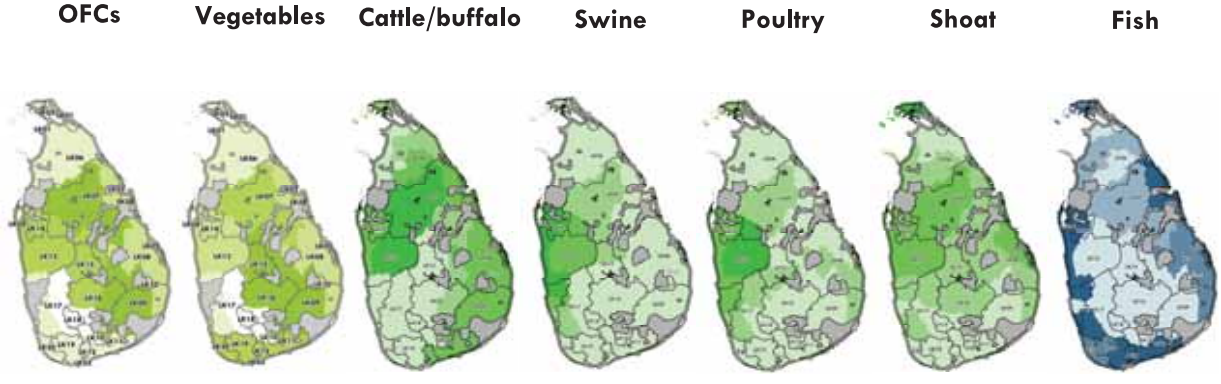
Overview

Approximately 45 percent (2.9 million hectares) of total land in Sri Lanka is arable. Out of arable land, 65 percent is currently cultivated with agricultural crops. Tea, coconut, and rubber plantations (estate sector) occupy 39 percent of cultivated land with the remaining cultivated under 'other crops' including food crops (DNP 2010). Paddy production dominates land under cultivation of other crops and contributes the majority of energy to the average Sri Lankan diet. As such, spatial availability of rice will be analyzed separately (see paddy sub-section).

While rice production is important for achieving food security by providing energy to the diet, it contributes little to nutrient security. As such it is useful to provide a brief overview of the production of other field crops (OFC), vegetables and fruit, livestock and fish.

Sri Lanka national-level production of other field crops including big onion, red onion, chilies, maize, kurakkan, cowpea, and soybean, currently does not yield sufficient quantities to meet domestic needs, resulting in import requirements of on average more than 360,000 MT per year (JICA 2013). By contrast, vegetable production has nearly reached self-sufficiency in the country. While up-to-date disaggregated data is limited, 2010 provincial data reveals that the almost half of the production of OFCs is concentrated in two provinces, Uva and North Central, with almost one-quarter (23 percent) produced in North Western and Central provinces (JICA 2013). Large-scale cultivation of vegetables is concentrated in particular geographic pockets as well, mostly in Central, Uva, and North Central (accounting for 60 percent of total production).

Figure 12. Distribution of production of nutritious foods as percent of total national production



Source: DCS 2012 (livestock data) and MFAR 2013 (fish data) mapped at district level and overlaid with the livelihood zone boundaries.

While the government expresses an interest in promoting self-sufficiency in OFCs, the heavy reliance on imports particularly of big onion and red chilies and high costs of production domestically makes this a challenging goal (JICA 2013, DNP 2010). The goal for vegetable production, by contrast, is to shift attention towards high value vegetable production oriented towards the export market (JICA 2013, DNP 2010). Fruit production is on a smaller scale than vegetable production and Sri Lanka typically imports about 35,000 MT of fresh fruit annually (JICA 2013).

The livestock industry in Sri Lanka is relatively small. Herd size and farming system varies, with larger herds more concentrated in Anurhadapura and North-Central. Pig production is predominantly in the western regions of Puttalam and Gampaha. While large-scale poultry is concentrated heavily in the northwest, small backyard ownership of chickens is common around the country. Goat and sheep are relatively less common (400,000 head) and are scattered everywhere with a slightly higher proportion in Jaffna (DCS 2012).

The fishing sector is also considered to be quite small with an estimated 685,700 metric tons of fish catch in 2013. Fish catch is generally higher along the western and southern coasts compared to the eastern coast, with the exception of Trincomalee. The difference is largely due to the higher number of multi-day off-shore fishing boats and large single-day boats with inboard engines in the southern and western districts and Trincomalee that greatly increase catch potential. The northern coastal areas have notably smaller catch except along the coast of Jaffna (MFAR 2013).

paddy

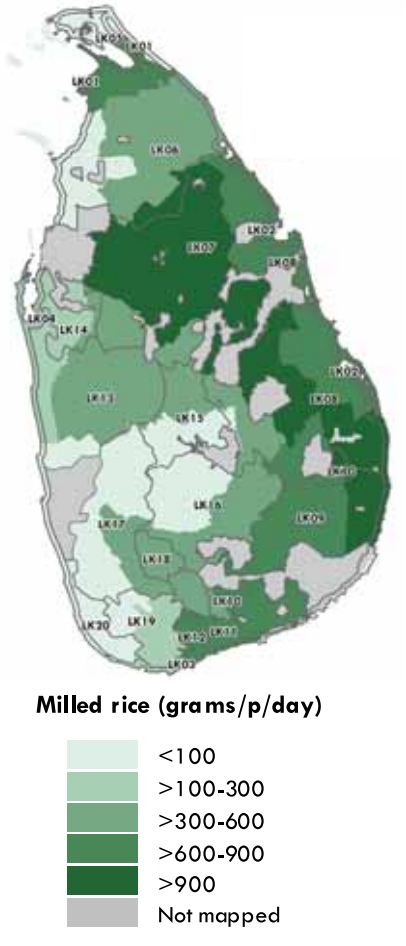
As the primary staple of the Sri Lankan diet, achieving self-sufficiency in rice production is strongly emphasized. Land under paddy cultivation currently accounts for approximately 40 percent of total cultivated land and is heavily fragmented, with over two-thirds of farmers producing on small plots of less than one hectare (DNP 2010, DCS 2002). Since 2006, Sri Lanka has been self-sufficient in rice production, producing more than the national requirement of 108 kg per person per annum.

However, recent erratic weather and a decrease in rainfall during the NEM (September 2013 through March 2014) resulted in major crop damages during the Maha production period 2013/14 and dramatically decreased the area planted for Yala 2014. As a result, Sri Lanka was unable to achieve self-sufficiency in rice for 2014 with total production providing for only 105 kg per capita for the year (see chapter 6 for discussion on climate change and the recent erratic weather in Sri Lanka) (DoA 2013a & b).

In addition to the threat that climate change poses to paddy production capacity, population growth, currently outpacing improvements in yields and output, further threatens the country's ability to maintain self-sufficiency in rice. In light of this, the government aims to improve yields by approximately one-third, increasing from an estimated 4.5 mt/ha in 2012 to 6.5 mt/ha by 2020, and to expand land under paddy by nearly one-third (DNP 2010). However, even with yield improvements and area expansion, the country must address the critical water resource constraints that will only increase in importance as the climate continues to change (see chapter 6 on vulnerability).

On average a person in Sri Lanka consumes about 300 grams of rice per day (DCS, 2013b). As such and as a measure of typical rice availability, figure 13 displays production of milled rice by district in grams per capita per day, thus reflecting areas of deficit production (<300 g/p/d) and areas of surplus production (>300 g/p/d) relative to population needs.

Figure 13. Typical Rice Availability (based on 2013 paddy production data)



Source: DCS 2012, mapped at district level and overlaid with the livelihood zone boundaries.

The areas of greatest surplus production fall largely into the major paddy producing livelihood zones of the Mahaweli mixed farming & livestock (LK07) and eastern irrigated farming & livestock (LK08) zones (Figure 13). This is a direct result of the extensive irrigation systems. Production is also in excess of population needs in the southeast rain-fed paddy & OFC (LK09), which is likely a reflection of the presence of some irrigated farming managed by more wealthy farmers. By contrast, rice production does not meet population needs in the more mountainous wet zones where livelihoods focus on cash crop production, including upcountry tea estates (LK16), small-holder tea & export cropping (LK15), mixed perennial plantations (LK17), small-holder tea plantation (LK19) and mixed farming & cinnamon (LK20).

