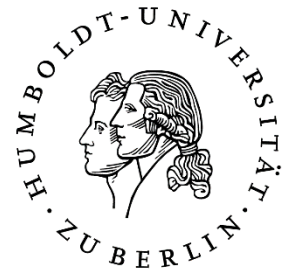


ARBEITSBERICHTE



Geographisches Institut, Humboldt-Universität zu Berlin



Jakob Engel, Elmar Kulke, Johanna Steep (eds.)

“Re-Figuration in Global Agriculture and Food Systems. Evolution and Impacts in the Global South” – Conference Report

Heft 212

Berlin 2025

Photo 1: Street market in Nairobi, KULKE 2022.

Photo 2: Greenhouse with rose cultivation in Naivasha, ENGEL 2022.

Photo 3: Urban Gardening in Nairobi, SONNTAG 2021.

Photo 4: Rose processing in Naivasha, ENGEL 2022.

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Prologue and Greetings

We would like to thank all participants of the successful conference "Re-Figuration in Global Agriculture and Food Systems. Development and Impacts in the Global South". It took place on 14 and 15 March at the University of Nairobi.

The conference was a collaboration between the University of Nairobi and Humboldt-Universität zu Berlin, which grew out of our shared experiences and ongoing research in Kenya. In addition to the long-standing friendly cooperation between our universities, the conference was part of joint projects. First, the EAGER Trans-Net project is a university collaboration between Universities in Berlin, Kenya, Tanzania and Cameroon funded by ERASMUS+. The Network collaborates in joint student projects, scientific staff exchange and workshops. Furthermore, there are two research projects "Apples and Flowers. Effects of Pandemics on the (Re-)Organisation of Commodity Chains for Fresh Agricultural Products" and "Knowledge and Commodities II: Communicative Action of Consumers and Intermediaries" (funded by the German Research Foundation (DFG)), which took place in Kenya from 2021 to 2025. Their joint focus on the Kenyan agricultural sector was the impetus for this conference. The projects are collaborations between the Institute of Geography at the Humboldt-Universität zu Berlin and the Technical University of Berlin. In addition, results were presented that were jointly collected by students from the University of Nairobi and Humboldt-Universität as part of the EAGER Trans-Net and ERASMUS+ projects. This is one of many joint courses and exchange programs that have taken place in recent years.

Through numerous visits to Kenya and the continuous exchange of knowledge, we have recognised the value of comparing the different value chains of several agricultural products. In particular, we wanted to compare the large-scale export products, such as roses, with the small-scale supply chains of fresh food for the local population, especially in Nairobi. An important area of interest for us was the impact of exogenous shocks and crises on these different value chains. Understanding how different agricultural systems respond to and recover from such disruptions is critical to developing resilient and sustainable practices.

The aim of the conference was to bring together different perspectives of stakeholders from the Private Sector, Research Institutions, Universities and NGO's, recognise commonalities and develop recommendations for the future. Together, 44 participants discussed the latest scientific findings from research and practical contributions from stakeholders such as retailers, producers, intermediaries or governmental institutions. We are convinced that by discussing these issues together, we can promote more robust agricultural practices and value chains. This report summarises the various outcomes and discussions.

We hope that the presentations and discussions were stimulating and helpful for all participants.

Yours sincerely

Jakob Engel, Prof. Dr. Elmar Kulke & Johanna Steep
Department of Geography, Economic Geography
Humboldt-Universität zu Berlin

Timetable - Re-Figuration in Global Agriculture and Food Systems. Evolution and Impacts in the Global South

Thursday, 14th of March 2024

Kenyan Agricultural Value Chains

09:00 – 09:30	Welcome & Registration
09:30 – 10:00	Opening (<i>Rural to urban: Re-Figuration of agriculture value chain production and urban food consumption in Kenya</i>)
10:00 – 10:45	Keynote PROF. CLAIRE MÉDARD , Institut de Recherche pour le Développement (<i>Territorial and land-tenure dynamics of urban growth in Kenya</i>)
10:45 – 11:00	Short break
11:00 – 12:30	Exogenous shocks on the Kenyan flower industry JAKOB ENGEL , M.A., Humboldt-Universität zu Berlin (<i>Kenyan rose supply chain. How exogenous shocks lead to long-term development in industry</i>) ROSE NGUKU , Kenyan Flower Council (<i>Challenges and changes for the flower industry triggered by global crises and shocks</i>) SILAS WABOMBA , Lake Naivasha Riparian Association (<i>Covid-19 and the cut-flower industry in Naivasha: risk, uncertainty and preparing for the future</i>)
12:30 – 14:00	Lunch break
14:00 – 16:00	Agriculture and fresh produce PROF. GILBERT NDURU , Chuka University (<i>Current developments in Kenyan agricultural value chains</i>) PROF. NINA BAUR , Technische Universität Berlin, & PROF. BEATRIZ BUSTOS GALLARDO , Universidad de Chile, (<i>The Social Impact of the Covid-19 Pandemic on Commodity Chains for Fruit and Fresh Vegetables: A Comparison of Conflicts between Resilience and Social Sustainability in Chile and Germany</i>) REAKEY SEDA , Fresh Produce Exporters Association of Kenya (<i>Challenges and changes for the fresh produce export triggered by global crises and shocks</i>) Prof. Jonathan Nzuma, University of Nairobi (<i>Fresh produce value chain In Kenya - lessons & policy options</i>)
16:00 – 17:00	Tea and Discussion

Friday, 15th of March 2024

Nairobis' urban food systems & peri- urban developments

- 09:15 – 09:30 – Welcome & Registration
- 09:30 – 10:15 – Keynote
PROF. SAMUEL OWUOR, University of Nairobi (*The dynamics of food systems in Nairobi*)
- 10:15 – 10:30 – Short break
- 10:30 – 12:00 – Resilient (Urban) Food Systems?
VERONICA MWANGI (PHD), University of Nairobi (*The effects of current shocks on food security and poverty in Nairobi*)
CHRISTINE CHEGE (PHD), International center for tropical agriculture (*The role of private sector on food retail and consumption in the informal urban neighborhoods of Kenya*)
- 12:00 – 12:30 – Student poster presentation of the study project: Global South Geographies of (Urban) Food Systems. Mapping the Example of Nairobi's Neighborhoods.
- 12:30 – 14:00 – Lunch break
- 14:00 – 15:30 – Peri-urban developments and their influence on urban livelihoods
JACK MAKAU, Associate Director of Muungano wa Wanavijiji (*Housing developments in Nairobi's peri- urban areas*)
PROF. OWITI K'AKUMU, University of Nairobi (*Large- scale infrastructure-induced urban growth and its distribution of welfare effects across different socio- economic classes*)
PURITY KAMANDE, Rural Outreach Program-Africa (*School gardens: empowering the next generation of urban farmers in Kenya*)
- 15:30 – 16:00 – Tea and discussion
- 16:00 – 16:30 – Closing

Participants

Name	Institution
Agatha Mutio Nthenge	Chuka University
Alexander Kohrs	Technische Universität Berlin
Alexander Murithi	University of Nairobi
Alice Ritho	African Population and Health Research Center (APHRC)
Barrack Brian Ogada	University of Nairobi
Beatriz Bustos	University of Chile
Bright Mutheu	University of Nairobi
Christine G. Kiria Chege	International Centre for Tropical Agriculture (CIAT)
Claire Médard	IFRA / University
Cynthia Khabetsa Mwavishi	University of Nairobi
Dailyne Murei	University of Nairobi
Eileen Kavata	University of Nairobi
Elettra Griesi	Freie Universität Berlin
Elmar Kulke	Humboldt-Universität zu Berlin
Felistus Mwalia	Heinrich Böll Stiftung Kenya
Gentrix Juma	Agricultural Employers Association
George Odunga	University of Nairobi
Getrude Chepwogen	University of Nairobi
Gilbert Nduru	Chuka University
Jack Makau	Slum Dwellers International Kenya
Jackson Kago	Kenyatta University
Jakob Engel	Humboldt-Universität zu Berlin
John Kamathi Kiige	Karatina University
John Shadrack	University of Nairobi
Jonathan Nzuma	University of Nairobi
Kate Owino	University of Nairobi
Linda Hering	Humboldt-Universität zu Berlin
Martine Oleche	University of Nairobi
Marygorety Akinyi Otieno	University of Nairobi
Maurice Ongosi	University of Nairobi
Michael Lokuruka	Karatina University
Morris Cerullo	Panda Flowers
Nina Baur	Technische Universität Berlin
Owiti A. K' Akumu	University of Nairobi
Pauline Liru	University of Nairobi
Purity Kamande	Innovative Agricultural Solutions Expert
Rose Nguku	Kenyan Flower Council
Samuel Owuor	University of Nairobi
Teresa Wanjiru Mbatia	University of Nairobi

Titus Kaloki	Friedrich Ebert Stiftung Kenya
Veronica Wambui Mwangi	University of Nairobi
Wanjala Silas Wabomba	Lake Naivasha Riparian Association
Zacharia Muindi	Map Kibera Trust
Zenah Odhiambo	University of Nairobi



Photo: “Re-Figuration in Global Agriculture and Food Systems” Conference Nairobi, March 2024 (ENGEL 2024)

Challenges & Changes for the Flower Industry Triggered by Global Crises & Shocks

ROSE NGUKU

The Global Flower Industry

In the year 2020, the global flower market was valued at USD 50 billion annually. While the Netherlands was the primary producer in the industry, this has changed over time and other growing regions have developed including Africa, Latin America, and Asia. In turn, we now have a large basket of flower varieties being sold in markets worldwide, ranging from the classic tulips of Holland to the exotic assortment of cut flowers from Africa.

The industry is regulated by international standards, ensuring quality control and safety for both workers and consumers. Moreover, the industry is driven by demand, technology, innovation, and sustainability. The use of advanced technology in the cultivation and distribution of flowers has led to increased efficiency and cost savings. Innovative techniques such as hydroponic farming have allowed for more sustainable practices.

The flower industry not only brings beauty and joy to people's lives but also supports countless livelihoods around the world. From small-scale farmers to large corporations, the flower industry provides employment opportunities for millions of people. Additionally, it has a significant impact on the environment, with many flower companies taking measures to reduce their carbon footprint and engage in sustainable business practices.

Kenya's Floriculture Industry

Kenya's floriculture industry is a thriving industry that plays an important role in the country's economy. The country is ranked among the top three global producers of cut flowers. This sector provides direct employment to 200,000 workers, most of whom come from rural areas. It is noteworthy that 70% of these workers are women, promoting the welfare of women. The floriculture industry also employs an additional 1 million workers in the supply chain, overall supporting over 4 million livelihoods.

The floriculture industry is a major contributor to the country's economy, accounting for 70% of Kenya's total horticultural exports. The industry generates KES 1 billion annually contributing 1% to the country's Gross Domestic Product (GDP).

Kenyan cut flowers are highly sought after in the European market, holding a 40% market share. The country also exports its flowers to other destinations, including the United Arab Emirates, China, Asia, Australia, and the United States of America. In total, these flowers are exported to over 60 destinations worldwide.

Challenges and changes in response to global crises and shocks

The floriculture industry has faced a myriad of challenges and changes in response to global crises and shocks. The energy crises of the 1970s resulted in a sharp increase in the cost of heating greenhouses in Northern countries, compelling investors to seek alternative growing areas for flowers. This, in turn, led to the establishment of the floriculture sector in Kenya by Dutch investors.

Over the last decade, the industry has shifted its focus toward sustainability, adopting good agricultural practices, and social, environmental, and governance practices that prioritize the greater good for all and future generations. The industry's expansion and sustainability have also been influenced significantly by international trade agreements, taxes, and tariffs. Adherence to international regulations remains a challenge where some regulations become stringent with little room for negotiation on the best way to comply and while promoting market access. For example, in February 2024, the EU published a regulation amending the frequency of checks on plant consignments. This will translate to more inspections on cut flowers from Kenya and other countries of origin.

Global crises such as the COVID-19 pandemic, the Russia-Ukraine war, and the Red Sea attacks have had a significant impact on the sector. These crises have disrupted production costs, availability of materials, and logistical chains, leading to higher freight costs for flower exports. The Red Sea is now impassible. Water vessels are now taking a longer route from the Port of Mombasa, down to South Africa, to Europe, increasing transit times from 28 days to over 45 days. This has impacted the cost and cost and quality of flowers.

Despite these challenges, the floriculture industry remains committed to overcoming the challenges to ensure growth and sustainability. The industry is exploring efficiencies in sea freight, to reduce the carbon footprint while keeping the quality of flowers intact. It's also important to remain optimistic and seek mutually beneficial solutions to address the global trade challenges faced by the industry.

Advancements in the floriculture sector

Locally, the floriculture sector is heavily invested in research, making significant biotechnological advancements on the flowers including genetic modification to develop exotic varieties, enhanced fragrance, texture, shape, and color, and lengthening the flowers' vase life. Other developments include e-market platforms and export processing zones.

Opportunities in the sector

Kenya's geographical location along the equator offers favorable climate and altitude which are ideal conditions for year-round production of a diverse range of flowers and varieties. The country is well located with proximity to Europe offering direct flights and promoting exports. We take pride in the Port of Mombasa which is well-developed and services over 33 shipping lines to 80 destinations, making it a sea hub for Africa. Kenya's production land is extensive giving us unlimited opportunities to produce and export flowers to more destinations in the Middle East, Asia, and Africa. Moreover, the industry receives support from the government.

The current collaboration between the private and public sectors to set up aggregation and consolidation centers will reduce post-harvest losses, increase market access for both large and small growers, and improve the sector's competitiveness. By capitalizing on these opportunities and advancements, the Kenyan floriculture sector has the potential to thrive and play a significant role in the country's economic growth.

Kenya Flower Council

In all these, the Kenya Flower Council has been playing a pivotal role in the growth of the sector. Kenya Flower Council (KFC) was formed in 1996 by Kenyan growers and exporters of cut flowers. This is our 28th year of presence in the country. KFC is a voluntary Business Membership Organization for growers, exporters, and value chain actors in the floriculture sector. Largely, the sector is self-regulated as it is mainly owned by the private sector, but receives support from the government. Our mission is to deliver value to the members through compliance, advocacy, innovation, capacity building, trade facilitation, market access and communication. We do this with the vision to make Kenya the home of the world's best flower growers.

KFC executes its role in supporting the industry through four arms; offering business membership to different value chain players in the sub-sector, owning a certification scheme that is tailor-made to maintain international agricultural standards for the markets through the Kenya Flower Council, Flowers and Ornamentals Sustainability Standard (KFC FOSS) that checks on Good Agricultural Practices, Environmental and Social aspects of conducting business. The standard is one of the best two standards in the world on cut flowers and ornamentals. The standard has been growing and developing since our inception in 1996. KFC runs the standard and is finally a certification body. These four arms have their roles cut out and audited internationally to ensure there is no bias or interference from one role to another.

Future outlook of the Floriculture industry in Kenya

Looking into the future of the floriculture industry in Kenya, several things come into play;

1. Sustainability, Innovation, and Market Adaptation

Sustainability in the floriculture industry will continue to play a key role. There will remain a continued need to promote ecologically friendly techniques, resource efficiency, and social responsibility. This involves reducing water use and encouraging biodiversity protection. There has also been a change in consumer preferences toward sustainability. The sector will continue to explore and adapt climate-smart practices, develop drought-resistant flower varieties, and sea freight adaptive varieties, and implement adaptation measures to mitigate the impacts of extreme weather events.

2. Logistics

Kenya will continue to efforts on the shift from air to sea to reduce GHGs. Also, there is a need for improved logistics within Africa to promote local exports within the continent.

3. Technology

Technology plays a central role in the industry. This has led to a transformation of operations and will continue to do so. The need for precision agriculture will continue to grow as well as supply chain transparency, product development, and research in genetics, agronomy, and economics to support climate-smart flowers & ornamentals. This will increase efficiency, reduce costs, reduce postharvest losses, and stay ahead in an increasingly competitive global market.

