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(Re) Thinking the Off- Grid City

Report 5:
Commodity Flow Analysis and Node Infrastructure Analysis



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The UKRI-GCRF (Re)Thinking the Off-Grid City (referred to as the 'Off- Grid City' project hereon) is an ESRC funded research project, with the Institute of Development Studies, as the Lead University and partner institutions across Asia and Africa. As a part of this research project, the partner institutions are undertaking research across sites in Ghana (Tamale), South Africa (Mossel Bay), Zimbabwe (Epworth), Sri Lanka (Colombo) and India (Bengaluru). The Indian Institute for Human Settlements (IIHS) as one of the partner institutions in this research consortium, is undertaking the research in Bengaluru, India.

Table of Contents

Introduction to the 'Off- Grid City' Project 1

Context for the Food Markets Stage of Study 2

Research Design and Approach 3

Historical Background to Bengaluru's Food Markets 6

Governance of Food Market Systems in Bengaluru 7

Part 1: Food Market Study of Vegetables and Fruits 9

Part 2: Food Market Study for Eggs 51

Part 3: Food Market Study for Fish 55

Part 4: Food Market Study for PDS 62

Part 5: Food Market Study for Indira Canteens 68

Conclusion of the Bengaluru Food Markest Study 72

References 74

Introduction to the 'Off- Grid City' Project

The aim of the Off- Grid City research project is to reframe infrastructure planning, governance and participation in various city contexts to better support the lives of their most marginalised residents. In particular research will reimagine what infrastructure means in such contexts, where it is rarely experienced in the way envisaged by planners as the progressive realisation of access to a formal, city-wide 'grid' (Pieterse et al., 2018). Focus in particular will be on infrastructure 'assemblages', i.e. the multiple arrangement of infrastructure access determined not only by physical infrastructure, but the social, ecological and political relationships, and ideologies operating and influencing access at multiple city scales. Research will examine the interactions between five types of infrastructure assemblage: energy, water, sanitation, transport and communication. Whilst these infrastructures can be planned in silos, marginalised people's daily experience across these infrastructures needs to be researched together. In this research the focus is to understand how infrastructure constraints can combine to add to the vulnerability of the most marginalized to longer-term shocks and stresses and exacerbate their inability to meet basic needs. We will concentrate on food and nutrition security as one set of basic needs, which is significantly dependent on these infrastructures. Charting infrastructure interactions as they relate to food outcomes at multiple scales (city, neighbourhood, household) offers an innovative conceptual and methodological approach to unpack such interactions, and better understand the everyday means of coping, gaps and governance implications that they entail.

This will enable a deliberate typology of cities and a range of different grid access - from being completely 'off-grid' to encompassing several hybrid types of formal and informal service delivery. The settings are well known to the research partnership and the methodology will pinpoint sites in which marginality and infrastructure poverty combine, so as to allow charting the time and cost burdens to residents and their vulnerability to political, social and environmental disruptions which exist in such neighbourhoods.

Context for the Food Markets Stage of Study

This report presents the findings from the city- level commodity flow analysis and infrastructure analysis for key city- level market nodes for select food items, undertaken by the IIHS team in Bengaluru in 2023.

The food items were selected based on the findings of research undertaken previously by the IIHS team over 2021- 22, including the – (1) infrastructure assessment and food retail analysis at the neigbourhood scale, and (2) food- infrastructure journaling and assessment study at the household scale.

Our earlier work helped us to identify key food items available at food retail outlets in our study neighbourhood and consumed most frequently by households, as per the food journals of the households and data from the qualitative interviews about eating habits. The household level study draws on data of 576 meals consumed across 24 HHs, and analysed on the basis of the food journals maintained over four weeks and supplemented by qualitiative interviews with the households about their food choices and eating/ cooking habits.

The food items that were selected for the current stage of the study, include:

1. **Vegetables and fruits** – Most meals consumed by the households, included in our sample, consumed fresh vegetables and fruits on a daily basis. The households indicated that they brought vegetables and fruits from vendors within the neighbourhood. Fruits and vegetables procured by vendors have linkages to the city's key markets, as well as the Agricultural Produce Market Committee[1], which we have explored in this report.
2. **Fish and Egg** – Our household study highlighted that chicken is the most commonly consumed meat product. 10% of all meals, recorded as a part of the household study, included chicken as an item. However, much of the chicken consumed in the neighbourhood is sourced from a chicken wholesaler and butcher located on the main road adjoining the neighbourhood, who we interviewed at an earlier stage of the research. So, we have not selected chicken as the food item to study in more detail. Instead, we have selected fish and eggs. The household study highlighted that fish was consumed as a part of 5% of all meals recorded, and eggs were also consumed as a part of 5% of the meals recorded. The supply- chain management of fish and eggs offer particular and unique insights into the food commodity flow in Bengaluru. In brief – the supply chain of fish includes a proportion of the cheaper fresh water fish cultivated in local Bengaluru lakes. These fish are frequently consumed by poor urban households. Thus, studying fish provides an opportunity to understand local urban food production practices, in addition to understanding the commodity's flow in the city. The supply chain management of eggs is interesting as the neighbourhood level study highlighted that there is some degree of integration of digital technologies in the daily price- setting of eggs. This offers additional insights into the ingress of digital communications and technologies into the contemporary urban food commodity flow in Bengaluru and so we have included eggs in this study as well.

[1] An Agricultural Produce Market Committee is a marketing board established by state governments in India. They act as the public channel for farmers to access urban markets and play an important role in moderating food prices across the value chain of the product, through mechanisms such as public auctions. For more details see: https://krishimaratavahini.karnataka.gov.in/english

3. **Rice distributed through Public Distribution System (PDS)** –The household study also identified that rice is the most commonly consumed staple/ grain in the neighbourhood's daily diet. Most of the households in the neighbourhood procure rice from the PDS fair price shops, which are situated in the neighbourhood. Given this, we have undertaken a commodity flow analysis of the PDS system in Bengaluru, to understand the commodity flow of rice in the city. This also gives an insight into the PDS system itself, which is one of the primary source of staples for the urban poor in Bengaluru (and across India) and which became a critical public infrastructure for food distribution during the COVID years.
4. **Cooked meals served through Indira Canteens (ICs)** – In keeping with our intent to explore the food system infrastructure available to the urban poor in Bengaluru, we have included Indira Canteens, which provide cheap cooked food across three meals daily, in our study. Our study neighbourhood has two Indira Canteens. Most households, who were part of our household study, did not acknowledge eating at the Indira Canteen, and expressed uncertainty about the quality and taste of food from Indira canteens during qualitative interviews. However, as mentioned we have included Indira Canteens, given the criticality of the infrastructure as a public and municipally- funded food infrastructure in the city.

Research Design and Approach

Commodity flow analysis

The commodity flow analysis that has been undertaken includes tracing the commodity flow and mapping the flow of these commodities which are dependent on, facilitated by, or constrained by urban infrastructure assemblages at multiple scales. As mentioned in the introduction, we selected the food items for the commodity flow analysis based on previous stages of our research at the the neighbourhood and household scales. Then these commodities were traced backwards from the neighbourhood level outlet to the market/ distribution/ storage nodes at the city- scale. In doing this, we realised that there are multiple webs and networks associated with the commodities' flow for each selected item.

Market nodes analysis

Since mapping the multiple networks of commodities' flow could not be undertaken comprehensively at the city- scale, within the time and budget constraints of this project, we identified key market nodes that act as gateways for these commodities into the city and account for the bulk of the flow of these commodities into the city. Using these market nodes as entry-points for our research allowed us to both understand the backward and forward flow of the commodities from these market sites, and to understand how urban infrastructure provisioning at these markets is facilitating/ constraining the city's food supply system.

At each of the node, we have assessed; 1) the infrastructures access and dependencies, (2) how infrastructure access and dependencies are mediated by economic and political factors, and (3) how access determines the behaviours of market actors in ways that shape food security and nutrition dynamics.

As part of this, we have looked at:

(1) Kalasipalyam, Yeshwantpur and Electronic city food markets, as wholesale markets for fruits and vegetables,
(2) KR Market as a city- level retail node for fruits and vegetables
(3) Russell Market, as a city level wholesale and retail node for fishes
(4) A wholesale retailer in Hoskote for eggs
(5) The systems of procurement centers and warehouse facilities in Bengaluru for the PDS system
(6) The systems of operator warehouses and base kitchens for the Indira Canteen system

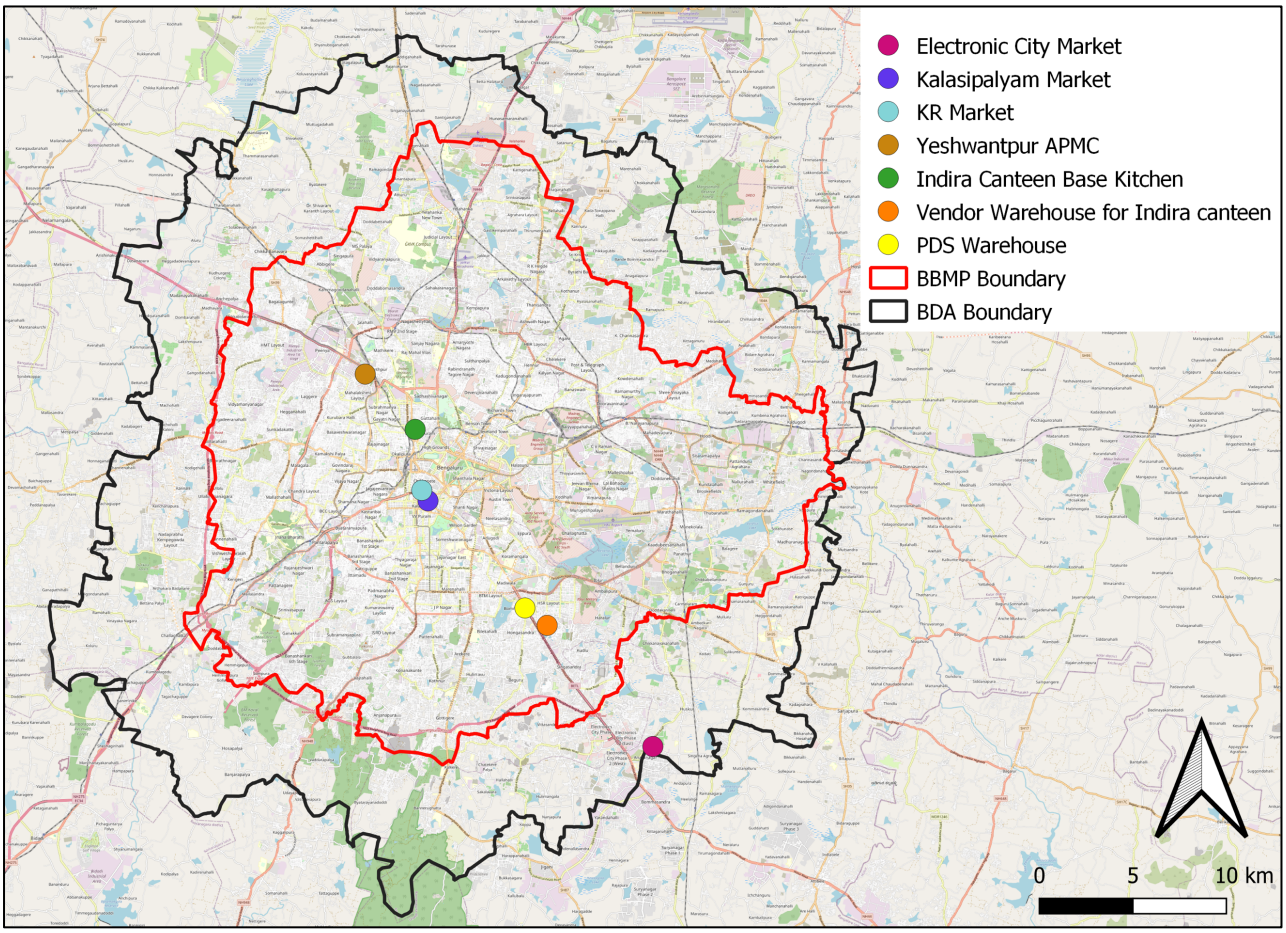


Figure 1: Primary field sites

The analyses and assessments mentioned above were based on:

(1) Structured Observations: To understand the spatial, built-up, infrastructural and logistical characteristics of each of the nodes. As part of this analysis, we have assessed the built spaces and infrastructure access, in terms of water, electricity, garbage disposal, drainage, at each node. We identified typologies of retailers/ vendors at each of these markets, where relevant, to give a better sense of the builtup areas and infrastructure access differentiations that exist in these markets.

(2) Semi-structured Interviews: These were undertaken with actors that constitute the food market eco- system at each of the nodes. Purposive sampling was used to select respondents associated with different vendor typologies and key operations at each of the selected nodes, to assess how each of these markets are part of the commodities' flow and the value chain (value- addition at each stage of the commodities' flow) and how the operations within each market is organised. Details included transportation, storage, communication and pricing. It was also ensured that the

sampling is done to follow through the value chain of the selected commodities. Interviews with retailers, distributors and wholesalers focused on understanding their supply chains, pricing behaviours, as well as their infrastructural, space- use and storage practices. Interviews with representatives of market associations, government authorities and other market agencies in the area focused on understanding the negotiations in the provisioning of infrastructure and management of supply chains.

The research team spent four months on the field for this phase of the study.

Historical Background to Bengaluru's Food Markets

Bengaluru has a long history as a trading/ market center (Patel, S et al, 2021)[2]. In the 16th century, under the Vijayanagara Empire, Bengaluru began to grow into a significant fortified settlement and market town[3]. The city's foundation lay in its *petes* (or markets in Kannada, the local language) which were largely located in the southern part of Bengaluru. The original *pete* streets – Chickpete Street and Doddapete Street – formed the heart of commercial and social Bengaluru, and continue to be central to the city's culture and commerce. Bengaluru gained regional dominance during the British Empire as a military or cantonment town. The presence of the British military had a significant impact on the economic and social structure of the city. While the older trading areas of the city were under the control of the erstwhile royal family, the north-eastern parts of the city were developed by the British[4]. Markets, too, featured heavily in the British plans for the city. Governance in the cantonment areas fell under the British administration, with the rest of the city under the Mysore Kingdom.

Bengaluru's supply of fresh fruit and vegetables traditionally came from the hinterland of the city[5]. However, long-distance transportation has become just as common now. As a result, the city now has a year-round supply of fresh food products. Arakai (2005) mapped the major geographical source regions for products in the Kalasipalyam market (one of the market nodes that we have included in our study) and shows that, while rural Karnataka is still the dominant supply area, some products were coming to the city from other states including Gujarat, Tamil Nadu, Kerala and Andhra Pradesh.

Major market nodes such as KR Market, Madiwala Market, Ulsoor Market, Johnson Market, Russell Market, Kalasipalyam, Yeshwantpur and Electronic city are critical for the urban food system of Bengaluru.

[2] Patel, S., Furlan, R., & Grosvald, M. (2021). A framework for enhancing the spatial urban form of informal economies in India: The case of Krishna Rajendra Market, Bengaluru. SAGE Open, 11(2), 21582440211023184.
[3] No. 05: The Urban Food System of Bengaluru, India (wlu.ca)
[4] (Kamath, 2006)
[5] (Araki, 2005)

Governance of Food Market Systems in Bengaluru

Urban Local Bodies and Urban Development Authorities

Bengaluru Municipality, Bruhat Bengaluru Mahanagara Palike (BBMP) is responsible for the upkeep and maintenance of the markets within the BBMP area which includes; KR Market, Kalasipalyam Market and Yeshwantpur Market. The market division is responsible for allocation of shops and collection of rent. Electronic city market comes under the purview of an Urban Development Authority (UDA), Bommanahalli Bengaluru Development Authority. The organization chart for the Market division within the Municipality is given below.

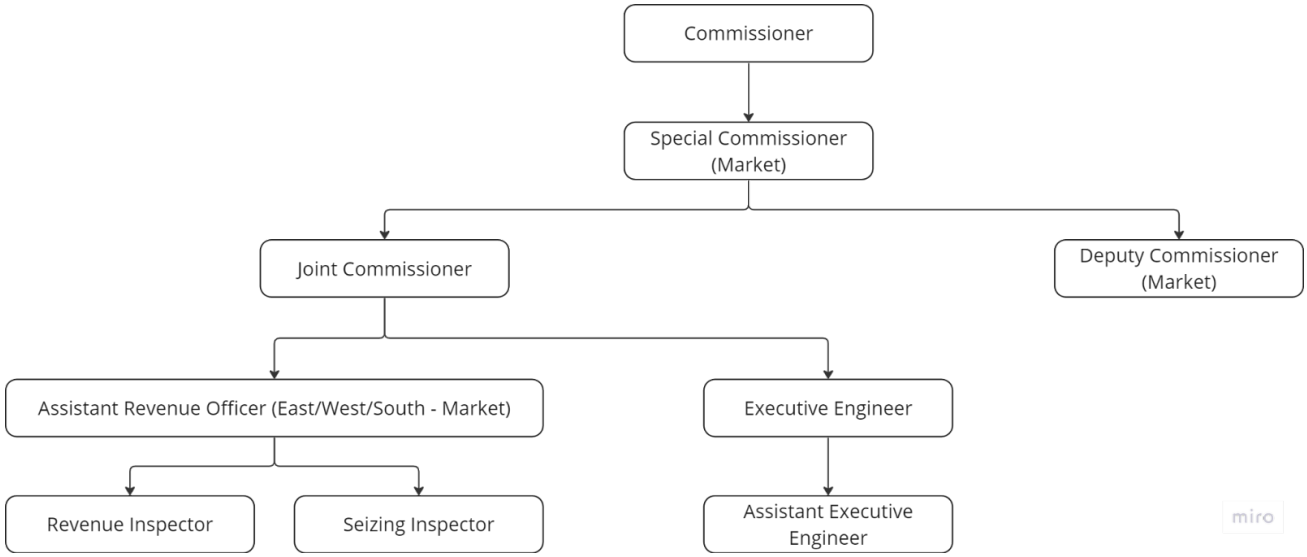


Figure 2: Organizational chart of Market Division with the BBMP

Agricultural Produce Market Committee (APMC)

APMC is the marketing board established by the State Government to regulate prices to ensure fair trade of food commodities. Before the establishment of APMCs, farmers used to sell their produce at the local market, where prices fluctuated widely and farmers were vulnerable to being cheated either in terms of price or weights. Farmers often received low returns on produce, and consumers would end up buying at higher prices. Middlemen and traders made the bulk of the profit. The APMCs were established by state governments to regulate intermediaries in the supply chain6. It provided for the constitution of "market committees", having representatives from farmers and traders to oversee the functioning of the marketplaces and regulate trade.

One of the key functions performed by the APMC markets is to act as a platform for price discovery. The transactions inside APMC market are a result of interactions between various stakeholders. The farmer brings produce to the market, which is then arranged for sale by commission agents, who market the product as representatives of the farmer. The commodity is then displayed to the traders who determine the prices through a regulated (including auction) mechanism. The whole system is supervised by the elected committees. Each transaction involves a commission fee which is paid to the APMC committee for maintaining the market infrastructure. Usually, 5% commission from wholesalers and retailers goes to commission agents, out of which 1% is given to the market committee7. Bengaluru APMC has 15 members from 699 villages in and around Bengaluru. The elected members then vote for the chairperson and vice-chairperson. Elections are fought without political affiliation, but

[6] (Patil 2014)
[7] (Patil 2014)

most people admit that it is the politically-connected who become chairpersons and members8. The election and functioning of APMC is determined by the Karnataka Agricultural Produce Market (Regulation and Development) Act, 1966.

An amendment to the APMC Act in 2013 meant that no market fees are levied on flowers, fruit and vegetables, and the marketing committee collects user fees from buyers at rates specified in the bylaws and approved by the Director of Agriculture Marketing. Buyers of fruit and vegetables pay a 1% commission fee to RMC yards, while farmers are not charged anything. This includes bulk buyers such as Safal and Reliance. In December 2020, in line with the amendment of the central farm laws, the government of Karnataka passed an amendment to the Karnataka Agricultural Produce Marketing (Regulation and Development) Act, 1966. This amendment reduced the scope of the APMC by effectively ending their status as the only place (with some exception) where wholesale agricultural trade was permitted by the law. Despite the three Central Form Laws repealed after the year-long farmer's struggle, the Government of Karnataka repealed its amendment to the APMC system in June 2023.

Beyond APMCs

Many marginal land holding farmers also choose to bypass the APMC system altogether as the cost of logistics outweigh the benefit of using an APMC. Only 35% of the farmers use the APMCs to sell their produce[9]. Few recent developments also include farm-to-doorstep start-ups where groups of farmers sell directly to consumers through regular deliveries to apartment complexes and gated communities[10].

Vegetable and fruit supply to the city is also via HOPCOMs. HOPCOMS was originally a cooperative founded in 1959 and currently covers Bengaluru and other urban centers. Each day over 70 tonnes of vegetables and fruit reach the city through HOPCOMS. The organization has its own small shops where it sells produce at fixed prices[11]. Farmers sell their produce to HOPCOMS and are paid in cash or by cheque on the same day.

[8] Yeshwanthpur APMC yard A marketplace for farmers across India - Citizen Matters, Bengaluru - Google Docs
[9] How Bengaluru's APMC yard works and what it means for farmers: Here's all you need to know - Citizen Matters, Bengaluru
[10] (Bhumika 2016)
[11] (Patil 2014)

Part 1: Food Market Study of Vegetables and Fruits

Commodity flows for vegetables and fruits in Bengaluru follow multiple pathways, which involve both formal and informal actors and processes. Bengaluru consumes over 6,000 tonnes of fruits and vegetables per day[12].

For this study, we selected the four market nodes below:

1. Kalasipalyam Market- Wholesale vegetables market
2. Yeshwanthpur Market- Wholesale onion and potato market
3. Electronic City Market- Wholesale fruits market
4. KR Market- City- level retail market for fruits and vegetables

Kalasipalyam, Yeshwantpur and Electronic city markets are regulated by their respective APMC whereas KR Market does not come under any APMC. Vending licenses are obtained by respective APMC, in case the market is regulated by APMC. Building services like rent and electricity are usually provided by the BBMP. A formal contract exists between the BBMP and the vendors which details the rent and other bill payments. BBMP revenue inspector is responsible for the collection of rent and utility bills. The payment is made either on a monthly basis or on an annual basis. Rent rates increase by 2% each year as per the contract. Payments are usually made using Demand Draft (DD) or cheque, given the unavailability of digital payment infrastructure with the BBMP market department. However, the municipality does not accept any cash payments so as to bring in more transparency and accountability.