As will be discussed in the next section, excess production from these zones in the north and east flow through market value chains towards the deficit rice production areas in the west and southwest, as well as in the far north.

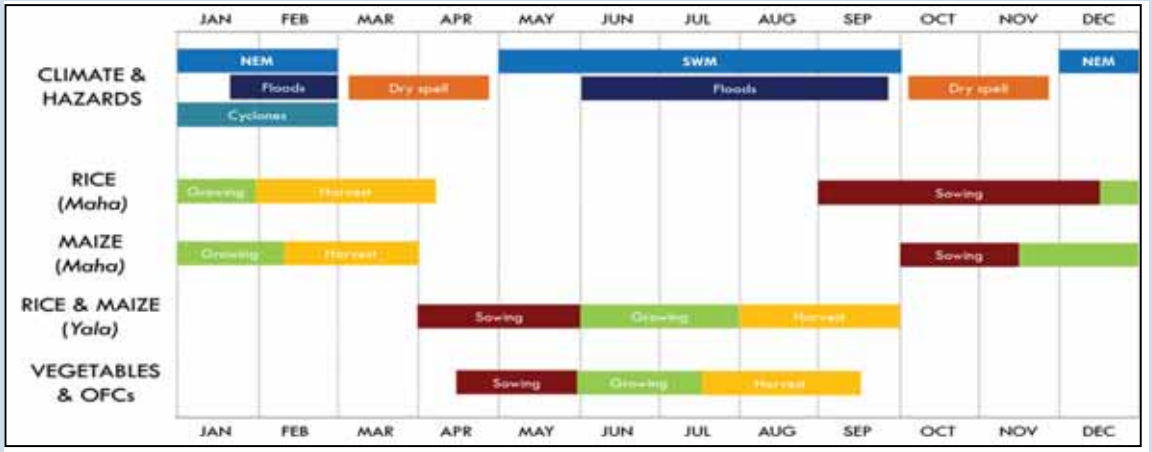
seasonality

Agriculture production across Sri Lanka varies depending on the different monsoonal periods: the main production season, called the Maha, falls during the North East Monsoon season, followed by the minor production season, Yala, during the South West Monsoon period.

In the dry zone, Maha season is focused mostly on paddy production. As the central mountains block the SWM rains from reaching the dry zone, paddy production during the Yala season decreases in terms of land under paddy cultivation and production of less water-intensive crops (lowland vegetables and OFCs) expands. While functioning tanks can enable year-round production, damaged tanks in the north and less extensive networks in the northwest and east mean that Yala production is more limited. As a result, households typically experience a lean season between November and December before the main season harvest is reaped. A second lean period can be observed during the Yala sowing period in June and July.

In the wet and intermediate zones that experience both the NEM and SWM monsoons, production of upland vegetables is ongoing year-round. The limited about of paddy production (in the southern areas) is mostly rainfed with less need for irrigation.

Figure 14. Seasonal Calendar



Source: FAO and aquastat

ACCESS

Access to food refers to the ability of the household to obtain sufficient food to achieve a healthy and nutritious diet. While food may be physically present in a region, households may be unable to obtain it due to a lack of (1) Physical Access – the infrastructure necessary for households to visit markets and enable markets to function; (2) Economic Access – the financial capacity to purchase adequate and nutritious foods; and/or (3) Social Access – the social capital through which to engage in formal (e.g. government support programs) or informal (e.g. bartering/gifting or remittances) mechanisms.

In Sri Lanka, access is a key factor underscoring food insecurity given the heavy reliance on food purchases across livelihood groups (WFP 2011). An estimated 60 percent of produce in the country is considered marketable surplus and almost all rural farming households engage to some extent with the markets (JICA 2013).

physical access

Road density is a key proxy indicator for accessibility to daily markets with a diverse range of food items. Overall, road density is comparatively high in Sri Lanka (1.71 km/km2 of land), but disparity across regions in accessibility via road is evident: the highest density of roads is found around the urban centres of Colombo and environs, Kandy and Galle, while in the north and east there is particularly low access due to widespread destruction of infrastructure during the conflict years (Figure 15). Analyzed together with poverty distribution, the areas with the highest proportion of poverty tend to track areas with the lowest road access. This corroborates the findings from the small area estimation of poverty conducted in 2005 that associated poverty in Sri Lanka with geographic isolation (DCS 2005).

However, density of roads speaks little to the quality and width of the roads as there are major bottlenecks for transportation in the country (DNP 2010).1 Of the 114,093 kilometers of existing roads, only an estimated 40 percent are in good condition and the vast majority are 2-lane roadways. For example, while density appears high in the upland tea estate area, much of the road network is tertiary small roads that are unlikely to be paved. Such conditions severely hamper the efficiency and timeliness of high volume transportation (WB data 2010, DNP 2010).

Table 1. Planned Highways
(minimum 4 lanes)

Northern Expressway Ambepussa—Jaffna	320 km
Eastern Expressway Dambulla—Trincomalee	190 km
Kandy Expressway Colombo—Kandy	100 km
Outer Circular Highway Kottawa—Kerawalapitiya	28 km
Southern Expressway Extension Matara—Hambantota	74 km

Completed Highways
(minimum 4 lanes)

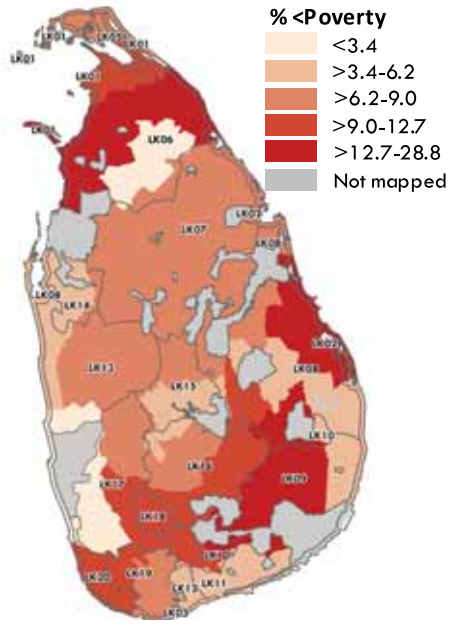
Katunayaka Expressway Colombo—Katunayaka	25 km
Southern Expressway Kottawa—Matara	128 km

Source: DNP 2010

Figure 15. Roads and Road Density

Source: Urban Development Authority, overlaid with livelihood zones

Figure 16. Poverty Rate (2012/13)



Source: DCS 2014, mapped at district level and overlaid with livelihood zones

economic access

Assuming road accessibility and functionality of the markets (see next section, market functionality), the ability to procure sufficient and diverse food from the market depends also on household financial capacity. The proportion of the population living below the poverty line as well as the depth of poverty serve as useful proxy indicators of differential financial access across regions.

According to official figures, poverty in Sri Lanka has been declining rapidly, from 15.2 percent in 2006/07 to 8.9 percent in 2009/10 to 6.5 percent in 2012/13 (HIES DCS, 2013). In absolute numbers, the poor population has declined from 4.3 million in 2002 to 1.8 million in 2009/10, to 1.3 million poor people in 2012/13. The vast majority of the poor (>90 percent) live in rural areas of Sri Lanka.

However, the pace of poverty reduction, with an estimated 3 million moving out of poverty in a decade, raises questions about the resilience of those living just above the poverty line. Based on calculations by the Institute of Policy Studies (IPS), small adjustments of 10 percent increase to the poverty line moves approximately 800,000 people into poverty, suggesting that a large proportion of people eke out a living precariously close to the poverty line (Nanayakkara 2013). Likely to be households with poor asset profiles, narrow livelihoods and households in debt, this population risks slipping quickly back into poverty as the result of shock or hazard.

