CITY REGION FOOD SYSTEM TOOLKIT

Assessing and planning resilient and sustainable city region food systems

Examples – Flow charts showing findings of food flow mapping

Brief description	Understanding food flows is necessary to determine the relationship between food offer and food demand and its footprint in the territory. This example in Colombo helped the project team to assess the CRFS rice flows and provides recommendations on how to improve inefficiencies.
Expected outcome	Understanding rice food flows from farm to fork
Expected output	Indicative food flow networks of rice with recommendations for improved efficiencies and resilience in its CRFS rural-urban linkages
Scale of application	Project level
Expertise required	Research and analysis, GIS expert
Examples of application	Colombo, Sri Lanka
Year of development	2022
Author(s)	Carmen Zuleta Ferrari
Relevant CRFS Handbook modules; related tools, examples and activities	Rapid scan module

Description

Food flow mapping involves identifying the main areas where assets and infrastructure are located, and where activities take place as food travels across the city region, and through the value chain from farm to fork. This includes the main production areas, storage facilities, whole markets, main modes and routes for distribution and transportation, and retail outlets, markets or other consumer-oriented provisioning. Based on this information, the project team may decide if it is necessary to re-define the boundaries of the CRFS, which were initially set in the Define the CRFS module.

Commodity - Rice

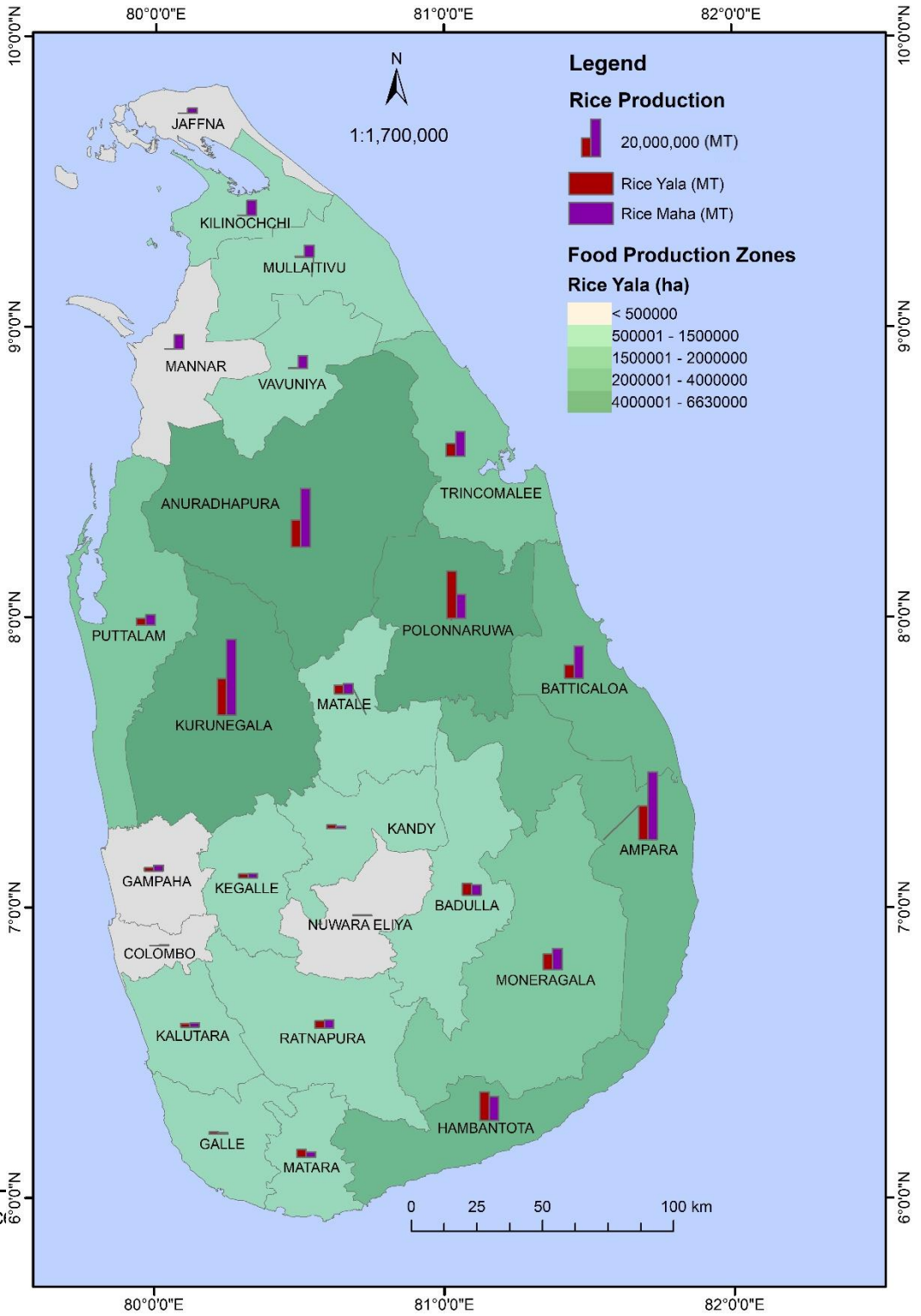
Rice is the main staple for Sri Lankans. The paddy crop is cultivated in the main cultivating season (*Maha* season[1] (supported by the second inter-monsoon and southwest monsoon) at approximately 850,000 ha and in the minor cultivating season, the *Yala* season[2], at an extent approximately 450,000 ha in Sri Lanka. Sri Lanka produced rice (de-husked paddy) at a surplus of the annual requirement (Approx. 2.4 million Mt) until the year 2021. The main areas of paddy cultivation is illustrated in Figure