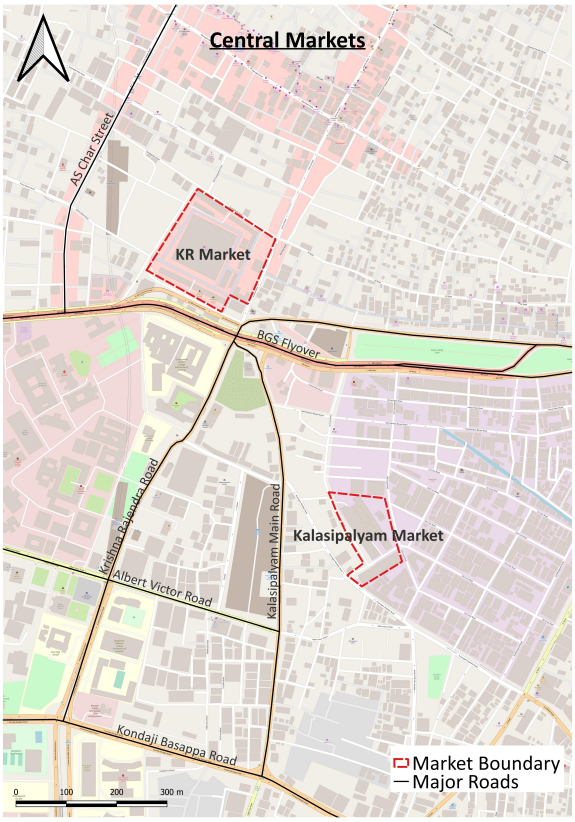


Figure 3: Location of central markets

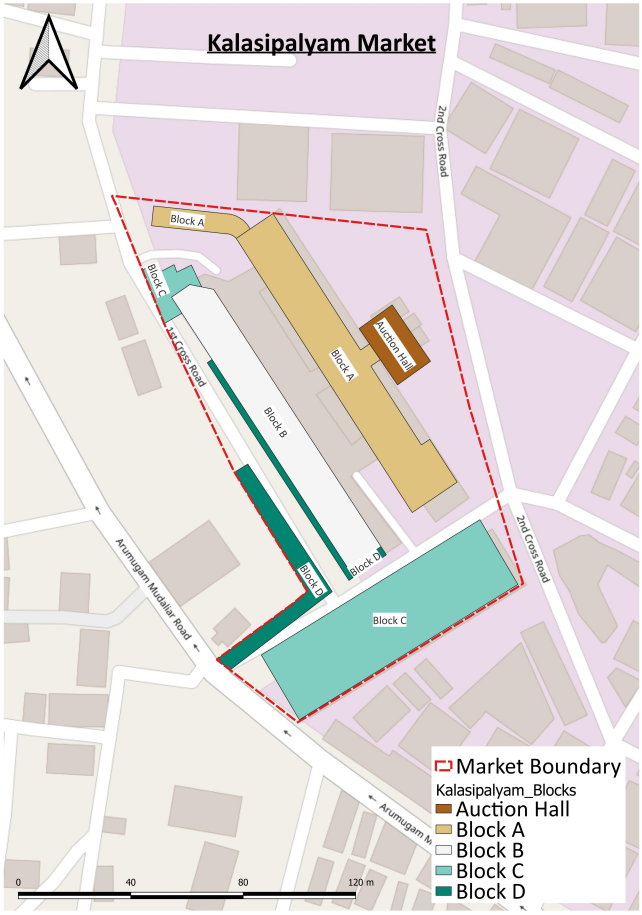
Kalasipalyam Market

Kalasipalayam has been an important market node for Bengaluru since the city was part of the provincial state of Mysore. The name of the market started appearing in maps and official documents since the 1820s[13]. Media reports claim that the Kalasipalyam bus stop was a critical city node before the central bus stand of Majestic was established, which also made it a prominent trading node. The 3.8-acre market is known as a hub for food, gadgets and automobiles. It accommodates both retail and wholesale traders and is the one of the largest wholesale and retail vegetable markets of the city[14]. The Regulated Market Committee (RMC) yard in Kalasipalyam, which falls under the APMC, receives over 280 tonnes of vegetables per day from Mandya, Mysore, Ramnagar, Doddaballapur, Chickballapur, Magadi, Hoskote, Sidlaghatta, Anekal, Malur and Kanakapura[15]. The increase in size and density of market activities at Kalasipalyam market prompted the government to relocate about 400 traders from the Kalasipalyam market to a new market built at Electronic City, adjoining the existing fruit market at Huskur, when

[12] Bengaluru: From where silicon valley of India gets its vegetables? | News9live
[13] https://economictimes.indiatimes.com/magazines/panache/kalasipalayam-once-a-military-base-this-hub-now-speaks-only-commerce/articleshow/46538508.cms?from=mdr
[14] https://economictimes.indiatimes.com/magazines/panache/kalasipalayam-once-a-military-base-this-hub-now-speaks-only-commerce/articleshow/46538508.cms?from=mdr
[15] Where does Bengaluru get its vegetables from? - Citizen Matters, Bengaluru

COVID lockdowns were in effect[16]. We have included a study on the new Electronics City market in this study as well.

Market Layout and Retail Spaces at Kalasipalyam Market



The market comprises of 4 blocks spread across three two-storey buildings (Block A, B and C) and a semi-permanent fourth block, Block D, constructed incrementally with metal and tarpaulin sheets, in anticipation of increase in demand. Shops in Block D have electricity connection despite the impermanent nature of the building. Overall, the market has 478 registered shops, allocated by the municipality to wholesale vendors, who were relocated from KR Market, as a decongestion move. The move was done with the consent of the Kalasipalyam APMC to minimize resistance. The market has three main entrances, of which two are accessible by large vehicles. Block A and Block B are inter-connected by a bridge on the first floor of the complex.

Figure 4: Map of Kalasipalyam Market



Figure 5: Bridge between the two blocks

[16] https://timesofindia.indiatimes.com/city/bengaluru/traders-in-kalasipalyam-market-upbeat-about-moving-to-e-city/articleshow/81455542.cms

The ground floor of the market complex accommodates most of the wholesale and retail trading of vegetables, since there is easier access to the delivery vehicles and customers. 'Headloaders'/ 'hamalis'/ porters, who help carry goods from the delivery vehicles to the shops, also charge less to deliver goods to shops on the ground floor. Though there are shops on the first floor, accessible by a vehicle ramp, these shops are used by tailors who repair packaging bags, as a rest area for daily workers, and other such uses.



Figure 6: Ramp to First Floor of the Market

1. Block A and B: These two blocks are the most accessible to delivery vehicles and customers. There is additional parking near Block A. The accessibility reduces unloading costs for shops here. The large frontages of the shops is used for display. During fieldwork, we were informed that the shops on the ground floor in these two blocks are typically the most profitable.

   The shops on the upper floors of these blocks are mostly used by tailors who stitch jute and fiber bags from leftover packing materials discarded by the wholesale traders. They buy these materials cheaply and make bags for reuse. The remade bags that are in better condition are used for packing vegetables, while poorer quality bags are used by the BBMP to collect market waste. Some of these shop spaces are rented by ground floor shop owners as rest areas for use by their daily-wage workers after market hours.

   Registered shops on the ground floor and the first floor of the market are rented out by the Bengaluru municipality. The amount is paid to the revenue inspector who physically collects the amount. The amount varies based on the location of the shop; Block A and B shops pay around INR 5500, Block C around INR 2,000 and Block around INR 650 – 1,100. A rental agreement exists between the municipality and the traders that operate out of the shops, which gives the authority to the municipality to revise the rent amount by 10% every year. The rental amount has been increased by 2% for the past four years (since 2019). The municipality also collects a penalty from the traders to the tune of about 5% of the monthly rental amount, in case there is delay in payment. The shops are further sub-leased to the commission agents, usually via an oral agreement. The lease price depends on the location of the shop within the market and varies widely, sometimes going as high as INR 100,000 per month.

   Street vendors have to mandatorily make payments to the APMC, however they may or may not pay rents to the registered shops for using their frontage. There also exists an APMC license fee which is about 2% of the weekly total sales made by the commission agent. The amount is to be paid to the APMC committee every week while submitting a record of total quantity of

commodities handled by the particular commission agent. However, most of the commission agents are no longer relying on the APMC mechanism and hence not paying the fees anymore.

The parking space adjacent to Block A is used by vendors. Makeshift arrangements with tarpaulin sheets, battery inverters or electricity connections drawn from nearby (registered) shops characterise the use of the space in this area. Though regulations are in place and these vendors face eviction threats, the space is used regularly. The vendors have a mutually consensual system of designated spots, as they have been using the space for decades.

2. Block C: This block located further away from the market's main entrance has reduced accessibility and visibility. The built- form is similar to Block A and B and they also use their frontage for display. On average, the BBMP monthly rent for shops in this block is INR 2000. Vendors with makeshift space and infrastructure arrangements are present in front of the building.

3. Block D: This block is located close to the main entrance, behind Block B. It is built by local traders with impermanent materials, as there is great demand for shop- space near the main entrance. BBMP has registered these shops, issued licensing certificates to them and provided them with metered electricity connections. These shops made of tin and tarpaulin sheets, do not have shutters and are prone to flooding during monsoons. They accommodate retail rather than wholesale activities, and handle smaller inventories. The BBMP charges a monthly rent of INR 650 – INR 1000, as per the shop- size.



Figure 7: Frontage of Block B



Figure 8: Street Vendors using the Road



Figure 9: Shops on the First Floor of Block A and B



Figure 10: Vendors using the Steps to Block C



Figure 11: Auto-constructed Shop in Block D



Figure 12: Spillover on Road near Block D

Infrastructure at Kalasipalyam Market

Water Infrastructure

Water is required only for drinking purposes within the market premises. Other non-drinking purposes such as washing stock was not observed. There is no gridded water supply for the shops in the market. Most vendors are dependent on off-grid arrangements such as water cans. The 20 litre water cans are supplied by a private water vendor who supplies water cans every morning and collects empty cans in the afternoon. Smaller vendors also get drinking water from their homes.

Power Infrastructure

Electricity connection is provided by the parastatal authority, BESCOM to all registered shops in the complex. For the incrementally built shops in Block D, electricity connection was provided much later. While the provisioning of electricity connection is through BESCOM, the municipality (revenue inspector) collects the electricity bill payments. BBMP transfers the final amount to BESCOM.

Although the registered shops have electricity connection, it is not reliable, especially during rains. There is no generator, due to which black-outs are frequent. Street vendors depend on off-grid arrangements such as personal inverters or battery-powered lights.

Drainage, sanitation and solid waste management

BBMP is responsible for the maintenance and upkeep of the market, including the cleaning of the market premises every morning. The APMC pays INR 44,00,000 annually to the municipality towards cleaning costs.

The JCB Backhoe Loader clears the waste accumulated on the streets, with BBMP sanitation workers cleaning whatever remains.

There are no drains in the market, which leads to water loogging and flooding when it rains. The market closes when it rains.

Operations at Kalasipalyam Market

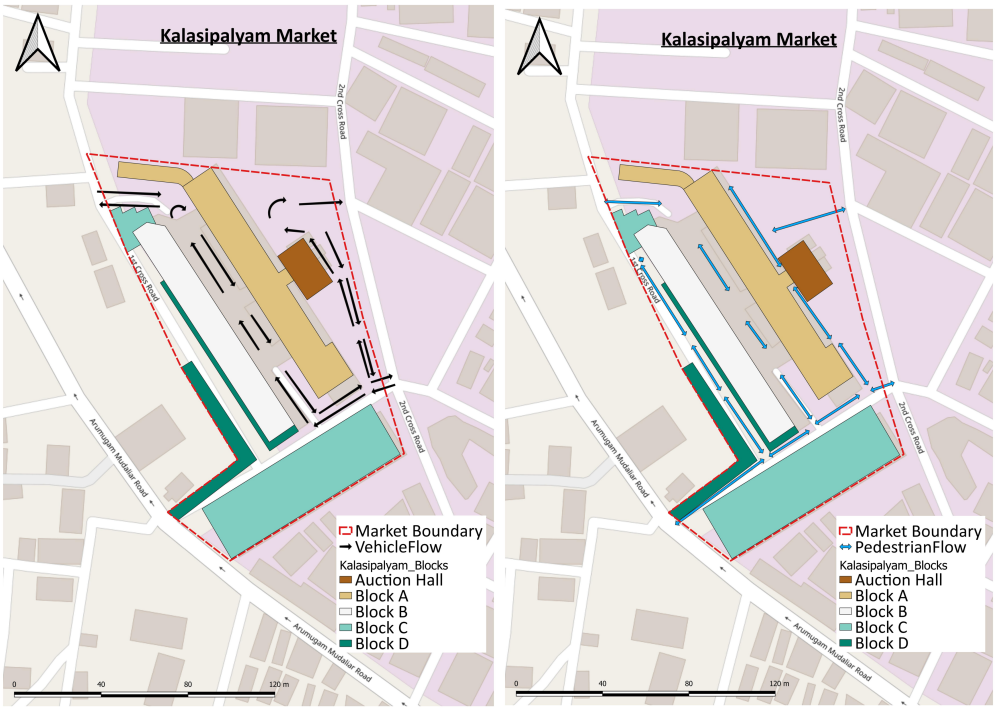


Figure 13: Operations in Kalasipalyam

Transportation

Vegetables sold in Kalasipalyam market are brought from all over India. Farmers, farmer associations and/or APMC send items via trucks daily, which reach the market at 3am every morning. Each commodity is transported separately. The cost of transportation, including toll costs uptil the market is paid for by the famers/ producers. Parking and entry fees are paid by either the logistics agency or the commission agent.

The market's unloading zone can handle 5 large trucks at a time. Unloading is on a first-come-first-served basis. No parking fee is charged for the unloading. Once emptied, the large trucks are parked on nearby streets in the neighborhood. The designated parking space within the complex is not used for parking but rather for auctioning. Smaller tempos catering to the retail shops in the market park near the main entrance. No parking fee is charged.

The auctioning mentioned above has important logistical implications. After the morning auction, the wholesale shops that have won the auctions, hire 'headloaders' and porters to transport the goods from the trucks to their shops. As the large trucks are restricted to the unloading zone in the market, these porters are an important part of the wholesale logistics system in the market. They are also

critical to the retail trade in the market as they also carry goods from the wholesale shops to the retail shops, when the retailers purchase items from the wholesellers or when they directly purchase items from the commission agents. These porters are however paid minimal amounts. They are typically migrant labourers from Bihar and Uttar Pradesh and many are employed by a labour middle- man, who is referred to as the 'malik' (which translates to 'owner'). This middle- man collects their pay and distributes it to them. Their payment is linked to weight of goods, type of goods and distance and ranges from INR 2 - 30 per bag, with INR 10 per bag being the average. Commission agents or shop owners make these payments.



Figure 14: Parking Space within the Complex



Figure 15: Push-cart

Storage

The market has no separate designated storage area. Shop- spaces on the ground floor are used for storage. Unused shop- spaces on the upper floor are not preferred for storage, as extra costs for logistics may be involved. There is no cold storage facility at the market, however the market typically functions on a day- long cycle, which does not necessitate cold storage. The movement of goods is rapid. Fresh produce is supplied daily, and stored at most for a day. Stocks are only stored and covered with tarpaulin sheets, in case unpacking has not taken place.

Communication

The registered wholesellers, retailers, commission agents and other main actors in the market rely heavily on mobile phones for organising their daily operations and trading activities, such as setting up orders, sharing information about delivery timings, goods' availability, logistics etc. Whatsapp groups are also used frequently.

The head loaders and porters are daily wage workers. They do not receive prior information or communication about when they will be needed. They arrive daily and wait in expectation of being picked by the labour middle- man to undertake deliveries for each day. The labour middle- man communicates with the commission agents about portage requirements, rather than the porters themseleves.

The financial transactions between different players in the market is undertaken either through cash or demand draft (DD). Digital transactions are not preferred as many do not own smartphones. Some retailers and wholesellers accept digital payments, but there is an overall preference for cash payments.

Pricing

The prices of the various commodities are influenced by the following factors:

- The quality of vegetable
- The season and market demand of the vegetable
- The pre-processing charges for sorting and cleaning
- The packaging charges
- The logistics charges to bring the items to the Kalasipalyam market
- The profit margin of wholesale traders in the Kalasipalyam market
- The delivery charges for distribution
- The profit margin of the retail vendors
- Price published by the APMC[17]

Following are the prices of few vegetables sold in the Kalasipalyam market:

Item	Final
Cabbage	The retail price per piece is INR8 to INR20 based on quantity.
Avarekai	Cost of one bag is INR3200 (approximately INR125/kg) when sold.
Ladies Finger	Bag resold for INR20-30 per bag when it is wholesale, and INR40-50 per bag when sold in retail.

[17] https://market.todaypricerates.com/Bengaluru-vegetables-price-in-Karnataka

Radish	Based on the quality of the item each bag is sold for INR200-350.
Shimla Mirch	Each bag is resold for INR500.
Ginger	The wholesale price of one bag is about INR5000-5500, while its retail price goes up to INR250/kg.
Suvarnagadde (Elephant foot yam)	Resold for INR60 per kg.

Commodity Flow at Kalasipalyam Market

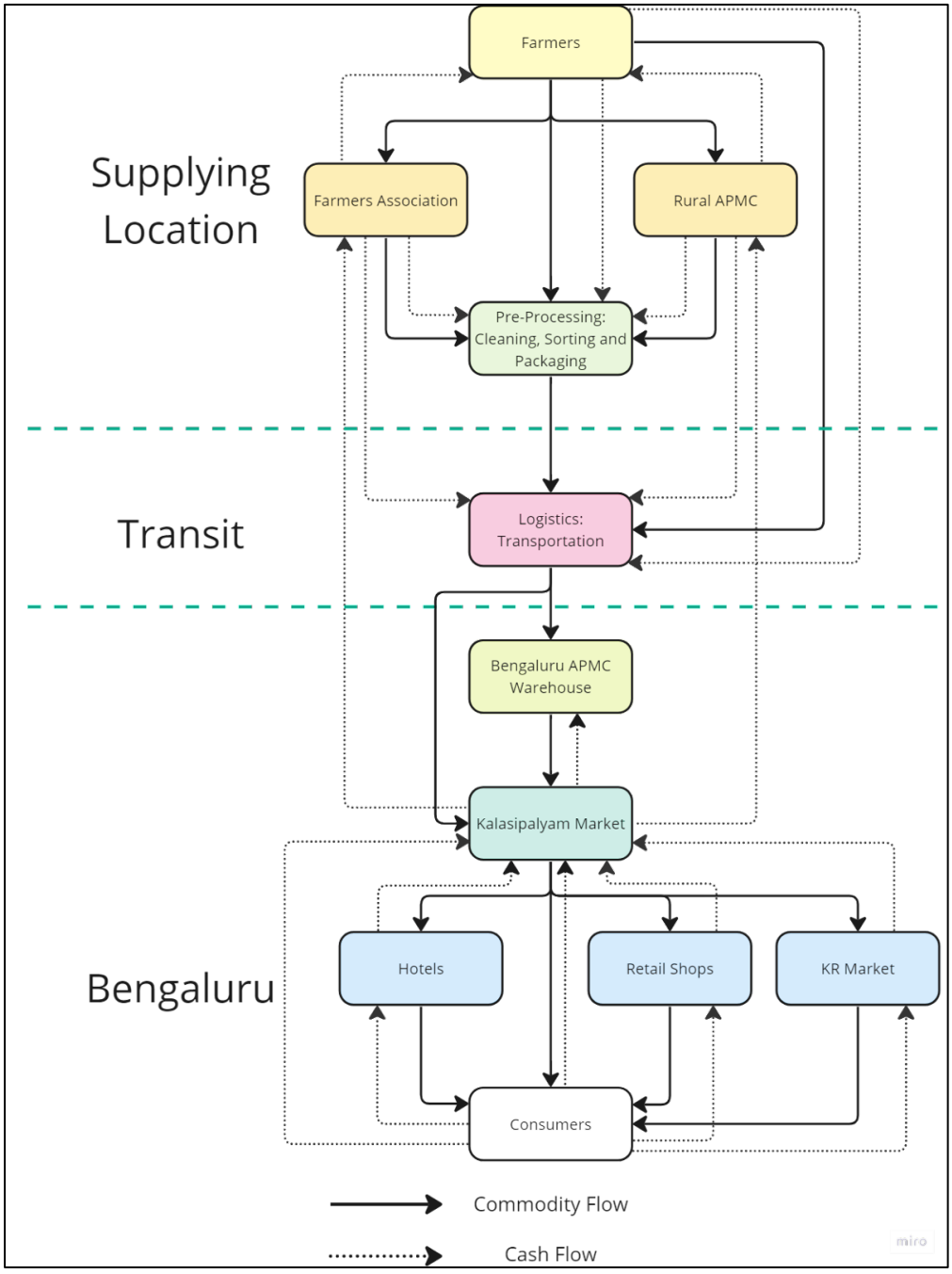


Figure 16: Commodity Flow for Kalasipalyam Market

The backward linkages that we discovered for the Kalasipalyam Market, are highlighted below:

1. Farmers: The storage and logistics of the vegetables upto the sale to the APMC or the farmers' association is managed by the farmers. They are paid for their produce within 1-2 days of delivering it. They sell to the rural APMC or the farmers association for pre-processing.

2. Farmer Associations: Farmers' associations are organised as per type of commodity or location. They handle the pre-processing of fruits and vegetables in many regions, especially those that need more attention with regard to cleaning, packaging and storage. These associations exist to safeguard the interests of farmers growing a particular vegetable/ fruit. They also help farmers understand what is to be grown in the next cropping season.

3. Rural APMCs: The rural APMCs are the alternative to farmers' associations and play a major role in aggregating vegetables from various farmers and pre- processing, i.e. sorting, cleaning and packaging of items before they are delivered to the Kalasipalyam or Bengaluru APMC storage warehouses. They are in charge of the logistics of items until it reaches the Bengaluru markets. The rural APMC negotiates with the Bengaluru APMC regarding the prices when it is not favourable to the farmers.

4. Bengaluru APMC: Rural APMCs and farmers associations deliver their produce to the Bengaluru APMC, which sets the minimum selling prices[18] of different items each day before they are transported to Kalasipalyam market. The items whose prices are not decided by the Bengaluru APMC are determined via auction at the Kalasipalyam market everyday. Bengaluru APMC is also critical in providing warehouse facilities to the commission agents in case there is a drop in the price of the commodities so as to maintain the market rate and ensure fair prices to everyone. These warehouses are developed by the state or the central government from the commission charges that are collected.

The forward linkages that we discovered from the Kalasipalyam Market, are highlighted below:

1. KR Market: The KR Market is the oldest market in the city and also called Bengaluru's city market. It is the city's main retail market for fruits and vegetables. It is located close to Kalasipalyam market and gets its daily supply of fruits and vegetables from there, each morning, after auctions (used as a price- setting mechanism) are completed at Kalasipalyam. Autos and push-carts are used to transport goods to KR market.

2. City- level retail outlets and vending: Most city- level retail outlets and vendors of fruits and vegetables buy their produce at KR Market and sell at the neighbourhood scale.

[18] The link which the vendors use to check the prices of various commodities is http://www.krishimaratavahini.kar.nic.in/MarketApp.apk.

Value chain at Kalasipalyam Market

The research team has mapped the value chain for some of the critical food commodities. The table below summarizes value addition at each of the critical steps of procurement, pre-processing (sorting, cleaning), packaging and distribution.