Looking at spatial patterns of poverty provides a relative picture of where economic access is more limited. According to the most recent data from 2012/13, poverty rates are highest in the northern districts of Mullaitisvu (28.8 percent) and Mannar (20.1 percent), in the southeastern district of Monaragala (20.8 percent), and eastern district of Batticaloa (19.4 percent). Poverty is lowest in the Colombo environs (Colombo, Gampaha and Kalutara) (Figure 16).

Additional data sources focusing on the northern and eastern areas provides more insight into the trends in poverty in these areas, given the lack of data collection prior to 2012/13. While the extent and depth of poverty remains quite high in the north and east, qualitative assessments suggest that there has been consistent decline in poverty since the end of the conflict in 2009 (WFP, MED, & HARTI 2012). Nonetheless, poverty remains a key driving factor of food insecurity in the areas. With livelihoods disrupted, income sources remain low and vulnerable households tend to cope by borrowing money thereby resulting in high levels of indebtedness (WFP, MED & HARTI 2011 & 2012).

By livelihood profiles, pockets of poverty persist around the country usually reflective of narrow and more vulnerable livelihood profiles. These include the small-holders dependent on rain-fed paddy in the southeast (LK09), small paddy farmers in the eastern zone (LK08), tea pluckers in the upland tea estate (LK16) zone, and off-shore fishermen operating with traditional boats and fishing equipment in coastal zones (LK01-04).

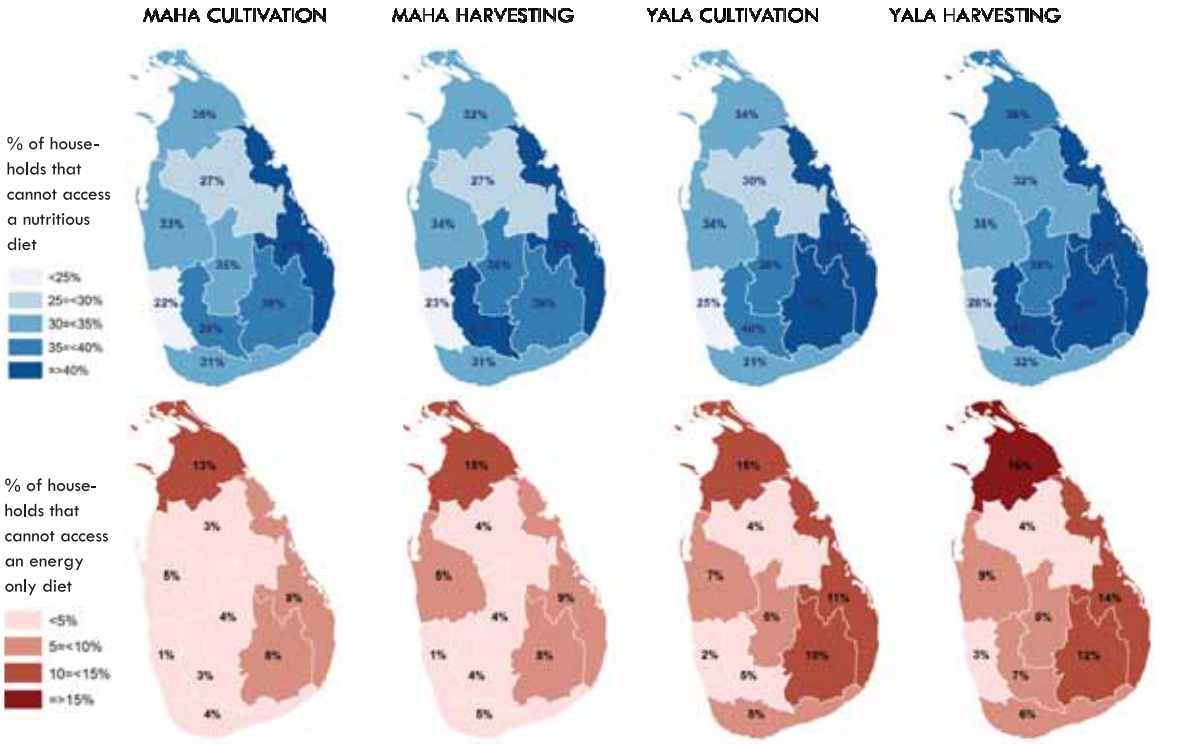
cost of diet

In addition to poverty status, price volatility plays a major role in the ability of households to afford sufficient and adequately nutritious food. "The Minimum Cost of Diet (COD)" is a modeling exercise that, taking into account the nutrient content and prices of locally available foods, generates a minimum possible cost for a diet (food basket) that satisfies all nutritional requirements for a modelled family. Any other food basket at the same price would be less nutritious and any other food basket of the same nutrient value would be more expensive.

A detailed report on Minimum Cost of Diet is scheduled to be published by HARTI in June 2015.

Using household income and expenditure data, the COD then estimates the proportion of the population unable to afford this nutritious diet (nutrient poverty line). In addition, the COD can also be used to calculate the proportion of the population unable of affording a diet providing only sufficient calories (calorie poverty line). In Sri Lanka, the COD has been initiated to monitor seasonal and regional changes in access to a nutritious diet over time.

Figure 17. Nutrient and Calorie Poverty Rates by province (2013 / 2014)



Source: WFP, 2014

Based on prices of locally available foods and 50 percent of locally calculated income, more than half of the households in the Eastern Province could not afford an adequately nutritious diet during the past year. In the Uva Province, it ranged between 39 and 48 percent, while in the Northern and Central Provinces the percentage of households that could not attain a nutritious diet was more stable, ranging between 27 and 36 percent (Fig. 17).

By contrast, most households could afford sufficient calories across Sri Lanka, although access was still difficult in the Northern Province (about 15 percent) and increased significantly during Yala season in the Eastern province (14 percent).

While improvements in health, hygiene and education are also needed, the COD analysis demonstrates that, despite a significant reduction in poverty, adequate household purchasing power to afford a nutritious diet at local market prices, remains a significant barrier to impact nutrition outcomes.

MARKET FUNCTIONALITY

While physical access to markets is critical to food and nutrition security, the functionality, efficiency and price responsiveness of markets is equally important in household capacity to obtain sufficient food. The efficiency of agricultural marketing systems affects rural populations from two angles, as the producers of food and as net purchasers. In Sri Lanka, it is estimated that as much as 60 percent of food in Sri Lanka is marketable surplus and therefore enters the agricultural marketing system (JICA 2013).

The agricultural marketing system is complex, involving a range of actors and processes from the point of purchase at the farm-gate, through the transport, processing, and storage, to the point of retail sale. Prices at farm-gate and at the market are heavily influenced by bottlenecks that emerge at various points along this complex chain. The following section summarizes the results of the market analysis for agricultural production conducted by JICA in 2013.

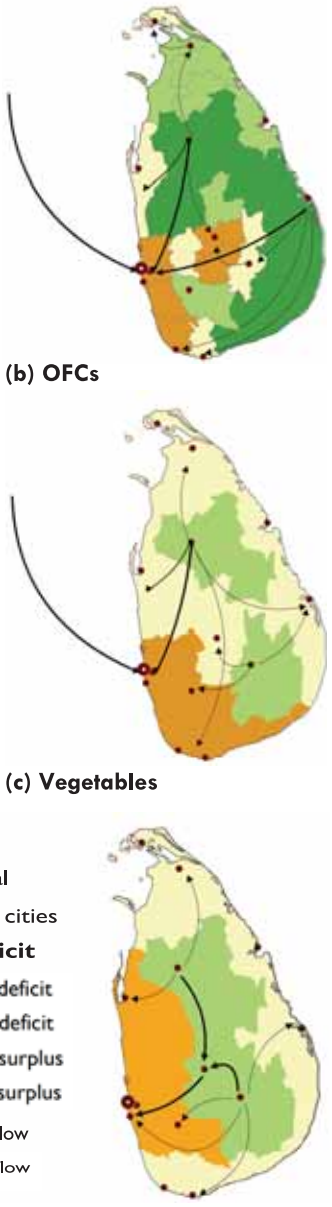
Overall, the study found that agricultural marketing systems lacked efficient supply side management. With supply chains for each agricultural product flowing through a large number of different actors, sizable gaps in price across time and space and between farm-gate and retail prices are prevalent. Poor infrastructure and roads tend to exacerbate the situation. Post harvest losses are also a major challenge for all produce, and particularly high for fruit and vegetables at over 25 and 30 percent losses respectively and over 30 percent for fish.