[1] *Maha* season – Major cultivating season (October to February)
[2] *Yala* season – Minot cultivating season (March-September)

The sector is mainly driven by the state and private sector (organized and individual), with regulatory support from the government of Sri Lanka. Rice is cultivated in about 42 out of 46 agro-ecological regions in Sri Lanka.

The crop is cultivated in all three climatic zones, namely, Wet, Intermediate and Dry zones. Though there is a surplus of rice production, Sri Lanka still imports specialty rice such as Basmati type from India and Pakistan, Jasmine rice from Thailand, to cater to the additional demand from the tourists arriving from overseas, and the requirement of those in the Sri Lankan society including the non-Sri Lankan residents, with demand for imported high quality rice types for consumption.

Paddy-growing regions of Sri Lanka[3]

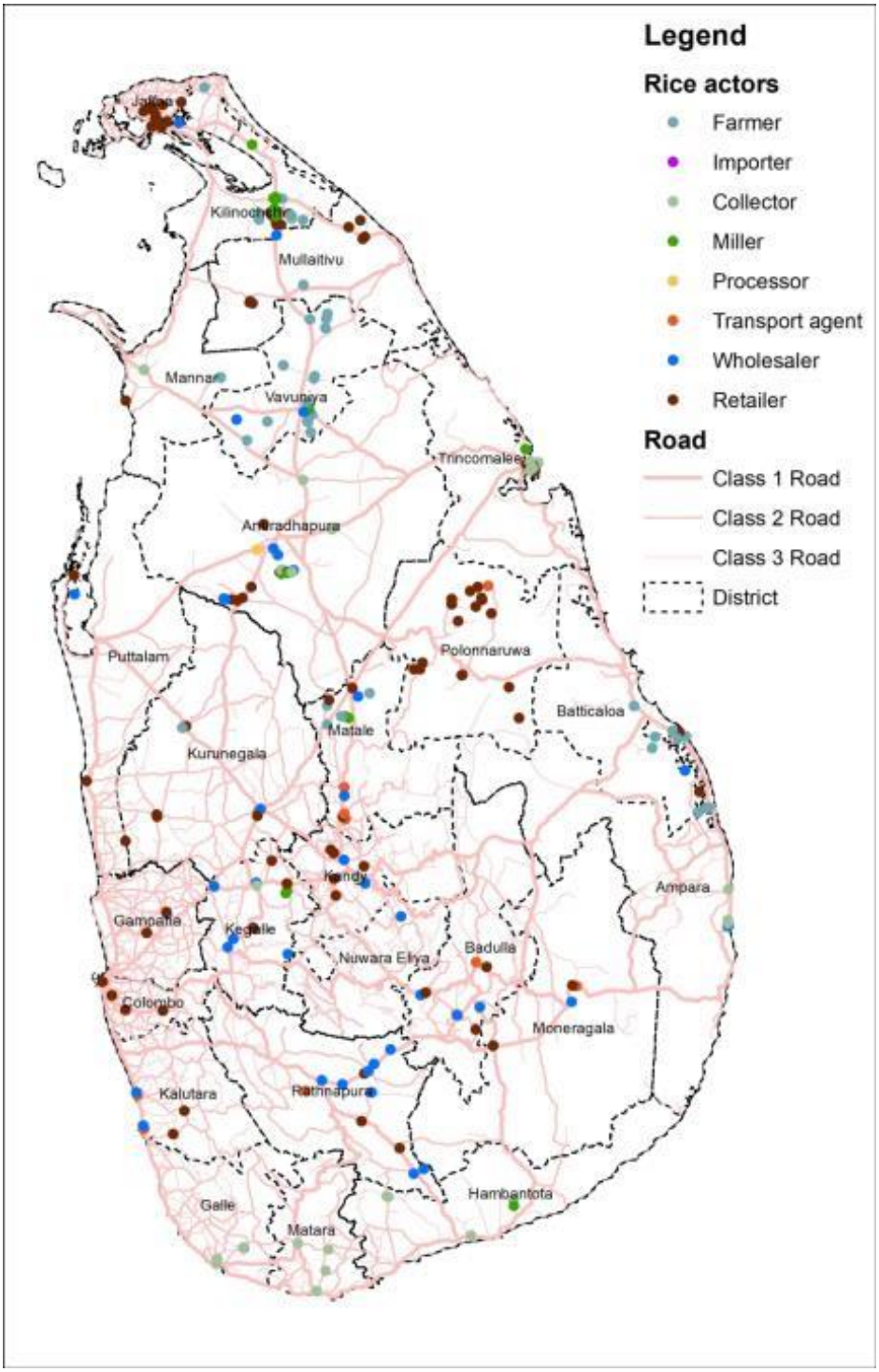


[3] Source

Sampling frame