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The challenges of the COVID-19-Pandemic for the Kenyan Rose supply chain.

JAKOB ENGEL

Abstract

The increasing number of exogenous shocks in the globalised world is having a particular impact on global value chains. The COVID-19 pandemic has highlighted the vulnerability of such chains like no other shock before. This study examines the impact of the pandemic on rose farms and breeding companies in Kenya. It becomes clear that the shock must be divided into three categories: Product shock, process shock and civil society shock, each of which brings different challenges. It also shows that the shock of the COVID-19 pandemic has led to upgrading and offshoring processes in the companies analysed.

Keywords: *Global Value Chains, Kenya, COVID-19, Shocks, Upgrading, Roses*

Introduction

Global supply and value chains have increased in recent decades, linking production, logistics, trade and consumption worldwide. While the processing industry initially dominated, fresh products such as fruits, vegetables or cut flowers followed later. Since the outsourcing of the cut flower industry to countries in the Global South, the demands on the value chain have been higher than ever. Kenya established during the last years as the main producer of cut roses for Europe and the city of Naivasha is its centre. Nowadays, it is the third largest industry in the country. Due to the great distance, the most difficult challenges are the rapid perishability and the maintenance of a secure cold chain. The question arises how exogenous shocks affect such a highly organised chain. The COVID-19 pandemic and the war in Ukraine are examples of this. These shocks lead to short- and long-term developments. This article briefly describes the value chain for Kenyan roses and highlights the impacts of the COVID-19 pandemic on the chain.

Theoretical background

To comprehensively analyse the links and relationships in global supply chains, the theoretical approaches to *Global Commodity Chains*, *Global Value Chains* and *Global Production Networks* have been present in economic geography for years (COE, DICKEN, & HESS, 2008; GEREFFI, 1996; KULKE, 2017). They have also proven their worth in numerous studies on supply chains of agricultural products from countries of the Global South (DANNENBERG, 2012; DANNENBERG & NDURU, 2013; SONNTAG, 2021). It therefore makes sense to use them to analyse the value chain of roses. In addition to analysing the chain, the approach to *Global Value Chains* offers the possibility of assessing forms of power and coordination between the actors in the chain by analysing governance structures in greater depth (GEREFFI, HUMPHREY, & STURGEON, 2005). In agricultural value chains between countries of the Global South and North, there are often power asymmetries emanating from lead firms in the chain (DANNENBERG, 2012). In

addition to coordination, later publications focused the possibility of *upgrading* in value chains. *Upgrading* can improve the position of an actor by increasing the share of value creation (KULKE, 2017). A distinction is made between the four forms of *process*, *product*, *functional* and *inter-sectoral upgrading* (HUMPHREY & SCHMITZ, 2002). For reasons of simplicity, this article only analyses the structure and sequence of the value chain.

Global Value Chains are particularly vulnerable to exogenous shocks due to the large number of actors and their multi-layered interactions within the network. Due to the strict temporal and spatial coordination, the entire network suffers if one link fails. Value chains can provide channels for shocks to be transmitted across national borders to other regions and industries (ANBUMOZHI, KIMURA & THANGAVELU, 2020; RÖGLINGER et al., 2022). Three types of shock must be distinguished (PIPKIN & FUENTES, 2017). First, *process shocks*, which describe external changes in the production process. Second, *product shocks*, which affect process flows. Third, *civil society shocks* that affect workers. When there is a combination of these shocks, this condition is referred to as systemic vulnerability (DONER, RITCHIE, & SLATER, 2005; PIPKIN & FUENTES, 2017). This often leads to *upgrading* processes to ensure the survival of the firm or industry. Long-term developments can therefore result from exogenous shocks.

Countries in the Global South are much more vulnerable to exogenous shocks than countries of the Global North. The stability of the systems in countries of the Global North already absorbs a large part of the effects forced by exogenous shocks (DABLA-NORRIS & BAL GÜNDÜZ, 2014). In addition, the economic focus is often on specific agricultural products. This low level of diversification leads to a higher economic vulnerability (SAVUN & TIRONE, 2012). Finally, a large part of the population lives at the subsistence level, which means a higher risk of hunger, homelessness, and poverty. An exogenous shock can reinforce these (personal) fates.

Methodology

The subject of this study was the international value chain of Kenyan rose production, spanning two continents and several countries. Qualitative guided interviews were used to collect data. This method offers the best conditions for explaining exogenous shock processes, as these are unforeseen events that everyone experiences individually. For a comprehensive analysis and reconstruction, relevant actors along the whole chain (in Kenya, the Netherlands and Germany) had to be interviewed. After the interviews were transcribed, they were coded into different thematic blocks using QDA software. In addition, the proven method of value chain mapping (Figure 1) and photo documentation (Photos 1-6) was carried out.

Results

The value chain of Kenyan cut roses for the German market

To describe the value chain comprehensively, it is necessary to start with the development of a new variety. Plant breeding develops new varieties of cultivated plants with novel genetic characteristics (DONS & LOUWAARS, 2012, p. 264). This involves developing varieties that are better adapted to the local climate in Kenya, better able to withstand transport conditions and meet current demand preferences (LEUS, VAN LAERE, RIEK, & VAN HUYLENBROECK, 2018, p. 723). However, the process is extremely costly and takes up to ten years (KAZIMIERCZUK, KAMAU,

KINUTHIA, & MUKOKO, 2018, p. 12). The main regions where new rose varieties are developed are Aalsmeer and De Lier in the Netherlands. This is where the breeding and propagation companies are headquartered and have research laboratories within an established cluster structure (INGENBLEEK, EDERER PEER, & CHRISTENSEN, 2007, p. 9; PORTER, RAMIREZ-VALLEJO, & VAN EENENNAAM, 2011).

The newly developed varieties are exported to Kenya as living cuttings. These are very small shipments of low volume. There, they are propagated in the local branches of the breeding and propagation companies and offered for sale in showrooms (KAZIMIERCZUK et al., 2018, p. 12; PERRY, 2011, p. 17) (Photo 1). These locations serve as a point of contact for buyers from the flower farms. Here, they are advised on the latest developments and customer preferences in the various regions of Europe, and cuttings are sold between the breeding company and the rose farm.

After this step the product is mass-produced on the farm for the first time. Two stages of production can be identified. At the beginning, the cuttings are grown in greenhouses with high humidity for three to four weeks until their roots are large enough to plant them in the greenhouse (Photo 2). From then on, it takes around three months until harvest (Photo 3 & 4). In the meantime, the roses must be pruned weekly and sprayed with pesticides to protect them from diseases and pests. The roses are then harvested by hand, cooled down to two degrees overnight, trimmed the next day and packed in boxes for transport (LEUS et al., 2018, p. 727). They are transported from the farm to Nairobi airport in the company's own refrigerated lorries (BABALOLA, SUNDARAKANI, & GANESH, 2011, p. 406; KIRIGIA, BETSEMA, VAN WESTEN, & ZOOMERS, 2016, p. 42).

In Nairobi, a local freight forwarder, who has the necessary refrigeration capacity directly at the cargo terminal, takes over. The forwarder handles the process with the customs authorities, the government authority, as well as the security clearance and loading onto the aircraft (HORTIWISE, 2018, p. 26). Most of the flowers are going directly to the Netherlands. Direct purchases that are traded between the farms and supermarket chains, for example, are also traded via the Netherlands. The auction serves as a kind of infrastructural hub where buyers, traders and forwarders meet. Here, the value chain is divided for the first time between direct trade relations and distribution via the auction (see Figure 1).

Once the goods have landed in Europe, in the case of the supermarket chain, they are briefly stored in a warehouse and from there distributed to the local supermarkets, from where they reach the end consumer. If the flowers are traded at auction, they are offered by the auctioneers on behalf of the farms and sold in an online auction (Photo 5). The auctioned roses are then delivered to the buyer within the *Royal FloraHolland* site within a maximum of two hours (KOSTER & YU, 2008, p. 1182). The buyers are usually wholesalers from all over Europe or owners of flower shops.

The wholesalers transport the roses to their local shops. The customers there are florists, hotels or restaurateurs (PETERS, 2015, p. 15). Finally, the flowers are offered in flower shops, where customers buy them for private use (Photo 6).

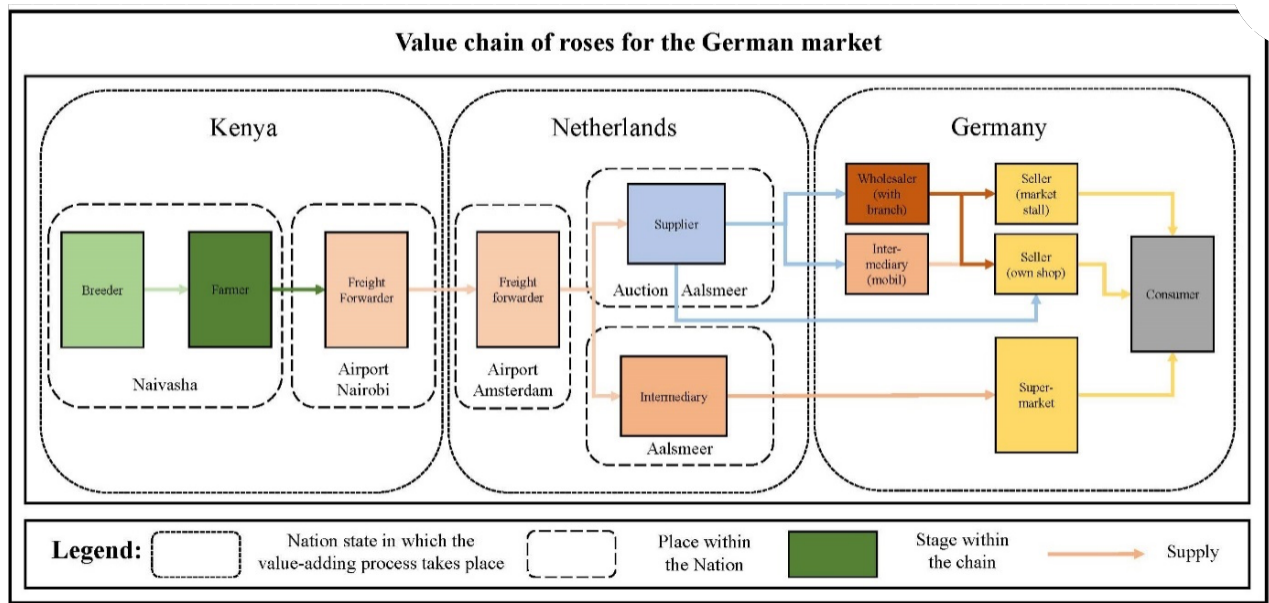


Figure 1: Value chain of roses for the German market (own draft).



Photo 1: Showroom of a Dutch breeder (March 2022)



Photo 2: Rose Cutting (March 2022)



Photo 3: Roses in the greenhouse (March 2022)



Photo 4: Harvested roses (March 2022)



Photo 5: Online rose auction at *Royal FloraHolland* (April 2022)



Photo 6: Kenyan roses in a German flower shop (February 2023)

Struggles of the COVID-19-Pandemic for the Kenyan rose farms

The COVID-19 pandemic was a completely new challenge that could not be compared to other shocks in the past. The biggest challenge for the Kenyan industry was the standstill in air traffic, as this meant that no flowers could be exported. The situation has had both direct and indirect impacts on the Kenyan rose industry and its stakeholders. It makes sense to consider growers and breeders separately. Starting with the breeders. The pandemic primarily manifested itself as a process shock for them. The regulations enacted to minimize the infection rate and restrict contact in the private and public sectors jeopardized the entire business process. The restrictions imposed exceeded those in Europe many times over, which is primarily due to Kenya's poorer medical infrastructure.

“There are curfews imposed. It was 7 to 7. That was the first month. Then it was relaxed to 7:00 PM to 5:00 AM. Then 9:00 PM to 4:00 AM, so that's where it stayed for a long time. Then they pushed it to 10:00 PM to 4:00 AM. Stayed there for quite some time. Until recently, when they lifted everything.” (Breeder, 4th of March 2022)

“Well, basically everyone used the facility where employees could take leave. And once they had exhausted their annual leave, then it was on half pay. So dependent on some company, some companies just continue to pay normal. I mean one farm.... normally had rather about 11 employees in a greenhouse per hectare. They reduced it to five and then within one month they realized the quality was going down. So, they immediately increased it back to 8, but there was still 3 less so.” (Breeder, 8th of March 2022)

The statements make clear that the official requirements necessitated a reorganization of the entire operating process. Firstly, this affected the duration of working hours, which are normally split into two shifts between 5.30 am and 10 pm. Secondly, the work processes had to be fundamentally reorganized to minimize the physical interaction of the staff. This resulted in direct restrictions on staff, which were expressed in a limitation of employees per hectare. Shortly after the shock occurred, there were extensive cancellations on the part of the farms, which in turn led to a slump in sales. With the lack of orders and transport options for the farms, the

breeder's income also fell to a minimum. This directly demonstrates the importance of transport and the chain's dependence on international air traffic.

“As a breeder we have one main problem. Normally we charge money for growing our varieties. A Grower has a product there, the fee is for one hectare you can pay it over 18 months, starting six months after planting. So obviously through that COVID period all payments stopped. So, we had absolutely no income for more than two months.”
(Breeder, 5th of March 2022)

However, opportunities for site development were also recognized. For example, a manager of a breeding company responded to the question of whether the site in Kenya should be downsized in future because of the pandemic:

“No in reverse, in fact, quite possibly our full breeding program will come to Kenya.”
(Breeder, 4th of March 2022)

This statement shows that the pandemic is fuelling a further increase in offshoring. This was justified by the fact that the working conditions and infrastructure in Kenya are now more favorable. Furthermore, Kenya is a growth market, while the Dutch flower industry is in recession. This emphasizes that a crisis, in this case the COVID-19 pandemic, can also mean opportunities for an industry, a region or a company.

When looking at the Kenyan rose farms, it quickly became clear that they were the most affected by the shock of the COVID-19 pandemic of all the players in the value chain. The impact manifested itself in both process and product shocks. Initially, at the beginning of the pandemic, the process shock had the same effect on operations as it did for breeders. The key difference compared to them was simply the number of workers. On the one hand, this required a higher sequence of bus journeys¹ and, on the other, an earlier cessation of work to ensure that all workers were at home at the start of the curfew.

“There was a time we had a curfew that was running from 7 to 7. So, which means by 7:00 PM everybody should be at home and for everybody to be at home by 7:00 PM we must give them allowance like 2-3 hours. So, by four we have closed the job. So that maybe somebody can pass like this supermarket pick something and rush home.”
(Flower farm, 3rd of March 2022)

The most difficult challenge for the operational process was covering the costs of labour. During the field phase, it was striking that all the interviewees from the farms proudly announced that they were not laying off any workers during the COVID-19 pandemic. At the same time, they referred to the other farms in Naivasha, where there were (mass) redundancies. These statements contradict each other but could not be verified during the survey phase. They show

¹ The workers are picked up daily from their homes by the farms' own buses and dropped off again after work.

that it was very important for the external image of the farm not to be associated with any redundancies.

“Despite not exporting, the company was able to use its reserves to sustain employees exactly match here in Kenya. Everybody got their salary. We retained all our staff in March, in April. When we got to May... It was getting difficult. We were not selling, and we negotiated with the Union, and we came to an agreement that we could make the workers work part time. So, half of their workforce would work for two weeks in a month. Another half, then they go and take two weeks unpaid leave as the other group comes. That's how we're rotating. So, at any one point will be half salary. Yeah, because that's what the company could afford. So that happened for three months, May, June, July. By August things were picking up and everybody was back to work. So, we didn't lay anybody off.” (Flower farm, 3rd of March 2022)

All interviewees emphasized the approach described here. It should be recognized that no workers were made redundant. However, they were forced to forgo 50% of their wages. The only alternative was to resign, which very few of them are likely to have considered in view of the general challenges. In this context it is necessary to point out the general situation of the workers again.