In the rice market, government intervention keeps farm-gate prices relatively stable. In January 2015, the minimum price for paddy was increased by about 40 percent. However, only Paddy Marketing Boards (PMBs) and Multi-purpose Cooperative Societies (MPCSs) purchase paddy at these prices and both lack sufficient storage facilities to absorb most of the available in peak season. As a result, rice is mostly sold to private collectors, mobile traders and private millers at lower prices. Sometimes these prices fall below the farmers' cost of production during harvest.

Despite low prices immediately post harvest, farmers are often forced to sell in order to fulfill debt obligations and/or because they lack of their own storage facilities, particularly in the north and east where most were destroyed during the conflict.

(a) Rice

Figure 18. Commodities market flow



Source: JICA 2013, based on DCS data

Due to drought impact on rice production in 2013/14, the retail price of rice increased significantly during 2014.

In the marketing system for other field crops (OFCs), the key challenge is the lack of quality seeds and overall poor quality of produce making it difficult for Sri Lankan farmers to compete with imported products. The cost of production is also high, which when considered together with the high ad hoc tariff charges and protection of selected crops, makes it unappealing for entrepreneurs in the private sector to invest and support local farmers.

Vegetable and fruit marketing systems are undergoing the most change of all agricultural marketing systems as supermarkets and large specialized retailers introduce new modern purchasing and distribution mechanisms. Supermarkets, in particular, are introducing large scale refrigerated transport that has greatly reduced spoilage rates and are purchasing through central purchasing units where fresh produce is consolidated, sorted, weighted, and graded. While this modern system is more efficient than the traditional marketing value chain and opens new opportunities for farmers, there is a critical lack of price signaling to the farmer which translates into large differentials between what the farmer receives (farm-gate price) and the ultimate retail price.

Dedicated Economic Centers (DEC) have also dramatically changed the face of marketing in Sri Lanka since the first one opened in Dambulla in 1999. With 12 established DECs (mostly located in Colombo-Kandy area) and more planned for construction, these centers are supervised by the government and aim specifically to reduce the difference in farm-gate and retail prices, thereby empowering a fair and competitive market. According to JICA, an estimated 38 percent of all agricultural produce in Sri Lanka currently passes through DECs. Expansion of DECs would mean this figure would likely increase substantially.

The fish marketing system is still mostly domestic-focused with three-quarters of marine production staying in Sri Lanka. This is in part due to the low quality and high spoilage rates of fish catch (estimated at 30 percent) caused by poor transport and marketing facilities and infrastructure. Lack of up-to-date technology in the fishing sector results in fish catch falling far below potential.

Finally, marketing systems for livestock products vary depending on the product. As milk is a relatively small market and the channels remarkably complex, it will not be covered in this summary. For poultry, the expansion of the out-grower system has come to dominate the market for broilers but not for layers. Egg production is concentrated in the northwest of the country and while industrial operations are increasing, much of the production is done in small and medium size farms. Increasingly, however, these smaller producers are finding it difficult to compete.

UTILIZATION

Food utilization includes household food preferences and modes of storage and preparation, as well as the ability of individuals to absorb nutrients from the food. Given the lack of data on food preferences and storage practices, this Report focuses on the biological utilization of nutrients in the body, i.e. the conversion efficiency of the body. Illness is a key reason why the body is unable to utilize nutrients in food and access to clean water and improved sanitation are primary vectors, serving as proxies for utilization.

health profile

Sri Lanka provides free universal health care through an extensive system of hospitals and primary health units. As a result of considerable investment in the system, health outcomes in Sri Lanka are high compared to regional averages:

For women and children's health care, child immunization rates are near-universal and antenatal care is extensively utilized—it is estimated that 90 percent of pregnant women have access to health facilities (UNDP 2012). However, some disparities are seen sub-nationally, with poorer health outcomes and utilization of services particularly notable in the estate sector as well as in the eastern and northern districts (UNDP 2012, FHB 2012).

	Sri Lanka	India	Bangladesh
Under-five mortality rate per 1,000 live births	9.5	56	41
Maternal mortality rate per 100,000 live births	35	200	240
Life expectancy	74.1	66.2	70.3

Source: UNICEF and recent data

water & sanitation

Access to improved water and sanitation sources is critical to the disease status of communities and to nutrition outcomes particularly for young children. Using data from GN level, access to improved water is defined as coming from a tap, protected well, tube well, or rural water supply project. Unimproved sources include unprotected well, bowser or tanker, bottled water, and river/stream/spring.

Figure 19. Households with poor access to water

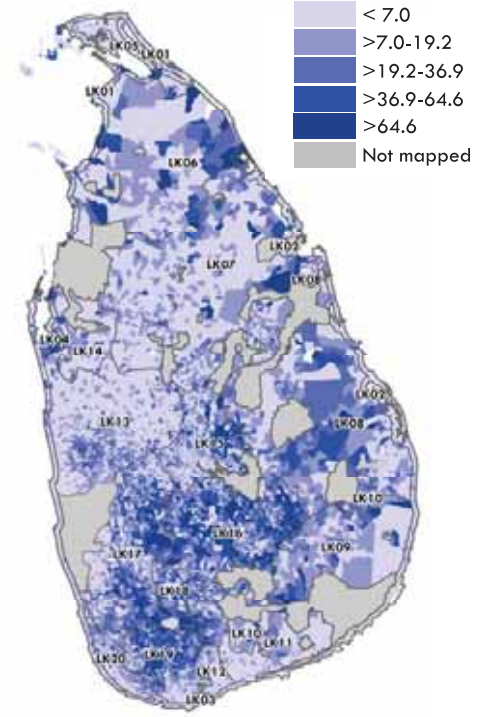
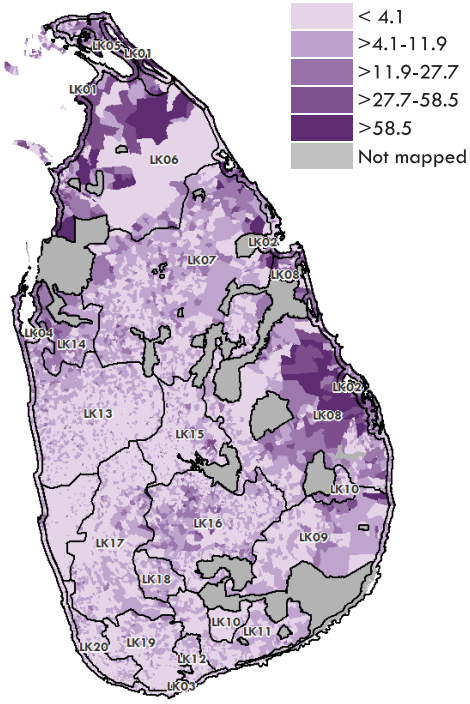


Figure 20. Households with limited or no access to toilets



Source: DCS 2012 mapped at GN level and overlaid with livelihood zones

By livelihood zone, reliance on un-improved water supply is worse in the mountains, southeast and eastern areas, and in patches in the north. In the up-country tea estate (LK16), Mixed perennial plantations (LK17), gem mining (LK18) and small holder tea plantation (LK19), the high concentration of communities reliant on unimproved water sources is largely explained by utilization of mountain rivers and streams . In the eastern areas, including the eastern irrigated farming & livestock (LK08) and the southeastern rain-fed paddy farming & OFC (LK09) zones, the high rates of unimproved water sources is more related to use of unprotected wells as well as streams.