The key locations where the interviews were conducted with the engagement of actors of the rice food flow in Sri Lanka, as per the snowball sampling techniques used, is illustrated in the figure below.

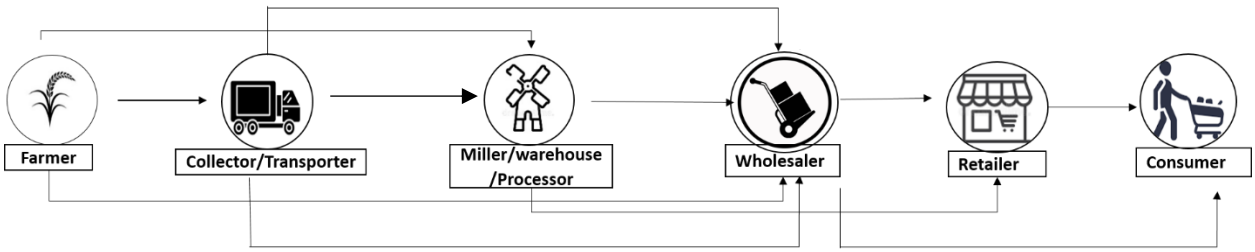
Key locations of interviews of actors in the rice food flow path in Sri Lanka



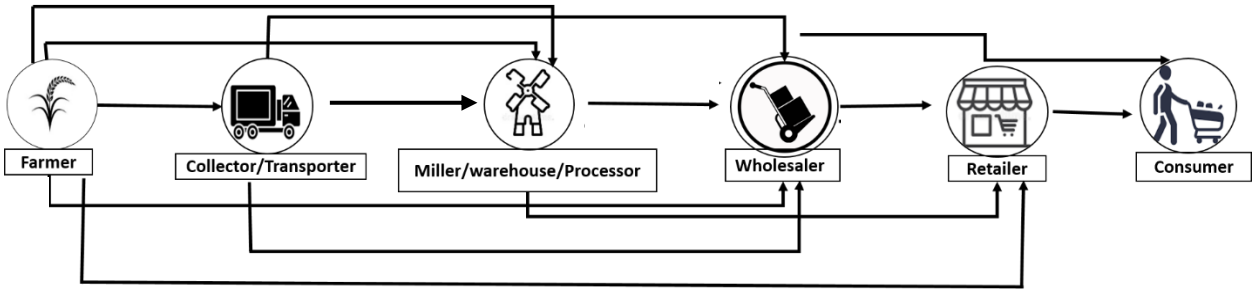
Key food flow Paths Across Provinces

The figures below depict the food flows of rice in Sri Lanka across the provinces at pre-COVID-19 and COVID-19 scenarios, respectively. The survey results showed that there were 618 transactions three or two actors in the Rice food flow path during pre-COVID-19 scenario, which has marginally reduced to 598 during the COVID-19 scenario. This indicates that there were no major changes in the combinations of three- and two-actor transactions to the normal Rice food flow due to COVID-19 scenario, and between *Yala* and *Maha* seasons.