“I would note it is nowhere compared to what businesses felt in Europe. We had serious disruptions. We have locked down here, but due to the nature of the economic ability of most Kenyans. You cannot afford to sit in the house even if you are forced, because in this country, what you work for today is what you eat in the evening. Then number will stay in the house it was never going to happen. Never!” (Flower farm, 22nd of March 2022)

This statement emphasizes people's (everyday) problems. It shows that an exogenous shock with far-reaching macroeconomic effects in the countries of the Global South is far more threatening and has more serious consequences (CHAKRABARTI, 2015). These circumstances signal the danger of a shock to civil society due to the massive threat to the basic physiological needs according to MASLOW (1943) that occur in the event of exogenous shocks in the Global South. With the review of labour relations through negotiations with the trade unions mentioned in the previous statement, the farms have taken preventive action to counteract bigger problems. This largely prevented a shock to civil society in the wake of the COVID-19 pandemic. The farms received support from the Kenyan government, the NGO Fairtrade and parent companies from the Global North. The parent companies helped financially to subsidize wages. Fairtrade provided hygiene products and organized food aid packages. The government provided support mainly in the form of tax relief.

The product shocks that companies have experienced during the COVID-19 pandemic cannot be clearly separated from the process shocks. The massive slump in orders and existing contracts at the beginning of the shock is due to new regulations at national and international level (process shock) on the one hand and a change in demand (product shock) on the other.

“There was also lockdown in Germany. Lockdown in Holland. So, they were not, they are reducing their orders, they're saying people are working very limited time. Yes, even if you bring the flowers, we do not have enough people to process them. So, they reduced their order by more than half. [...] we have the customers, who supply to shops. Most of the customers are small customers who supply to flower shops. So, during that time we could not sell anything to those customers because shops were closed.” (Flower farm, 1st of March 2022)

The product shock affected the Dutch intermediaries backwards through the chain to the farms (Figure 1). The occurrence of the COVID shock shows clearly the power asymmetry of the governance structures in the value chain. In the event of a shock, lead firms and intermediaries cancelled their orders to reduce their own losses. At the same time, both sides emphasised the importance of open and honest communication, which underpins the business relationships and contributed significantly to overcoming the shock to the satisfaction of both sides. After the first shock phase (March & April 2020), the situation for farms improved rapidly. Due to the ongoing lockdowns in Europe and the restriction of leisure and travel opportunities, consumption in the private sector increased. Most people invested in their homes by trying to make them as beautiful as possible. In this context, the purchase of flowers also increased rapidly, causing an upswing in the industry after the resumption of international trade.

“COVID was good for us. We did very well last year. I did my best year ever. That is simple, nobody was allowed to go anywhere. So, what do you do if you have to stay home? You make your home nicer. Otherwise, people are busy with like I want to go on holiday to Australia and next year to there. And you can only spend that euro one time. Look at the ‘Baumärkte’ they did very well ‘cause everybody started doing things in their house because they had time. And they couldn't go anywhere. Same for us, same thing.” (Flower farm, 19th of March 2022)

Once the initial shock phase had been overcome, a characteristic crisis followed, which intensified in the global movement of goods. This once again demonstrates the importance of transport and logistics in *Global Value Chains*, which has already been emphasised by COE et al. (2008, p. 276). The problems in the international transport system manifested themselves as a product shock on the farms. In the initial phase, the company was threatened by the mass destruction of roses, as exports were not possible due to the cancellation of air traffic.

“Some of the impacts we are still feeling today. One of the impacts was about the freight. The flight capacity, yes, you remember that. Because of the corona crisis, most of the planes well, maybe because of lockdown. Maybe because of restrictions from different countries, so the planes were very few. You know, our business is majorly exports. We don't sell flowers local. 100% of our production. Other than the regions which we just we throw away.” (Flower farm, 1st of March 2022)

The statement describes the massive vulnerability of the chain due to its dependence on air transport. In response to this product shock, the players realized the core problem of the entire

value chain and were forced to innovate and invest. This consisted of diversifying transport by tapping into sea freight.

“At least we have learned some lessons from the pandemic. We also now have some preparedness. For example, when it comes to now the introduction of sea freight. Yeah, because of the pandemic, we learned that sea freight can be an option. Don't have selling it but it has given sea freight some lightning. Yes, we are seeing that there is a problem of air we can try to sell through sea. Because with the flowers the biggest problem was the freight. The biggest problem was attributed. There was also the lockdown part of it, but it resulted now to the freight. So, one of the things we learned that we need to have an option that we can export flowers to Europe other than air.” (flower farm, 1st of March 2022)

The shock has therefore led to a *functional upgrade* of the chain. As soon as this system is applied by the entire sector, it can be seen as a general breakthrough. With further experimentation, this innovation could be extended to other agricultural products (such as mangoes, berries or avocados). This would have the side effect of massively reducing the environmental footprint of products coming from the Global South. At the same time, transport costs would be reduced. The main challenge for the future lies in quickly overcoming the distance between Naivasha and Mombasa harbour. To do this, the refrigerated containers must be transported from the harbour to Naivasha, filled there and brought back again. This process is currently still too expensive and has not been developed. However, the future endeavours of the industry are clearly moving in the direction of expanding this option.

Conclusion

To summarize, it can be said that both the farms and the breeders have overcome the shock of the COVID-19 pandemic. Especially at the beginning, the biggest challenges for both were the *process shock* caused by the new contact restrictions and curfews. This *process shock* was more serious for the farms, as they have a larger number of workers and fewer financial resources than the (European) breeding companies. There was therefore a risk that the farms would not be able to pay their workers. This could have led to a *civil society shock* but was averted through preventative cooperation with the unions.

The *product shock* consisted of the cancellation of orders, which first affected the farms and then the breeders backwards in the chain. The main problem was the restricted air traffic, which limited the export of roses. These challenges meant that measures had to be taken to reduce costs and coordination (breeders) and to develop alternative trade routes (farms). For breeders, the reduction in the number of branches in conjunction with further *offshoring* to Kenya can be seen as a *process upgrade*. It reduces the costs and coordination effort for the companies. The opening up of the sea transport should be seen as a *functional upgrade*. It creates diversification in the transport options of the value chain and thus increases the general resilience of the chain. The development of these upgrading processes and their long-term success as well as their transferability to other value chains for agricultural products would be of great interest for future research projects.

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Envisioning the future of urban agriculture in Nairobi; Are green roofs the new savior?

JOHN K. SHADRACK

Introduction

The thesis of this paper is that Nairobi's space (the conventional) for urban agriculture is shrinking and that the adoption of green roofs (GRs) is the solution. Today, it is assertable that every square inch of the world is urbanized to some degree (SCHMID & TOPALOVIC, 2023) and this is more advanced in the cities. Thus, it becomes evident that 'the lack' of conventional open spaces for urban agricultural activities is a challenge. The World Cities Report (2022) notes that 'Cities are here to stay, and the future of humanity is undoubtedly urban' as well IAN GOLDING and TOM LEE-DEVLIN, in their work, 'Age of the City' have highlighted the developing countries are rapidly urbanizing at a faster rate than the developed cities (GOLDIN & LEE-DEVLIN, 2023, p. 109). Less than 3% percentage of the world's surface is currently urban and yet accommodates more than half of the world's population. The global inventory of density and spatial distribution of built Impervious Surface Area (ISA) shows that 0.43% of the total surface of the world (579,703 km²) is built impervious surfaces, which include concrete (grey spaces) infrastructures, such as roads, railways, industries and urban buildings and this has an impact on the available land for urban agricultural activities. This paper is based on fieldwork carried out in 2019 and 2023, in which 6 (six) green roof case studies were subjected into an in-depth analysis. Interviews with state and non-state actors, as well as the professional bodies in the built environment, were conducted. Further, relevant documents that align with green spaces in Kenya and beyond were studied. In this paper, first, a presentation of how urban agriculture in Nairobi is at risk and how urbanization is depleting the open green spaces in Nairobi is done. Then, the paper goes on to show how and why green roofs are the solution(s) to the declining [in size] and deteriorating [in quality] green spaces. The various methods that were used to gather data are presented followed by a detailed discussion of the findings.

Urban Agriculture in Nairobi is at risk

Urbanisation is unavoidable, and this is depleting the open green spaces in cities. It is estimated that more than half of the world's population will be urbanized by 2050 (WORLD CITIES REPORT, 2022), indicating that there will be an explosion of concrete development in the already declining conventional urban green spaces. According to LI ET AL. (2019) urbanization results in the occupation of urban green spaces, and this has contributed to the accelerated loss of natural spaces, resulting in numerous urban environmental hazards. A study by XIE ET AL., (2023) have demonstrated how urbanization is posing a threat to food security due to the reduction in available urban agricultural land. Further, YOSHIDA and YAGI (2023) highlight the pros and cons of urbanisation to urban and peri-urban farming activities. In their exploration, HIRPA ET AL. (2023) have revealed that by 2030, urbanisation shall have consumed 1.8–2.4% of the world's croplands, with 80% of this loss happening in Asia and Africa (see also BREN D'AMOUR ET AL., 2017). The decline of urban green spaces (UGS) is depriving the urban residents of the

opportunities to interact with nature through urban agriculture and thus, the need to have innovative means of bringing back this experience through the adoption of green roofs. PÉREZ-URRESTARAZU ET AL. (2015) note that green roofs are some of the new urban greening concepts that have been established to address environmental and social concerns resulting from urban development. As populations gravitate towards cities, the urban landscape becomes a crucible for concentrated anthropogenic activities. It is evident that Nairobi city is facing a complex, and mostly worsening, set of environmental sustainability challenges, including the lack of land for urban agriculture. The rapid decrease of conventional green urban spaces has made man come up with innovative alternatives, such as green roofs, which can creatively bring back the lost green spaces within urban areas (KIMOTE, 2020.)

Is adoption of green roofs the solution?

OBERNDORFER ET AL. (2007) note that roof gardens serve as the historical precursors to modern-day green roofs, which have evolved over a long and rich history (MAGILL ET AL., 2011). Among the earliest known roof gardens were the Hanging Gardens of Babylon, located in present-day Syria and recognized as one of the Seven Wonders of the Ancient World (BRODERSEN, 2016; STANČIUS & GRECEVIČIUS, undated: p. 18-19). The development of contemporary green roof technology, however, began in Germany at the turn of the 20th century, when vegetation was employed on roofs to mitigate the harmful effects of solar radiation on building structures (OBERNDORFER ET AL., 2007). Thus, they [the green roofs] functioned as fire-retardant systems during summer (KÖHLER ET AL, 2003). Additionally, between the 1600s and 1800s, Norwegian communities used roofs covered with soil and grass for stability—a practice later adopted by American settlers in the Great Plains, contributing to the evolution of early green roofs (OBERNDORFER ET AL. 2007). Today, a variety of comprehensive green roof systems exist, each characterized by distinct materials and implementation processes, yet all serving similar environmental and structural functions.

Historically, roof gardens were primarily reserved for the elites and Benedictine monks during the Middle Ages (BROWN, 2022). However, today, GRs are widely implemented across various sectors, including hospitality, commercial buildings, and private residences. The rise of environmental awareness in the 1970s, particularly in urban contexts, facilitated the adoption of innovative environmental policies and technologies, with Germany playing a pioneering role. Due to the diverse environmental benefits associated with green roofs, the technology quickly gained traction. Interdisciplinary research during this period led to the establishment of technical guidelines, the first of which was published by the Landscape, Research, Development, and Construction Society (FLL) in 1982 (WERTHMANN, 2007). Today, building codes in several German urban areas mandate the installation of green roofs. These regulatory frameworks have been instrumental in promoting the widespread adoption and refinement of green roof technologies, with Germany witnessing an annual expansion of approximately 13.5 million square meters of green roof coverage.

Today, green roofs are a common feature in European countries such as Germany, and this technology has diffused to other countries, including North America and Asian countries, but for the case of Nairobi, GRs are infrequent. Several cities such as Helsingborg (Sweden), Melbourne (Australia), Utrecht (Netherlands), and Hamburg (Germany) are encouraging (through

incentives, regulations, and rules) the adoption of green roofs for their benefit. In newly industrializing countries such as Bangkok in Thailand, the adoption of GRs is encouraged (through incentives such as reduced land rates and other forms of tax breaks) as a new strategy for reintroducing green spaces in already congested urban areas.

The increasing use of GRs in urban environments, particularly in European cities, highlights their capacity to address environmental degradation and promote urban biodiversity (OBERNDORFER ET AL., 2007). Statistically and globally, the adoption of GRs has grown, currently offering more ecological services just like conventional urban forests. Green roofs, as KNAPP ET AL. (2019) observe, are more likely to support a wider variety of plant taxa, increasing their potential to restore urban biodiversity.

In Nairobi, open spaces are rapidly becoming almost unavailable (or are pushed to the peripheries) with few exceptions of the undeveloped state lands such as the Kasarani stadium. This gives the space to see their adaptability and the potentials that come with Green Roofs, including Urban Agriculture. Although a single benefit (for this paper, urban agriculture) of green roofs fails to substantially validate [economically, socially, politically and biologically] their adoption, it is arguable that most of the advantages of green roofs are interconnected. Thus, urban agriculture on the rooftop will serve more benefits such as storm water reduction, thermal insulation, increased property value, and act as a source of urban biodiversity, including bees [during pollination], butterflies and birds.

Green roofs can be broadly categorized into three types: semi-intensive, intensive, and extensive (VIJAYARAGHAVAN, 2016) and the selection of a green roof system is typically contingent upon the building's structural design and roof type (OBERNDORFER ET AL., 2007), with urban populations adopting these systems based on their diverse environmental and operational advantages. Structurally, GRs consist of multiple layers, including a root barrier, drainage systems, waterproof membranes, filter fabrics, growing media, and vegetation. Semi-intensive Green Roofs (SIGs) typically weigh between 25 to 40 pounds per square foot when dry (TAM, 2020) and can be constructed using layered systems or modular tray setups and are characterized by a deeper substrate layer, which supports a wider variety of vegetation types (PREVATT ET AL., 2012). There are contemporary technological advancements that have introduced the use of lightweight materials such as polyethene and low-density polyethene, which reduce the overall load on structures (BIANCHINI & HEWAGE, 2012). Extensive green roofs (EGRs) are lighter in weight, require less maintenance, and are generally more cost-effective (BOCANEGRA ET AL., 2024; YIN ET AL., 2019). Thus, by contrast, have a shallower growing medium and are often planted with drought-resistant species such as sedum or native grasses. Intensive green roofs (IGRs) feature deeper growing media, which can accommodate larger plants such as shrubs and small trees. Due to their enhanced water retention capacity, IGRs do not necessitate drought-tolerant species (SZOTA ET AL., 2017). The maintenance, labour intensity, cost, and load-bearing requirements vary significantly between IGRs and EGRs, with intensive roofs offering a broader range of ecological and aesthetic functions similar to those of conventional green spaces.

Methods

To answer the 'why' and 'how' questions on the (im)possibilities of GRs in salvaging Nairobi's urban agriculture, data was borrowed from a master's thesis (KIMOTE, 2020) and a literature review, there are six (6) case studies of GRs for analysis and thus a Multiple Case Study Design (MCSD) adopted. The cases studied (fig 1.) include the Swiss Embassy in Nairobi, the French Embassy, Morning Side Office Park, GTC in Westlands, and Haveli Apartments. The unit of analysis included only the buildings with GRs that are part of the original designs of the buildings [avoided pot plants and free-standing plants on balconies]. In fact, the International Landscape Industry of Green Roof Association rejects free-standing plants on top of a roof or balcony. However, they may provide a practical solution to increased urban greenery and an acceptable greening effect because they do not integrate vegetation with the roof structure.