In the northern areas, water infrastructure is being rehabilitated, but there are still many communities that lack access to improved water. In 2012, it is estimated that over 8,400 wells were cleaned and 120 tube wells repaired or re-drilled, yet thousands still require rehabilitation (UNDP 2012).

Sanitation, measured in the form of access to improved sanitary facilities, is critical for reducing contamination of water sources and preventing water-borne diseases that impair absorption of nutrients. At GN level, limited access to improved sanitary facilities is expressed as households dependent on public or shared toilets or with no access to toilets at all.

Across the country, access to toilets follows similar trends as poverty and accessibility. Around Colombo environs, Galle, and Kandy, the proportion of households with access to toilets inside the premise or just outside the premise increases. The poorest access is seen in the east and in the north as rehabilitation of toilet facilities continues slowly.

The poor access to improved water in the upland areas and the combined poor access to toilet and water facilities in the north and east likely play a major role in explaining worse nutrition outcomes such as stunting. However, more research in the context of Sri Lanka is needed.

6 VULNERABILITY

Livelihoods in Sri Lanka are vulnerable to the impacts of climate variability due to high exposure to climate-related hazards and high reliance on climate-sensitive activities.

Climate risk is one of the key challenges to ensuring food and nutrition security in Sri Lanka. Climate variability and change disproportionately affect the poorest and most food insecure through a combination of decreasing crop production, decreasing resource availability, higher magnitude of disasters, and unpredictable weather.

Sri Lanka is highly vulnerable to climate risk. Recent events such as floods (2011, 2012, and 2013), droughts (2010, 2012, 2013 and 2014), coastal hazards such as tsunamis (2004) and tropical storms (Cyclone Nisha in 2008), combined with increasingly erratic weather in recent years all highlight the sensitivity of livelihoods to climate-related risks.

Rainfall is the key climatic variable influencing food security in Sri Lanka. Reliable rainfall is needed for sufficient harvests of rain-fed crops—particularly rain-fed paddy in the southeastern parts of the country. Similarly, adequate rainfall during the monsoonal periods is required to replenish and maintain water levels in the microtanks, reservoirs, and ground water aquifers around the country. Sufficient rainfall from both the SWM and the NEM allow for irrigated agriculture of paddy and other field crops in the dry zone (northern and eastern regions) of the country.

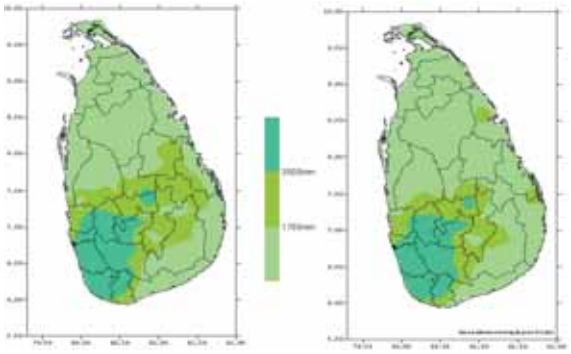
In light of a projected long-term increase in rainfall variability and the accompanying intensity and frequency of floods and droughts, as well as hazards such as sea-level rise, coastal inundation and soil salination, water management and climate adaptation strategies are becoming ever more necessary. Demands on water come not only from agriculture, but from the energy, industry, drinking, sanitation and other sectors, and will continue to increase with population growth making the challenge of managing conflicting demands on water ever more difficult (MIWRM 2010). Developing appropriate climate adaptation efforts at national and local levels will be mandatory for balancing these competing demands and for avoiding detrimental effects on livelihoods.

HISTORICAL CLIMATE VARIABILITY

Climate change over the past century has manifested itself in a noticeably decreasing trend in rainfall across most of the island, except in pockets on the eastern coast. Mean annual rainfall has decreased by 144 mm (accounting for 7% of the annual total) compared to the period 1931-1960.

The decrease in rainfall has been most significant in the intermediate climatic zone (Figure 21), where rainfall supports rainfed paddy farming. Combined with observed increases in temperature, this trend can significantly reduce water availability for agriculture and therefore reduce the suitability of certain areas for crop production.

Reduction in rainfall in this zone is significant as it can also intensify drought impact in the Dry Zone, particularly in the north-central and eastern parts of the country where agriculture depends on a complex network of irrigation canals and man-made dams.



Source: Premalal 2013

Figure 21. Annual rainfall mean between 1961-1990 (left) and 1975-a2004 (right) shows a gradual westward reduction of rainfall, particularly in the intermediate climatic zone. This trend can have an especially adverse effect on rain-fed paddy farmers in the south-west of the country.

As the majority of paddy is grown in the north-central and eastern parts of the country, significant alterations to rainfall can affect availability of essential food items.

There is also evidence of increasingly frequent abnormal weather in small pockets of the country. For example, traditionally dry areas are receiving larger amounts of rainfall. This is particularly noticeable in the eastern coast, near the lagoons of Trincomalee and Batticaloa.

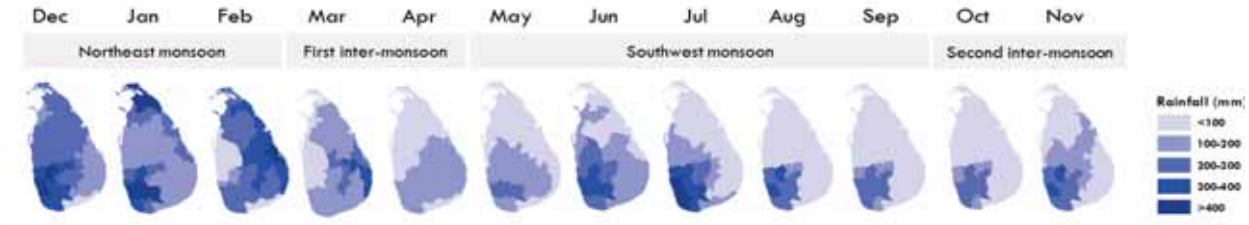
SEASONAL VARIABILITY

There are four key rainfall periods in Sri Lanka. **The first inter-monsoon** occurs between March and April, immediately followed by the **southwest monsoon** from May to September. The southwest monsoon accounts for 55% of the annual rainfall in the country, and can exceed 3,000 mm in some parts of the country. The **second inter-monsoon** occurs after the southwest monsoon between October and November, with rainfall rarely exceeding 750 mm. The **northeast monsoon** (December-February) brings rain to the easternmost parts of the island. This season coincides with the end of the North Indian Ocean tropical season and this is also the period during which the country gets hit by storms and cyclones.

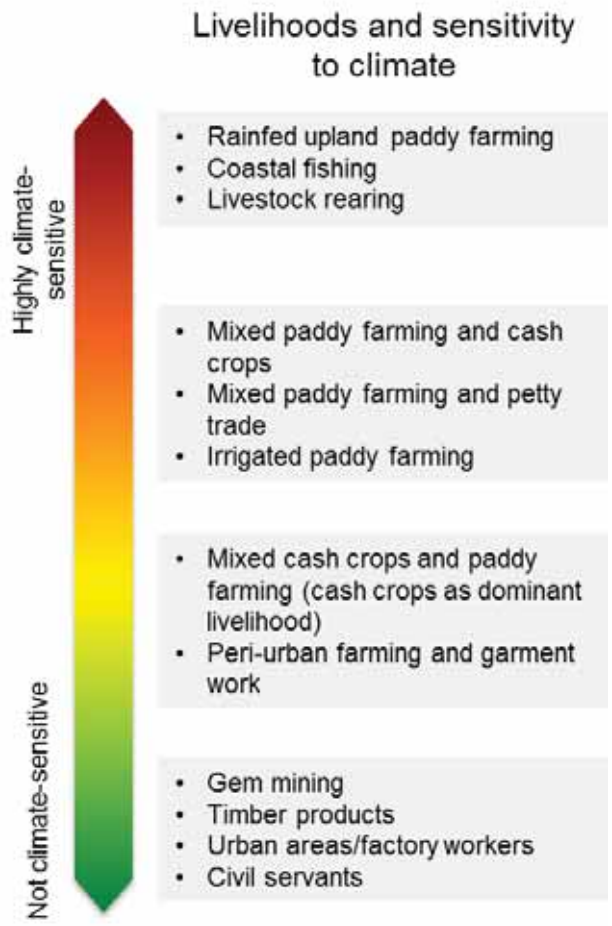
The southwest monsoon rains have remained relatively stable over the past century, providing a reliable source of rainwater for agriculture and other livelihood activities.