Item	Procurement	Pre-processing	Packaging	Distribution	Final Pricing
Cabbage	90% of sales goes back to farmers association or rural APMC and 10% is retained as commission.	Sorting and cleaning carried out by the farmers' association or rural APMC	Packaging into plastic mesh bags is carried out in the farmers' association or the rural APMC. One bag contains 30 kg of cabbage.	Coolie charges begin from ₹5 and go up to ₹20 per bag based on the distance of the truck from the shop for cabbages.	The retail price per piece is ₹8 to ₹20 based on quantity.
Avarekai	Items procured from farmers association or rural APMC.	Sorting and cleaning carried out by the farmers' association or rural APMC	Packaging into plastic mesh bags is carried out in the farmers' association or the rural APMC. One bag contains 25 kg of avarekai.	Coolie charges are about ₹10 per bag.	Cost of one bag is ₹3200 (approximately ₹125/kg) when sold.
Drumstick	Items procured from farmers association or rural APMC.	Sorting and cleaning carried out by the farmers' association or rural APMC	Cleaning occurs at source. May or may not be packed into fiber bags. Fiber ropes are used to tie a bundle together.	Coolie charges vary based on the shop location.	Not known.
Ladies Finger	Supplier not fixed. Sometimes from rural APMC/farmers association and sometimes directly from the farmers. Buys 50kg bags of ladies finger for ₹0.80, ₹1 and ₹2 for poor. Average,	Sorting and cleaning occurs at source.	Packed in plastic mesh bags at a source of 50 kg each.	Shop is located near the entrance of the complex so distance is not a factor. Instead the coolie charges vary between ₹5-10 per bag based on the quality of	Bag resold for ₹20-30 per bag when it is wholesale, and ₹40-50 per bag when sold in retail.

Item	Procurement	Pre-processing	Packaging	Distribution	Final Pricing
	and high quality of the food items.			the ladies finger.	
Radish	Procured for ₹100-150 per bag. Obtained from the farmers association or rural APMC	Cleaning of radish occurs at source. Sorting occurs based on the size of the radish.	Items are packed beforehand into bags of 20kg capacity.	Shop owners hire workers who have 10 hrs shift and are paid ₹800 per shift. They guide the coolies in unloading.	Based on the quality of the item each bag is sold for ₹200-350.
Shimla Mirch	Bought for ₹300 per bag.	Sorting and cleaning occurs at source.	Packed in jute and fiber bags.	₹10 per bag is the average coolie rate.	Each bag is resold for ₹500.
Ginger	One bag is obtained for ₹2000-2500. It is brought from Chikmagalur with 210 bags in one truck.	Cleaning occurs to remove the dirt.	Packed in jute and fiber bags of 60 kg capacity.	₹12000 is paid for the truck delivery to Kalasipalyam market. ₹10 per bag is the average coolie charge.	The wholesale price of one bag is about ₹5000-5500, while its retail price goes upto ₹250/kg.
Suvarnagadde (Elephant foot yam)	Obtained from Salem for ₹50 per kg.	Cleaning is carried out at the source.	No packaging is involved for this item.	Not known.	Resold for ₹60 per kg.

Yeshwantpur APMC

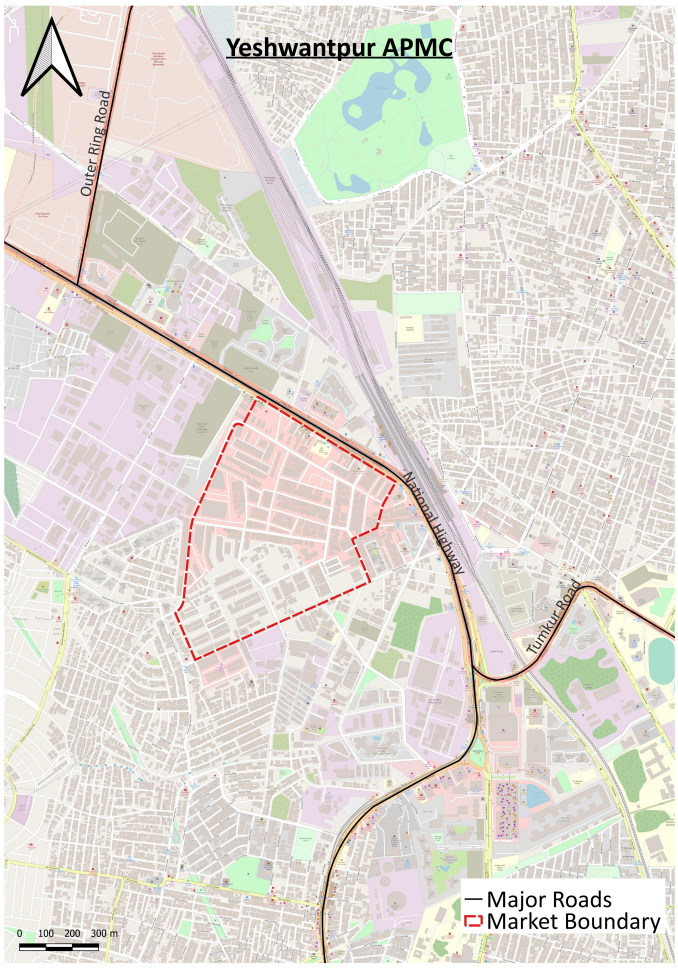


Figure 17: Yeshwantpur market location

The Yeshwanthpur APMC yard, spreads across 85 acres, and is one of the largest markets for farmers and traders across India. It was established in 1955. It is one of the biggest markets for onions in South India. 92 commodities are traded here. Many buyers and sellers are from outside Bengaluru; hence the commodities traded are mostly those with longer shelf life, such as onions, potatoes, garlic, ginger, chillies, coconuts, and food grains including wheat, maize, ragi and rice. Each commodity is traded at specific and separate places in the yard.

There are around 1,597 licensed commission agents registered at this market. Commission agents act as facilitators between farmers and buyers. As per media reports, over 3,600 tonnes of onion and potatoes are brought in daily. On an average, the market receives 20,000 bags of onions and potatoes daily, with each bag selling between INR 600-1,500 depending on the variety, quality and market price for the day. This translates to an average of INR 1000,000 per day in commission fees[19].

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Different commodities have their own Sanghas - group of farmers who grow the same crop. The members of a Sangha mutually decide the rate for their produce and put forth their issues regarding growing & sale of the crop to the Karnataka APMC. The farmer/ Sangha is charged only for the services of the '*hamali*' (who loads and unloads sacks of produce), at the rate of INR 10 per sack. Agents earn by charging a commission of 5% from the buyer for the produce they sell. The agents play a key role in

[19] Yeshwanthpur APMC yard: A marketplace for farmers across India - Citizen Matters, Bengaluru
[20] Yeshwanthpur APMC yard: A marketplace for farmers across India - Citizen Matters, Bengaluru

facilitating trade between farmers and buyers, especially in the case of perishable vegetables like onions and potatoes. The agents receive farmers' produce, which is then auctioned in their shops to a handful of buyers who are retail traders or agro-industry representatives. Many agents themselves own retail stores, or are exporters. APMC is responsible for setting a minimum price every day. Post that, at 9am, the auction starts and open bids are heard. The stocks are sold to buyers from across the country. The amount is paid in cash or through cheques and bank transfer[21].

The APMC only facilitates trade and acts as a safety net for the farmers. Farmers may lodge a complaint with the APMC when a buyer fails to pay or underpays them, which can also lead to the buyer being blacklisted from the market. This committee is entrusted with enforcing norms of Minimum Support Prices [MSP] announced by the government. They also issue the licenses for the commission agents and traders[22].

The Committee is tasked with development and maintenance of the market, which it carries out by collecting a market fee of 0.35% on transactions within the yard. As of 2020, the average daily turnover was in excess of INR 500,000,000 at the yard, with INR 1,750,000 collected daily as market fees[23]. Before 2020, the market fee was higher at 1% for onions and potatoes, and 1.5% for other produce. However, Covid-19 reduced sales in the market, which made APMC lower its market fee rate. The Committee also charges an annual license fee from agents/traders[24].

Market Layour and Retail Spaces at Yeshwantpur Market

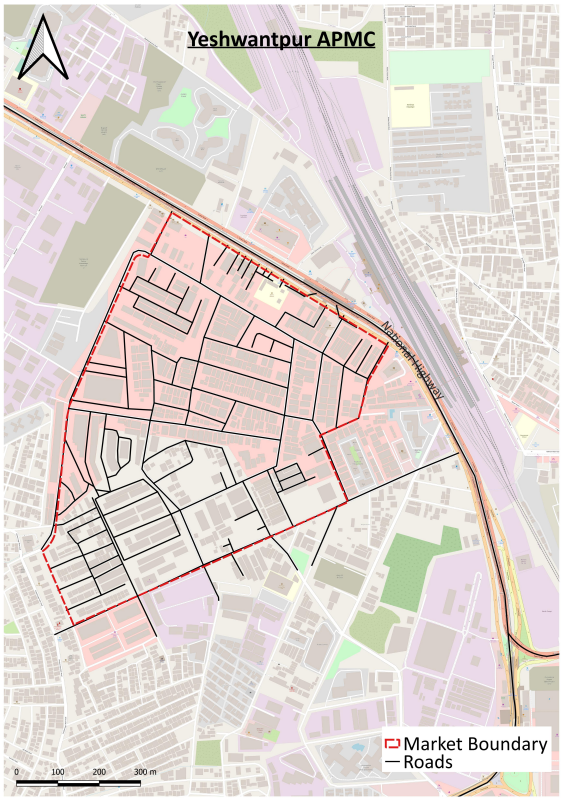


Figure 18: Yeshwantpur APMC Market

The market is well connected to an extensive city-level road network. The roads within the APMC are also of good quality with ample space for trucks to come inside the market and park in front of the shops for unloading and auctioning purposes. This is essential as each truck approximately carries about 25 metric tonnes of stock. The market comprises mostly of APMC registered shops with a few farmers and traders selling their wares through the license of a registered shop. All shops are permanent structures. The BBMP revenue inspector collects rent for the premises on a monthly or yearly basis. The size of shops is nearly uniform throughout the market.

[21] Yeshwanthpur APMC yard: A marketplace for farmers across India - Citizen Matters, Bengaluru
[22] How Bengaluru's APMC yard works and what it means for farmers: Here's all you need to know - Citizen Matters, Bengaluru
[23] How Bengaluru's APMC yard works and what it means for farmers: Here's all you need to know - Citizen Matters, Bengaluru
[24] How Bengaluru's APMC yard works and what it means for farmers: Here's all you need to know - Citizen Matters, Bengaluru

Retail and Vendor Typologies at Yeshwantpur Market

Typology 2A: RMC Registered Shops

The market comprises mainly of shops registered under the Yeshwantpur APMC/ RMC. These shops receive their supplies early in the morning (around 4am) and begin storing the items (mostly onions). The shops are used for storage while the items are shown for display on tarpaulin sheets, in front of the shops. At around 10am, the market commences its wholesale trading. Retailers from all across the city and southern part of India buy stock from the APMC market. The wholesale market continues for about 2 hours, by the end of which most of the items are sold. In case there is any stock that remains, the commission agents store them in the shops itself and sell them the next day. Since new produce is brought everyday to the market it is preferred to sell the produce within a day (before it loses its freshness).

Typology 2B: Unregistered Traders

There exist many farmers and traders who display their wares on tarpaulin sheets and sell directly from the trucks. They do not own any shop in the market and instead pay a commission to existing agents to gain entry to the market. These vendors look to clear their stock the same day and offer much lower prices at the time of the morning market closing. The farmers and truck drivers come from rural areas and prefer to leave in the evening of the same day.

Infrastructure at Yeshwantpur Market

Electricity

BESCOM provides the electricity connection to the shops in this market. A meter has been installed in each shop and bills are issued every month. Those vendors who do not own a shop use battery-powered lights and battery weighing scale instead of the electronic weighing scale. Some vendors share the weighing scale with the commission agents.

Water

There is no direct water supply to the market. A private entity supplies 20L water cans to most of the shops and headloaders every day. This system still continues as there is no demand for piped water, which is needed if cleaning of items is required.

Sanitation

The APMC has built and maintains two public toilets in the market which is used by the commission agents and the headloaders. An extensive drainage system prevents rain water runoff from entering the shops. This enables the shop to be used for the storage of produce.
Waste from the shops and in the market is collected by the BBMP after the morning market hours and is disposed away as organic waste.

Security

The local policemen are in charge of the security for the market as well as the ward. The APMC has hired security guards at the gates of the market. These guards prevent unlicensed vehicles from entering the market. The guards are present throughout the day in two 12-hr shifts.

Operations at Yeshwantpur Market

Transportation

Transportation of goods to the APMC yard is mainly through trucks. Transportation is handled by the suppliers of the produce to the market; the farmers or the rural APMC. The usual price of hiring a 20-ton truck for one trip is INR 25,000 – INR 30,000. Farmers often pool their produce and hire one truck to reduce the cost of transportation. The commission agents in the APMC are not responsible for transportation.

The 'hamalis'/ headloaders/ porters at the APMC unload the stock and reload it in Light Commercial Vehicles (LCVs), which are used by retailers. The commission agents pay for the unloading of onion bags from the trucks while the retailers pay for the loading of the bags from the shop into the LCV or auto.

Storage

There are no storage facilities available with the rural APMCs or the Sanghas to store goods in times of supply and/ or price fluctuations. Farmers who want to benefit from price fluctuations of onions, use their fields as storage spaces but this affects the quality of the produce. The warehouses constructed by Bengaluru APMC are also not being used for storage.

Communication

Most of the stakeholders across the supply chains use mobile phones and telephones extensively, to discuss delivery schedules, orders and price points. Communication infrastructure is critical for farmers to determine when and to whom produce has to be sold. Most truck drivers and headloaders also have access to mobile phones. Commission agents, farmers and retailers often coordinate with the transporters and headloaders using phones.

Commission agents make payments to farmers via Demand Drafts (DD). This is done to get official visibility on the transactions and helps to ensure that prices are regulated within the market. Cash payments are typically made to headloaders and transporters within the APMC. However, most retailers have now started using digital payment infrastructure to pay commission agents. The rent to BBMP paid by each shop is collected through cheques or DDs for greater transparency in payments and records.

Pricing

The prices of the various commodities are influenced by the following factors:

- The quality of the commodity
- The season and market demand of the commodity
- The pre-processing charges for sorting and cleaning
- The packaging charges
- The logistics charges to bring items to the APMC market
- Typology of shop
- The profit margin of wholesale traders in the APMC market
- The delivery charges for distribution
- The profit margin of the retail vendors

Pricing mechanisms are set via two scenarios within the market:

- Scenario 1: In this case, farmers enter into an oral agreement directly with the commission agents who are based in the APMC markets. The commission agent is responsible for selling the entire stock and charging a commission fee from the farmer. The commission agent and the farmer mutually determine the commission fees. The fees may be 10% of sales, rent for the vending space or a fixed price; depending on the relationship between the two parties. Once this is agreed, farmers send their produce to the commission agents who are then tasked with selling the entire produce within a day or two. In this scenario, given the commission agent is involved, the agents can also store their procured produce in their respective shops at APMC market and demand a better price. However, most commission agents aim to sell stock in one-two days.



Figure 19: Onion Bags sold by a Commission Agent

- Scenario 2: Farmers rent a vending space from one of the commission agents for INR 6,000 for entry into the APMC market. Sometimes the farmers may bribe the gatekeeper for entry. The produce is then displayed on tarpaulin sheets and sold at a wholesale price directly from the trucks. The farmers ensure that all their stock is sold quickly as they do not have a place to store the produce.



Figure 20: Onion Bags sold by a farmer

Further, the minimum selling price is determined by the Bengaluru APMC to ensure fair price for farmers. Seasonality plays a strong role in determination of the price of the commodity. For example, during summers, the minimum price of onions is around INR 1500/bag and the farmers aim to sell it at INR 2500 – INR 3000 per bag. When the demand is high for onions an auction is conducted every day within the market to let the highest bidder secure the produce. The profits gained through an auction is higher for both the farmer and the commission agent, though this process is sustainable only when there is sufficiently high demand for the produce. An auctioneer will announce the quality and quantity of the onions while the commission agents will place the bids when the produce enters the market.

Commodity flow at Yeshwantpur Market

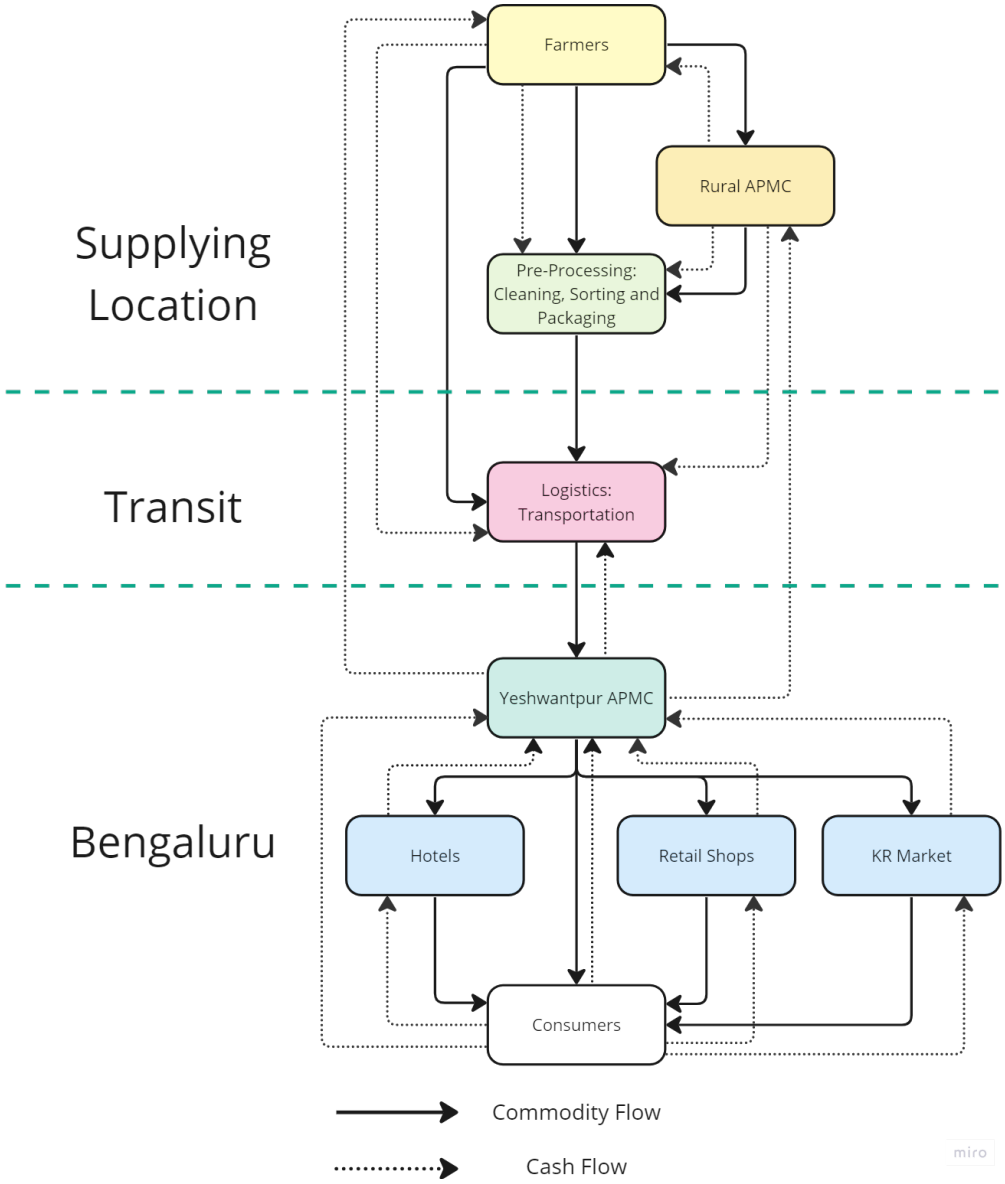


Figure 21: Commodity Flow for Yeshwantpur APMC Market

The backward linkages that we discovered for the APMC Yeshwantpur, are similar to the Kalasipalyam market. However, given the longer shelf- life of the commodities handled at the Yeshwantpur APMC, some of the details are different and are highlighted below:

1. Farmers: Farmers grow onions and look at storing it in the fields itself when the market price of onions is low. When the market price is profitable the farmers look towards maximizing gains by selling either to the rural APMC or commission agents in other APMCs, e.g. Bengaluru. The farmers usually sell to the rural APMC when the profit margin from sales in other APMCs is low, and look to transport their produce when gains are higher in other APMCs. It is noticed that the prices in Yeshwantpur APMC are reasonably sustainable for the farmers as compared to other city markets where the margins fluctuate widely.

2. Rural APMC: The rural APMC buys produce from farmers. Cleaning, sorting and packaging of produce is carried out by them. The rural APMC then maps the demands at various APMCs and supplies the stock accordingly. Most times, the stock is supplied to Bengaluru APMC given the high demand.

The forward linkages for the APMC Yeshwantpur, are also similar to the Kalasipalyam market and include KR Market, retail shops throughout the city as well as bulk consumers such as restaurants.

Value chain at Yeshwantpur Market

The research team has mapped the value chain for onion. The table below summarizes value addition at each of the critical steps of procurement, pre-processing (sorting, cleaning), packaging and distribution.

ITEM	ONIONS
Procurement	Commodities with longer shelf life are traded - with focus on onions. The procurement takes place from Vijayapura, a district in Karnataka.
Pre-processing	Manual labour is hired to remove dirt from the onions.
	Produce is cleaned of dirt and sorted based on quality (A, B and C grade) before being filled into plastic bags of 40-60 kgs capacity. There is no usage of water, and the activity is done using hand and a rough cloth.
	Labour cost is INR 400 per day for cleaning, sorting and loading in trucks. Working hours are between 10 am to 4 pm. In case there is work outside the working hours, labourers charge a price between INR 2 – INR 5 per bag.
Packaging	Onions are then packed in plastic bags. The plastic bag cost an average of ₹0.20 per bag, and must be less than 500grams. The bags can hold upto 50kg of weight.
	Cost for cleaning and packing onions into the bags comes out to be INR1- 2 per bag on an average, and INR4 per bag when the demand is high.
Distribution	Cost of transportation of one truck to the market comes around INR25,000 - INR30,000 for the farmers or the rural APMCs.
	Headloaders charge based on the quality of item and the distance of the shop from the truck.
	Price per bag is usually INR5 per bag, with the minimum being INR1 per bag in off-seasons and INR10 per bag when demand is high.
	The price of the coolie is usually covered by the end consumer, where the coolie will shift the bags to the designated location/LCV of the consumer.
	The transportation cost for the LCVs is borne by the retailer and not the commission agent.

Electronic City APMC

Government of Karnataka created the Electronic City fruit market as a separate larger market to decongest the space at Kalasipalyam market and create a separate APMC. There was initial resistance from the vegetables and fruits wholesale merchants association at Kalasipalyam, however later the move was accepted[25]. This shift has come during the time of the Covid pandemic, when physical distance was critical.

[25] https://timesofindia.indiatimes.com/city/bengaluru/traders-in-kalasipalyam-market-upbeat-about-moving-to-e-city/articleshow/81455542.cms

The market is managed by the APMC and comprises over 500 shops. It is connected by Huskur road which joins the Electronic City flyover, allowing for easy access to the market by multi-axle trucks. The road network within the market also provides ample space for unloading and parking without interrupting the business of other shops. The roads are well maintained with drainage and footpaths.

Shops within the market are used by the commission agents who exclusively deal in fruits such as apples, mangoes, oranges, watermelons, plums and muskmelons among a few examples. The shops are customized to deal with the type and quantity of fruits. The size of shops is uniform within a block.