The study aimed to collect data uniformly across all levels of analysis using standardized methods. However, due to variations in the case studies, this was not feasible. As a result, qualitative data collection techniques were employed for all six green roofs, drawing on multiple sources of evidence. These included rapid site assessments, observations, desk studies (tracking social media platforms such as Facebook and X and websites), social media discussions, policy reviews, and interviews. For the Rapid Site Assessment (RSA), structured observations were conducted across Nairobi using a checklist to capture preliminary data. The checklist included variables such as geographical location, green roof typology, biodiversity, aesthetics, and GPS coordinates. This was complemented by desk studies that identified the architects, landscapers, and construction companies involved in green roof projects.

Additionally, relevant environmental policies and regulatory frameworks related to green roofs and Nature-Based Solutions (NBS) were reviewed, including the Climate Change Act (2016), Nairobi City County Urban Agriculture Promotion and Regulation Act, 2015 (No. 4 of 2015), NEMA's Strategic Plan (2019-2024), and the Nairobi Integrated Urban Development Master Plan. Both structured and unstructured interviews were conducted with a range of stakeholders. State actors included representatives from the Nairobi City County Urban Planning Department and NEMA. In contrast, non-state actors involved the Kenya Green Building Society (KGBS), the Kenya Alliance of Resident Associations (KARA), and individual green roof owners.

Interviews and conversations were recorded, transcribed, and translated using naturalism transcription, preserving all utterances, pauses, and non-standard accents. Post-translation, the data underwent a cleaning process to distil relevant texts, ensuring scientific organization for interpretation while maintaining strict quality control. Data sources included structured texts from secondary literature, research articles, books, and interview comments; unstructured texts from transcriptions and field notes, audio and video recordings.

Given the qualitative nature of this study, analytical techniques were employed to interpret visual and textual data. While desktop studies and emails were pre-existing written records, interviews necessitated transcription. The data was coded to label meaningful segments, facilitating the identification of recurring themes and new codes. This coding process enabled the categorization of data, transforming raw information into coherent findings aligned with study objectives. Narrative analysis contextualized respondents' stories within the research framework.

Ethical Considerations

Maintaining privacy and ethical standards is essential in qualitative research, especially given the depth of analysis. Several respondents, notably neighbours of the green roofs (GRs), requested anonymity and declined to be photographed or recorded. Protective measures were implemented to safeguard their rights. Interviews were conducted only after participants were thoroughly informed about the study's aims. While no commitments were made to address respondents' social or economic challenges, generalized feedback was provided when possible, ensuring participation was voluntary and devoid of coercion.

Findings and discussions

Respondents noted a scarcity of recreational spaces in Nairobi, highlighting the need for urban greening strategies. The adoption of green roofs across different contexts—Morningside Office Park, Swiss Embassy, French Embassy, The GTC, the former Coca-Cola Regional Headquarters and Haveli Towers—illustrates a shared vision of integrating sustainability into urban architecture. Each of these cases accentuates the benefits of green roofs in rapidly urbanising spaces. Six case studies (see fig. 1) of GRs were identified, available and accessible for the study that is (1) The Former Coca-Cola Building in Upper Hill, (2) The Haveli Towers in Parklands, (3) The Morningside office park, along Kilimani/Ngong Road (4) The Global Trade Center GTC-in Westlands (5), The French Embassy along Peponi Road, Westlands and, (6) The Swiss Embassy in Gigiri.

The Morningside Office's green roof was installed in 2010 and is one of the oldest green roofs in Nairobi. The GR covers 90% of the rooftop area and was envisioned as part of a "*timeless*" architectural design to remain relevant despite urban changes. Today, the GR serves several purposes, including providing a recreational and scenic space for the office's occupants, compensating for vegetation lost during construction, and enhancing biodiversity. From a design standpoint, Morningside Office Park embodies an early, forward-thinking approach in Nairobi aimed at creating a building that would stay relevant and "timeless." The green roof at Morningside enhances the building's aesthetics. It reduces the need for paid green spaces in urban settings, consistent with studies highlighting the recreational and psychological benefits of green roofs.

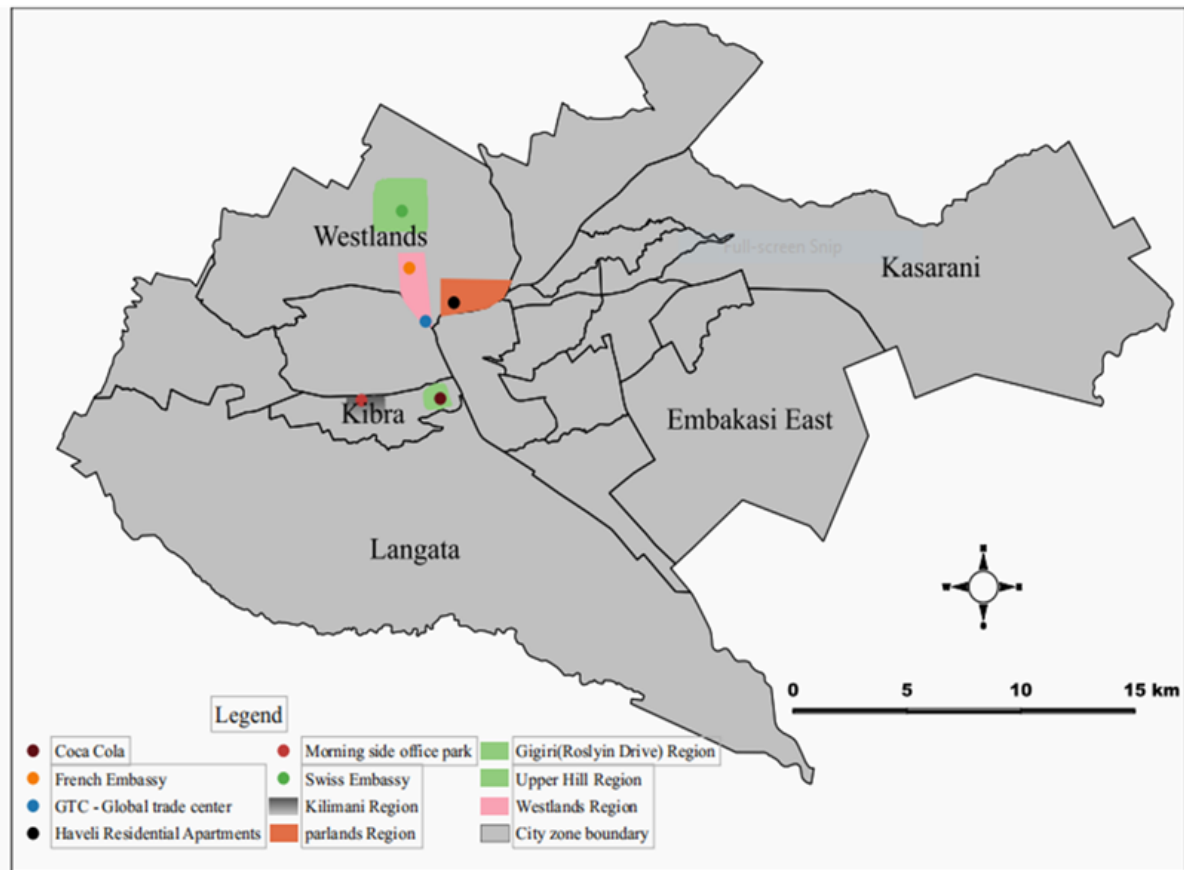


Fig. 1: Spatial distribution of the case studies (Source: KIMOTE, 2020).

In contrast, the Swiss Embassy's green roof (fig. 2-4) is deeply rooted in concerns over security and urban environmental conservation. The camouflage provided by the rooftop vegetation demonstrates an innovative use of GRs to blend architecture with its surroundings, particularly in high-security environments. Additionally, the green roof's water management system emphasizes the practical benefits of integrating natural systems into urban infrastructure, echoing global research on the sustainable use of water resources in green roof design (LI, 2019). The Swiss Embassy in Nairobi installed a green roof in 2015 was designed by both local and Swiss architects. The GR aligns with the embassy's commitment to biodiversity conservation and security concerns, camouflaging the building to resemble a forest cover. *Aptenia cordifolia* (see fig. 2-4), a drought-resistant plant, was chosen for its ability to survive rooftop conditions with minimal water and uncontrolled winds. Additionally, GR enhances environmental sustainability by collecting rainwater, which is reused for irrigation, and provides additional benefits such as temperature regulation and noise reduction.

The French Embassy's GR (installed in 2017) aligns with France's international commitment to sustainable development. Sedum and other succulents (fig. 2-4), which have low-maintenance characteristics (ARABI ET AL., 2015) for the vegetation of this GR, were planted. The embassy's green roof aids in thermal regulation, storm water management, sound insulation, and biodiversity conservation, and this is a practical and symbolic representation of France's dedication to global sustainability goals, consistent with the findings of various scholars on the ecological advantages of GRs (ARABI ET AL., 2015; KIMOTE, 2020).

The various types of vegetation used at various green roofs.



Fig. 2: *Aptenia cordifolia* used at the Swiss Embassy GR (Source: KIMOTE, 2020).



Fig. 3: Kikuyu grass used on the Haveli Towers green roof; The same is used at Coco cola Building (Source: Innovative Planning & Design Consultants (IPDC, 2020).



Fig. 4: Sedums used on the French a green roof (Source; Daria Motsar (Sedum Green Roof Plant Selection, 2019).

The GR at Haveli Towers (fig. 8-9) is primarily used to restore vegetation lost during construction. Kikuyu grass (fig. 3), a robust and adaptable plant, was chosen for its resistance to disease and weeds and its ability to thrive in various soil conditions. The GR was an integral part of the building's design, and this aligns with the role of GRs in urban biodiversity restoration (WILLIAMS ET AL., 2014) and eco-friendly architecture. The Coca-Cola building (former head office) in Upper Hill constructed between 2006 and 2008, reflects the shift in Upper Hill from industrial to commercial use (MWANGI ET AL., 2018). The area's zoning updates, driven by increasing demand for space, have resulted in diminished green areas, indicating a 3.84% growth in concrete cover and a corresponding loss of greenery over a decade and thus the adoption of the GR was timely and purposeful.

The French Embassy's green roof represents a balance between cultural values and environmental responsibility. By using low-maintenance plants, the French Embassy shows how green roofs can be designed to meet both aesthetic and functional goals, such as improving building insulation and fostering urban biodiversity. This is especially relevant in the context of global commitments like the Paris Agreement and the Sustainable Development Goals (SDGs), where green roofs contribute to the broader objective of reducing carbon footprints in urban settings. The GTC building (fig. 9; by the time of the research this was under construction), spans 7.5 acres and it has the GR located on the 5th level. Designed by Triad Architects, this GR was envisioned to be the largest in East Africa, featuring a 1.5-meter soil depth to support diverse vegetation.

A view of the Morningside, Swiss and Haveli Towers green roofs.



Fig. 5: The Morningside Office



Fig. 6: Swiss Embassy

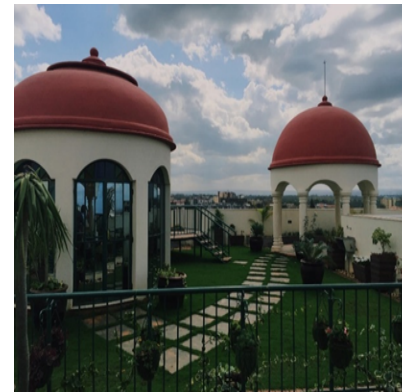


Fig. 7: The GR at Havelin Towers

Source: field work, 2017 (KIMOTE, 2020)

The GTC green roof aims to provide multifunctional spaces for jogging, social events, and dining, aligning with the European Commission's advocacy for integrated urban green spaces. It aims to enhance well-being and counter biodiversity loss impacts. The in-depth analysis emphasized that the GR fosters connections to nature, promoting social benefits within urban environments. This integration reflects the Social Ecological System (SES) framework, linking human activity, space, and policy to enhance urban resilience. Additionally, the GTC green roof contributes to Sustainable Development Goal 11, advocating for innovative urban designs that prioritize sustainability and accessibility, in line with Kenya's Vision 2030 and National Climate Change Response Strategy (NCCRS).

A view of The French Embassy and the GTC building, green roofs



Fig. 8: The French Embassy (Source: French Embassy[from, Kimote,2020])



Fig. 9: The GTC building, Westlands (Source: Triad Architects, 2020)

From the roof to the urban plate

Urban agriculture (UA) has been gaining traction in Nairobi as the city scuffles with rapid urbanisation (with predictions connoting continued growth; MUNDIA, 2017), food insecurity, and environmental degradation, the negative impacts of climate change. In Nairobi, the city is changing into a jungle of concrete developments with colossal infrastructure projects

(GILLESPIE & SCHINDLER, 2022) consuming some of the state-preserved green spaces, such as Uhuru Park, which had to surrender some piece (1.3 acres [0.5 hectares]) of land to the development of the Express Highway. The Nairobi National Park is the main natural vegetative space that consists of a wildlife game reserve and a forest- Karura and Ngong forests. Earlier, in 1996, there was a push to have the Karura forest sold to private investors, and the government regime of that time supported the idea. The urban scholars, as shown by RODRIGUEZ-TORRES and CHARTON-BIGOT, (2010), supported the government of that time; 'it was scandalous to protect Karura at the expense of men' (p. 25). There has been a historical and ongoing effort(s) to see 'Karura forest's shifting value from a public resource to a privatized landscape' (NJERU, 2010; pp. 339-339). Further, political scientists and environmentalists in Kenya document a hi(story) of urban forest (and land) grabbing as a persistent aspect of political corruption and patronage, with unlawful and improper distribution of forest land endangering both livelihoods and biodiversity (MANJI, 2017) and this is further threatening the availability of conventional land for urban agriculture. The Environmental and Social Impact Assessment (ESIA) Report for the Inland Container Depot Nairobi Access Road (Line A) along the inner boundary of Nairobi National Park (NNP) evaluated the construction of a 4.153 km road. This road was designed to link the Nairobi Inland Container Depot to the Southern Bypass, with the alignment planned to minimize disruption and enhance logistical connectivity (KIMOTE, 2020; NDUNG'U, 2020). The road alters the Nairobi National Park (NNP) boundaries at the eastern side and joins the Southern Bypass near Nairobi's Wilson Airport. The road was designed to utilize approximately 4,153-metre length by 21-metre width of the NNP's land. Nairobi also lost more open spaces due to the construction of the Standard Gauge Railway (SGR), which passes through the largest natural green space in Nairobi. The Nairobi County government has committed about 21% (147 sq. km) of the city's space to the natural green space reserves.

Such threats call for innovative strategies since it is true that natural urban green spaces are in danger. Thus, there is an urgent need to come up with innovative ways of increasing spaces for farming activities in Nairobi. However, the question remains: shall the concrete structures be demolished to pave the way for urban agriculture? Borrowing from the Theory of Inventive Problem Solving (TRIZ) in its principle that 'Less Is More' (LAGAEVA & SIMAK, 2020), Yes, the open green spaces in Nairobi City are indeed diminishing, that should not actually be a problem since the concrete walls and roofs are also increasing in numbers. Thus, they shall provide avenues for the green roofs that shall be used for urban agriculture.

TRIZ asserts that "solutions already exist," meaning that the solutions to a given problem are often be found within the problem itself. In the case of declining urban green spaces, the solution lies in utilizing concrete developments, such as rooftops, which are repurposed to effectively address the issue by serving as alternative green spaces. Through the lens of Diffusion of Innovations Theory (DIT), it is possible to borrow (here in Nairobi) what has worked in the cities that have managed to adopt and make the adoption of green roofs the norm E.M. Rogers developed the Diffusion of Innovations Theory (DIT) in 1962 to explain how, why, and at what rate new ideas spread through cultures (ROGERS, 1995). The theory identifies various stages of adoption and categorizes individuals into groups based on their willingness and speed to adopt innovations. These categories include innovators, early adopters, early majority, late majority, and laggards. Green roofs are an example of such innovative strategies, offering benefits across environmental, social, and economic sectors and borrowing from DIT, the global adoption of

GRs is seen as; the innovators (Germans and other European nations), the early adopters include (North America) early majority (Asia) and laggards (Africa) whereby the concept of green roofs is still in its infancy.