Rice food flow during pre-COVID-19 scenario



Rice food flow during COVID-19 scenario

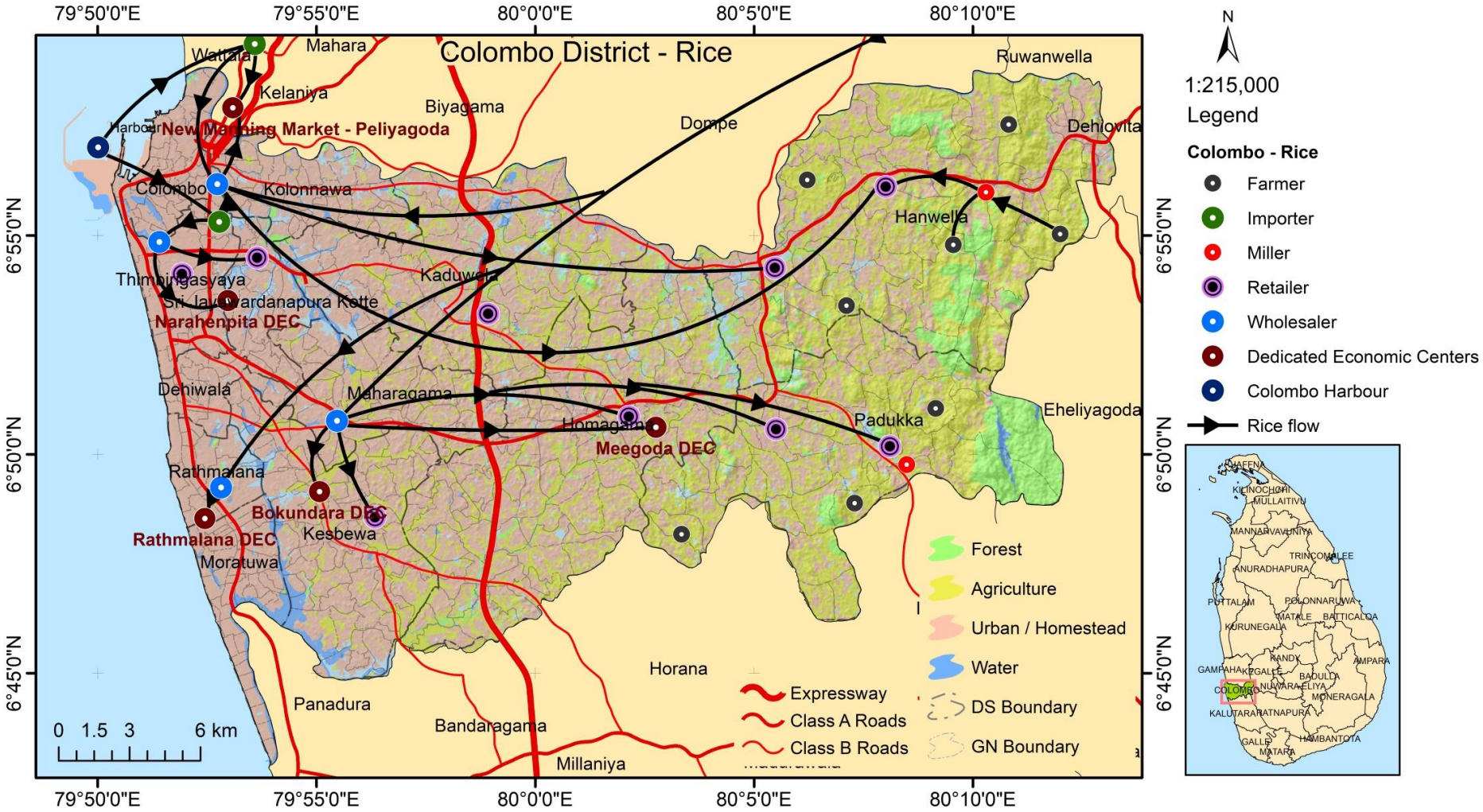


The pandemic has led farmers to store paddy for a longer period as a buffer stock of household food security. They also store larger quantities than usual in such crisis situations anticipating higher selling price at later stages. than providing the same for collectors/transporters and for milling.