The northeast monsoon rains, by contrast, have decreased and have become increasingly erratic. As livelihoods in the Dry Zone depend on rains from the northeast monsoon, erratic rainfall seriously threatens certain activities, such as cultivation of rice and other field crops (OFCs).

Figure 22. Monthly rainfall (average by district)



Source: World Climate



Experiential knowledge collected by ICRISAT (2013) from farmers corroborates these trends. Farmers report significant declines in rainfall, particularly in recent years, and that the onset of the northeast rains (yala) has become increasingly unpredictable. Delay in the onset of the monsoon rains and erratic rainfall patterns have been highlighted as key concerns by different farmers as this has an effect on the livelihood activities that they can engage in. Unreliable rainfall patterns also affect production in home gardens where an irrigation system is not feasible.

Changes in climatic patterns, both long-term and seasonal, have a detrimental effect on livelihoods that depend on climate-sensitive income, such as seasonal or daily agricultural labour, sale of rainfed crops, and fishing.

Incomes for the poorest households are particularly climate-sensitive in most of the Dry Zone, as well as along the coast. In the northernmost parts of the country, agricultural activities are possible due to the availability of groundwater which is replenished annually following the northeast monsoon rains. Increasingly erratic northeast monsoons therefore increase the sensitivity of livelihoods in this region. Microtanks exist in these zones, but require upgrading in order to provide more reliable water supply. In addition to poor maintenance, many of the tanks are shallow and wide resulting in high evaporation rates, likely to be an increasing problem as temperatures continue to rise, rainfall decreases, and the area becomes drier overall.

Fishermen on the northern coast of Sri Lanka are also highly vulnerable to climate risk—during the northeastern monsoon, fishing is not always possible and therefore households have to engage in unskilled labour. The demand for labour in this period is, however, not always predictable.

Paddy in the southeastern region of the country is usually cultivated in small-holdings, and the poorest households depend almost exclusively on rainfall. Here, two important climate trends could affect livelihoods. First, rainfall is decreasing rather rapidly. Second, this region depends on rains from the northeastern monsoon, which are becoming increasingly unpredictable. These two trends exacerbate the vulnerability of poor households.

Sensitivity of farm-based income in the Mahaweli mixed farming zone and eastern farming zone was traditionally mitigated by the historic capacity of the microtank system to weather short and less frequent dry spells, a reality that is increasingly challenged as droughts increase in duration and frequency and tanks are left un-improved. However, while farm-based income is highly sensitive, the diversification of income sources to non-climate sensitive activities helps to reduce the overall sensitivity in these zones.

Most households in the intermediate and wet zones have low sensitivity of income. As there is sufficient and reliable rainfall from the southwest monsoon in these zones, households have diversified into a variety of agricultural activities that are not affected by seasonal fluctuations. Such activities include cultivation of tea, rubber, cinnamon, and other field crops for export. This diversification into non-sensitive activities allows households to be more resilient to the impacts of climate change.

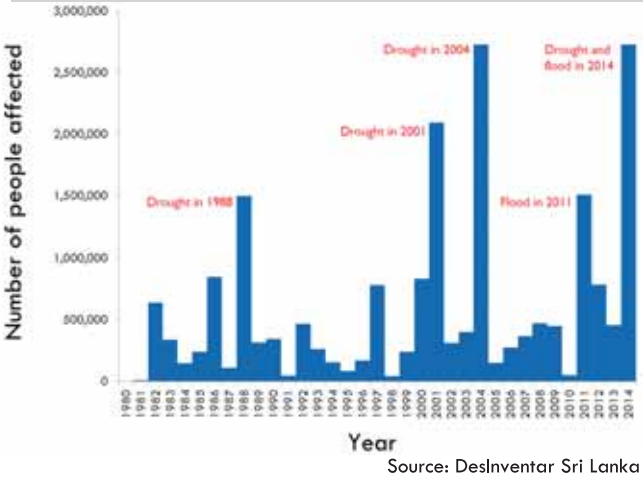
CLIMATE-RELATED HAZARDS

Sri Lanka is exposed to a diversity of climate-related hazards, including floods, droughts, landslides, and storms. Extreme climate events can have detrimental effects on livelihoods, for example through destruction of livelihood assets (farming tools, fishing boats, water tanks for irrigation), and destruction of agricultural land which may take several months or years to recover.

Historical data suggest that the number of people being affected by climate-related hazards is increasing, from an average of approximately 400,000 people affected every year between 1980 and 1990 to an average of 750,000 affected annually between 2000 and 2013 (Figure 24). The majority of the affected population is exposed to drought or flood which are linked to failure or high intensity of the monsoon rains.

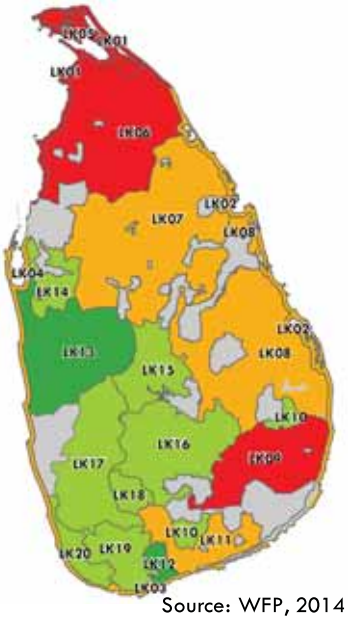
The increase in exposure is largely due to erratic monsoon patterns resulting in more frequent and intense floods and droughts. In addition to the increasing magnitude of floods and drought, recent evidence suggests that both, floods and droughts, are occurring where historically they typically did not.

Figure 24. Historical trend in number of people affected by



Source: DesInventar Sri Lanka

Figure 23. Climate-sensitivity of income amongst the poorest households



Source: WFP, 2014

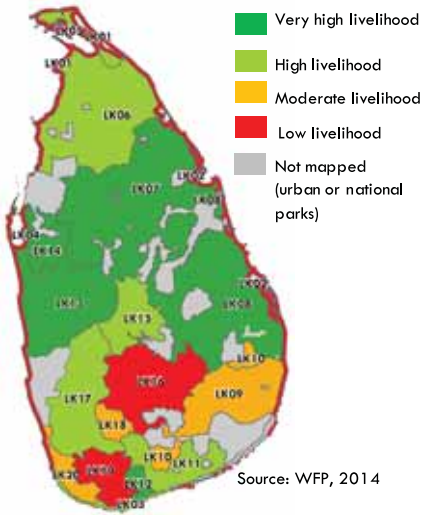
- Non-sensitive income
- Low climate sensitivity
- Moderate climate sensitivity
- Highly sensitive income
- Not mapped (urban or national parks)

Over the past two decades, the severity of landslides has increased in the highland regions through a combination of heavy rains, geological changes in the hill country, and deforestation.

Cyclones often affect the northern region of the country, especially in the months of November and December. There is no evidence to highlight whether cyclones are becoming more intense or frequent, and though historically their severity has been moderate, projected changes in sea-level could result in higher cyclone impact in coastal areas with significant impacts on fisherfolk.

To cope with climate risk, households may diversify their livelihoods. The most diversified livelihoods are located in the Dry Zone, where dry spells occur more frequently. Here, the poorest households engage in different on-farm and off-farm activities. The least diversified livelihoods are in the coastal areas where households may depend exclusively on their catch, in the up-country tea estates where the poorest live off wage labour, and in the small-scale tea plantation zone, where households almost exclusively dedicate their time to the cultivation of tea. Households in the southeastern paddy zone also have relatively low levels of diversification, largely because the region is remote and alternative livelihood activities are not feasible (Figure 25).