The GRs offer a promising 'new space' for Nairobi City that can be used for urban agriculture. The said urban agriculture on the rooftops comes with tangible functions; it shall promote biodiversity and mitigate environmental impacts such as climate green roofs act as carbon sinks and even today, there is the possibility of using GRs as carbon offsets. The discussed case studies present this new space whereby various vegetation is grown. Although the GRs have focused on non-food kinds of vegetation, they have contributed greatly to the Nairobi biodiversity. The Morningside Office Park's green roof, which covers 90% of its rooftop area, has various shrubs, grass and flowers. The Swiss Embassy's GR has adopted *Aptenia cordifolia*, a drought-resistant plant which thrives under hostile conditions. The French Embassy's GR has sedum plants, while The Coca-Cola building and Haveli Towers have adopted the local grass, Kikuyu grass.

Green roof plants need to be chosen with care, however, not all plants are suitable for growing in this way (KSIAZEK-MIKENAS ET AL., 2023). Thus, when choosing plants for a green roof, they need to be able to withstand wind and frost, be drought-resistant, tolerate living in poor soil, and be maintenance-free (BELLINI, 2024; LEOTTA ET AL., 2023). Recent research (KSIAZEK-MIKENAS ET AL., 2023; STIBOLT ET AL., 2023) shows that GRs can grow and produce food for urban citizens.

Table 1: spatial distribution, ownership and Nature of the GRs (Source: KIMOTE, 2020)

Case Study	Social-economic characteristics of the region	Type of Building & Location	Type of Ownership	Type of Vegetation
Swiss Embassy; Gigiri area	High Class (Upper)	Commercial (Gigiri area)	Foreign Owned	<i>Aptenia cordifolia</i>
French Embassy; Westlands, Peponi Road	High Class (Upper)	Commercial (Westlands)	Foreign Owned	"sedum" and "crassulaceae", plants
Haveli Towers; Parklands	High Class (Upper)	Residential (Parklands)	Locally Owned	Mainly Kikuyu Grass & Various Shrubs
Coca-Cola Building; Upperhill	High Class (Upper) Upper Class Business Hub	Commercial (Upper Hill)	Private international company (Foreign Company)	Kikuyu grass
Morning Side office park; Kilimani-Ngong Road	High Class (Upper)	Commercial (Ngong-Kilimani)	Locally owned Owner not identified*	Grass, shrubs, flower plants.
Global Trade Centre (GTC);	Upper Class Business Hub	Commercial residential (Westlands)	Foreign owned (Owned by Chinese Company)	Grass, shrubs, flower plants

Many vegetables and herbs thrive on GRs, many in a growing medium as little as four inches deep, including herbs, tomatoes, peppers, and lettuce. The Swiss GR has a rainwater collection system that allows for irrigation and reuse, and this makes it possible for the plants to survive during the dry season. As well these methods can be used in other urban areas that face rainwater challenges. Borrowing from a visit to the Futurium gGmbH (December 2023), it is evident that the future of urban development shall have to take into consideration issues like climate, housing, food, and technology. The use of walls and roofs to produce food and mitigate climate change in the future design of cities highlights the need to create new spaces for the betterment of the cities.



Fig. 10: Future use of walls and roofs for food production (Source: Own picture visit at Futurium GmbH, December 2023).



Fig. 11: Future use of walls and roofs for food production (Source: Own picture visit at Futurium GmbH, December 2023).

Summary, Conclusions and Recommendations

This study explored the prospects of urban agriculture in Nairobi by assessing the potential of using green as 'new spaces' for urban agriculture. Six GRs were identified across Nairobi, with their distribution found to be uneven, located in Upper Hill, Gigiri, Ngong/Kilimani, Westlands, and Parklands. The GRs are mostly owned by foreigners, which aligns with the transfer of ideas and knowledge. Three main types of green roofs were identified: intensive, semi-extensive, and extensive. Among the six case studies, none qualified as intensive green roofs. From the findings, it is possible to categorize The Swiss Embassy's GR as extensive. At the same time, the Morningside Office Park GR, the French GR, The Coca-Cola GR, and The Haveli Towers GR clearly fit the semi-extensive green GR. The GTC's GR mirrors the definition of an Intensive Green Roof. Maintenance for all six green roofs is manually performed by skilled personnel, with the Swiss Embassy being notable for employing a qualified gardener. Despite this, there is a general lack of skilled personnel for green roof maintenance across the city.

The adoption of green roofs was noted to be highly influenced by costs as well owner's environmental awareness and keenness to environmental issues. The interviews revealed that all case studies were concerned with mitigating the loss of urban biodiversity during construction. The Swiss Embassy's GRs were adopted to integrate European cultural values, align with the

Green Belt Movement philosophy, and support sustainable development goals (SDGs) and climate change mitigation. Similar motivations were observed at the French Embassy. Haveli Towers and Morningside Office Park focused on creating resilient, visionary structures. Despite the additional costs, all case studies acknowledged the environmental, economic, and social benefits of green roofs, in agreement with findings from TAM (2020) and WILLIAMS ET AL., 2014.

Interviews conducted with twelve neighbours residing within 1 km of the GRs revealed a significant need for more awareness about these installations. Of the interviewees, only two knew green roofs, acquired through education. This indicates that GRs are not widely recognized in Kenya, with many neighbours unfamiliar with their presence, which is a great gap that research should take place. Vegetation variability among the green roofs was noted: the Swiss Embassy's *Aptenia cordifolia* is wind-resistant and drought-tolerant; Morningside Office Park features diverse vegetation supporting local insects and small animals, consistent with OBERNDORFER ET AL. (2007) who highlighted green roofs as habitats for biodiversity. The Coca-Cola and Haveli Towers roofs are covered with Kikuyu grass, while the French Embassy's choice of *Sedum* and *Crassulaceae* plants minimizes maintenance needs.

The study concludes that Nairobi's rapid urbanization has led to a decline in urban green spaces, severally threatening urban agriculture. Thus, there is a need to come up with innovative ways of recovering urban lands for agriculture. Green roofs are providing a new space for urban agriculture. The current GRs in Nairobi have adopted non-food types of vegetation, and this can be reapproached using food crops such as Sukuma wiki, Cabbages, and tomatoes, bringing the argument of 'from roofs to the table' into a reality. In Kenya, as noted from the study, the lack of standards, policies, and guidelines for green roofs impedes the GRs' widespread implementation. The study suggests that to increase the adoption of green roofs, Nairobi needs explicit policies and effective planning. Respondents varied in their opinions: some advocated for mandatory adoption, while others favoured incentivizing green roof installation. Evidence from other cities indicates that a mix of regulatory and incentive-based approaches could be beneficial.

Further suggestions include the establishment of regulations to mandate GR adoption, as supported by Italbuild Imports Limited and Pharos Architects. Conversely, respondents from the Swiss Embassy, French Embassy, and GTC recommended promoting adoption through government incentives, aligning with ZHANG ET AL. (2012). Further research is necessary to quantify the ecological services of green roofs, particularly for private developers, to facilitate informed policy creation.

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Foodretail at Nairobi's urban edge – The Case of Kasarani Location

ALEXANDER KOHRS

Introduction

Nairobi is an extraordinarily remarkable city, having transformed over its approximately 120-year history from a railway station of the Uganda Railway into an East African megacity (OWUOR & MBATIA, 2012). Although there are, of course, many nuanced academic discourses about Nairobi, currently, two major narratives can be identified regarding the city's present development paths:

1. The narrative of Nairobi as a premier global hub in East Africa (OWUOR ET AL., 2017, pp. 5-7; MYERS, 2014; VAN DER MERWE, 2004, pp. 38-43). This perspective highlights the city's dynamic urban and economic growth in recent decades, which has established Nairobi as a regional and globally connected center for finance, trade, and services. This can also be seen in the fact that Nairobi is home to many regional multinational corporate (mnc) headquarters in East Africa. Furthermore, some transnational political institutions like the UN and others sustain this narrative of global importance.
2. The second narrative describes Nairobi as a colonial city, founded as the front of British subjugation of native Kenya, and as a place where the global inequalities in the distribution of goods, income, and opportunities are produced and reproduced up to this day. This is linked to rapid urban growth and expansion that began immediately after independence in 1963. Additionally, urban growth in its material-structural dimension is frequently linked to different form of conflicts and living conditions (KOHRS, HERING & SHADRACK, 2024) resulting in a fragmented and heterogeneous City (MCFARLANE 2021, CHARTON-BIGOT & RODRIGUEZ-TORRES, 2010). This perspective emphasizes how Nairobi's history has led to its fragmented development, reflecting the ongoing rise of spatially bounded inequality and the marginalization of a significant part of Nairobi's urban population.

Interestingly, both perspectives reveal that urban and economic growth, as well as historical path dependency and the connectiveness to the world's economic centers and its surrounding hinterlands/operational landscapes (BRENNER, 2019, p. 306), form a starting point for describing and evaluating today's urban economic geography.

Sub-project A03 of the Collaborative Research Center (CRC) 1265 - Refiguration of Space aims to investigate these new urbanizations and the economic activities occurring within them. Our research primarily focuses on the urban food system. The broader focus in which we are working on the topic of urban food systems is important hence it allows us to integrate questions related to the development of urban geography, such as the distribution of housing and living conditions, income levels or infrastructure connections, with questions of what, where, how and who can trade and consume food. Moreover, it allows us to address questions from economic geography, such as how different value chains produce distinct products which are

consumed in different neighborhoods or how new consumer imaginations influence the buying behavior in regard to specific products.

For our research, we have selected four adjacent neighborhoods within the Kasarani area that exemplify the rapid urbanization processes occurring at the periphery of Nairobi. These areas have been undergoing a significant transformation since the 1990s, increasingly becoming an integral part of the city's urban fabric. It encompasses both well-connected neighborhoods, marked by urban-industrial elements and associated with global south middle-class lifestyles, as well as peripheral and marginalized quarters. As part of the research, an intra-urban comparison of structurally different city neighborhoods is being conducted to identify commonalities and differences concerning the actors involved in food trade and consumption, as well as the associated power dynamics and conflicts (MCFARLANE, SILVER & TRUELOVE, 2017, ROBINSON, 2022). Initial insights into the historical development of these neighborhoods reveal a high level of diversity and varying contextual conditions that shape the opportunities available to actors in the food systems. However, data from the interviews also show asymmetric relational connections between the neighborhoods - for example, when residents of poorer neighborhoods report working as domestic workers for residents of close by higher-income neighborhoods earning there their income from which a big share goes to buy the food groceries for the family. However, since presenting all the results would exceed the scope of this article, the focus will be on two main aspects: first, using qualitative interview data, to provide a historical overview of the development of the neighborhoods. Second to provide a more detailed understanding of the retailer structure in the neighborhood.

Research Design and Methodology

The results presented here are based on data collected during three field phases, totaling approximately 12 weeks of fieldwork, and were designed and executed by a multi-member research team. These field phases were conducted at shorter intervals between November 2022 and March 2024. The first field phase employed ethnographic methods such as site visits, participatory observations, as well as photographic and other documentation (HEINRICH ET AL., 2024) to identify a suitable research area in Nairobi that:

1. is located in the urban fringe and
2. exhibits various forms of food retail and a diverse social structure among the selected research neighborhoods, putting a particular emphasis on their spatial proximity to each other.

The objective of this study was to analyze the diversity and connections of food retail and consumption in the urban fringe through an intra-urban comparison (ROBINSON, 2022, MCFARLANE, SILVER & TRUELOVE, 2017). Kasarani was ultimately selected due to its alignment with all the identified characteristics and its potential for providing a valuable field access. We extend our profound gratitude to our Kenyan research assistants and colleagues—*John Kimote Shadrack, Kate Owino, Alexander Murithi, Eileen Kvata, and Charlotte Auka*—who are well-established and personally rooted within these neighborhoods. Their professional assistance was crucial in facilitating contacts, quantitative data collection, and interview support, including translation and other fieldwork-related tasks.

This approach also incorporates the perspectives and discussions of METH ET AL. (2021) and PIETERSE (2019), who highlight that the concept of the (urban) periphery inherently involves at least two key dimensions. First, the term 'periphery' always entails a geographic-spatial dimension in relation to central urban areas. For instance, Kasarani serves as an example, being a district on the city's outskirts where factors like communication and mobility are less concentrated compared to Nairobi's more central districts. Secondly, drawing on dependency theories (e.g., PREBISCH, 1950; FRANK, 1966) and particularly WALLERSTEIN's (2004) concept of axial differentiation, the term 'periphery' also encompasses a social dimension. This dimension emphasizes the unequal distribution of power, opportunities for social mobility, and economic resources between central areas and their marginalized peripheries. In this context, it would be misleading to uniformly categorize all of Kasarani as peripheral, as social marginalization varies significantly across the four neighborhoods studied, with Gituamba representing the most marginalized. Therefore, this intra-urban comparison facilitates a more nuanced exploration of the various dimensions of urban peripheralization, particularly in relation to issues of food access. As a result, the term 'urban peripheries' (in plural) will be employed in the following discussion.

In the second field phase, our focus shifted to conducting foodscape mapping (SEDELMEIER ET AL., 2021; MACKENDRICK, 2014; FÜLLING, HERING & KULKE, 2024) in key main roads within the researched neighborhoods. This was part of a teaching-research project involving approximately 25 Kenyan and German students. Utilizing an online, georeferenced data collection tool—KoboToolbox—we gathered statistical data on business types, product assortments, pricing, employees, and other characteristics of food retail in these areas.

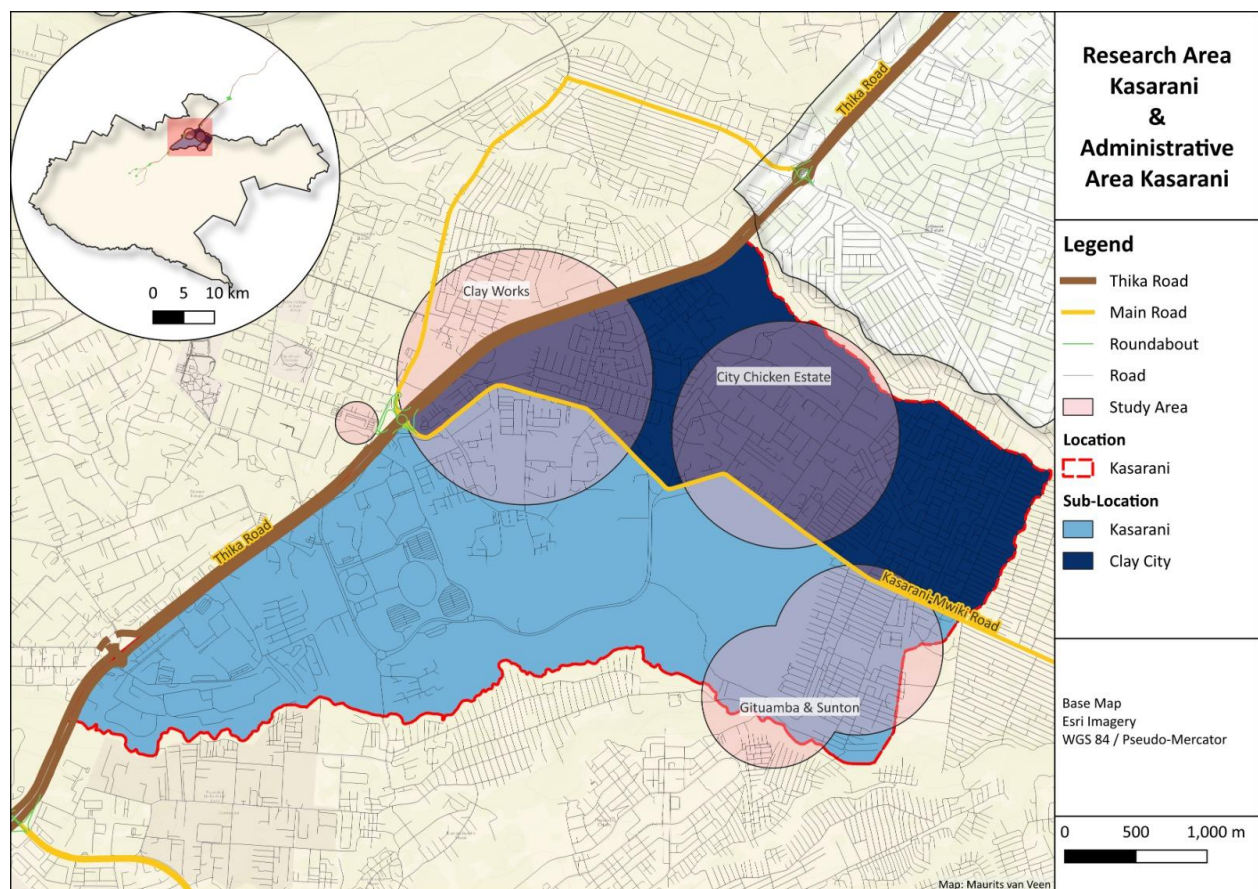
Additionally, we conducted three focus group discussions with food retailers in the neighborhoods. We also carried out guided interviews with residents and selected stakeholders regarding their food consumption habits, urban development, and city history. Furthermore, we conducted expert interviews, primarily with academic colleagues, to gain insights for interpreting our experiences and results. This phase of the research continued into the third field phase, resulting in a total of 39 interviews. The interviews, which lasted between 30 minutes and 2 hours, had to be partially translated from Swahili to English, a task performed by our fieldwork assistant, Kate Owino. All interviews were transcribed and analyzed using MAXQDA software, with coding and analysis following content analysis methods. Additionally, during the third field phase, a quantitative survey of rent price data was conducted, as the collected information can provide insights into which social classes (upper, lower middle class, floating group, and urban poor) dominate specific neighborhoods.