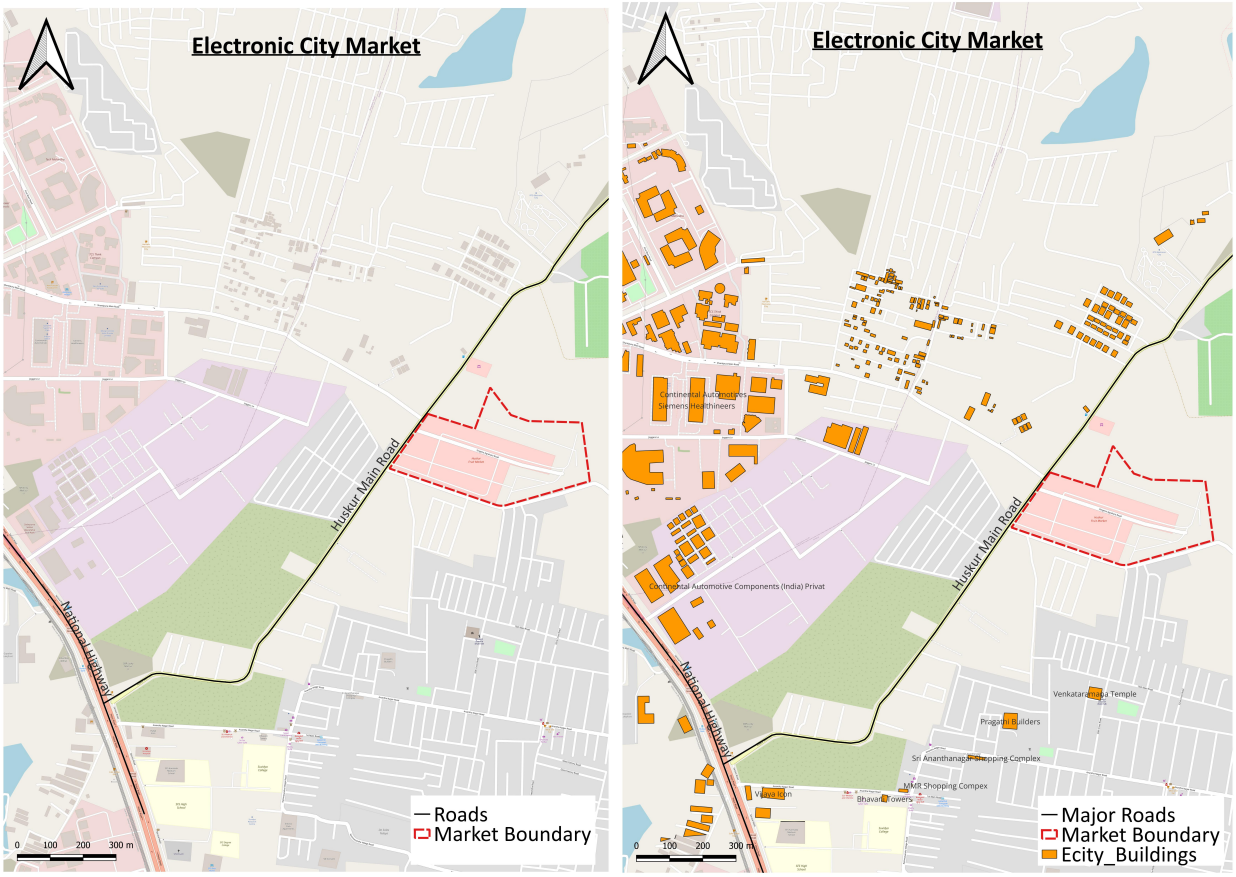


Figure 22: Electronic City Wholesale Fruit Market

Market Layout and Retail Spaces at Electronic City

The Electronic City APMC is organised into three main zones, with the largest shops located near the main entrance. The mid- size establishments are mid- way, while the smallest establishments are the furthest away from the main entrance. The layout is organised to ease the traffic conditions within the market and make it easier for the different size vehicles that cater to the different size establisments. Large trucks cater to the large establishments near the main entrance, LCVs cater to the mid- size establishments, while both auto- rickshaws and LCVs cater to the needs of the smallest establishments.

The fruit wholesale market is registered under the APMC. There is no monthly or yearly rent that is the paid to any institution. Private individuals directly buy the shop from the APMC and pay a license fee for trading in the market. APMC license fee is about 2% of the weekly total sales made by the commission agent. Sub-leasing is also prominent in this market where lease amount varies in accordance with the location of the shops.

Retail and Vendor Typologies at Electronic City

Typology 3A: Large-scale Wholesale Shops with Cold Storage



Figure 23: Two-storey Large-Scale Shops

These shops are located close to the entrance of the market and deal in bulk orders to other districts in the state along with sales to the local markets. They are the largest in size, in the market, and have space for storage. Most of these shops have cold storage facility with a small office setup. They usually deal in only one kind of fruit. Samples of their commodities are shown for auctioning in the morning and buyers that win load the fruit onto their trucks and transport them out. These shops often have regular customers who pre-place orders and collect the produce regularly.

Typology 3B: Large-scale Wholesale Shops with Normal Storage

These shops are located close to the entrance of the market and deal in bulk orders to other districts in the state along with sales to local markets. These shops are also large with room- temperature storage spaces, and an office setup. They usually deal in two to three kinds of fruit. These shops also show their goods for auctioning in the morning, with a similar system of buyers using trucks to transport out their purchased stock. These shops also have regular customers and deal with pre-placed orders.



Figure 24: Large-Scale Shops with Storage Space

Typology 3C: Medium-scale Wholesale Shops

The main difference with the two previous typologies is in term of of size of shop and location within the market. These shops smaller, although they still have storage space (room- temperature) within the shop- space. They are located further away from the main entrance. They engage with both bulk wholesale orders, with some regular orders from repeat customers, as well as daily sales. They are more vulnerable that the largest establishments, as they have a smaller buyer base. These shops deal in two-three fruits. Transportation used by buyers include trucks and LCVs.



Figure 25:Medium-Scale Wholesale Shops

Typology 3D: Small-scale Wholesale Shops

The smallest shops are located further inside the market. They trade 4-5 types of fruits and act as a one-stop shop for retailers, who come from across the city. They deal with the smallest quantities and they do not guarantee/ promise the supply of any particular variety of fruit. Bargaining rather than auction is the main form of price- setting here. Retailers that make the purchases use LCVs and autos to transport their purchses. Many of these shops display their items in the open air, on tarpaulin sheets

and wooden/plastic crates. This makes their sales highly vulnerable to rain and their profits are sometimes hampered because they need to clear out items quite quickly due to limited storage space.



Figure 26:Small-scale Wholesale Shops

Typology 4: Roadside Vendors

The market also have roadside vendors who usually buy one type of item from the medium-scale wholesellers and sell to retailers. They do not own a shop- space and set-up their stalls on the side of the road close to the small-scale wholesale shops. They preferably procure items that are in demand. In summer they sell pumpkins and oranges.



Figure 27:Roadside Vendors

Infrastructure at Electronic City

Electricity

The shops in the market are provided with metered electricity connections by the BESCOM. The bills for the service are issued on a monthly basis.

Water

The lack of water supply has led to the commission agents relying on 20 litre water cans for drinking and water tumblers for cleaning purposes (if required).

Sanitation

A well laid drainage system ensures that there is no rain water run-off, though the dumping of organic waste into the drains leads to water logging in some places.

Security

Security guards verify the gate pass and collect the entry fee for the freight vehicles, at the entrance of the market. The Bank of Baroda, located within the market, has its own security guard for the bank and the ATM.

Operations at Electronic City

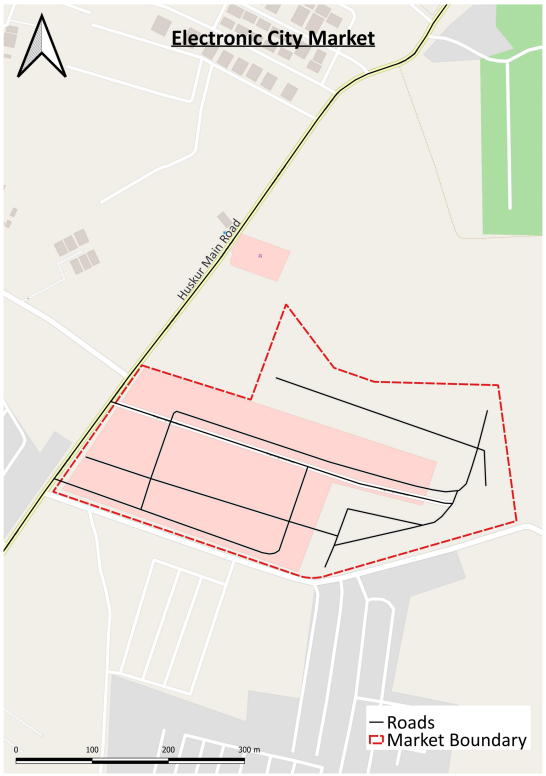


Figure 28: Road network at Electronic city

Transportation

Multi-axle trucks, cold storage trucks, regular 20–25-ton trucks and LCVs are all used to transport fruits from all over the country. This freight transportation is usually handled by the supplier or by logistics agents. However, the cost is borne by the commission agents of the electronic city market.



Figure 29: Cold-storage Truck parked in Front of Shop

The wholesalers from various nearby districts and within the city procure the items needed and transport them with the help of 20-25-ton trucks and LCVs. This transportation cost is borne by the customers. The items requiring cold storage or having a shorter shelf life are usually distributed within the city.

The trucks and LCVs are parked in front of the shops when loading or unloading of fruits is taking place. Once the vehicles are ready they are moved out of the market immediately to make way for other vehicles preventing congestion within the market.



Figure 30: Loading of Items into LCVs

Storage

There are no common storage facilities within the market. Each commission agent has redesigned their respective shops to cater to the fruits they trade-in. The commission agents dealing with seasonal fruits usually have multiple partitions made of wooden planks or metal mesh within their shop space for

sorting and auctioning. Some agents have added another floor within their shop for storage. Agents dealing with one fruit throughout the year usually use cold storage and ripening sheds. Most of this storage infrastructure is created by the commission agents themselves.



Figure 31: Additional Floor Space with the Use of Crates for Storage

Communication

Communication is a critical infrastructure for the Electronic City market. Given the absence of a fixed supply chain, orders are placed and logistics is coordinated via continuous communication between multiple actors. Commission agents contact multiple suppliers before procuring an item. The negotiation of price takes place over the phone call though minimal discounts are given to regular commission agents. Based on the location and type of commodity the supplier reaches out to different logistics groups for the delivery of the fruits.

Minimum market price for each commodity is published on the internet. Most farmers and commission agents primarily use the internet and social media to check minimum market prices, as published by the Karnataka APMC.

The payments across different nodes of the supply chain are usually through cheques and cash. The use of digital transactions is not preferred due to the volume of transactions. Larger money transactions are carried out through cheques while the smaller transactions are done through cash.

Pricing

The prices of the various commodities are influenced by the following factors:

- The quality of the commodity
- The season and market demand of the commodity
- Import charges of the commodity
- Pre-processing charges for sorting and cleaning
- Packaging charges
- Logistics charges to bring items to the APMC market
- Typology of shop
- Profit margin of wholesale traders in the APMC market
- Delivery charges for distribution
- Profit margin of the retail vendors

The minimum price of the fruits is fixed everyday by the APMC. The items whose minimum price is not set by the APMC and those items which are in high demand are usually auctioned. The auctioning takes place in the respective commission agent's shop where multiple retailers assemble around a hired auctioneer for a particular commodity.



Figure 32: Auctioning of Mangoes to Retailers

Commodity Flow at Electronic City

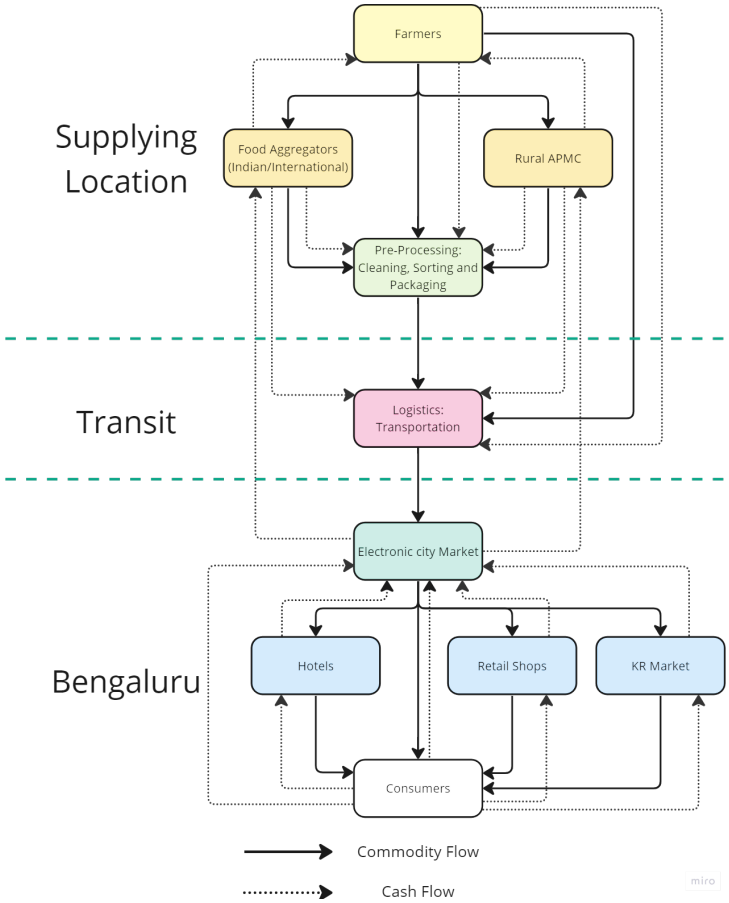


Figure 33: Commodity Flow for Electronic City Market

The backward linkages from the Electronic City fruit market include:

1. Farmers: The farmers sit at the primary node of the fruit supply chain. They sell their produce to fruit aggregators, mostly without sorting or cleaning their produce. The entire produce of multiple farmers is bought by a single aggregator, who sets the price based on the different qualities and quantities of produce. If a farmer is growing more than one type of fruit then it is sold to multiple fruit aggregators.
2. Wholesale Fruits Aggregators: There are fruit aggregators who buy fruits from various farmers and carry out the task of sorting and cleaning. Based on the quality and quantity of fruit, they maintain an inventory and sell to various wholesalers throughout the country. The items are packed in wooden boxes, plastic crates or jute bags based on the type of fruit. Many times, the aggregator may be in another country and export the fruit to an Indian fruits aggregator. This is especially seen in the case of exotic fruits and apples.

   The aggregators have their own logistics network or hire a logistics agent for transporting as the aggregators usually deal with only one particular commodity and are better informed regarding the type and duration of delivery. The trucks may have a cold storage facility or have a closed roof based on the type of fruit being transported. One type of fruit is usually transported by one truck. The cost is borne by the buyers but it is the duty of the aggregator and logistics agent to ensure the quality of the fruit remains the same. This cost will vary based on the type of truck and the distance for delivery.

The trade at the Electronic City market is primarily undertaken by commission agents. The forward linkages are primarily retailers across the city and sometimes from outside Bengaluru as well.



Figure 34: Corridor to Block C and Block D

Value Chain at Electronic City

Value chain	Mango	Apple
Procurement	Procured from all over the country. It is bought based on the number of crates, where one crate can hold up to 25 kg of mangoes. The Mallika variety is bought for ₹30 per crate.	Imported from Iran, locally brought from Kashmir, Srinagar, Shimla. etc. • Iran → Iranian local agents → Imported to India (Usually Mumbai) → Import agent in Mumbai → Shop owner in Electronic City → Wholesaler/Retail • Rural farmers → Rural agent → Shop owner in Electronic City → Wholesaler/ Retail The amount procured is based on demand.
Pre-processing	Fruits are sorted and placed in different crates based on the variety before it is bought by the commission agents.	Apples are sorted based on variety and quality by the fruit aggregator before transporting it to the market.
Packaging	Plastic crates of 25 kg capacity are used for packaging mangoes. When the mangoes are needed to be ripened the commission agent wraps the mangoes in layers of newspaper while adding an ethylene ripener for each crate.	The apples are packed into plastic crates of 20 kg. The apples may or may not have plastic mesh covering.
Distribution	Fruits are brought to the market through trucks of the supplier or the logistics agent, the cost of which is borne by the commission agent. Retailers arrange for the transportation of fruit from the electronic city market to their shops by LCVs or autos. Coolie charges are about ₹10-20 per crate for loading and unloading.	The apples are shipped from Iran in cold storage container ships to the Mumbai port, where it is shifted to cold storage trucks for transportation to the market. If the apples are from Kashmir then cold storage trucks are used to bring the fruit directly from the aggregator to the e-city market. Further distribution occurs in LCVs and autos if it is within the city, else through cold storage trucks to other districts of the state.
Price	Mallika variety was bought for ₹30 per kg for a crate of 25 kgs. It was resold for ₹50 per kg for a crate while its retail price is ₹100 per kg.	Every day one lakh boxes of apples are sold.

KR Market [Krishna Rajendra Market]

KR Market is located in the heart of the city between Avenue road and Bengaluru Fort. KR Market as a trading spot existed much before the formal establishment of the market, in an area which acted as a buffer zone (earlier a battlefield) between the native town and the fort area. There used to be an extensive platform known as Siddikatte where vendors from nearby villages sold their produce and this area soon developed into a market place. The market continues to be a one-stop shop for flowers, dry fruits, and items for festivities, rituals and ceremonies. It attracts a lot of footfalls, and is currently under redevelopment as part of the Smart City project. The slow pace of the project has deeply impacted trade for a lot of traders[26].

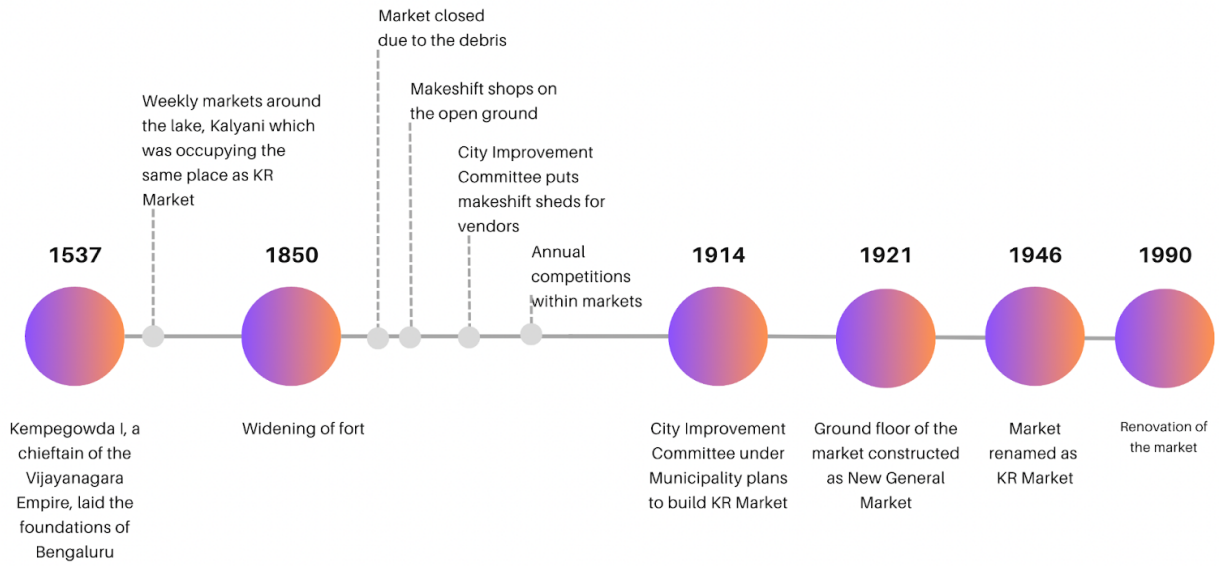


Figure 35: Timeline of KR Market

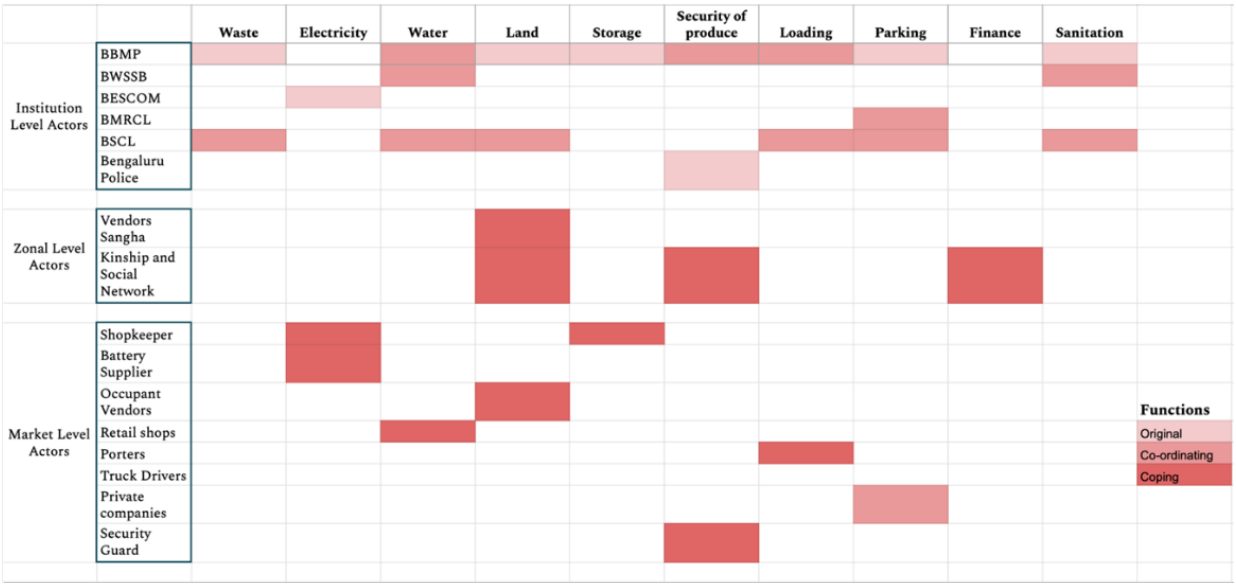
The KR Market building, with its red brick arch and clock tower, was initially constructed in the 1920s[27]. Subsequently, in 1997, the building underwent reconstruction. Patel, S et al elaborate on the implications of the new design of the building[28]; a 100,000 sqm space with shell roofs to allow for sunlight. Traders were relocated from their outward facing establishments to the building, which significantly changed their visibility and logistics and severely affected the viability of their businesses. Political negotiations took place for acquiring stalls within the building, as traders wanted a stall on the ground floor, near the entrance. Given the lack of visibility inside the building, traders who were allocated space on upper floors etc. leased out their shops inside the building (for storage etc.) and moved back to the front road[29]. Further, this infrastructure project failed to provide basic services such as access to sanitation, spaces to rest, drinking water and waste management services. The market space was further reduced after the construction of an elevated highway. Street vendors below the flyover were most affected. The two mega projects had limited involvement of the elected representatives, resulting in minimal participation from the traders[30].