Figure 25. Relative livelihood diversity amongst the poorest households



Source: WFP, 2014

FUTURE CLIMATE

Projections of future climate change in Sri Lanka are associated with high uncertainty due to the coarse resolution of global circulation models which do not provide accurate information for island nations. However, there is general agreement in models that three key trends will continue, and that they will exacerbate current vulnerabilities.
First, sea levels will rise, affecting all coastal areas of Sri Lanka.

Sea-level rise would:

- increase the magnitude of coastal flooding;
- exacerbate coastal erosion;
- increase salinization of estuaries and freshwater aquifers; and
- exacerbate storm surges.

Sea level rise is expected to be more significant in the west, southwest, and southern coastal belt where about half of the island's population lives.

The most direct effect of sea-level rise would be on fisherfolk who live in highly degraded coastal areas along the west, southwest, and south. For these livelihoods, sea-level rise associated with climate change would result in unavoidable impacts, as well as potential displacement to areas further inland.

An extensive network of microtanks and larger water bodies has been developed in Sri Lanka to facilitate agricultural production-even of water-intensive crops such as paddy– in the Dry Zone. These are replenished during the rainy seasons; however, a failure of the monsoon could result in longer dry spells and consecutive droughts which would limit the availability of water for farming.

Coastal areas along the northeastern coast would also likely experience higher storm surges in the cyclone season due to rising sea levels. Communities further inland who depend on freshwater aquifers for aquaculture and farming would also be affected.

Second, **rainfall will become increasingly erratic,** particularly during the northeastern monsoon. At present, erratic rainfall patterns have a more direct effect on livelihoods along the intermediate climatic zone-particularly rain-fed paddy farmers in the southeast. A continuation of this trend in the next few decades would render rain-fed agriculture unsustainable.

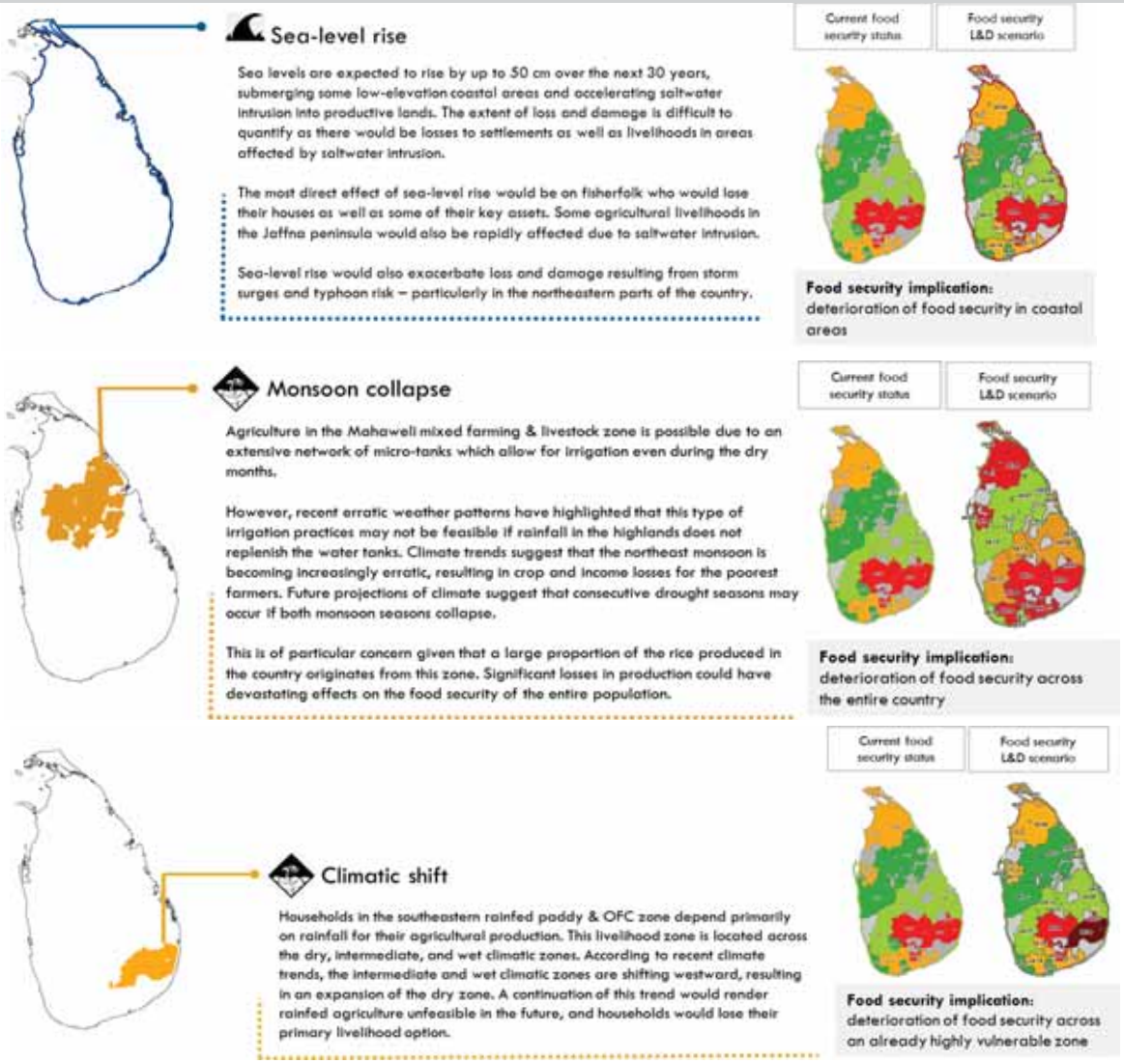
In the long-term, more extreme declines in rainfall, such as insufficient rainfall during the northeast monsoon, combined with increasing surface temperatures, will reduce the capacity to irrigate, directly affecting farmers in the north-central and northeastern parts, and indirectly affecting all of Sri Lanka as the production of rice, the main staple of the Sri Lankan diet, will be increasingly constrained.

It is estimated that three-quarters of paddy in the country is produced during the Maha season and in the dry zone. Based on scenarios that take into account changing rainfall patterns, escalating temperatures, and potential evapotranspiration, it is estimated that average paddy water irrigation requirement could increase by as much as 23 percent by 2050, thereby increasing the strain on already heavily stressed water resources (Eryigama 2010). As mentioned earlier, continued population growth and the multiplicity of demands on finite water resources add to this conjecture of increasing water scarcity and management challenges.

Finally, **long-term climatic shifts** in the intermediate climatic zone could have an impact on the suitability of agricultural production in those areas. Of significant concern is the westward movement of rainfall which is resulting in a shrinking of the intermediate and wet climatic zones. A continuation of this trend would especially affect households in the southeast rain-fed paddy zone as well as in the tea plantation zones: reliance on rain-fed agriculture may no longer be feasible under erratic rainfall patterns, and several studies have suggested that tea production could be reduced if monthly rainfall reduces by more than 100mm and temperatures continue to rise (Eryigama 2010).

The negative consequences on food security and livelihoods of these long-term climate projections are summarized in figure 26.