Food flow paths to Colombo

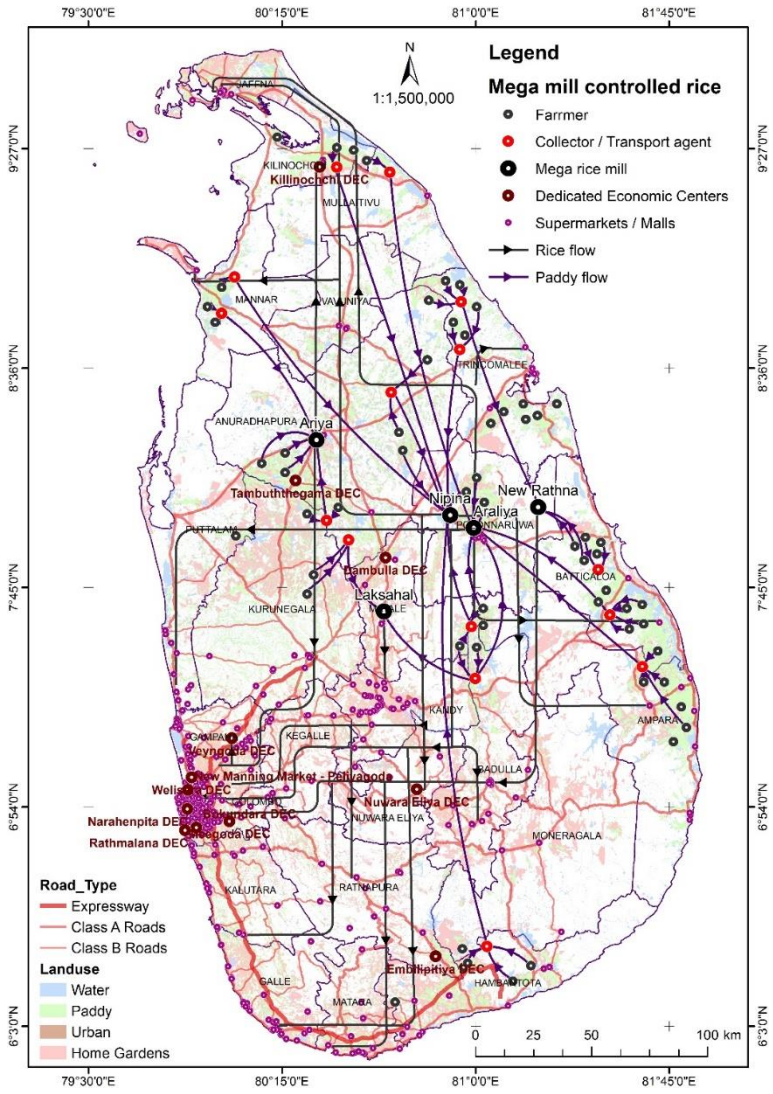
The rice food flow path to Colombo from various production areas during both *Yala* and *Maha* seasons are illustrated in the map below. The commodity has travelled from short and long distances to reach the consumers in both seasons, depending on the area of production. It is a well-known fact the peri-urban areas in Colombo are becoming more urbanized thus resulting in diminishing land available for agriculture, especially paddy production. Hence, there is an increasing reliance on the rural paddy production to support to ever increasing population of the Colombo city region. Furthermore, specialty rice produced in Sri Lanka such as rice with red pericarp and traditional rice varieties travel long distances from the rural Sri Lanka to the Colombo city and also via mega milling facilities found in the North Central and Central provinces. In some paddy produced in the Southern province would reach Colombo City region in the form of rice after being milled in improved paddy mills in the North Central province thus, increase the food miles (distance the food travels from farm gate until it reaches the consumer), and also the food price that consumer has to pay.

Rice food flow to the Colombo district

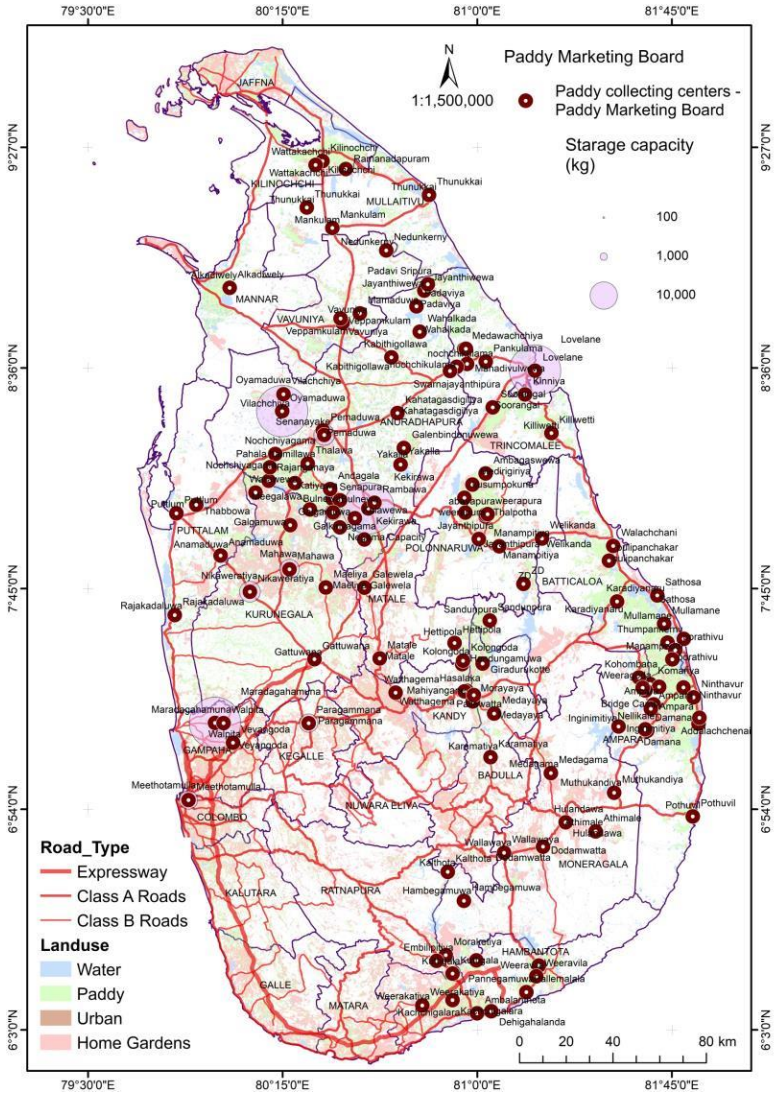


The maps below show the rice flow network governed by the mega mills in Sri Lanka and through the government of Sri Lanka through its paddy purchasing network (through the paddy marketing board, PMB) it's noted that the government involvement is mainly for price stabilization in the rice market and as a source of maintaining rice buffer stocks to be milled to small to medium scale millers to be released to the market during shortages. This network also increases food miles in paddy/rice food flow path in Sri Lanka and especially the Colombo city region.