Governance

In the figure below, the 'original' mechanisms marks the infrastructural/ operational/ service mechanisms, which are managed by an institutional stakeholder. For example the BBMP is responsible for the waste management and disposal in the KR Market. No other stakeholder is involved in this

[26] https://www.deccanherald.com/city/bengaluru-infrastructure/smart-city-works-hit-kr-market-traders-the-hardest-1124418.html
[27] https://www.joinpaperplanes.com/the-legacy-of-kr-market-in-bengaluru/
[28] (Patel, S et al, 2021)
[29] Leary, M. E., & McCarthy, J. (Eds.). (2013). The Routledge companion to urban regeneration (pp. 1-616). London
[30] Leary, M. E., & McCarthy, J. (Eds.). (2013). The Routledge companion to urban regeneration (pp. 1-616). London: Routledge. Chapter by Lalitha Kamath

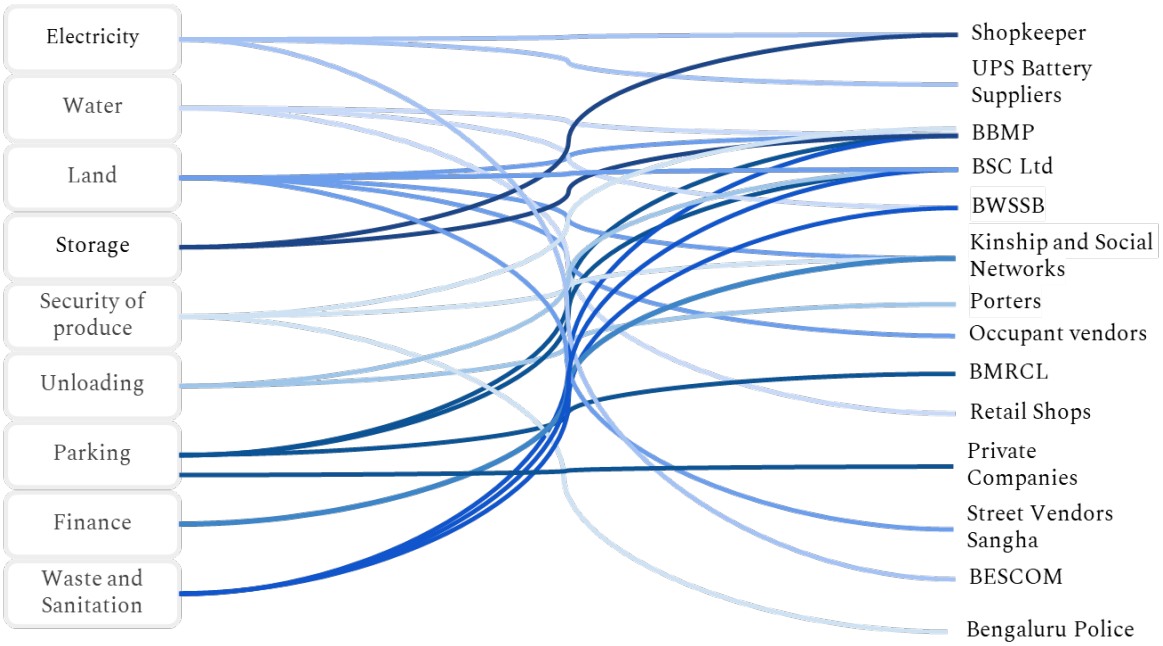
service. Next, there are 'co-ordinating' mechanisms, where more than one stakeholder is involved in providing a single service. For example, the provision of water to the market and maintenance of the service is the joint responsibility of BWSSB and BBMP. The third category of 'coping' refers to the mechanisms that have required local actors to find adoption/ adaptation strategies and make- shift arrangements as the service provided by the institutional actors is insufficient and have necessitated coping mechanisms. An example would be the use of battery-powered lights as electricity connections to street vendors have not been provided by the BESCOM. The table below details the multiple actors involved in the provisioning of the key infrastructure within the market.



Source: Semi structured interviews with 30 retail and wholesale vendors and four stakeholders conducted over a 4 month period (Dec '22 - Mar '23)

Figure 36: Governance framework for KR Market

The numerous stakeholders and their different functioning mechanisms lead to a single service being provided by multiple stakeholders. The following chart has been prepared to summarise the linking of services with the respective stakeholders.



Source: Semi structured interviews with 30 retail and wholesale vendors and four stakeholders conducted over a 4 month period (Dec '22 - Mar '23)

Figure 37: Key infrastructure and Stakeholders

Market Layout and Retail Spaces at KR Market

KR Market comprises of two buildings and the spaces around it. The main complex is a three-storey building with a basement while the old building is a red heritage site located south of the main complex. The new KR Market building is meant to accommodate over a a thousand traders.

However, the traders who were able to secure units on the lower level of the building are the only ones that are seen inside the complex. The ones that got space on the upper floors have since moved to the streets for trading activities.

The entrance from the south is lined up with street vendors on either side of the road. These vendors focus on the sale of fruits and vegetables along with other daily use commodities. The road leads to the elevated entrance of the market which is occupied by vendors using wooden crates and poles along with tarpaulin sheets. The east side of the market complex is lined with a wholesale fruit market while the south side is filled with vegetable vendors. The wholesale fruits market are permanent shops located just outside the market compound. All other vendors outside the complex along its periphery use semi-permanent structures or tarpaulin sheets to display their products.

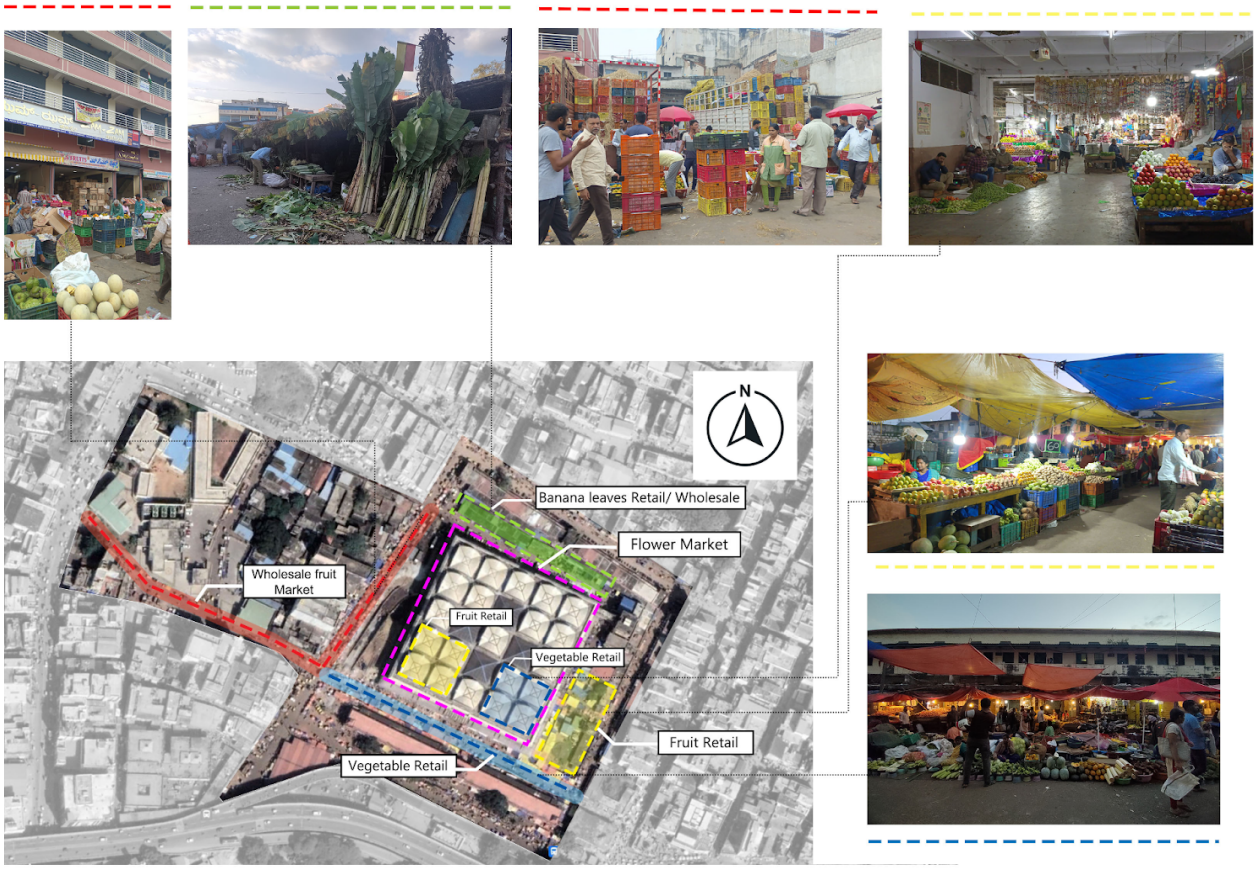


Figure 38: Map of KR market

The market can be divided broadly into wholesale and retail zones and a formal complex in which food vending takes place on the ground floor. The fruit wholesale market is present outside the market complex. These are shops with tinned roofs having vending spillovers to attract customers. The area experiences traffic congestion especially during early morning hours as a lot of loading and unloading activities takes place. The periphery of the market complex includes coconut and banana leaf vendors clustered on the rear side of the building having shops with tinned roofs or banana leaves. The vegetable retail vendors along with the fruit retail vendors are concentrated to the south and east of the main complex building. They use wooden crates, bamboo baskets and tarpaulin sheets to create semi-permanent structures occupying nearly three-fourths of the outdoor vending space. Some

vendors squat on the ground using '*chaar pais*', tarp sheets, jute sacks and small plastic baskets (*tokris*). The inside of the complex comprises mostly shop vendors having built shops and metered electricity connections. They engage in both retail and wholesale for fruits and vegetables.

Vendor typologies

Typology 1A: Vendors in Owned Shop outside the Market Complex

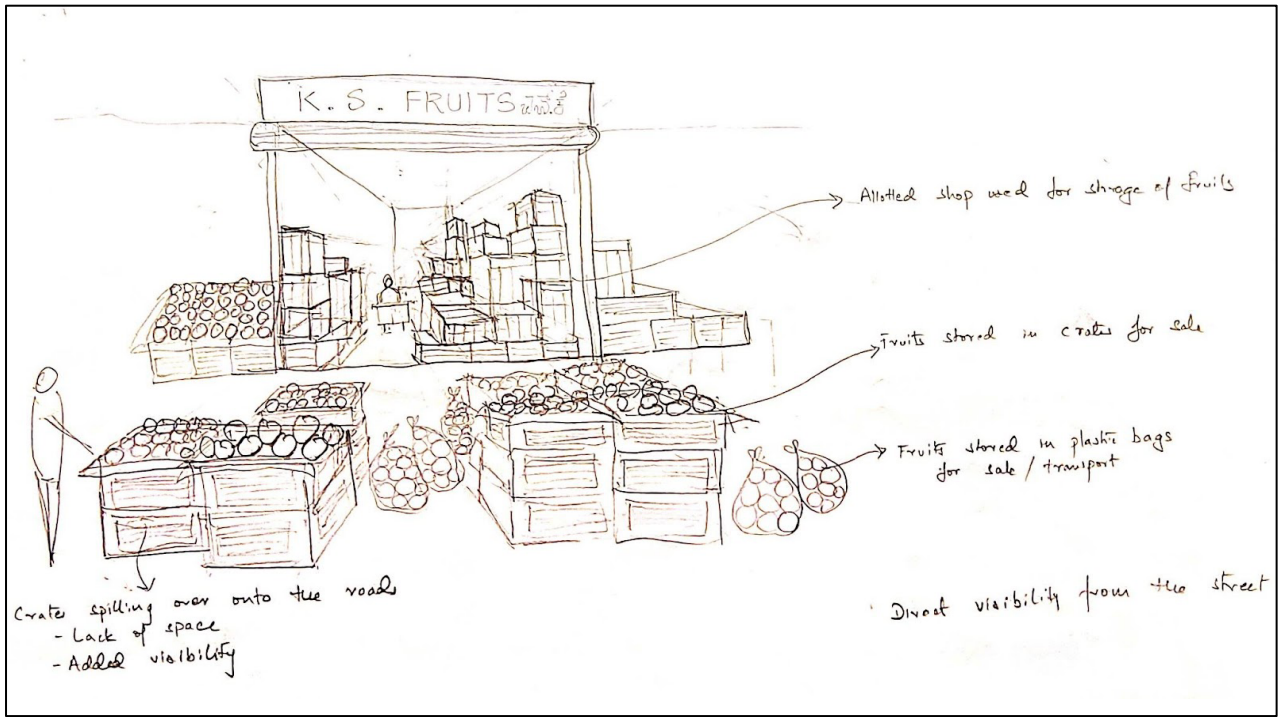


Figure 39: KR Market Vending Typology 1A

There are fruit vendors with allotted shops along the periphery of the market complex. These shops are provided with metered electricity connection. Monthly rent needs to be paid for these shops. The vendors use the shop for storage and display wares on the street for added visibility. These shops are directly visible from the street. They use crates and plastic bags for selling.

Typology 1B: Shops inside main market

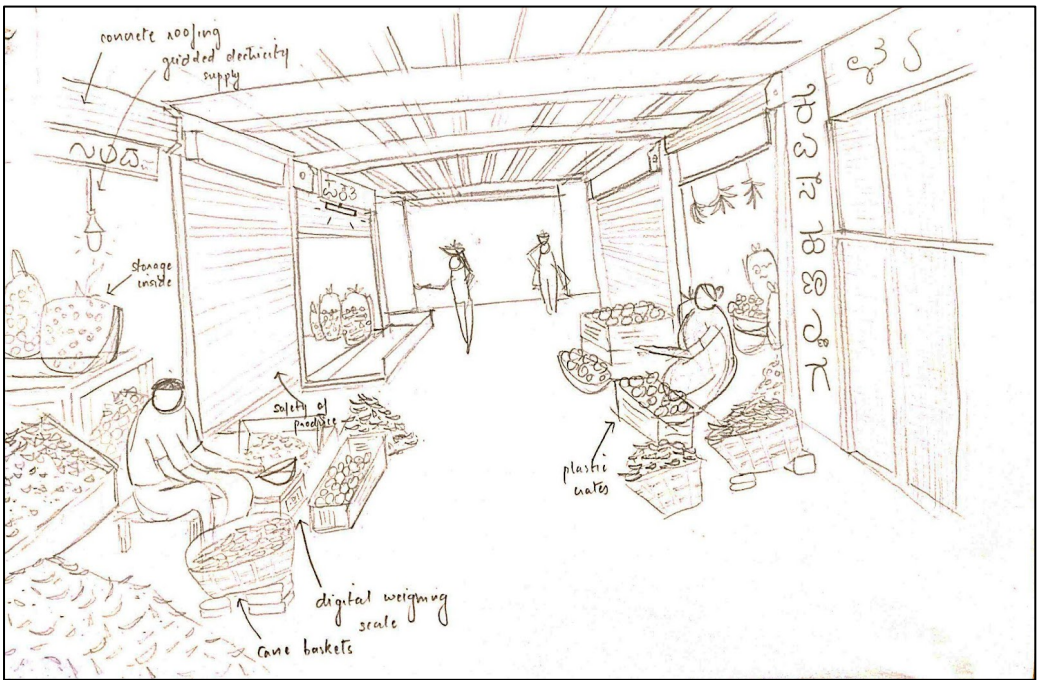


Figure 40: KR Market Vending Typology 1B

BBMP has allotted shops inside the main complex, however only the shops which are situated on the lower ground floor, as well as some shops on the upper ground floor and first floor are utilized. These shops are provided with metered electricity connection and tinned shutters. They are not visible from the street so spill-over on the corridors is common to attract customers. Many shops are left vacant, especially on the first and second floors due to lack of footfall. Yearly contracts for rent are made with the BBMP for the shops in the market complex.

Typology 1C: Vendors sitting in the Main Market

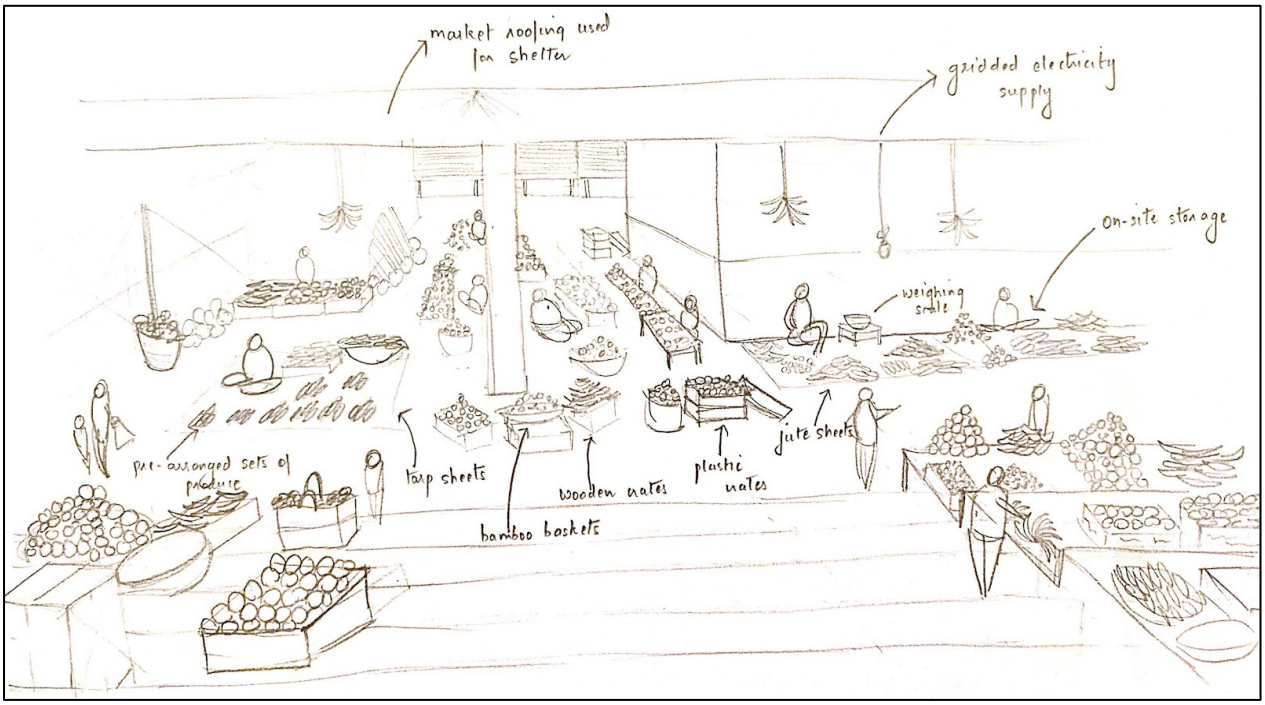


Figure 41: KR Market Vending Typology 1C

The market complex has created spaces for small- scale street vendors who use the corridors. They do not own a shop and use batteries for electricity needs. Digital weighing machines are used by these vendors. They may or may not pay a premium to respective shop owners for occupying the floor space around the allotted shops. They are protected from direct rains though they are vulnerable to rain water runoff.

Typology 1D: Vendors beside the main market

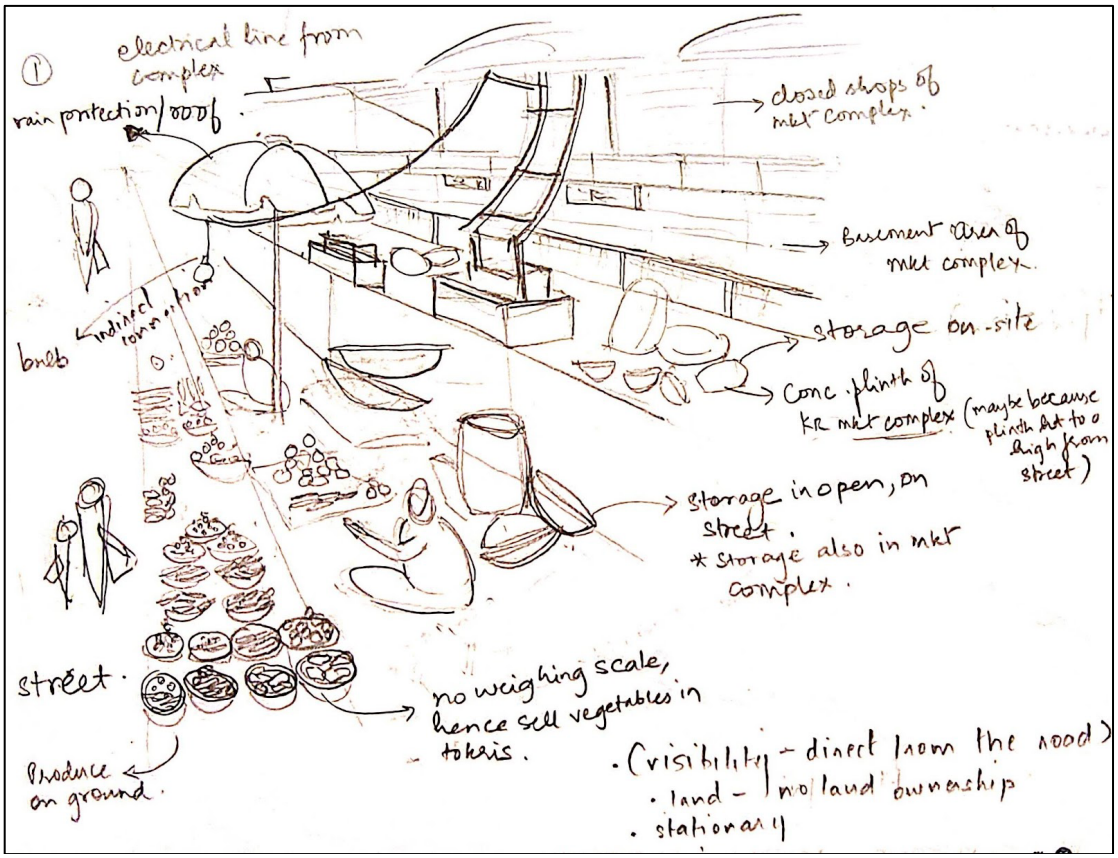


Figure 42: KR Market Vending Typology 1D

The plinth and outer corridor of the market complex is occupied by street vendors who use removable umbrellas, blue tarp sheets and crates. Electricity supply is procured from the shops in the complex for which a monthly fixed charge is paid to the shop owner. They use small baskets instead of weighing scales for sale. These vendors do not own any landholding documents for selling within the complex compound.