Figure 26. Summary of climate change-related loss & damage and impact on food security



Erratic weather since 2011 has led to food insecurity and livelihood deterioration across much of Sri Lanka

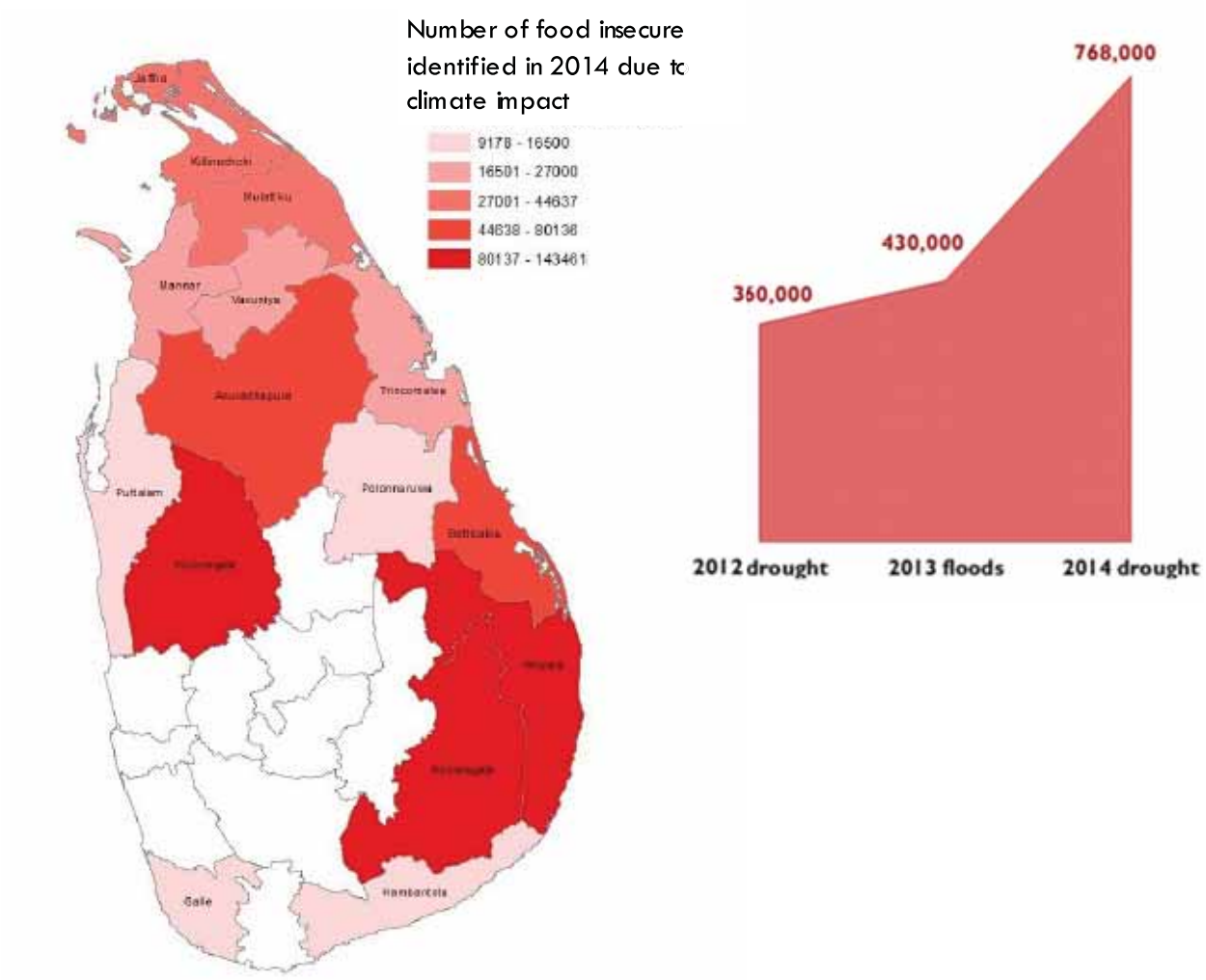
Erratic weather and declines in rainfall during the past years have led to insufficient water being available for irrigation and to prolonged drought across most of the country. Estimates of vegetation cover in April 2014 were far below the long-term average, especially in the northwestern, north-central, and southern parts of the country where a large proportion of households practice farming.

The drought led to damages in agricultural production. This problem was exacerbated by the fact that there have been three consecutive years of natural disasters which have undermined household resilience: populations in affected areas have built up unsustainable levels of debts, have insufficient access to water for irrigation, have limited quality seed supply and are exposed to a continual de-cline in agricultural income. According to a Government and WFP assessment covering 14 districts in April 2014, these factors have led to a dramatic increase in prevalence of food insecurity, estimated to affect 768,000 people (MED, MDMC & WFP 2014). This is more than double the caseload from 2012.

The survey also revealed that household food consumption had deteriorated sharply: 18 percent of households consumed inadequate diets of low calorie and/or diversity compared to an average of 6 percent before the drought.

This drought exemplified the type of scenario that is likely to become more and more common under climate change. Without sufficient adaptation and livelihood support strategies, climate risks will likely continue to pose significant food security challenges for the poorest and most food insecure communities.

Figure 27. The number of food insecure resulting from climate-induced disasters has risen substantially as a consequence of a gradual erosion of resilience among the impacted population



7 A SUMMARY OF RESILIENCE

The capacity of livelihood groups, communities, households and individuals to manage stressors and shocks with no long-lasting adverse effects on development.

For this analysis, three key indicators were identified through consultation to describe resilience in the context of Sri Lanka:

RESILIENCE

- Normal Food Security Status
- Livelihood Diversity
- Climate Sensitivity of Income Sources

Using three indicators of climate resilience discussed in the previous chapters — food security status, livelihood diversity, and climate sensitivity of income sources — it is possible to identify livelihood-based resilience patterns that can help inform programmatic interventions. In Sri Lanka, the analysis has been on the poorest households to allow for comparability between the different livelihood zones.

The most resilient livelihood groups in Sri Lanka are those in the Mahaweli mixed farming & livestock (LK07) and in the coconut & agriculture triangle (LK13) zones. This is largely due to a combination of access to a diversity of income and food sources, relatively good access to major cities and economic centres, and access to micro-tanks to better manage the impact of drought. However, multi-year droughts, or particularly severe droughts, may challenge this resilience in the future as seen in the recent erratic weather patterns of 2011 to 2014.

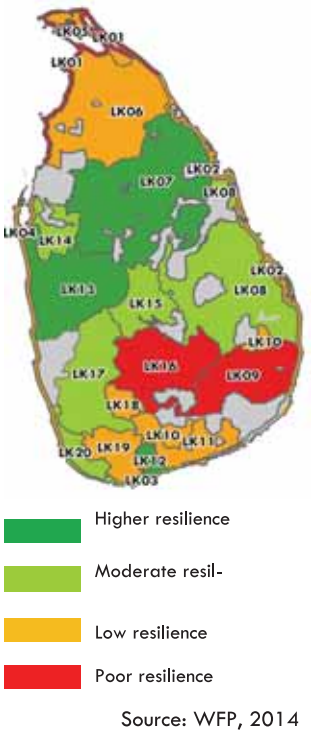
Generally, there is poorer resilience in the north, and in the southeastern parts of the country. Resilience capacity in the Jaffna mixed agriculture (LK05) and northern mixed agriculture & palmyra plantation (LK06) zones is likely to improve rapidly over the next few years especially as critical infrastructure is enhanced and developed following the end of a protracted crisis which affected millions of livelihoods.

Households that depend on fisheries in the northern part of the country have poor resilience as they have limited livelihood diversity and are often hit by storms and cyclones which significantly impact on their catch.

The poorest households in the tea estates have low resilience due to chronic poverty and very limited diversity of livelihoods. Although their primary livelihood activity – namely tea plucking – is not particularly climate-sensitive, wages are chronically low and terms of contracts not favorable to the tea plucker. With little livelihood diversification, shocks in terms of illness to the primary wage earner, pest affecting tea production, any variance in demand for the tea and/or any large scale economic shock means that these poorer households will be unable to weather the income variability.

The southeastern rain-fed paddy farming & OFC (LK09) zone also has poor levels of resilience. Households in this livelihood zone generally live in remote areas with poor access to roads and basic services such as education and markets. This zone, spread over the dry, intermediate, and wet climatic zones, is also highly sensitive to climate variability given the high reliance of households on rain-fed agriculture. This is of significant concern given two important climate trends. First, historical trends indicate that the northeastern monsoon – on which most of the households in the easternmost part of this zone depend – is becoming increasingly erratic and unpredictable. Second, the intermediate and wet climatic zones are moving westward and essentially shrinking, which may result in less rainfall available for rain-fed farming.

Figure 28. Overall resilience amongst the poorest



Source: WFP, 2014

*Climate sensitivity of food sources was not analyzed in this report but is recommended in future analyses

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