Between the field phases, we also dedicated extensive time to desk research and reviewing relevant academic literature as well as government and NGO reports interesting for our research project. Additionally, satellite and aerial image analyses were conducted, along with spatial referencing of the collected data using standard GIS software such as QGIS and ArcGIS Pro. This allowed a more thorough examination of spatial relationships and dimensions.

The Urban Peripheries in Kasarani: Development and Retail Structure

Kasarani, a neighborhood located in the northeastern part of Nairobi, has been undergoing a significant transformation since the 1990s, becoming an integral part of the urban fabric. Situated approximately 17 km northeast of the Nairobi Central Business District, Kasarani can be characterized as a peri-urban development area. As emphasized by peri-urbanization research, those areas are best understood as dynamic transition zones (FOLLMANN, 2022, pp. 2-4), where rural and urban landscapes, along with associated livelihoods, are transforming from rural to urban. These changes are often marked by various logics, such as those driven by institutional investors in the housing sector (VAN NOORLOOS & KLOOSTERBOER, 2018), and the transversal logics of the urban poor (CALDEIRA, 2022). As CALDEIRA illustrates especially the urban marginalized contribute to the creation of urban spaces where informal practices and regulations converge and hybridize with hegemonic logics.

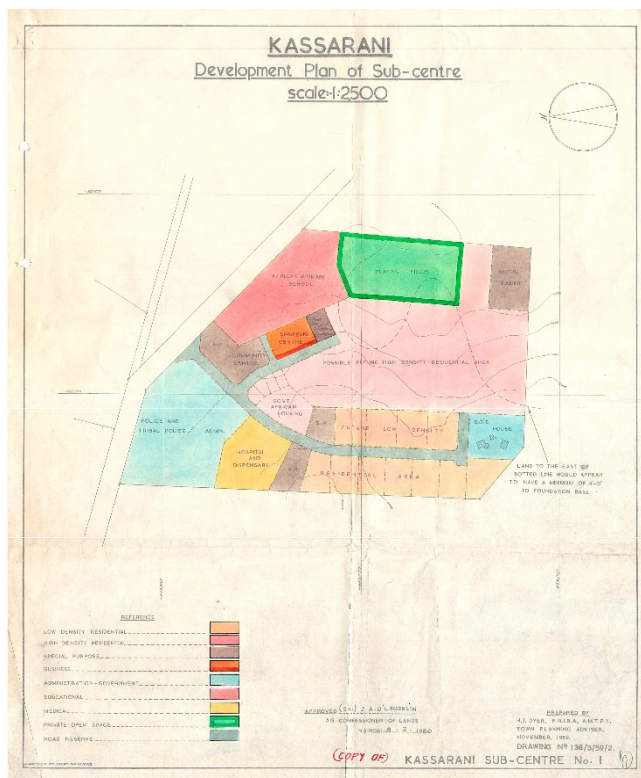
While Kasarani also designates an entire sub-county, our research specifically focuses on the Kasarani Location, a smaller administrative unit within this sub-county. This location extends from the Thika Road Superhighway to the Mwiki Location, encompassing a variety of neighborhoods. As of 2019, the Kasarani Location was home to approximately 138,000 inhabitants (KNBS, 2019), with an estimated half residing in the neighborhoods under scrutiny. The specific areas of our research include Clay Works, City Chicken, Sunton, and Gituamba, all depicted in the following map (Map 1).



Map 1: Research Area of the study project (own map by SFB Projectteam).

As previously mentioned, the following section will focus on analyzing the specific urban development trajectories and the resulting urban figuration and structure in Kasarani. Additionally, this analysis will be aligned with the development of retail structures across the four neighborhoods under study. To ensure clarity and coherence, the results will be presented by neighborhood, followed by a synthesis in the conclusion.

Clay City – How Nairobi’s emerging middle classes influence retail development



Map 2: Clay City development plan from 1959.
(Researched in Kenya National Archives)

The urban history of Clay City can be traced back to the late 1950s, when Kasarani's oldest neighbourhood was originally conceived as a residential area for European farmers and settlers. During this period, the land between Nairobi and Thika was subject to intensive agricultural exploitation, driven by the railway connection established between Nairobi and Nanyuki (1908-1931), which significantly reduced transportation costs and made the agricultural land between Thika and Nairobi highly attractive. It is well-documented that east of the railway line, sugar and sisal cultivation, as well as livestock farming, were primarily practiced, while large-scale coffee plantations were almost exclusively located west of the railway line (KINUTHIA ET AL., 2021).

Clay City was established on the western side between the railway stations of Dan-

dora and Kahawa, which are approximately 12 km apart. However, it is not entirely clear when

the first permanent houses and infrastructure were constructed. Nevertheless, a development plan for Kasarani found in the Kenya National Archives, dated 1959, already shows key structures that are still in use today, such as the District Officer's (D.O.) Place and the primary school (Map 2).

After Kenya's independence, Clay City transformed into a residential area for workers from a nearby clay brick factory, which is also reflected in its name. However, significant population growth only began in the late 1980s and was rapidly accelerated by the construction of the Thika Road Highway starting in 2009 (K'AKUMU & GATERI 2023; MANJI, 2015; SIRO & SICHANGI, 2017). In Clay City, primarily middle-class residents purchased greenfield plots (MWAU ET AL., 2020), and until the 2000s, the neighborhood was characterized mainly by large single-family homes. Nevertheless, these properties have now been purchased by investors and developers, and have been replaced by apartment blocks comprising five to seven stories. This demonstrates the significant impact of investment in the built environment, which is currently precipitating the initial manifestations of gentrification.

Our own analysis of rental prices in the various neighbourhoods (Table 1) and interviews with residents corroborate the existence of significant differences between Clay City and the other neighbourhoods surveyed. Clay City is a highly diverse neighbourhood, comprising a variety of social groups. These include long-established civil servants with high incomes, young families whose male breadwinner often has a high level of education and a better-paid job in the city centre, and students who live in shared flats. The data indicate that Clay City is a socio-economically better-off neighbourhood in which various milieus of the Kenyan middle class live together, who have achieved or are aiming for social advancement through education and increased income.

Average renting price/ month	Clay City	City Chicken	Sunton
1-bedroom	15.280 KES	14.342 KES	10.979 KES
2-bedroom	20.766 KES	24.429 KES	15.500 KES
Studio	10.292 KES	6.278 KES	6.875 KES

Table 1: Data from own surveys. Due to difficult field access, no rental prices were quantified for Gituamba.

The ongoing process of urbanisation in Clay City, which is the result of the expansion of Thika Road on the one hand and with this connected the influx of residents from the urban middle class on the other, is also having an impact on the food retail sector. The opening of the Thika Road Mall in 2014, which is described by its operators as 'one of the largest shopping malls in East Africa, with over 100 outlets featuring the best of Kenya's shopping, eating, banking and entertainment, along with numerous services and amenities for everyday needs' (TRM, 2024), as well as the establishment of other supermarkets such as Naivas, Kassmatt and Power Star in the 2010s, is directly linked to the construction of the highway. This resulted in a notable enhancement of the connection to the Central Business District (CBD), which transformed Clay City into a residential area with convenient access to the CBD and facilitated the logistical supply of the markets. Furthermore, it is evident that the highway and subsequent investments

are fueling the perception that Clay City and City Chicken districts are developing into new sub-centres of a multi-nodal, multi-centric city. This is consistent with the findings of recent studies on supermarket expansion in the Global South, which have identified a correlation between the establishment of new urban supermarket settlements and proximity to urban transport hubs (SMIT, 2016; KAMAU, THOMSEN, MC CORMICK, 2019; OWUOR ET AL., 2017). The fact that supermarkets primarily target car owners plays a role here, as they tend to be more affluent and follow the weekly shopping principle - including fresh produce stored in household infrastructures such as the fridge.

In addition to the supermarkets, a variety of other commercial establishments have emerged along the main road in Kasarani the Kasarani - Mwiki Road (see Map 1) and some collector roads, including Seasons Road and Judah Avenue. These include mini-markets, stalls, kiosks, butchers, and mobile traders (see Figure 1). In contrast, the surrounding streets exhibit minimal commercial activity, with most establishments comprising kiosks and small vegetable stalls. The data set on traders in Clay City indicates that, in contrast to the areas of Sunton and Gitu-amba, most food shops are characterised by a predominantly male workforce. Furthermore, it was also found that in most shops, two to four people serve the point of sale. (Figure 3). It is therefore pertinent to note that the shops in Clay City exhibit a higher degree of professionalisation, frequently employing a larger number of staff and stocking a more extensive product range than those in the other districts surveyed.

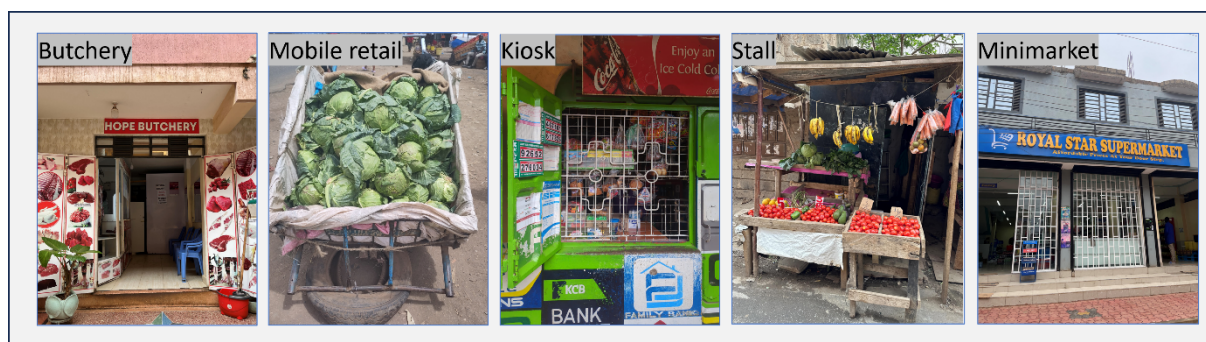


Figure 1: Mapped Ideal Types of Food Retail without supermarkets picture in Kasarani.

The retailers, some of which are concentrated on specific sections of Short Central Street, also benefit from good access to the city's road infrastructure, which connects them to other areas of the city. Consequently, they also target customers other than just the local population. To illustrate, a retailer situated in close proximity to the Kassmatt supermarket along Kasarani Mwiki Road has a fruit shop with a distinctive appearance and a selection of imported goods.

Some people prefer instead of going to Githurai, where there is a lot of jam, let me just go to Kasarani. The same price that I'm getting in Kasarani is the same price that I'm getting from [Githurai] (...) Right now, everything you can get from there. You can get fruits. You can get the cereals there. You can get those tomatoes and the rest there. So, some people prefer if I do a parking behind and I'm not paying, I can buy anything. In fact, some people come and spends more than even 20,000. Yes, because for fruits, like me, if you come to me, you buy like 3,000. You go to the cereals. Cereals are there. There

is somebody who sells cereals there and then the eggs and the rest. You buy like 10,000. Then he comes to the tomatoes and the cabbages and the rest. (Trader in Group discussion, 18.08.2023)

It is evident that the proximity to central transport axes, particularly to railway areas, exerts a significant influence on the design of retail trade and, most notably, on the catchment area of its customers. Concurrently, the vicinity of a highway has the effect of enhancing the quality of residential neighbourhoods, resulting in increased rental costs and the establishment of retail outlets and restaurants in Kasarani. However, these establishments cater more to the affluent demographic in Nairobi than to the local community.

City Chicken Estate – Retail in a residential neighborhood of Nairobi’s Upper Middle Class.

In contrast to Clay City, the development of City Chicken began only in the 1980s. At that time, the land was acquired by the City Chicken & Eggs Co-Op Society, a Nairobi-based cooperative focused on chicken farming and egg production. The area was subsequently privatized, initially to the cooperative's staff and later to private buyers from the middle class, primarily senior civil servants and military officers. However, a key distinction to Clay City is that the single-family house structures in City Chicken Estate have largely been preserved. The few apartment buildings present are mainly concentrated along Kasarani-Mwiki Road. The predominant single-family house development is characterized by plots featuring large gardens that aesthetically evoke the appearance of English garden city estates. Additionally, it is notable that the detached houses are separated from one another and from the road by distinctive “gating” practices, such as walls with barbed wire and dense planting along property boundaries (Figure 2).



Figure 2: Gating practices and large expansive green lots in Clay City (Own pictures).

Furthermore, this has an impact on food retailing, as evidenced by our data, which indicates that shops are predominantly concentrated around Kasarani–Mwiki Road. In contrast, there are generally far fewer shops in the area. The data collected from our foodscape mapping corroborates this observation, indicating that City Chicken has less than half the retail density of Sunton, with 3.3 shops per 100 m (Table 2). One of the principal factors contributing to the disparate levels of food retail density can be attributed to the architectural characteristics of the neighbourhood development. This results in a lack of direct interaction between retailers and residents, due to the border-drawing and selective effect of the aforementioned factors. Furthermore, the spaciousness and low density of the neighbourhood make it more challenging to attract a sufficient customer base for perishable fresh produce. Furthermore, the ethnographic observations indicated that there is a greater prevalence of individual traffic in City Chicken compared to other neighbourhoods. Nevertheless, the reliance of many food vendors on walk-in customers has a detrimental impact on the training of food retailers.

	Total number of Food businesses	Walking Distance in m	Business Density on 100m street
Clay City	82	1838	4,5
City Chicken Estate	58	1760	3,3
Sunton	94	1355	6,9
Gituamba	35	1145	3

Table 2: Food retail shops per 100m of mapped street (own data).

Furthermore, the retail structure of the City Chicken Estate is characterized by the notable absence of supermarkets. In contrast, City Chicken features a significant number of kiosks, mini-markets, and butcher shops. This reflects the consumer behavior of many residents, who are predominantly upper middle-class individuals, often wealthy civil servants and pensioners who purchased single-family homes in the 1990s, as well as highly educated professionals living in the few rental apartment blocks.

From our customer interviews, it is clear that a substantial proportion of these consumers place great importance on time and quality when making purchasing decisions. The time factor is exemplified by the tendency of middle-class consumers to visit shopping centers with the specific intention of purchasing all their food items in one visit and in large quantities, aiming to stock up for the entire week. Conversely, it is observed that consumers often employ household helpers who undertake various domestic tasks, including laundry, cleaning, grocery shopping, and cooking.