Rice food flow controlled by the mega paddy mills in Sri Lanka



Rice food flow controlled by the Government of Sri Lanka

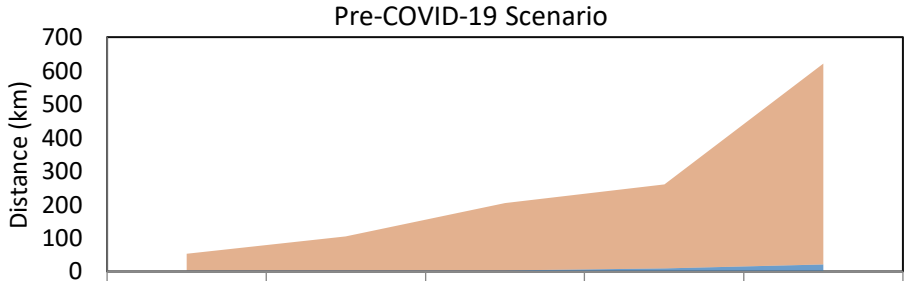


Food miles, Quantitative losses, and Price increase in key nodal points of Paddy food flow to Colombo

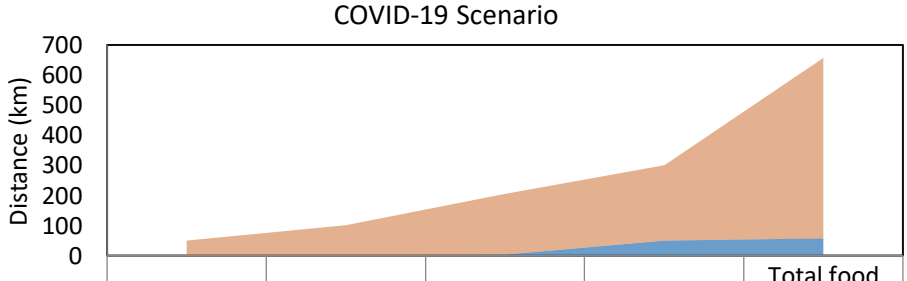
The paddy (farm gate) and rice food flow results showed that there is a wide variability in the minimum and maximum distances of travel of rice to the consumer in Colombo. The estimated total distance of food travel from producer to retailer is shown in the map above, during both *Yala* and *Maha* seasons. There were no major differences in the parameters measured between *Yala* and *Maha* seasons. The study results did not show any major deviations of the distance travelled between the two closest transaction points when comparing the COVID-19 scenario with the pre-COVID-19. However, the total minimum distance of food travel was higher in the case of COVID-19 scenario compared to pre-COVID-19, mist likely due to farmers providing the paddy directly to the millers without going through collectors. The overall climate impact of distance travelled by the rice food commodity, from the farm gate to consumer was not calculated owing to the difficulties in its estimation from the survey data and also from the secondary data due to the complex network of distribution of the commodity as shown in both maps.

The longest distance that rice has travelled (in both pre-COVID-19 and COVID-19 scenarios) was between the segment "wholesaler to retailer" (range: 10-250 km; figure below). The shortest distance of travel was between the transaction segment farmer (Paddy) to the collector or miller, while the longest distance of travel of the commodity is from the mega mills in the north central province (producing more than 1 Mt rice per hour) to the retailer in Colombo. Most of the paddy from other production areas of the country (e.g. Southern province) reach the mega millers due to the presence of polishing facility in such mills, as this technology is not available with many of the small to medium-scale millers in the country.

Distance of travel of paddy/rice from the producer to the consumer considering the two closest transactions in the food flow to Colombo in the *Yala* and *Maha* seasons.



	Farmer to next nodal point	Collector to next nodal point	Transporter to next nodal point	Wholesaler to retailer	Total food travel during Pre-Covid (km)
max	50	100	200	250	600
min	3	4	4	10	21