Typology 1E: Banana shops behind the Main Market

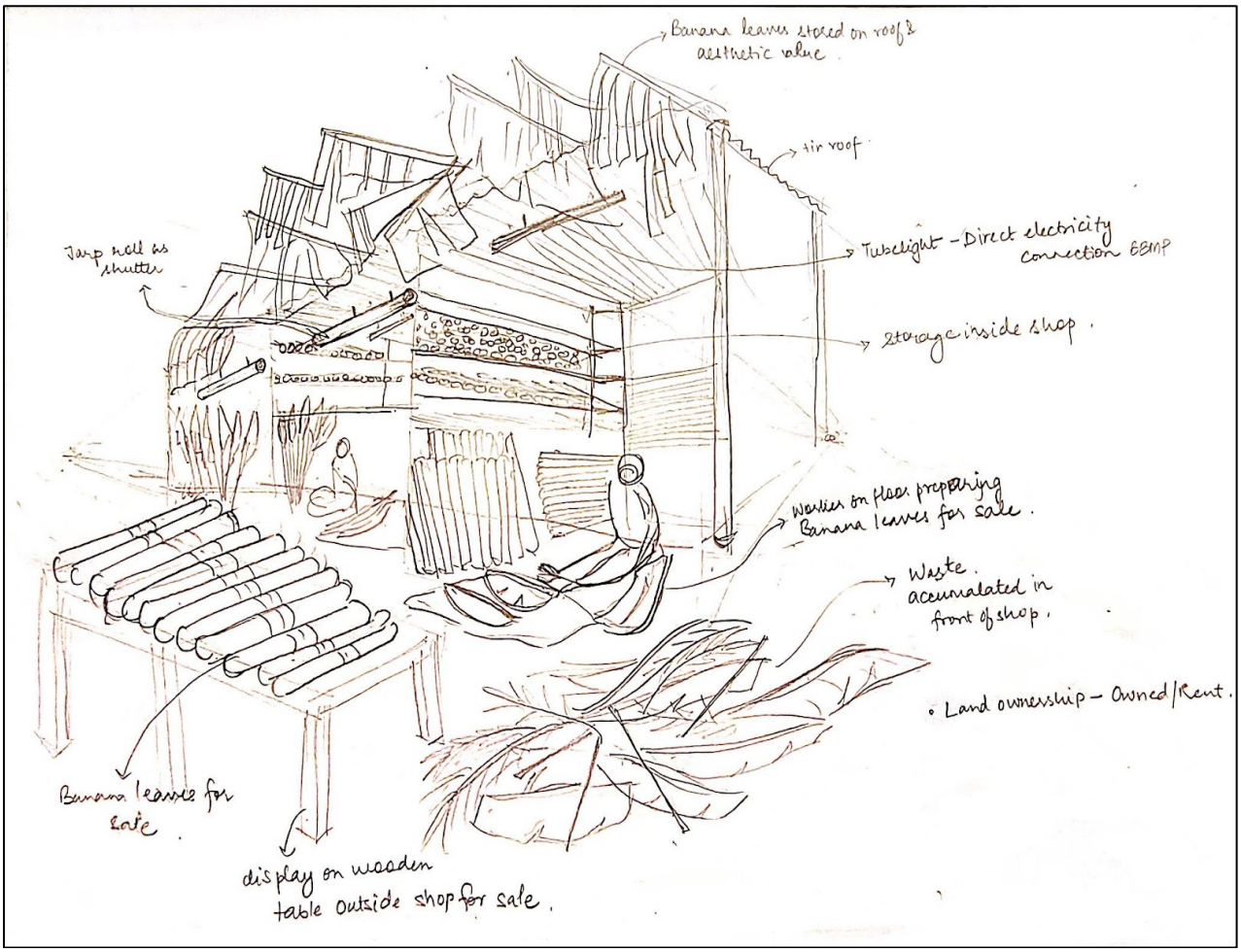
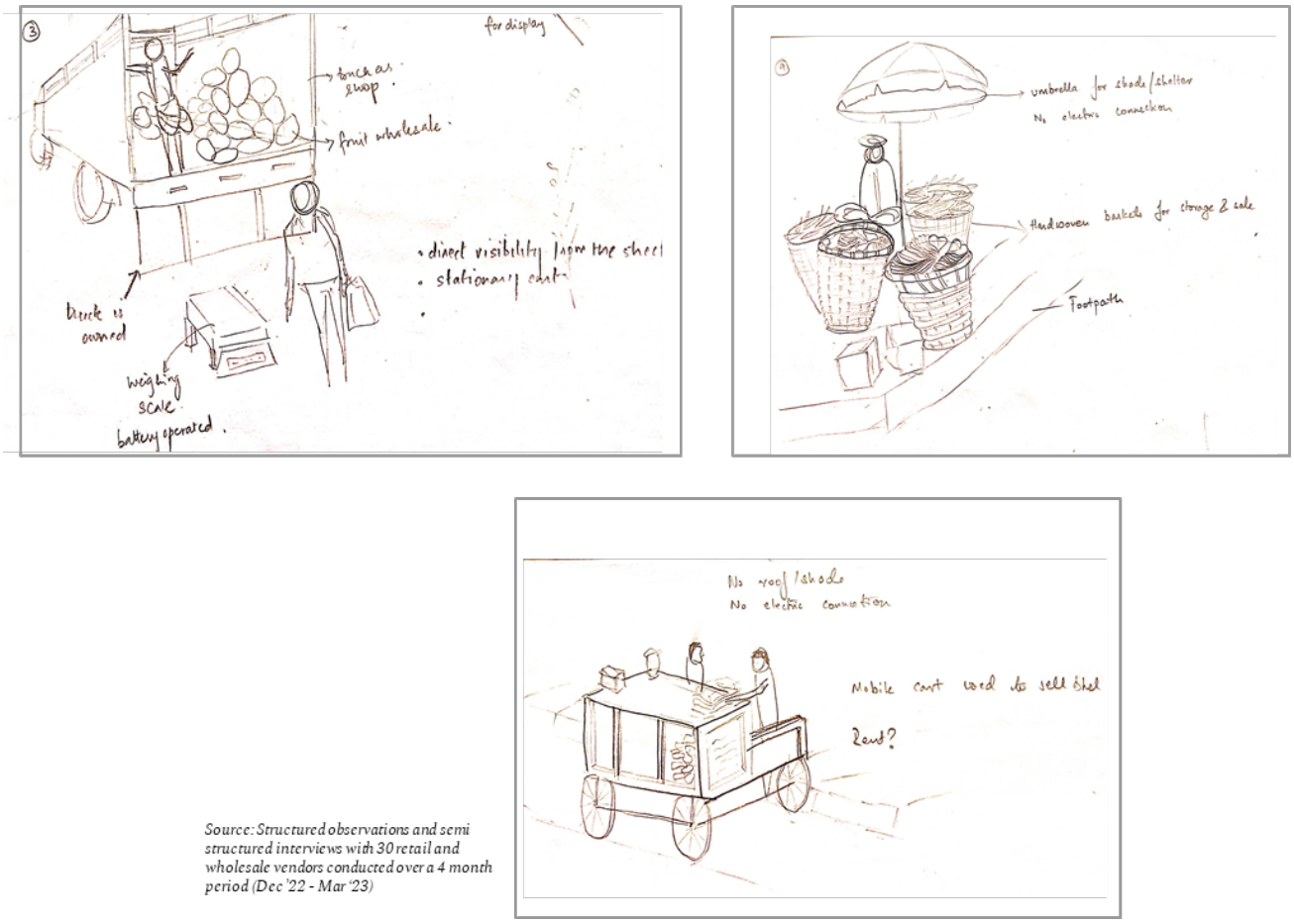


Figure 43: KR Market Vending Typology 1E

Semi-permanent structures made of tinned roof and banana leaves are seen on the rear side of the market. This zone is used by the banana vendors who use the street for display of produce while storing their produce in the shop. Tarp sheets are used as shutter and also for water-proofing. These vendors pay a monthly rent to the BBMP for the utilization of the rear space of the market. In exchange these shops have been provided with metered electricity connections. The visibility of these shops is poor because of being located on the rear side of the market.

Typology 1F: Mobile vendors

The market comprises many other vendors with no dedicated vending space. They use any open space or may even sell directly from the truck. Snack vendors on push-carts, betel leaf vendors behind the main market, fruit vendors selling from trucks, and vendors hawking on the main street are a few examples of mobile vendors. These vendors shift their location based on the availability of space every day.



Source: Structured observations and semi structured interviews with 30 retail and wholesale vendors conducted over a 4 month period (Dec '22 - Mar '23)

Figure 44: KR Market Vending Typology 1F

Infrastructure at KR Market

Electricity

Electricity connections are provided to the shops which are situated inside the KR Market complex by the state parastatal authority, BESCOM. Electricity meters have been set up in their shops and the bills are collected every month. Metered connections are only available to the vendors who have been allotted a unit inside the main building of KR Market or who have units in the existing parts of the old market buildings.

Vendors who are on the street mostly rely on other off-grid arrangements to fulfil their electricity needs. Electricity is primarily required for the purpose of display of wares. Most vendors who occupy the periphery of the building enter into an informal agreement with the nearest shop within the market to pull electricity lines from the shops. Vendors pay a fixed amount of money for this arrangement. Vendors who are further away from the gridded electricity connections of the main building rely on other off-grid arrangements, such as UPS and battery systems for the purpose of lighting and using

weighing scales. Vendors use the overnight charging facility provided by some local shops within the market for a fixed monthly fees.

Water

There is no provision for gridded water supply within the market. Most vendors in the market rely on Water ATMs, which are situated around the main market complex. The water ATMs are used for filling 20 litre water cans for Rs. 5. Few vendors also use packaged drinking water from local retailers. Headloaders often deliver water from the water ATM at the price of INR 40 for 2 cans of 20 litres each.

Sanitation

The market complex is cleaned by the BBMP every day for which the shop owners pay a monthly fee.

Security

The local police station is largely in charge of the security of the area. The shop owners have shutters to close their shop and the local policemen deal with disputes arising in the complex. However, the vendors hawking on the streets are usually not covered in the patrolling by the policemen. Most of the time, they collectively hire a private security guard or arrive at a negotiation with the shop owners to place their stock within the shop. The disputes between vendors are handled among themselves. Usually a neutral vendor becomes an arbitrator and resolves the disputes.

Operations at KR Market

Transportation

Lack of direct access to the main road due to inadequate road widths has increased difficulties in transporting produce thus leading to the emergence of the porter economy. Lack of vehicular locational access to shops through these streets and loading/unloading infrastructure, forces wholesellers and retailers to depend upon porters for moving the produce.

The zones allocated for unloading stock varies according to the typology of the traders. The fruit traders situated to the east of the market complex get their produce unloaded on the main street and pay porters/ headloaders to carry it to their shops. The main market complex has no defined off-loading zones as the height of the parking is too low for trucks carrying produce to enter. Most of the unloading happens behind the market from where porters who are hired on a per trip basis carry the produce to the various vendors.

Parking is an issue in and around the market. Although a designated parking space exists in the basement of the market complex, it finds limited users due to its low height. The existence of parking charges also induces shop owners and vendors to park their vehicles behind the market complex where “nobody asks for money”. In the fruit wholesale area to the west of the main market complex, the only parking zone is run by the BMRCL. Wholesalers use it to park and unload trucks from 4 to 10 in the morning after which it is mostly used by market goers and users of the metro. The wholesalers themselves prefer to park their vehicles along the streets.

Storage

The market lacks designated storage spaces for traders so most resort to alternative systems of storage. Some shops store produce inside their allotted units while selling it on the streets; others who

sell outside just cover their wares with a tarp overnight. The absence of cold storage is particularly an issue for the fruit vendors, who are forced to sell their produce at lower than usual prices in order to clear stocks every night. An interesting example of the coping mechanisms employed by the traders in the absence of cold storage is filling a layer of water between two boxes and storing the kiwis within them to provide a layer of insulation.

Communication

The vendors in the market rely on phone calls for the placement of orders and exchange of information. Each vendor has their own linkages in the supply chain who they reach out to regarding the demand of items and their price. The supply of water cans and hiring of porters also takes place through phone calls. The use of social media is limited for news and entertainment purposes.

The use of digital transactions is open majorly for the customers. The payments between a vendor and the supplier usually occurs through cheque or cash. The headloaders and logistic agents are paid through cash if it is on a daily basis, or else through cheque.

Pricing

The price of the commodities in the market is dependent on the following factors:

- The quality of vegetable
- The season and market demand of the vegetable
- The transportation charges to the KR Market
- The profit margin of the vendors
- Price published by the APMC[31]

The negotiations of the traders with the wholesalers and the bargaining power of customers are the two most important factors in determining the final price of the commodity. Thus the price of the commodity varies by the shop and the season along with the discount provided for each customer.

Commodity flow at KR Market

KR Market is central to the food distribution system in the city. It supplies produce in bulk to all food based industries while also remaining a commercial hotspot for retail customers. The market sources its products from major wholesale nodes in Bengaluru like the Yeshwanthpur APMC, Kalasipalyam and Electronic City. These markets get their produce from around 20 districts in India - which have been mapped out here - besides imported produce from 8-10 countries across Asia, Europe and Africa.

[31] https://market.todaypricerates.com/Bengaluru-vegetables-price-in-Karnataka

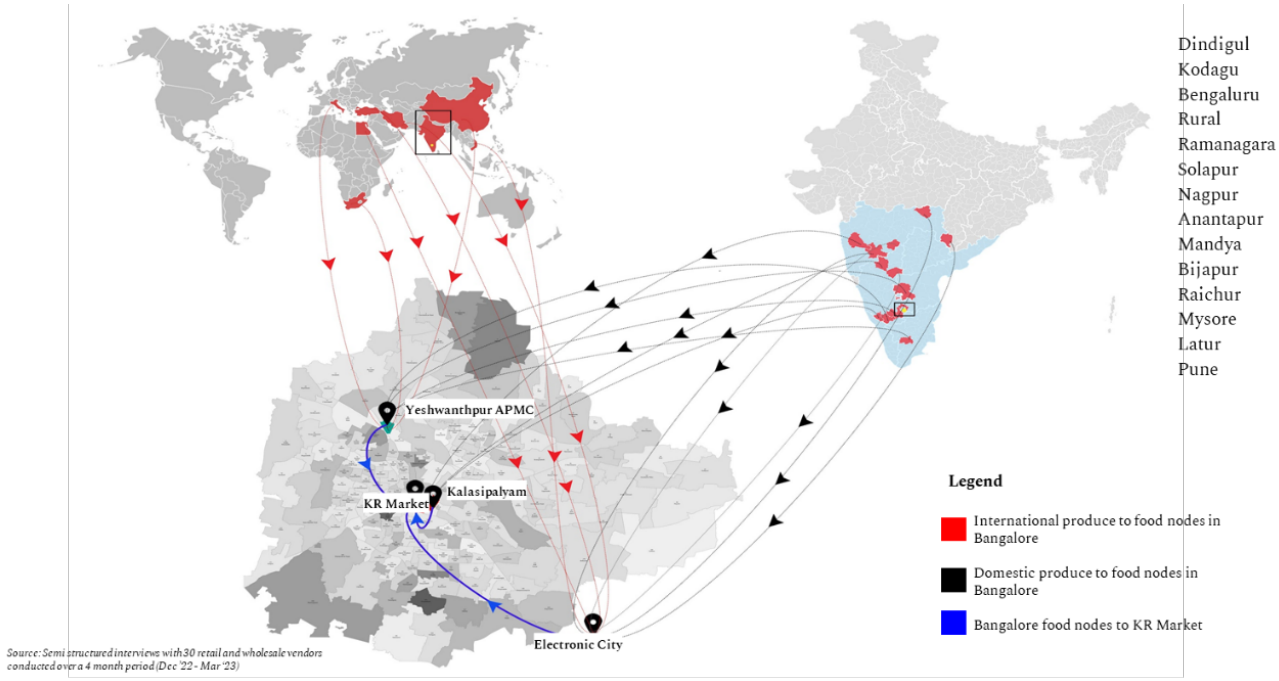


Figure 45: Commodity flowThe backward and forward linkages of KR Market are as follows:

The backward and forward linkages of the produce at KR Market is highlighted below:

1. Wholesale Markets (Yeshwantpur APMC, Kalasipalyam Market and Electronic City Market): Yeshwantpur APMC, Kalasipalyam market and the Electronic City Market are the three central wholesale APMC markets which supply the KR Market. Most of the vendors in the KR Market buy stocks from the wholesale markets and then display a mix of the same for retail sale. The vendors are responsible for managing the logistics of their stocks to the KR Market.
2. Rural APMCs and other Food Aggregators: Rural APMCs are suppliers to the wholesale market nodes of Bengaluru. They collect produce from farmers. They undertake sorting, cleaning and packaging of the stock. Communication is via phone calls to commission agents and suppliers regarding the demand of stocks. The commission agents pay for the logistics service provided by the supplier or the supplier-linked logistics agent.
3. Farmers: Indian or international farmers grow their crops and sell it to government associations like APMC, food aggregators or to commission agents. The quantity and quality of their produce of a particular commodity is one of the key factors determining the price of the commodity.

Value Chain at KR Market

Item	Mango	Brinjal	Onion, Potato & Garlic
Procurement	Supplied from Electronic City Market via a logistics group, who use LCVs and coolies. The price of transportation depends on the type and quantity of items.	Brought from Kalasipalyam market every day at 6 am or at 7 pm. Items are bought at a fixed rate (per kg) rather than auction. Pays nearly ₹30 per bag for using LCVs and coolies for transportation of the items.	Brought from Yeshwantpur APMC every day through an auction. LCVs and coolies are hired for transportation. Pays approximately ₹35 per bag
Pre-processing at KR Market	The items are checked to remove rotten mangoes. The remaining mangoes are sorted based on the time required to ripen. No cleaning is carried out.	No cleaning is carried out. The sorting of rotten items is carried out manually by the shop owner.	Sorting of rotten items is carried out. Basic cleaning for the removal of dust and other particles is carried out manually. Rates are ₹30 per bag for onions, ₹10 per bag for potatoes and ₹50 per bag for garlic.
Packaging at KR Market	The vendor uses plastic crates for displaying the mangoes. Polythene bags are used when a customer requires them. These bags are kept hidden from the BBMP inspector.	No packaging is carried out. Customers are expected to bring their own carry bags.	The vendor uses plastic crates and jute bags for displaying the onions, potatoes and garlic. Polythene bags are used when a customer requires them. These bags are kept hidden from the BBMP inspector.
Distribution	Stocks are expected to be sold within the same day. Discounts are provided to clear out the stock. All customers buy the items for consumption rather than resale. Leftover items are discarded in one corner of the market.		

Part 2: Food Market Study for Eggs

The neighbourhood level study highlighted that eggs are an important component of the daily meals. There is a dedicated egg shop in the study neighbourhood. In this section of the report we have traced the supply chain of eggs tracing them back from this neighbourhood outlet.

The neighbourhood level egg- shop source its eggs from a wholeseller in Hoskote, which is 30 kms from Bengaluru. The shop has to pay an amount of INR 100,000 to the whoeseller to secure their tie- up. This amount is exclusive of the price of the eggs purchased subsequently. Hoskote has several such wholesellers. These wholesellers have tie- ups with private egg farms in the region. The initial tie-up involves the wholesellers paying the farm an amount ranging between INR 200,000 to 300,000. With this they secure a 'code' for future transactions. The supply orders are flexible and wholesellers purchase eggs from the farms on a daily or weekly basis depending on their requirements and supply chain. Some wholesale shops which export eggs to other states and cities including Bengaluru procure about 100,000 eggs daily. The supply chain of eggs is also differentiated in terms of the two varieties of eggs that are available: "white egg" and "colour egg". The two are priced differently and have different demands. Their price setting also follows different processes. These are highlighted in the next sections.

Neighbourhood Egg- Shop



Figure 46: Neighbourhood shop

The neighbourhood level shop is around 200 sq feet. It has basic infrastructure amenities such as electricity, water, weighing scale (electronic and normal). Egg crates are stacked on top of one another. A person is employed to regularly check the eggs and remove broken ones.

On average, the shopkeeper has to go to Hoskote once a week to collect the eggs. This is usually quite early, e.g. 6am. However, the schedule is not fixed and dependent on supply available with the wholeseller at Hoskote or the private egg farms. The schedules are decided dynamically over phone conversations. The shopkeeper we interviewed has invested in a mini truck to transport the eggs at a

cheaper price. He highlighted that renting a truck was not economical as costs are higher and availability is erratic. There is also a certain degree of transportation loss. These may include breakage while loading, en- route and/ or unloading. However, the shopkeeper has to always purchase the whole crate as breakage losses cannot be negotiated. The pricing of eggs for the shopkeeper is fixed and there is no scope of negotiation. Only card payments are acceptable by the wholeseller that the shop purchases from. Cash transactions are not allowed. Bakeries in the neighbourhood purchase about 20 boxes from the shop regularly. The rest are retail sales to households and restaurants in the area. The shopkeeper usually sells the egg for 6-7 INR.

Wholesale shop at Hoskote

Node 2: Hoskote wholesale node



The shop we surveyed in Hoskote, was located 3 km away from the town centre. It was located in a peri-urban location amongst agricultural fields. It had three rooms of 400 sq feet each. The rooms were used to store eggs. The rooms had basic infrastructure such as electricity and water. One of the rooms had an air-conditioner to maintain a lower temperature, but there was no cold storage available. The room with the air- conditioner is used frequently during summer months. The 'colour eggs' have a shelf life of 10 days while the 'white eggs' have a shelf life of 25 days. With air- conditioning the shelf- life is increased by 5-10 days more. When the eggs are spoilt or break, waste disposal is difficult. Shopkeepers have to dispose their waste at the main dumpyard.

Figure 47: Wholesale storage in AC rooms

Transport Infrastructure



Figure 48: Transportation in trucks

The wholesalers usually have their own transport vehicles and they also take trucks on rent, when required. One of the wholesellers in the area owned three LCVs for transportation of eggs from the farms to the wholesale outlet. However, for long distance transportation, the wholesellers prefer hiring a largge truck, as it is more economical. Hired labour used by the wholesellers are mostly migrant workers from other states and/ or family members. They are paid about INR 10,000 to INR 12,000 a month, with accommodation and food facilities.

Digital Infrastructure

The egg supply- chain incorporates digital infrastructure. There is an app for "Egg and Chicken Rates"[32] where the rates of the white egg are updated daily for select cities or talukas in a state. These rates are set by the National Egg Coordination Committee (NECC). The app necessitates access to a smartphone. It does not require any registration. The rates are also published in the newspaper. For example, in the state of Karnataka, the app provides price information for three cities, namely, Mysore, Bengaluru, and Hospet. The rates of the colour egg are not set by the NECC. The seller directly sets the price and usually messages the buyer (shopkeeper) about the price. The message is usually sent once a week. According to a few of the wholesellers, the 'colour eggs' have been hard to sell in the past few years, as almost 90% of the household demand is for 'white eggs'.