However, it is evident that these consumers rarely engage in informal practices and are often discouraged from doing so. For instance, several middle-class consumers expressed that negotiating prices during food shopping is a source of frustration, as it prolongs the time required to purchase food items. Additionally, they believe that they frequently pay higher prices due to the social dynamics influencing pricing and place a greater emphasis on food security standards, which they often find unverified in informal trade. Consequently, they often prefer weekly food shopping by car over daily purchases from local informal vendors and kiosks.

Sunton: Food Retail in a Neighborhood bridging the Lower Middle Class and Urban Poor

Similarly, the origins of the other neighborhoods the Sunton neighborhood can be traced back to the 1980s. According to an informant about the neighborhood's history, the entire land belonged to the first president, Jomo Kenyatta, after independence and was merely "bush land" when she, as the second resident of the area, began to build her house there (Historical resident interview Sunton, 25.08.2023). This became possible after the president's death in 1978, when the land was privatized by the presidential family with the assistance of a church closely affiliated with them, from which the informant reportedly acquired her plot of land (Ibid.). Today, Sunton is a residential area comprising middle- and lower-middle-class demographics, alongside a notable presence of high-rise apartment buildings. However, the quality of these flats is notably inferior to those in Clay City. This is reflected in the inconsistent availability of essential infrastructure services, such as water and electricity, and the flats themselves tend to be smaller. As a result, rental prices in Sunton are 20-30% lower than those for similarly sized apartments in Clay City (Table 1). This picture of poorly developed infrastructure is further highlighted by the fact that in Sunton, only the three north-south collector roads leading to Kasarani-Mwiki Road are paved with concrete blocks, while many side streets are either only partially paved or completely unpaved.

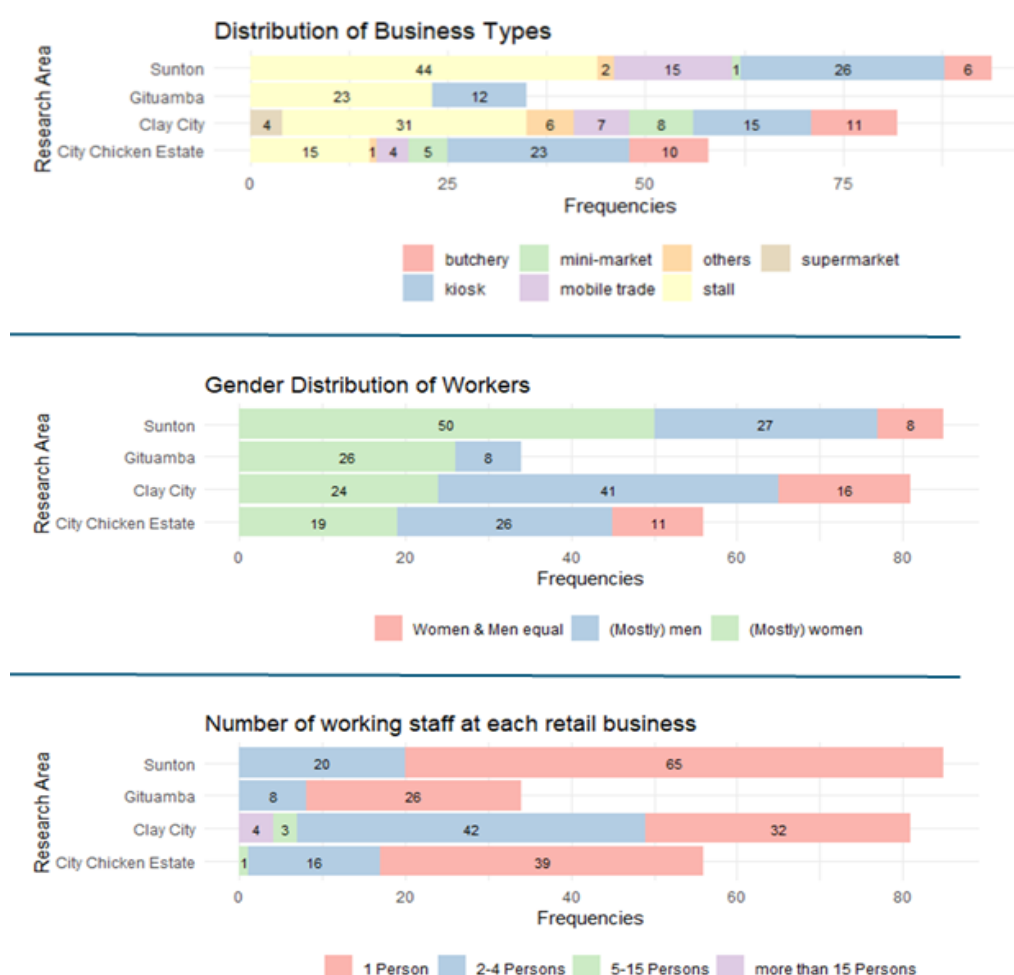


Figure 3: Graphs depicting the distribution of types of food retail, the gender of employees, and the number of employees (own figure).

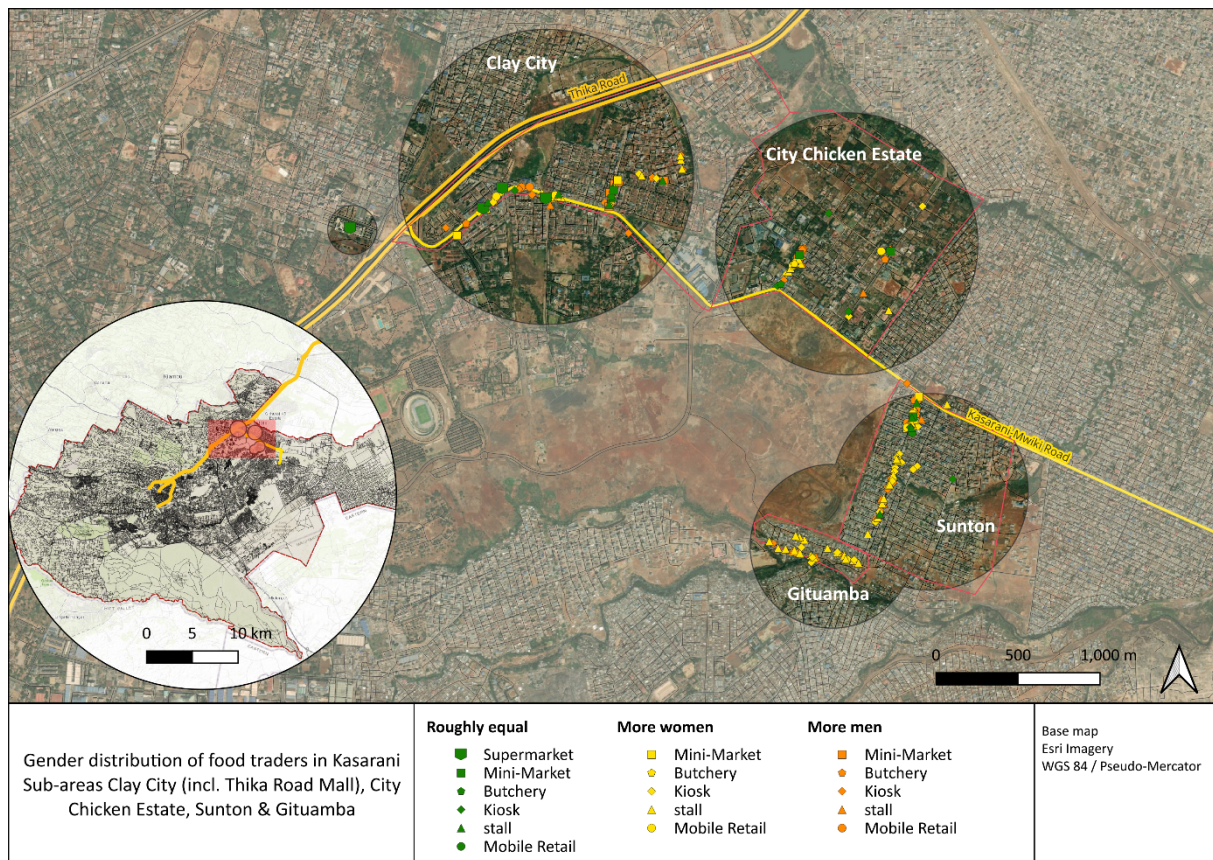
The primary locations for retail trade, particularly food retail, are along the central north-south collector roads. This is exemplified by the prevalence of kiosks and fruit and vegetable stalls

(Figure 3). While there are signs of formalization and differentiation in the retail sector, as seen with owner-managed mini-markets near Kasarani-Mwiki Road, Sunton is predominantly characterized by informal trading activities. A significant presence of mama mbogas (fruit and vegetable vendors), mobile traders, and other unregulated traders is evident. Data from the food mapping exercise indicates that Sunton has the highest density of food retail outlets among the surveyed neighborhoods, with approximately seven food shops per 100 meters of street (Table 2). Furthermore, the retail landscape is characterized by a high concentration of smaller shops, the majority of which are operated by individual entrepreneurs, notably with a significant representation of female-led enterprises.

This density of retail leads to a situation of intense competition, requiring various strategies for customer acquisition through differentiation from competitors. Some strategies mentioned in interviews include efforts by traders to distinguish themselves from the competition through a strong supplementary and additional offering or cross-selling strategies. For instance, it was observed that vendors process fruits into juices at their own fruit stalls or chop and clean vegetables for sale (Trader in Group discussion, 21.08.2023). At the same time, these supplementary services also represent an additional processing step in the food value chain, implemented on a small and artisanal scale.

Informal practices also play a significant role as sales strategies, such as pricing goods based on the perceived purchasing power and social position of the customer, informal lending, and repackaging into smaller quantities (e.g., 50 ml of oil; 100 g of flour), referred to as the “Kadogo economy”. It is clear that these practices are employed as competitive factors. Moreover, they also have an emancipatory-functional character, as these informal practices somewhat mitigate the exclusions brought about by the poorly regulated market economy and the absence of a welfare state. On the other hand, practices such as the “Kadogo economy” and informal lending, which are now also linked to institutional banks through programs like Fuliza and Tala, involve the poorest segments of the population in the financial system at relatively high prices and unfavorable credit conditions (DONOVAN & PARK, 2020). Interestingly, interviews suggest that there is a correlation between the extent and nature of informal practices and household income in the neighborhoods (Trader in Group discussion, 21.08.2023, Interview Customer Sunton, 22.08.2023). In particular, household incomes in Sunton, which typically fall between 20,000 and 35,000 KSH, often make it necessary for women to contribute to household finances to maintain economic stability. The food retail sector, in this context, offers several benefits, which help explain the significant presence of women in this industry. Firstly, engaging in food retail increases the accessibility of food for both family members and their broader social networks (Trader in Group discussion, 21.08.2023). Given that food expenses were identified as the second most significant monthly cost in our interviews, this is a crucial factor. Secondly, operating a food retail business allows women to reconcile reproductive responsibilities with paid employment, as many female traders reside nearby and often run family-owned enterprises. Some interviewees also expressed that managing their food businesses helps them establish informal networks and view their ventures as both learning opportunities and pathways for career advancement (Trader in Group discussion, 21.08.2023, Trader in Group discussion, 18.08.2023). Interestingly, male food traders typically framed their roles as Male Breadwinner jobs, indicating that their work generates sufficient income to cover most of the family's monthly expenses. In contrast, many female respondents described their involvement in food

retail as a supplementary income for the household. Notably, food retail outlets where men are more frequently employed tend to be located in wealthier neighborhoods and are generally more professionalized (Map 3). This suggests a greater likelihood for these establishments to fulfill the Male Breadwinner role.



Map 3: Distribution of the gender of employees in the mapped food retail stores (own map by SFB Projectteam).

Gituamba – Retail Structure of an informal settlement

Gituamba is in terms of its spatial extension the smallest neighborhood, situated at the intersection of the Kasarani and Dandora districts, directly adjacent to the Nairobi River. Similar to many informal settlements, Gituamba occupies an urban insticial space (PHELPS & SILVA, 2018), characterized by suboptimal conditions for human habitation. The precariousness of the settlement is exacerbated by its steep topography and the hazards posed by the highly polluted Nairobi River, which frequently overflows its banks. Nevertheless, according to the local chairman, Gituamba currently accommodates a population exceeding 10,000 residents across an area of approximately 30 hectares. This results in a population density of around 360 inhabitants per hectare, rendering Gituamba less densely populated compared to other prominent informal settlements. For example, in the megaslums of Kibera and Mathare, population densities can reach as high as 2,300 inhabitants per hectare (OWUOR ET AL., 2017). Despite this, qualitative data from interviews verify typical occupancy rates for informal settlements, revealing an average of 2.6 individuals per available room (OMENYA, 2015).

The informal land occupation that facilitated the establishment of Gituamba has resulted in precarious property rights within the neighborhood. Historically, the settlement's formation was

enabled by political patronage from a KANU office (Kenyan African National Union) in Korogocho, another informal settlement, during President Daniel arap Moi's administration in the early 1990s (AYULU, 2022). Consequently, while the residents of Gituamba initially benefited from local political support for occupying state land, which formally belong to the Moi International Sports Centre, they lacked legally recognized land titles. As a result, Gituamba is predominantly characterized by improvised infrastructures, which convey a temporary nature. Many residences lack access to public water supplies and do not possess private sanitation facilities. Furthermore, the roads, which have often been constructed through community initiatives, remain incomplete and serve primarily as provisional pathways, typically accessible only by motorcycles (Boda Boda).

The retail landscape in Gituamba is notably characterized by limited diversity in business types and a relatively low number of food vendors, particularly in relation to its high population density. Two primary forms of informal food retail can be discerned: kiosks and mama mbogas (vegetable vendors), which are situated along the main east-west roads. Additionally, there are mobile vendors who intermittently bring goods into the neighborhood. However, inadequate access to Gituamba presents significant challenges for many mobile traders, who can only reach the area with handcarts or motorcycle-drawn vehicles. Access by private vehicle is limited, primarily facilitated by a paved road to the south of the neighborhood.

Kiosks predominantly offer non-perishable and processed goods, including maize flour, cooking oil, rice, potatoes, beans, salt, vegetable broth, and soft drinks. Notably, the pervasive application of the “Kadogo economy” principle allows goods to be sold in their smallest units, rendering them affordable for day laborers and informal traders. However, this necessitates frequent repurchasing, often resulting in higher costs compared to bulk packaging. For instance, in Gituamba, maize flour is individually packaged, enabling residents to purchase as little as 100 grams for meal preparation, rather than the standard 2 kg packages. Oil is typically dispensed into containers brought by customers, with a minimum filling amount set at 10 KSH (approximately €0.06 at the time), corresponding to only a few milliliters.

A critical inquiry concerning Gituamba is why, despite its high population density, the food retail sector remains so underdeveloped. In stark contrast to other studied areas, Gituamba exhibits not only a low density of food retail outlets but also lacks butcheries, mini-markets with an expanded assortment of staple goods, and larger supermarkets or wet markets. Interviews conducted with local traders reveal several factors contributing to this situation.

Firstly, the informality and absence of secure land tenure deter institutional investors from establishing sophisticated retail shops in the area. Furthermore, it became evident that the uncertainty surrounding property rights renders substantial investments in infrastructure, such as water storage systems or backup power generators for maintaining a reliable electricity supply, highly difficult. Consequently, retail activities are predominantly confined to robust, long-lasting products, and only minimal quantities of perishable items are introduced to Gituamba to mitigate quality deterioration due to inadequate storage conditions (Trader in Group discussion, 22.08.2023, Interview Customer Gituamba 1, 23.08.2023, Interview Customer Gituamba 2, 23.08.2023)

Secondly, the neighborhood's limited purchasing power constrains demand for a more diverse retail offering; many food items—particularly meat—are perceived as luxury goods. This

perception is further underscored by the assertion of a local trader who remarked, “*Gituamba is (...) a slum, and meat is not something that is eaten often here.*” (Trader in Group discussion, 22.08.2023). This sentiment is echoed in the product assortments offered by fruit and vegetable vendors, where non-seasonal produce or imported items, such as apples, are virtually absent, as they are considered luxury commodities due to their elevated prices.