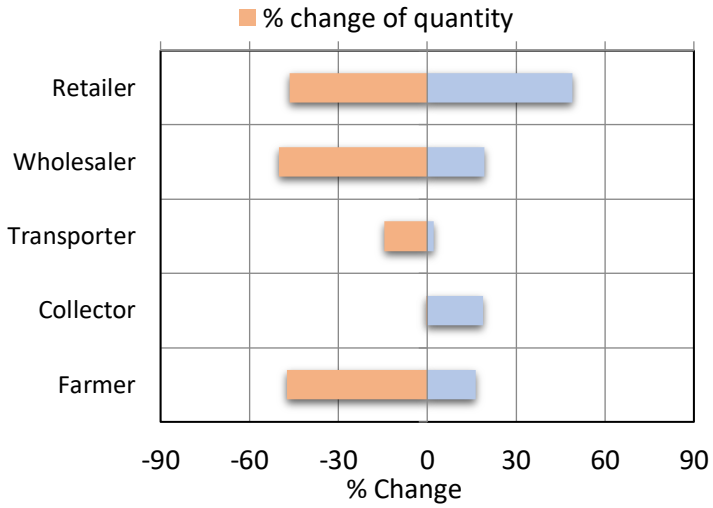


	Farmer to next nodal point	Collector to next nodal point	Transporter to next nodal point	Wholesaler to retailer	Total food travel during Covid (km)
max	50	100	200	250	600
min	1	2	4	50	57

Transaction Segment

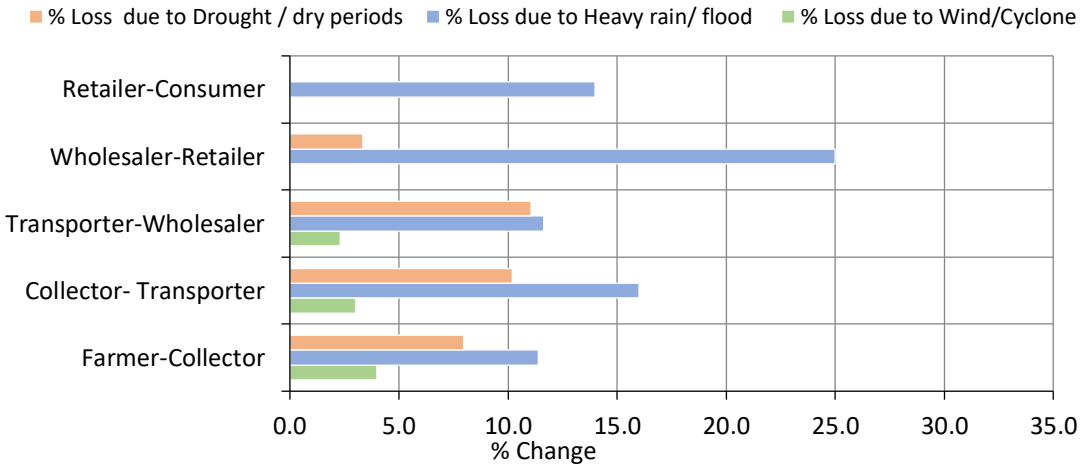
The losses incurred during two closest transactions and the increase in buying/selling prices of the paddy/rice commodity in the said transactions showed a wide variability among different transactions segments within and between *Yala* and *Maha* seasons. The COVID-19 scenario has increased quantitative losses of all transactions of the rice food flow compared to Pre-COVID-19 situation mainly owing to longer stay of the product (without being stored in a proper manner) and due to uncertainty and inefficient market operation. More losses and price increases have been experienced Farmers, wholesalers and retailers have incurred massive losses of paddy (farmers) or rice probably owing delays occurred in marketing the products during COVID-19 scenario. The price changes was the highest at the retailer level affecting the consumer in terms of non-affordability of the purchasing price.

Changes of quantities and prices of paddy/rice at closest transaction segments in the Colombo Food Flow System during COVID-19 scenario compared to pre-COVID-19



The figure below illustrates the climate impact of paddy/rice food flow. The loss of quantity of rice was the highest during high rainfall or flooded conditions in all transaction segments, especially in the between wholesaler to retailer. This was mainly due to the impact on transport (as depicted in other transactions segments as well) making delays in vehicle reaching the destination, de-routing, and poor storage (especially in small and medium scale millers), etc., leading to escalated costs. Heavy rains would have also dampened the retail shops by destroying the rice commodity.

Changes of quantities of paddy/rice at closest transaction segments in the Colombo Food Flow System due to climate change