[32] https://play.google.com/store/apps/details?id=com.fourglabs.farmstore&hl=en_IN&gl=US&pli=1

Pricing

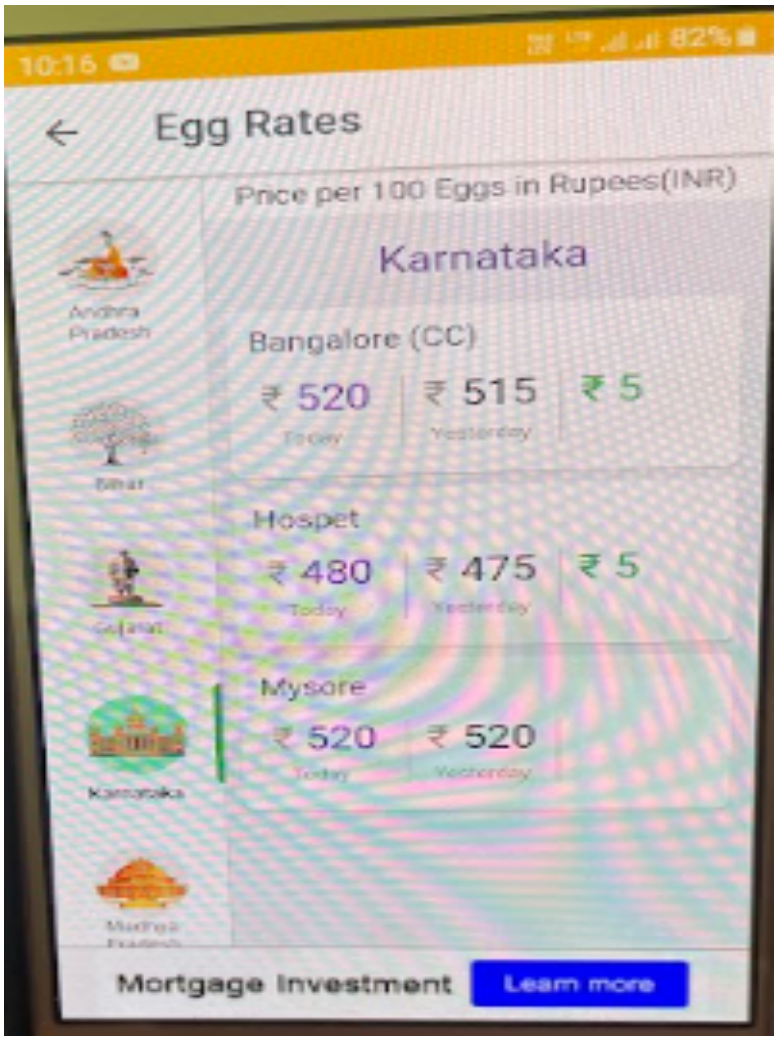


Figure 49: Mobile application for price setting

Currently one of the private companies sells one 'colour egg' for about 3 INR. The wholesale shopkeepers then sell each 'colour egg' for a price of about INR 5 to 6. Under special circumstances, usually for regular customers, the wholesellers sell the 'colour eggs' at INR 4. The price of one 'white egg' is 5 INR. According to the wholesalers, it is especially difficult to make a profit during the summer months and out of the 12 months they are only able to make a profit during the three winter months.

Part 3: Food Market Study for Fish

The neighbourhood level study highlighted that fish is an important component of daily meals. In this section of the report we have traced the supply chain of fish tracing them back from the neighbourhood level outlets/ vendors. In this section, we elaborate the commodity flow for fish from the neighbourhood level outlet to the retailers, wholesellers and major supply nodes in the city. Given the non-linearity of this flow, we also try to understand the fish markets within the city to understand the infrastructure that exists at these major nodes. Further, we assess the storage and distribution network that exist for supporting these nodes.

Bengaluru's fish commodity flows are unique. There are linkages to both marine fish (from the coastal areas of the state and other states such as Andhra Pradesh, Tamil Nadu, Kerala, and Maharashtra), and freshwater fish from the lake system and reservoirs in the peri-urban region of Bengaluru. As such, the commodity flow of fresh water fish in Bengaluru allows us to also unpack a form of local urban food production practice that is unique to the city. The commodity flow for marine and freshwater fish follow distinct pathways. However, these pathways converge at the level of wholesale and retail outlets within the city. At our research site, most low-income households consume freshwater fish given the price point at which it sells. Marine fish species are often consumed at commercial scale by restaurants and high-income households.

The research team conducted a comprehensive literature review to understand the value chain of the supply chain of fish. This included reviewing academic papers, and grey literature such as government publications and media reports.

The primary research included semi-structured interviews with actors involved in the value chain: vendors, retailers, wholesalers, government officials, and representatives from non-governmental organizations. The choice of semi-structured interviews as a data collection methodology facilitated flexibility, allowing the navigation of each respondent's unique experiences and perceptions while ensuring comprehensive coverage.

Supply Chain Details from Secondary Research

Fish is a state subject, and states may or may not classify fish within the APMC Act. As such, in most states fish is not traded within the APMC markets. So, the price of fish is typically determined by the commission agents who buy the catch from the fish farmers at the landing platforms.

The supply chain for sea-fish involves multiple actors and is pan- regional. Kumar et al. (2008)[33] provides a detailed explanation of this supply chain and infrastructural challenges at key nodes within the supply chain. At the sea fish production site, fish farmers require a landing platform. However, given the unregulated nature of fish trading, infrastructure is highly inadequate. Rajeev et al. (2016)[34] discuss the development of a landing platform by the German retailer Metro Cash and Carry store in collaboration with the Government of Karnataka to address this issue.

[33] https://krishi.icar.gov.in/jspui/bitstream/123456789/2548/1/266-Domestic%20fish.pdf

[34] Rajeev, Meenakshi and Bhandarkar, Supriya, A Study of Domestic Marketing Channels of Fisheries in Bengaluru City (March 15, 2016). Available at SSRN: https://ssrn.com/abstract=2747782

Once the produce is purchased through auctioning, agents that have made the purchase are responsible for packaging them in ice-boxes and transporting them to wholesellers in different cities. Infrastructure such as approach roads to landing centers, ice factories, and cold storage facilities are essential. Unfortunately, such infrastructure is frequently absent[35]. Transport and ice is the major cost component for all the actors in the value chain. Infrastructural costs for telephone, electricity and packaging is comparatively much smaller[36]. The agents supply the procured fish stock to wholesellers, in accordance to the orders placed by wholesellers every evening. After negotiation of price and demand, the agents use either the rail network or overnight road transport to deliver the stock to the wholesellers in the city. The wholesellers subsequently distribute the produce to multiple retailers, often employing auto- rickshaws for intra- city transport. Additionally, many retailers directly communicate with commission agents to receive supplies for their shops. In cases where a particular fish variety is unavailable, the retailer places orders with wholesellers. There is limited value addition throughout this supply chain for marine fish. Rather value has to be maintained, with regards to the freshness of the stock. Hence, most infrastructural arrangements are negotiated to ensure that fish reaches the retailers in the minimum amount of time, well- contained in ice- boxes.

Most value addition occurs at the retailers' end, involving activities such as grading, cleaning, dressing, packing, and storage. Most retailers also supply to smaller retail shops and mobile vendors. Such retail shops and vendors further sort, grade, clean, and ice the fish to prepare it for subsequent sale. To support these operations, retailers rely on essential infrastructure facilities such as ice and dressing platforms.

One of the most important wholesale and retail fish market in Bengaluru is Russell market. Rajeev et al (2016) highlight how Russell market is one of the oldest surviving wholesale markets in the city that also houses the largest fish market in Bengaluru. Fish from various states such as Tamil Nadu, Kerala, Andhra Pradesh, Gujarat, Orissa, West Bengal, and Karnataka is sold at the Russell market catering to both, retailers who buy for resale as well as individuals who buy for self-consumption. Their paper discusses the absence of critical infrastructure such as proper flooring, storage space, cold storage facilities or waste management system. Use of thermocol ice boxes is the most prominent way of cold storage. The study also highlights the absence of a dedicated parking space and the limited availability of loading and unloading space for fish boxes. We have included Russell Market and Yashwantpur, another prominent fish market in the North of the city, which sells fish to wholesale and retail customers, in our primary research.

The literature points out that the determination of price point in this entire supply chain is predominantly influenced by buyers[37]. Given the limited access of storage infrastructure, sellers have no avenues to store and influence the supply in the market. In addition to these supply chains, private limited and partnership companies[38] are also now featuring in the this market. These companies have emerged as significant players with autonomy to determine their price points. This stems from their investment on support infrastructure.

[35] http://library.enaca.org/AquacultureAsia/Articles/jan-march-2010/5-unique-marketing.pdf
[36] https://krishi.icar.gov.in/jspui/bitstream/123456789/2548/1/266-Domestic%20fish.pdf
[37] http://library.enaca.org/AquacultureAsia/Articles/jan-march-2010/5-unique-marketing.pdf
[38] http://isec.ac.in/WP%20445%20-%20Meenakshi%20Rajeev%20and%20Pranav%20Nagendran%20-%20Final.pdf

Governance

There are central and state public authorities which are responsible for provisioning of infrastructural support to the supply chain of fish. Ganesh et al (2008) elaborates about the various governance authorities that exist at the national level for development of infrastructure for the supply chain of fishes. The National Cooperative Development Corporation has been assisting fisheries cooperatives to create infrastructural facilities for fish marketing, ice plants, cold storages, retail outlets, etc. At the centre, the Department of Fisheries run multiple schemes for the fish farmers. National Federation of Fishers Cooperatives Ltd. (FISHCOPFED) market fish produce by providing market linkages. The National Fisheries Development Board (NFDB) is responsible for promoting domestic fish marketing through modernization of wholesale markets, establishment of cold chains, popularization of hygienic retail outlets and technology upgradation.

At the state level, the Karnataka Fisheries Development Corporation Limited is responsible for providing infrastructural linkages for supply of marine fish and the Karnataka Cooperative Fisheries Federation is responsible for provisioning of infrastructure for the management of supply chain of freshwater fish.

In the city of Bengaluru the municipal authority is the custodian for all lakes in the city, however it is the Department of Fisheries which is responsible for tendering the lakes and giving fishing rights to either a contractor or a fishing cooperative society. Fishing rights are allowed for lakes that do not have pollutants beyond a certain benchmark. This categorisation is done by the Karnataka Pollution Control Board. The fish markets within the city are governed by the Market division of the municipality.

Value chain for fish

From our primary field work, we traced the value chain of fish in the city, along with their space and infrastructure, operations including pricing mechanisms and value addition. The supply of fishes from Bengaluru's local lakes is mediated by contractors who procure the lease for fishing in the lakes. In comparison, the marine fish supply is mediated by commission agents, and is transported from the western and the eastern coasts of the country. Details of each of the nodes in the value chain are provided below.

1. **Neighbourhood scale Shops and Vendors**: Fish is sold in the neighbourhood by fish vendors who either go door to door or are located at fish shops within the neighbourhood. Given the limited availability of infrastructure mobile vendors prefer to ensure that all their stock gets sold on the same day. The fish shops have more flexibility in their sales, as they have more infrastructure. They store the fish in ice boxes. They are able to clean, grade, cut and pack fishes to be sold to the customer. The shop rent is about INR 18,000 a month for approximately 75 sft of space, and the retailer also pays for electricity and waste collection. The retailer employs two people for grading, cleaning, cutting, weighing and packaging of the fish. Each is paid about INR 600 per day. The retailers in the area spend a minimum amount on transportation given the proximity to the wholesaler and they have tie-ups with autorickshaws to bring in their supply. Mobile vendors visit the markets and buy fish directly. The fish vendor works with a margin of about INR 40-50 per kilogram of fish and sells fish at a rate of INR 150 - 400 per kilogram, depending on the variety of the fish. The major expenses for a stationary vendor are in terms of space and labour. On an average, vendors spend about INR 8,000 - 10,000 as rent on a monthly basis and spend INR 600 per

day on labour costs. There is minimum expenditure on ice boxes, storage, electricity and waste management.

2. **Local wholesale shop for fresh- water fish**: Most neighbourhood scale fish vendors buy fish either from the wholesale shop, located about 2-3 kilometers away from the neighbourhood (which prominently supplies lake fish) or Russell market (which supplies marine fish). The nearby wholesale shop is connected with the lake contractor as well as the sea fish suppliers. The supply from the city level wholesale market is not very regular. it is the wholesaler who is primarily responsible for communication with the suppliers, transport and storage of supply. The wholesaler also maintains a fleet of rickshaws for transporting the supply to other retailers in the city. The wholesaler has a larger set up with a shop size of about 100 square feet and an office to maintain administrative functions (such as invoicing, etc.). The wholesaler receives about 2-3 trucks every week with each truck containing 300 ice-boxes of fish. Each ice-box has 35 kilograms of fish, which is the standard that is maintained by all suppliers. The wholesaler receives the fish trucks at 4am in the morning and the supplies are then off-loaded in smaller rickshaws to be supplied to the retailers in the city.

   Pricing for wholesalers and retailers is determined upstream. In the case of wholesellers, the supplier/ commission agent determines the price. The price for retailers is set by the wholeseller. Price and demand are also subject to the annual festival calendar, such that price falls during Hindu festivals, Many people (mostly Hindus) prefer to eat vegetarian food on Tuesdays and weekly prices and supplies on this day are different.



Figure 50: Wholesaler shop operations wrap by afternoon



Figure 51: Truck to transport fish



Figure 52: Wholesale and retail transportation

3. **Russell market:** This is one of the biggest fish markets in the city. Besides fish, the market also sells flowers, fruits, vegetables and meat. The last block of the building is the main hub for fishes. The market was built by the municipality and has 20 registered fish- shops. The municipality issues the leases and collects rent. Each shop is about 100 square feet in area and the shops do not have access to electricity or water. Most shops do not have access to cold storage. The use of thermacol ice boxes is prominent. The market also has new private shops built-up with access to electricity and water, which are typically bigger (approximately 200 square feet). Cold storage facilities exist only with shops that sell frozen fish produce.There is an ice factory within the market which sells ice

to keep the fish fresh in the ice-boxes. The municipality is responsible for cleaning the market and taking away the waste. Road areas double –up as loading- unloading zones.

The market transforms throughout the day to provide for wholesale and retail operations. Operations begin late evening, when wholesale shop owners call commission agents, located at coastal areas such as Mangalore, Kerala, Andhra Pradesh and Odisha. The supply orders are systematically scheduled in accordance with the breeding regulations established by authorities in various coastal regions. This structured roaster ensures the sustainability and reproduction of sea fish while maintaining a consistent supply chain. Orders are placed for the next day after a negotiation of price. The commission agents procure the fish and transport it in ice boxes, each weighing 35 kilograms, via rail or road networks. This is the only value-addition at this step. The price for transport is included in the selling price charged by the commission agents. The stocks are received in the market around 4 in the morning and the wholesale trade begins at 5am and continues till 8am. The wholesellers in the market pay the 'head- loaders' for unloading the stock. After the wholesale operations are completed, the market transforms into a retail space. Wooden planks are laid outside of the shops, for retail operations. Fresh fish are sold directly to the bulk customers. The traders for fresh fish usually do not store fish overnight, and do not use cold storage facilities. The stock remaining at the end of the day is sold to vendors. The wholesalers in the market make a margin of INR 10 per kilogram of fish.



Figure 53: Entrance to Russell market


Figure 54: Russell Market

4. **Yashwantpur fish market:** This is the other private market for fish. Most shops in the market are rented at INR 30,000 per month and are sized about 100 square feet in area. The shops have metered electricity connection and have a cleaning desk to ensure that fishes are cleaned, graded and cut before being sold to the customer. They also receive water from the municipality to wash and clean the fish. It was noted that this particular private market adds a lot of value to the fish in terms of sorting, washing, cleaning, grading and packaging. The retail margins in this market are about INR 40-50 per kilogram of fish.



Figure 55: Yashwantpur shop

5. **Source of fish**: Value chain for freshwater fish is shorter and more direct. The lakes in the city are tendered out by the Fisheries Department to contractors or registered cooperative societies. Lake fishing rights are given out on five year contracts. However, the lakes have very limited infrastructure to support fishing. The fisherfolk require cleaning platforms, fishing nets and boats. Cleaning platforms exist at most of the lake sites; but there is very little oversight by the municipality. Boats and fishing nets are provided by contractors to the fisherfolk. The contractors also allocate fisherfolk to each lake. The contractor buys the daily stock of fishes and pays INR 20 per kilogram of fish. Daily supply from one lake in Bengaluru is typically between 20 - 60 kgs. This is about 2-3 ice-boxes every day. At this scale, the contractor usually sells it directly to small retail shops without further value addition. Margins for contractors are INR 50-60 per kilogram of fish. Fishing activity is planned in accordance with demand, which is usually communicated by the contractor. Lake fish are comparatively cheaper than marine fish. The prices are often negotiated in markets directly and are based on factors such as freshness, variety and seasonality.



Figure 56: Lakes in Bengaluru where fishing activities are done

Part 4: Food Market Study for PDS

In this section, we elaborate the supply chain for the PDS of Bengaluru city. Most households in the study neighbourhood are dependent on 'rations' supplied by Fair Price Shops (FPSs), thus making it critical to analyse the underlying supply chain.

The National Food Security Act, 2013 has made food provisioning a legal entitlement for all Indian citizens. Every household is entitled to subsidized food grain from the FPSs that are part of a public distribution system, aka the PDS. Eligibility criteria for PDS benefits include criteria such as income, occupation, assets, and housing size. Households categorized as 'Below Poverty Line' (BPL) families or as 'Antodyay Anna Yojana' card holders, are provided with 35 kilograms of food grains every month. Approximately 10 lakh households fall under these categories in Karnataka. Priority Household (PHH) card holders are provided with 5 kilograms of food grain per family member every month. Currently, there are 1.26 crore households who are part of Karnataka's PHH scheme.

Fod commodities provided through PDS have changed significantly, in line with changing understanding of nutrient requirements, as well as cultural and regional preferences. In most states, the PDS focus is now on staples; wheat and bajra in North India, and rice, jowar and ragi in South India.

A comprehensive literature review has been undertaken to understand the PDS supply chain. Given that PDS is a national level scheme, the literature review focussed on an overall assessment of the supply chain across India. Academic papers, government websites, official dashboards and grey literature, such as media reports were included in the study. For Bengaluru, we conducted semi-structured interviews with government officials, warehouse operators and FPSs dealers in the city to understand the space and infrastructure, operations and the overall commodity flow within the PDS supply chain in Bengaluru, which is comprised of FPSs in the neighbourhoods, state level warehouses and FCI godowns.

Supply Chain PDS from Secondary Sources

PDS is a government-sponsored scheme for the distribution of subsidised food, including grains such as wheat and rice, and commodities such as kerosene and sugar. It operates through a network of ration shops that distribute basic food and non-food commodities to beneficiaries below the poverty line at subsidised prices. To be eligible to buy at a PDS, customers need a card showing that their household is below the poverty line (Koduganti et al., 2019). India's PDS significantly contributes to the reduction of food insecurity, by primarily serving as a safety net and providing supplies at a reduced price. However, scholars (Jha et al, 2013; Gupta & Mishra, 2018; Pradhan & Rao, 2018; Chopra et al, 2017; George & McKay, 2019) have suggested that large quantities of food are not reaching the intended recipients due to the PDS's ineffectiveness, and there is significant food waste, which results in high expenses and few benefits.

In 1997, the PDS was restructured, shifting from a universal system, where all Indians, in principle, were eligible to receive a food subsidy, to a system that targeted those most in need. This targeting had two main purposes: (1) to bring down the ever increasing costs of the system; and (2) to provide more food to those in need (Mane, 2006). Under this change BPL households continued to receive subsidised foods, while subsidies for APL households were phased out. BPL households were identified via household income, compared against an absolute income line. However, households with any assets

(such as televisions, fans, two or four wheeled vehicles, or land) were classified as APL under this change, and despite owning such goods, many of these APL households were food insecure, and with the removal of rations were unable to purchase sufficient goods (Kishore & Chakrabarti, 2015; Jha et al, 2013, NITI Aayog, 2016). The problem of targeting is compounded by the lack of good quality regular data; no regular official estimates of the actual income of households are conducted, with many households BPL not classified as such, and some BPL households not holding ration cards (Mane, 2006). These problems with targeting limit the usefulness of the PDS in acting as an effective food safety network (Prasad, 2013), and are further exacerbated by the existence of illegal cards.

The whole supply chain network of PDS is comprised of the supplier (farmer), central warehouse, capital city warehouse, small city warehouse, and FPSs. The food product is distributed through FPSs at a reasonable price located in urban as well as rural areas (Barman, 2021). In the entire supply chain of PDS, FPSs are the last member of the supply chain. FPSs which are also known as 'Ration shops' in India are operated either by private owners, by cooperative societies or by the government. The state government issues licences for these ration shop owners to sell the commodities (Kumar & Kushwaha, 2018).

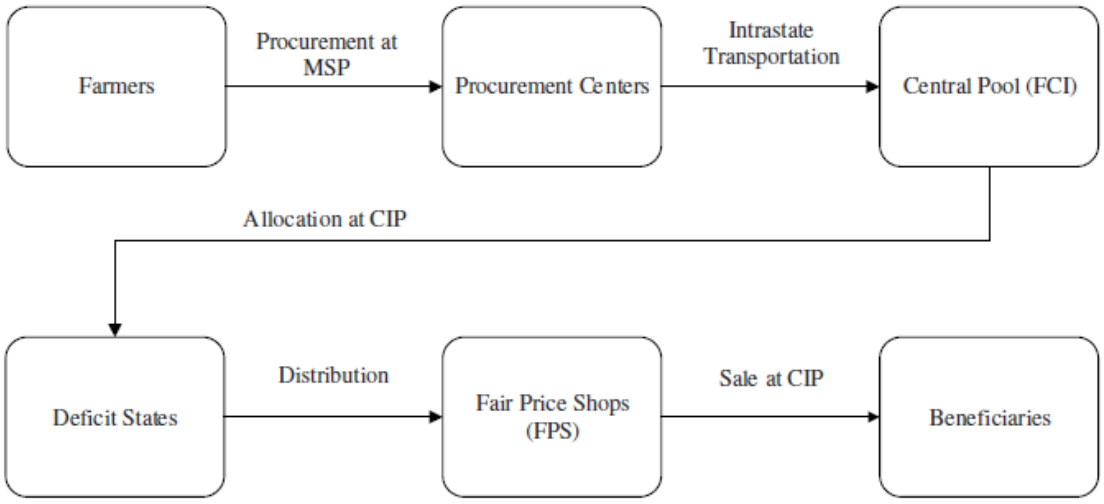


Figure 57: PDS Activities (Source: Mogale et al., 2017)

The Food Corporation of India (FCI) along with the State Public Distribution and Civil Supplies Department handles all these activities as shown in Fig. 62. The various states in India are categorised into producing and consuming states based on production quantity of food grains. The food grain is procured under two schemes, i.e. centralised and decentralised procurement scheme. In a centralised system, FCI and several State Government Agencies (SGAs) procure the food grain from the farmers in procurement centres, located in different parts of states, at minimum support price (MSP). Next, this procured food grain is transported to FCIs central warehouses for storage. The Government of India makes the annual allocation at a uniform central issue price (CIP) to each consuming state and Union territories based on the demand of the state and offtake in the previous period. The consuming state takes care of the distribution of food grains from the state depot to the final consumer. Primarily, the interstate movement of food grain from producing state to consuming state depot is carried out by rail mode and intra-state roads. Under decentralised procurement (DCP), SGAs procure, store and distribute food grains to beneficiaries through PDS on behalf of the government of India (Mogale et al., 2017; Barman, 2021).

Several authors have written about the inadequacies and problems with the PDS system. N.C. Saxena (2018), former member of the planning commission, highlights:

1. Large errors of exclusion of BPL families and inclusion of APL families.
2. Prevalence of ghost BPL/AAY cards in the custody of FPS dealers.
3. Diversion of subsidised grains to unintended beneficiaries.
4. Some APL households are not taking their ration quota and thus a part of the entitlement of these households is leaking out of the PDS supply chain.
5. The present procedure for selection of BPL beneficiaries is opaque, bureaucratic and does not involve gram sabhas (council of all voters in the village). The basis on which the cap on the maximum number of entitled beneficiaries per village is fixed is neither clear nor well defined.
6. Some states, such as Bihar, Jharkhand and Uttar Pradesh, are not being given the APL quota on the grounds that they did not take it in the past when the market price was low. This policy favours the southern states, which have been subsidising the APL quota out of state funds, and punishes the poorer states.
7. The selection procedure of FPS dealers is not transparent, and is often based on patronage or bribes.
8. Inadequate storage capacity with the FCI in some districts.
9. The poor financial condition of many State Food Corporations, which are supposed to transport grain from the FCI depot to the FPS.

Garg and Diatha (2013) highlight problems such as lack of transparency, accountability, poor governance and poor service delivery mechanisms. Peisakhin & Pinto (2010) highlight issues of leakage and diversion. Country- level data show that in 2007–2008 there was a 44 percent diversion rate for grain. This is a reduction from the 55 percent, which was the rate three years earlier. This reflects a decrease in losses, however there still remains a significant amount of food displacement (Khera, 2011; Balani, 2013). These diversions of commodities, intended for the PDS, into the general market result in shortages for those who rely on subsidised rations (Mane, 2006). Targeting has not resolved problems with leakage and diversion, and some suggest that it has made it worse (Kotwal & Ramaswami, 2012). Overall, the key issues of the PDS system may be summarised as: miscounting and misalignments in the identification of PDS beneficiaries, significant transportation and handling costs, underutilization of existing storage facilities, leakages/ diversions in PDS supplies, manpower shortages, vague buffer stock norms, insufficiency of vehicles, manual loading and unloading and lack of modern storage facilities.

Many of these issues are being incrementally targeted through technology infrastructure interventions across the PDS supply chain. In Karnataka, the Aadhaar's biometric infrastructure has played a major role in streamlining the beneficiaries' data. Masiero (2020), highlights that end-to-end digitization of anti-poverty schemes has been made in the name of greater effectiveness and applied to the PDS, generating local systems that inscribe technology in diverse parts of the program's supply chain. For example, in Chhattisgarh, an automatized system (COREPDS) has been instrumental in instituting program improvements, and offering an alternative to Aadhaar that creates new forms of back-end monitoring and reduces estimated diversion (Rajan et al. 2016; Khera 2018). In Kerala, where post-targeting problems have been significant, computerization has improved the ability to allocate goods at the ration shop level and monitor offtake from the program (Masiero, 2015).

Governance

The governance of PDS involves a shared responsibility between the central government and respective state governments. In terms of funding, the central government covers the cost for procuring food grains while transportation costs are equally shared between the centre and the state.

The Department of Food and Public Distribution within the Central Ministry of Consumer Affairs, Food and Public Distribution is primarily responsible for food procurement, allocation and distribution at the central level. Food Corporation of India (FCI) is a Public Sector Enterprise (PSE) set up within the aegis of the Department. FCI is primarily responsible for procurement from farmers and then maintaining in FCI godowns (owned / rented) spaces for further distribution.

At the state level in Karnataka, it is the Department of Food, Civil Supplies and Consumer Affairs Department. This department is primarily responsible for district wise allocation, distribution and monitoring of food grains. Transportation tenders are given out for wholesale (from FCI godowns to warehouses) and retail distribution (from warehouses to FPSs) via this department. Activities such as route mapping and tagging are also carried out to bring in operation efficiencies. Further, the warehouse service providers and FPS owners' registration also takes place within this department. Karnataka Food and Civil Supplies Corporation Limited is also a company established under the Government of Karnataka undertaking for procurement, storage and distribution within the state.

Value chain of PDS in Bengaluru

The commodities available through the PDS system in Bengaluru, as in the rest of the state, has undergone significant transformations. Wheat and rice were the main commodities till 2013-14 . This has now shifted predominantly towards rice. Ragi and jowar have also now been introduced, although they are still provided in very low quantities.

2,600,000 metric tonnes of commodities is supplied through the PDS supply chain in the state of Karnataka, out of which 6 metric tonnes is supplied in Bengaluru. Ragi, constitutes about 4.5 lakh metric tonnes of this, while jowar constitutes 80,000 metric tonnes. Karnataka's success in ragi has also motivated other states such as Tamil Nadu, Andhra Pradesh and Kerala to procure about 20,000 kilos of ragi from Karnataka in the previous financial year. Ragi is considered nutritionally a better alternative to rice, due to its low glycemic index. Ragi is also better suited to the traditional cropping practices (suitable for arid areas) and eating practices in the state. Karnataka has decentralized procurement where the state government agency, Karnataka Food and Civil Supplies Corporation Limited (KFCSC) is responsible for procurement.

The PDS infrastructure comprises of a network of procurement centres, warehouses, transportation fleet and FPSs. Each district usually has one FDI godown which supplies to the wholesale godowns (which are at taluk level). Given the scale of the city of Bengaluru, it has been divided into five informal rationing areas (IRAs). Each IRA is mapped to particular warehouses and the warehouses are in-turn mapped to fair-price shops. The mapping is done to optimise transportation. Overall, the city has 2 FCI godowns, 26 warehouses and 597 FPSs. The warehouses are either managed by KFCSC or by cooperative societies. Few warehouses are also managed by Taluk Agricultural Produce Cooperative Marketing Society Limited. The fundamental difference between KFCSC and non-KFCSC warehouses is

with respect to procurement. In cases where FCI procurement falls short, the state procures directly from the farmer or from private markets, primarily via KFCSC.

The following section will detail the space and infrastructure, operations and pricing through the supply chain of the PDS system:

1. **FPSs in Bengaluru**: Bengaluru urban has about 597 FPSs. On an average, one FPS is attached to about 400 ration card holders, requiring a storage capacity of about 80 - 100 quintals of food grains. The shops are typically 100-200 square feet in size and are primarily used by the beneficiaries to get their ration. Infrastructurally, these shops must have physical infrastructure in accordance with the guidelines of the central government, necessitating accessibility, locking facilities and flooring requirements. Digital infrastructure consisting of e-POS (Point-of-sale) machines for Aadhar authentication and a UPS system is also mandatory. Typically, ration is distributed within the 25th of every month. These shops use retail transporters for getting the ration from the wholesale warehouses to their shops. In Bengaluru, where renting a larger commercial space is usually difficult, most fair-price shop dealers stock their allocated stock from the warehouses in a phased manner. This helps them in terms of managing the space. Most dealers often prefer to establish their shops in residential areas to ensure easy accessibility for beneficiaries. Additionally, locations which have enough road width for vehicular movement and unloading stock are also preferred. The shops receive about INR 135 per quintal. The FPS infrastructure is also utilized for India Post Payments Bank (IPPB) transactions in Karnataka. Furthermore, recent tie-ups with companies like coconut oil suppliers offer discounted products, thereby enhancing FPS profitability.

2. **Wholesale warehouses in Bengaluru:** These warehouses primarily act as intermediary storage space for ration to be distributed to fair price shops. The warehouses are either operated by KFCSC or cooperative societies. Most of these warehouses were set up in the 1960s when PDS was initiated. In Bengaluru, there are a total of 26 warehouses which supply ration to the FPSs mapped to them. A warehouse typically requires about 7000 square feet of space. Infrastructurally, these spaces need to be leak-proof, have proper ventilation, meet with specific flooring requirements along with tarpaulin sheets, ample open area for easy loading and unloading and digital infrastructure (computer system, wifi connectivity, CCTV and UPS system) for monitoring and record-keeping of ration. Every month, the warehouses receive supply from the FCI godowns. A key element in maintaining the quality of the stock in warehouses is the adherence of First-In-First-Out (FIFO) principle and correct stacking methods, to minimize wastage. The stacking method is also critical in maintaining the count of the stock. The transportation is managed by a logistics company, which has received the tender from the state government. The warehouse is responsible for storage and distribution to FPSs. The transportation to FPSs is managed by another retail logistics company, as per the tender received from the state government. The warehouse is typically managed by a warehouse manager, computer operator and headloaders. The warehouse owner gets Rs. 35 per quintal of grain stored. Operations within the warehouse follow a monthly cycle.



Figure 58: Warehouse in Bengaluru



Figure 59: Stacking style in warehouses

3. **FCI warehouses:** These are large premises where procurement, packaging and storage occurs. Fumigation is a critical operation that takes place at FCI warehouses. FCI district of Bengaluru is divided into two revenue districts - Bengaluru and Kolar. Within Bengaluru, there are 2 FCI warehouses which are both owned by FCI. Most of the warehouses in Bengaluru urban areas are mapped from these two FCI godowns. A total of 6-7 trucks supply stocks from FCI warehouses to the wholesale warehouses in Bengaluru.

4. **Procurement Centres:** Registered farmers sell their produce at the procurement centres that are set up by the FCI or the registered state agencies (in case of decentralized procurement). Price is determined through the Minimum Support Price (MSP) mechanism which is set every year before the harvest by the Government of India. This also acts as a preventive measure to ensure fair prices for the farmers. Priority is given to small farmers. Milling and packaging occurs at the registered local milling centres. Further, the jute bags are centrally procured (usually through the jute mills based in Kolkata) which are used for packaging. Further, some of the warehouses now have also started receiving 'smart' jute bags, the supply chain for which needs to mapped further.



Figure 60: Smart jute bag

Part 5: Food Market Study for Indira Canteens

In this section, we elaborate the commodity flow for Indira canteens. Further, we assess the storage and distribution network that exist for supporting these nodes.

The Indira Canteen scheme is a state level food subsidization program launched in 2017, aimed at providing subsidised cooked meals in urban areas. As part of the program the price for meals are fixed at INR 5 for breakfast and INR 10 for lunch & dinner each. The government provides an equal amount to the vendor per meal. There is supposed to be one Indira Canteen per ward (smallest administrative unit within the Urban Local Body; 198 wards in Bengaluru as of 2007). As such, there are 174 Indira Canteens, located on public lands (within parks, community health centres, etc.) and 24 mobile canteens (vans in wards where public land is not available) across Bengaluru. The canteens are operated by vendors selected via tendering who are supposed to follow a fixed menu and quantity predetermined by the government. Currently, there are 3 vendors operating 198 canteens across Bengaluru. The food for these canteens are prepared at 27 base kitchens (1 per legislative constituency). There are 7-9 canteens per kitchen.

The Indira Canteen supply chain in Bengaluru comprises of neighbourhood level outlets, base kitchens and the vendor storage facilities. The research team has conducted semi-structured interviews with government officials and canteen operators to understand the space and infrastructure, operations and the overall commodity flow. It has also undertaken a comprehensive literature review of academic papers, government websites, official dashboards and grey literature, such as media reports.

Supply Chain for Indira Canteens from Secondary Sources

Indira canteen is one of many state level schemes addressing food insecurity in India. Tamil Nadu was the first state in 2013 to launch a “untargeted urban food security program” providing 3 meals a day under Amma’s Unavagam/ Amma’s canteen followed by Orissa (2015), Jharkhand (2016), Andhra Pradesh (2016), Rajasthan (2016), Madhya Pradesh (2016) and Karnataka (2017). Literature covering these programs is limited and focuses on consumption aspects, mainly demographics of beneficiaries and impact on household savings due to food related costs. In parallel, much of the literature also discussses the Mid-Day Meal scheme, the other state/central government run program, operated through a PPP model and the activities of Akshaypatra, a religious organization, providing free meals to school going kids, in order to solve hunger issues and promote school attendance among kids. The model of Indira canteens is based on a similar operating model as Akshaypatra with regional kitchens, which provide food to local outlets.

Despite Indira canteen’s popular uptake among the urban poor, the functioning of the program has faced several financial and budget related issues, which has been covered extensively in media reports over the last few years. The program is a Congress- government (named after Indira Gandhi) era scheme and had a budget of INR 1,450,000,000 in 2018-19. This dropped to INR 6,000,000 in 2022 under the BJP- state government (The Hindu, 2022). The reduced state support along with reduced footfall post- Covid led to a cash-crunch for both the local body and the operators (Citizen Matters, 2022).

As per our interviews and secondary sources, the operators have pending payments of INR 500,000,000 from BBMP, which has significantly impacted operations (Hindustan times, 2023).

Contractors in the system had to move away from bulk buying and salaries have not been paid for many months. The delays in payments have also led to fewer varieties of food being supplied at the canteen. Previously multiple options were available at each meal. However, now only one option is on offer and is being repeated on a daily basis.

Since the program runs on subsidies and with high volumes, the involvement of multiple state actors, such as the Ministry of Food, Civil Supplies and Consumer affairs (responsible for budget allocations) at the state level, BBMP at the city level (responsible for tendering, implementation, funds dispersal and M&E), as well as election- related changes have engendered a system which is vulnerable to budget cuts and shocks. However, since the Congress returned to power in Karnataka in May 2023, there have been announcements to increase funding for the program, along with tender renegotiations to increase food quantities and budgets, and the proposal to bring in alternative operators such as Akshaypatra, who have the experience of running subsidised community kitchens in other parts of the country (Sunny, 2022; Times Now, 2022; Indian Express , 2023)[39].

Supply chain of Indira Canteens from Primary Research

The program runs on a 'Hub and spoke' model with regional kitchens covering multiple neighborhoods. Since these models are public private partnerships, there are mainly two stakeholders, primarily the state/central government and the private partners. The state is mainly responsible for inspection and payments while the private vendor is responsible for day to day operations including procuring, cooking and distribution. Operational excellence is considered to be a key factor in low cost food canteens where the margins are very thin (Mitra et al, 2013). For example, in the case of Mid-day meals, there is an estimated gap of Rs. 2.27 per meal in the initial capital expenditure. The three main issues identified have been volatility in prices of raw ingredients, estimating quantities / minimizing food wastage and minimizing the kitchen to consumption time (Mitra, 2013 & Chavan, 2020). Institutions such as Akshaypatra have integrated ERP and ICT solutions in their supply chain to maximise efficiency around quantity estimations. Similarly, other pilot studies have also attempted optimization for vehicle capacity and route designs to maximise quantity per vehicle and minimize time from kitchen to plate.

Governance

The governance structure for Indira canteen involves the Directorate of Municipal Administration at the state level as the nodal agency at the state level. However, in the case of Bengaluru this responsibility is with the urban local body of BBMP. The responsibility is shared between the Health department, responsible for the tender processing, financing and initial capital expenditure required for setting up the kitchens (including land allotment for kitchens and outlets, and procuring required equipment for the kitchen), and retired defence personnel, who have been hired as 'Marshalls' to oversee M&E for base kitchens, outlet canteens and for data provisioning for financial processing.

[39] The Hindu. (2022). Despite no patronage by govt, a few Indira canteens retain success Premium. Link: https://www.thehindu.com/news/cities/Bengaluru/despite-no-patronage-by-govt-a-few-indira-canteens-retain-success/article65862475.ece, The Hindu. 2022). Congress protests cutting funds meant for Indira Canteen. Link : https://www.thehindu.com/news/cities/Bengaluru/congress-protests-cutting-funds-meant-for-indira-canteen/article65900603.ece, Dev, A. (2023). The many challenges facing Indira Canteen operations. Link: https://www.hindustantimes.com/india-news/the-many-challenges-facing-indira-canteen-operations-101676403719398.html, Times of Indira. (2023). Karnataka govt likely to hand over Indira Canteens to Iskcon. Link: https://timesofindia.indiatimes.com/city/bengaluru/karnataka-govt-likely-to-hand-over-indira-canteens-to-iskcon/articleshow/90738179.cms, Indian Express. (2023). Karnataka Govt all set to restart Indira Canteen, BBMP holds meeting. Link: https://indianexpress.com/article/cities/Bengaluru/karnataka-govt-all-set-to-restart-indira-canteen-8627873/

Value chain for Indira Canteen

On an average, each canteen currently sells between 300-700 meals per day with majority of the meals being breakfast and lunch with high footfall canteens selling close to 1,500 meals per day. The canteens have seen footfall drop 50% post-covid leading to major concerns around operational margins for contractors. We interviewed the largest contractor, operating 97 canteens in Bengaluru. They sell approximately 40,000-50,000 plates per dayand have achieved break-even point in their operations. On an average, the contractors bill approximately INR 30,000,000 per month. The major costs incurred involve procuring raw materials including staple (rice) and pulse (lentils) costing INR 18,000,000 per month per kitchen, fresh vegetables costing INR 5-6,000 per day), gas (INR 10,000 per day per kitchen). Other major costs include electricity and water costs at INR 4-500,000 each per month, transportation at INR INR 7-800,000) and manpower.

The value chain is as follows:

1. **Indira canteens:** The canteens are the primary neighbourhood level outlets providing foods. The canteen is equipped with heating facilities to keep the food hot and drinking water system. The kitchen staff consists of two servers (hired by the operator) and one marshal responsible for data collection on consumption and ensuring quality and quantity of food served. The main infrastructure dependency at the canteen level is for electricity (for heating equipments, water filter machine and weighing machine) and water. Based on our interviews with the operators, we learned that most canteens currently don't use water filter machine and instead provide water via 20 litre cans that are purchased from vendors on a day to day basis.

2. **Base Kitchens:** The base kitchens serve as the main nodes for cooking and distribution of food. These kitchens are equipped with large steamers (for idlis/rice cakes) and multiple pressure cookers with 100kg capacity each (for rice and sambhar/lentil stew). The kitchen has been setup by BBMP on government lands and is operated by the vendor. The kitchen area has designated spots for vegetable cutting, grinding and cooking areas with cold and dry storage facilities. The base kitchens produces 4000-5000 meals per day. BBMP issues an indent everyday to the canteen determining the food quantity required to be prepared based on the consumption data collected by marshals at the canteen. The kitchen is operated from 2am to 6pm in three batches (for breakfast from 2am – 6am, for lunch from 7am – 11 am and dinner from 2pm to 6pm). Once the food is prepared, BBMP marshal conduct quality and quantity checks, to ensure taste, food safety and quality of food. Weighing machines are placed at delivery areas to Once confirmed, the food is then packed and distributed to all designated canteens via trucks. The marshal issues a "Chit" mentioning food quantity which is then sent with the truck to be received by marshal deployed at each canteen.



Figure 61: Base kitchen

3. **Operator warehouses:** The operator ware house acts as a storage facility for storing raw ingredients, mainly staple, pulses and spices. Generally, these ingredients are bought in bulk to helps save costs and avoid price volatility and then transported from the warehouse to multiple base kitchens operated by the operator. The operator would store ingredients for up to 1 month in these warehouses but lately due to the ongoing delays in bill processing from the government, the warehouse stock has been reduced and ingredients are bought on a day to day basis. This has led to an increase in purchase costs of ingredients. The slow cash flow has also led to an increase number of vendors that the operator works with (~200 vendors currently) to align payment cycles with billing cycles. Most vendors supplying raw ingredients to the warehouse are based out of Bengaluru but source ingredients from multiple locations across Karnataka including Raichur and Gulbargh in North Karnataka and Ramnagar and Kolar, neighbouring districts of Bengaluru. Many ingredients are also bought directly from local wholesale shops such as Cash n Carry and Metro with multiple locations across Bengaluru.



Figure 62: Transportation

Conclusion of the Bengaluru Food Markest Study

1. **Multi-nodal urban food system** - The urban food system for the city of Bengaluru is multi-nodal; in-terms of sourcing, distribution channels and supply nodes. The multi-nodal form of the market is instrumental in engendering robustness within the food system for the city and allows for adjustments and redundancies that mitigates the possibility of a large- scale food scarcity within the city.

2. **Significant gaps in urban infrastructure and planning measures to support the food system in Bengaluru**: While the city has a well- diversified multi-nodal food market system, the intra- city roads that connect to these market nodes are congested and have to compete with regular traffic. This has been mitigated to some extent by time- separations, such that the bulk of the large trucks that supply to these markets are scheduled to deliver during the night and early mornings, when regular traffic is limited. However, this still does not solve the issues faced by the LCV and auto traffic that has to ply through the day between the wholesale and retail nodes of the city. Infrastructure support at the markets is also minimal with electricity and waste disposal being the most commonly available. However, these infrastructural services are also available only to the formal built-up shops in these markets and the other trading activities that veer towards the informal have to fall back on personal negotiations and adoption/ adaptation practices. Moreover, the formal planning interventions in the markets show similar patterns of planners and municipal bodies valorising built- form that is inward looking, with multiple floors.
   However, this is inimical to the operational needs of the traders, who valorise low- rise, outward looking built-form that maximise visibility and access to loadding/ unloading and auctioning spaces. As such, the significant investments made into high- rise buildings remain underutlised. Higher floors are either abandoned or used for storage. Meanwhile, the roads and incidental spaces around the new buildings have been repurposed through make- shift space and infrastructure arrangements. While it all somehow works, there is congestion in the common spaces, which affects loading/ unloading activities, exacerbates displacement risks for small traders and creates temporary and vulnerable infrastructure arrangments a necessity.

   As such, there is a potential to help urban planners rethink these spaces to be more outward looking and low- rise, but high density. Also drawing on the experiences of the ‘sites and services’ approach in housing (which was used in India in the 1960’s) there is also the potential to consider facilitating open- air vending spaces, with minimal built- up (for example- only a raised platform may be necessary), but well- connected to basic infrastructure, such as electricity, water, drainage and waste disposal. These spaces can be made available to vendors to repurpose in terms of shelter cover and storage spaces, as per requirements. Further, the M&E in these spaces need to also incorporate more robust systems of everyday repair and maintenance activities such as management of solid waste, provisioning of water supply and prevention of water logging.

3. **Adaptation and adoption practices** within key market nodes have allowed for diverse processes and entities to co-exist within the same space, that exist across the formal- informal spectrum. These different actors in the market have developed co- dependencies and practices that allow them to bypass infrastructural crises. The diversity has also engendered a vibrancy in the everyday routines, spaces, materialities and temporalities that have enable the various market spaces to come to life and deliver. Infrastructural and operational negotiations allow for multiple wholesellers, retailers and vendors, across the formal- informal spectrum to co- exist despite distinctly different business logics, and creating the possibilities of food commodities to be available at multiple price points, to cater to a wide spectrum of affordability levels amongst consumers who come to these market nodes.

Adaptation and adoption negotiations are visible across a variety of contexts: using the same space for unloading and auctioning; arrangements to watch and surveil each others' spaces and goods in exchange for mutual compromises on the use of space; material negotiations for the use of impermanent building materials to extend formal retail spaces or for auto-constructing new shop- spaces; and temporal negotiations to accommodate a variety of market operations ranging from wholesale activities, retail activities, gleaning activities through the day to ease access and logistics. These negotiations enable a range of sellers with diverse business models and different infrastructural and operational needs to co-exist. The co-existence of these diverse businesses allows affordability and accessibility for a wide range of consumers.

4. **Planning in terms of public urban infrastructure to address food as welfare is robust in Bengaluru (and India):** While there may be significant gaps in the infrastructure and market-space planning, as highlighted earlier, our research also highlights that Bengaluru has a robust urban infrastructure to address food as welfare, through the PDS and Indira Canteen systems. The Public Distribution System is one of the oldest pan-India welfare schemes, for which cities having developed comprehensive infrastructure such as fair price shops, warehouses and an extensive logistics chain to support it. Further, state level initiatives such as Indira canteens have also built an extensive infrastructure support from the municipality in terms of the canteens, base kitchens, warehouses and a logistics chain. Both these systems are part of the urban planning measures, with a role for government agencies, across multiple scales, including the municipality. The infrastructure that has been created for the PDS and the Indira Canteens in Bengaluru highlight that planning in Indian cities are not alienated from thinking about food as an essential urban infrastructure system.

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