Key Summary Conclusions

- Paddy/rice being the major staple food crop of Sri Lankans have been a priority crop cultivated by farmers in almost 42 out of 46 agro-ecological regions of Sri Lanka, including the Wet Zone (e.g. Western Province including Colombo, Gamapaha and Kalutara).
- The rice food flow (starting mostly from dispatch of paddy from the producer) is governed by the state and private sector agencies.
- The milling of rice in Sri Lanka is mainly controlled mainly by few major millers located mostly in the North Central Province, as a result of larger portion of the production coming from the dry zone of Sri Lanka in both *Yala* and *Maha* seasons.
- However, the rice food flow within and between districts is vulnerable to climate change (extremes in rainfall, temperature, strong winds, etc.) and pandemics such as COVID-19. This is mainly due to the severe impact of such calamities and as a result, disruptions in the connectivity between rural and urban communities.
- The cultivation land (paddy fields) available in peri-urban areas of the Colombo city region is diminishing due to high rate of urbanization, thus limiting the land available to provide rice as a buffer stock, missing opportunities to have access to rice with lower food miles to the Colombo city region.
- Eight dominant three-actor transactions were identified in the rice food flow, across the country, including the Colombo city regions food system (Colombo CRFS), namely, **ACF** (Farmer – Miller – Consumer), **AEF** (Farmer – Retailer – Consumer), **BDE** (Collector/Transporter - Wholesaler – Retailer), **BEF** (Collector/Transporter – Retailer – Consumer), **CDE** (Miller – Wholesaler – Retailer), **CEF** (Miller – Retailer – Consumer), and **DEF** (Wholesaler – Retailer – Consumer). Three common two-actor transaction segments were also identified, namely, **AB** (Farmer – Collector/Transport), **AC** (Farmer – Miller) and **AD** (Farmer – Wholesaler). These transactions and any impact of external factors on such transaction will determine the overall efficacy of the rice food flow to Colombo as well as within and between different districts.
- No main changes were observed in the combinations of three- and two-actor transactions to the normal rice food flow due to COVID-19 scenario, and between *Yala* and *Maha* seasons.
- In COVID-19 pandemic. the three-actor transaction segments CEF (Transport/Storage – Retailer/Supermarket – Consumer) and DEF (Wholesaler – Retailer – Consumer) were the most affected in the Rice food flow path in Sri Lanka. However, in total, value addition in rice seems to be the least affected due to the pandemic among the seven commodities tested due to the storability of the product even under minimum standards during a pandemic such as COVID-19.
- Climate change has mostly affected the three-actor transactions BDF (Transporter/Storage – Wholesaler – Consumer), CEF (Miller – Retailer – Consumer) and DEF (Wholesaler – Retailer – Consumer). This is due to the disruption of supply chains and shortage of quantity of supply due to heavy rainfall, drought and hot weather conditions.
- Transport and storage were the main components in the rice food flow path impacted significantly owing to the COVID-19 pandemic and climate change. Difficulties in transport due to flooded road network, low turnout of workers, and tendency of the producers to store paddy without quick dispatch to the next segment of the food flow (to support own household food security and anticipating higher market prices to sell the produce due to deficits in the market) were key determinants of the food prices especially under COVID-19 pandemic.
- In general, the two-actor transaction segments were the least affected compared to the three-actor segments as the flow has taken less time due to involvement of less number of actors in the former. Further, rice farmers have been directly approached the other actors in the further segments (e.g. millers without waiting for the collectors to supply the product) in the rice food flow to have quick dispatch of the product to the consumers during a pandemic and climate change.

- The extreme weather conditions would always have a negative impact on transport of food commodities thus affecting the rice food flow. Lower production and farmers showing preference to store paddy (expecting higher prices in the future and also storing products as buffer stocks to avoid food shortages at household level) than selling them to millers have resulted in shortage of supply of rice during drought.
- The wholesaler to retailer is the longest distance that rice has travelled (in both pre-COVID-19 and COVID-19 scenarios) before reaching he consumer (range: 10-250 km). The shortest distance was between the collector or miller, and the longest distance travel is from the mega mills (producing more than 1 Mt rice per hour), to the Colombo city. Most of the paddy reached the mega millers due to the presence of polishing facility as this technology is not available with many of the other small to medium-scale millers in the country
- COVID-19 scenario has increased quantitative losses of all transactions of the rice food flow mainly due to longer stay of the product (without being stored in a proper manner) and due to uncertainty and inefficient market operation.
- The quantitative losses and price increases have been mostly observed at the farm gate, wholesalers and retailers, probably owing delays in marketing the products during COVID-19 and changing climate.
- The price change was the highest at the retailer level thus making the product unaffordable to many of the poor and vulnerable communities in the Colombo city region.

Key Summary Recommendations

- Encourage the cultivation of limited available paddy fields in the peri-urban areas in the Western province of Sri Lanka at least to reduce food miles
- Upgrade the quality standards of selected small- and medium-scale milling facilities within the Western province to support the milling operations of rice at closer proximity to the Colombo city region.
- Build or improve existing storage facilities at both state and private sector organizations to improve storage life of paddy and rice.
- Provide mobile drying facilities to farmers (farmer organization) as a tool to support storability of the product at farmer level, and also reduce quantitative losses until the product is dispatched to the next transaction segment.
- Organize the transport network to operate during pandemics and changing climate scenarios to perform at a higher efficiency and smooth flow of the product from producer to consumer with lower food miles, minimized losses and reduce prices to the best possible extent.
- Educate all the actors in the rice food flow path on the impact of pandemics such as COVID-19 and climate hazards on the food miles, quantitative and qualitative losses, and undue increase in consumer prices to support an efficient food flow to the city regions from the production areas.