Additionally, infrastructural connectivity presents challenges for Gituamba's retail landscape. Larger markets would immediately face logistical difficulties, as substantial deliveries cannot be efficiently transported into the neighborhood. Moreover, essential infrastructure such as refrigerators and other appliances reliant on a stable electricity supply often remain unusable due to frequent power outages, which also adversely affects the reliability of water supply.

Conclusion

The analysis of Kasarani's neighborhoods reveals complex dynamics in both urban development and food retail structure, shaped by a variety of historical, socioeconomic, and infrastructural factors. From the historically rooted, gentrifying Clay City and City Chicken Estate to the lower middle-class Sunton and the highly marginalized Gituamba, each neighborhood presents unique challenges and opportunities. The study highlights that infrastructural development, such as the construction of the Thika Road Superhighway, has played a pivotal role in accelerating urbanization and shaping retail patterns, particularly with the expansion of supermarkets and formal retail in more affluent areas.

Simultaneously, informal practices like the “Kadogo economy” play a critical role in meeting the needs of lower-income households, especially in areas like Gituamba and Sunton, where residents often rely on small-scale, informal vendors. The juxtaposition of formal and informal retail underscores broader patterns of inequality, where access to infrastructure, consumer behavior, and economic stability vary widely across neighborhoods.

The research suggests that retail structures in Kasarani are not merely economic phenomena but are deeply intertwined with urbanization patterns, social stratification, and access to essential services. Moving forward, policymakers and urban planners must consider these multidimensional factors to promote more inclusive and equitable urban development that addresses the needs of all socioeconomic groups.

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Food Systems and Food Security in Nairobi County, Kenya: Analyzing the Influence of Gender, Household Affordability and Economic Disparities

BARRACK BRIAN OGADA

Abstract

This paper explores the critical dynamics of food systems and food security in Nairobi, Kenya. Focusing on the intersecting influences of gender roles, household affordability, and economic disparities. Rapid urbanization and socioeconomic inequalities have intensified food insecurity in Nairobi, impacting marginalized households and shaping diverse food access challenges. The study examines how the structure of food systems affects food availability and affordability, analyzing factors such as supply chains, market accessibility, and price volatility. Special attention is given to the gendered dimensions of food security, revealing how women disproportionately bear the responsibility for securing food at the household level and are more vulnerable to food insecurity due to economic constraints and social roles. Additionally, the paper delves into how income inequality exacerbates disparities in food access, comparing the experiences of low-income and higher-income neighborhoods in Nairobi. Through a combination of case studies, policy analysis, and household-level data, the findings underscore the need for inclusive food policies that address gender-specific needs and mitigate economic barriers to food access. The study concludes with policy recommendations to enhance food security in Nairobi, advocating for gender-sensitive interventions and economic support mechanisms to bridge the gap in food accessibility and affordability for vulnerable households.

Introduction

Food security has become an increasingly critical issue for urban centers worldwide, and Nairobi, Kenya's rapidly growing capital, is no exception. Defined as access to sufficient, safe, and nutritious food to maintain a healthy lifestyle (FAO, 2021), food security is vital to urban populations, where food systems are intricately linked to economic stability, social equity, and overall quality of life. Nairobi, as one of Africa's largest urban hubs, faces unique challenges in ensuring food security due to its high population density, economic disparities, and reliance on complex, often informal food systems. These systems determine not only the availability of food but also its affordability, particularly for vulnerable populations residing in informal settlements. According to MUTUNGA & DAMARIS (2019), in Nairobi's low-income areas, such as Kibera, Mathare, and Mukuru, residents regularly contend with rising food prices and limited access to diverse and nutritious food options, which heightens the risk of food insecurity.

Food systems, comprising the entirety of food production, processing, distribution, and consumption processes, are critical in shaping food security outcomes. In urban settings, these systems are often highly commercialized and susceptible to market shocks, climate variability, and resource constraints (BÉNÉ ET AL., 2019). Urban residents are generally net food buyers, making them more vulnerable to price changes and supply chain disruptions than rural populations,

who are often involved in food production (FAO, 2021). Economic inequalities further exacerbate these challenges, with disparities in income dictating levels of access to nutritious food. For example, food expenditure consumes up to 60% of household income in lower-income brackets in Nairobi, while it accounts for just 20-30% in wealthier households (KNBS, 2023). Such disparities emphasize the importance of affordable food systems tailored to meet the needs of economically disadvantaged groups.

Gender dynamics add a layer of complexity to the issue of food security in Nairobi. Women, particularly those who head households, are often disproportionately responsible for food provision, which makes them more susceptible to the impacts of food insecurity. According to UN WOMEN (2022), female-headed households in Nairobi face heightened risks of food insecurity due to limited income and access to resources, with women commonly earning less than their male counterparts. In urban informal settlements, women frequently engage in small-scale, informal food retailing to make ends meet, positioning them as critical actors in Nairobi's food systems (CRUSH & FRAYNE, 2018). However, their roles remain undervalued and unsupported, which limits their access to credit, market information, and policy advocacy. As a result, gendered disparities within Nairobi's food systems not only exacerbate food insecurity but also hinder equitable economic opportunities, creating an urgent need for inclusive policy interventions.

This paper seeks to examine the impact of Nairobi's food systems on food security, focusing specifically on gendered disparities and affordability issues. By analyzing the roles that food systems, economic disparities, and gender dynamics play in shaping food security outcomes, the paper aims to uncover the challenges that various socio-economic groups face in accessing affordable, nutritious food. The study's objective is to highlight the barriers to food security in Nairobi's urban context and propose policy solutions that can address these challenges, particularly from a gender-inclusive perspective.

Literature Review

Food systems in urban African settings, specifically in Nairobi, are characterized by complex networks involving sourcing, distribution, and consumption patterns that directly affect urban food security. Nairobi's food system predominantly relies on a mix of local production, regional imports, and global supply chains to meet the food demands of its growing population. However, urban food supply chains in Africa are often fragmented, with reliance on both formal and informal markets (BATTERSBY & WATSON, 2019). According to CRUSH AND FRAYNE (2018), urban centers like Nairobi depend on multiple food sources, including rural-urban food transfers, regional agricultural production, and international imports, which leaves the city vulnerable to fluctuations in global food prices, trade restrictions, and climate-related disruptions. SMIT (2016) argues that extreme weather events and political instability within the East African region can disrupt Nairobi's food supply, raising prices and contributing to urban food insecurity.

Distribution networks in Nairobi involve a variety of actors, including wholesalers, small-scale retailers, and informal vendors, who play a crucial role in making food accessible to urban residents (NJENGA ET AL., 2020). Informal markets serve as significant food outlets for lower-income residents, where fresh produce, grains, and other staples are commonly sold at relatively

lower prices. However, informal vendors often face challenges related to limited storage facilities, regulatory barriers, and susceptibility to market fluctuations, which impact the stability and affordability of food supplies in informal settlements (BATTERSBY & WATSON, 2019). Consumption patterns in Nairobi reveal a diet heavily reliant on staples such as maize, beans, and vegetables, with limited consumption of higher-cost proteins like meat and fish, especially among lower-income households. MUTUNGA AND DAMALAS (2019) emphasize that diet diversification remains constrained for many urban poor in Nairobi, resulting in higher levels of food insecurity.

Gender and Food Security

Gender dynamics play a critical role in determining food security at the household level, especially in Nairobi's urban context. Research shows that women in Nairobi and other urban centers in Sub-Saharan Africa bear the primary responsibility for ensuring household food security. They are frequently involved in food procurement, preparation, and managing household nutrition, despite facing several barriers (FAO, 2021). Women's involvement in food security is further complicated by wage disparities, limited access to agricultural resources, and restricted opportunities within the formal employment sector, which often relegates them to low-paying, informal jobs (WORLD BANK, 2020). According to the FAO (2021), female-headed households in Nairobi are disproportionately affected by food insecurity due to lower average incomes and fewer assets compared to male-headed households, exacerbating their vulnerability in the face of economic shocks and rising food prices.

Studies have noted that, although women are integral to food provision, they often face significant structural constraints that inhibit their full participation in the food economy. For instance, FAO (2019) highlights that women's limited access to credit and market resources hampers their ability to contribute effectively to urban food systems as food retailers or informal vendors. In Nairobi, a substantial number of women are involved in informal food vending, yet they face regulatory challenges, such as eviction from public spaces or punitive licensing fees, which limit their economic resilience and ability to support household food security (CRUSH & FRAYNE, 2018). Furthermore, gender-based power dynamics within households can impact women's ability to allocate resources towards nutritious food, with male household heads sometimes prioritizing other expenditures (UN WOMEN, 2022). Gender-sensitive policies that address these constraints are essential for improving food security and empowering women as key players within Nairobi's food systems.

Economic Disparities and Affordability

Economic disparities also affect food access within Nairobi's various neighborhoods. Wealthier areas, such as Kilimani and Westlands, are served by supermarkets and high-quality fresh markets, providing residents with a broad range of nutritious food options (KIMENYI & MBAKU, 2019). Conversely, lower-income areas such as Kibera and Mathare primarily rely on informal markets, where food prices can fluctuate significantly and where options are often limited. In these areas, the affordability of food is severely impacted by transportation costs and other logistical constraints, which are passed down to consumers in the form of higher prices for

perishable goods (NJENGA ET AL., 2020). This spatial inequality in food access highlights the need for interventions that prioritize equitable food distribution and support the resilience of informal markets, which serve as critical food access points for Nairobi's urban poor.

Research by MAZZUCATO and ARNDT (2021) also underscores the role of urban policy in shaping affordability outcomes, suggesting that economic disparities are not only a product of market forces but also of urban planning decisions that prioritize certain areas over others. Policies that support subsidized food programs, improve infrastructure for food transport, and provide incentives for vendors to operate in underserved areas are essential for addressing these disparities. A more equitable food system in Nairobi would include targeted interventions that reduce food costs for vulnerable populations, stabilize prices in informal markets, and increase the availability of affordable, nutritious food for all residents, regardless of income level.

This review of the literature highlights the multi-dimensional factors influencing food security in Nairobi, with food systems, gender dynamics, and economic disparities each playing a significant role. The city's reliance on fragmented food networks, the gendered nature of household food provisioning, and deep-seated economic inequalities create a challenging environment for achieving food security. An inclusive approach that addresses gender-specific challenges, strengthens informal markets and tackles economic barriers to food access is crucial for developing a resilient food system in Nairobi. Such an approach would support affordable and accessible food options for all Nairobi residents, contributing to a more food-secure urban population.

Methodology

This study employs a qualitative research approach, primarily utilizing secondary data analysis to explore food security in Nairobi, with a focus on gender dynamics and economic disparities. The analysis draws from a range of reputable literature and data sources, including the Kenya National Bureau of Statistics (KNBS), the Food and Agriculture Organization (FAO), and various academic studies and reports that provide insights into the urban food system.

Data Sources

1. Kenya National Bureau of Statistics (KNBS): The KNBS offers comprehensive datasets and reports on socio-economic indicators, including food security statistics, income distribution, and demographic data. This information is crucial for understanding the broader context of food access and economic disparities in Nairobi.
2. Food and Agriculture Organization (FAO): The FAO provides valuable information on agricultural practices, food security assessments, and gender-related statistics in food systems. Their reports help in analyzing the impact of gender roles on food security and the challenges women face in accessing food resources.
3. Academic Literature: Peer-reviewed journals, research papers, and publications from institutions such as the University of Nairobi, the International Institute for Environment and Development (IIED), and other relevant organizations are reviewed to gather qualitative data and theoretical frameworks that inform the study.

4. NGO Reports: Insights from non-governmental organizations working on food security and gender issues in Kenya, such as Oxfam and Action Against Hunger, provide practical examples and case studies relevant to Nairobi's context.

Analytical Framework

The analysis employs the Sustainable Livelihoods Framework (SLF) as the primary analytical tool to examine how different households in Nairobi manage food security. The SLF emphasizes the importance of understanding the various assets that households possess such as human, social, financial, physical, and natural capital, and how these assets influence their ability to achieve food security.

- a) Human Capital: This includes the skills, knowledge, and health of household members. For example, the ability of women to engage in income-generating activities is often limited by a lack of education and training, impacting food security.
- b) Social Capital: This encompasses the networks and relationships that households can leverage for support. Women's access to community support systems can significantly affect their ability to secure food for their families.
- c) Financial Capital: Access to financial resources, including savings, credit, and income, directly influences households' purchasing power and ability to afford food. The disparities in income among different socio-economic groups in Nairobi highlight the critical role of financial capital in food security.
- d) Physical Capital: This involves the infrastructure and tools available to households, such as access to markets and transportation. For instance, residents in informal settlements may face challenges in accessing fresh produce due to poor transportation networks.
- e) Natural Capital: This refers to the natural resources available to households, including land for agriculture. The pressure of urbanization on land availability in Nairobi poses significant challenges to local food production, which the SLF helps to contextualize.

Data Analysis

The analysis combines qualitative and quantitative data to provide a comprehensive understanding of food security in Nairobi. Qualitative data is used to interpret the narratives around gender roles and economic disparities, while quantitative data from KNBS and FAO helps quantify food security levels and economic conditions across different neighborhoods.

Case Study Methodology: To illustrate the effects of these factors on food security, case studies from various neighborhoods such as Kibera, an informal settlement, and Westlands, a more affluent area are employed. These case studies provide concrete examples of how economic stratification and gender dynamics shape food access and security in different contexts.

Ethical Considerations

While this study primarily relies on secondary data, ethical considerations are taken into account in the interpretation and presentation of the findings. All sources are appropriately cited, and care is taken to present data objectively and accurately, acknowledging the complexities of food security issues in Nairobi.

Food Availability, Imports, Urban Agriculture, and Informal Markets

Food availability in Nairobi is primarily supported by a blend of imported goods, local urban agricultural production, and extensive informal markets that connect various parts of the city. Imports constitute a major part of Nairobi's food supply, especially for items like grains, rice, and certain vegetables that the local production cannot sufficiently meet (CRUSH & FRAYNE, 2018). Kenya imports staple foods such as maize, wheat, and rice from regional and global markets, thus ensuring that demand is met despite fluctuations in local production. According to the Food and Agriculture Organization (FAO), Nairobi's reliance on imported food makes it vulnerable to global price changes, which can cause sudden increases in local food costs (FAO, 2019).

Urban agriculture also plays a critical role in Nairobi's food system, particularly in informal settlements where access to affordable food can be challenging. In these areas, small-scale urban farming practices help supplement household food needs by providing vegetables, fruits, and even poultry (NJENGA, 2020). Urban agriculture initiatives, such as rooftop and backyard gardens, have grown in popularity, helping to reduce food shortages and providing residents with fresh produce. However, while urban agriculture supports food security, it is limited by urbanization and land scarcity. Many of Nairobi's informal settlements have minimal space for agricultural activities, while higher land values and zoning restrictions further limit expansion (FRAYNE, CRUSH & PENDLETON, 2018).

Informal markets are another essential component of Nairobi's food system. They provide convenient and affordable food access for millions of residents, particularly in lower-income neighborhoods. Markets like Gikomba and Wakulima are central hubs for fresh produce, with vendors and hawkers playing a critical role in food distribution. Informal markets in Nairobi are crucial because they offer a variety of food at lower prices compared to supermarkets and formal retailers (NJENGA ET AL., 2020). However, they face challenges such as lack of infrastructure, sanitation issues, and limited support from government policies, which impact the quality and stability of the food supply they provide (BATTERSBY & WATSON, 2019). For example, during periods of heightened economic inflation or in the wake of supply chain disruptions, informal vendors struggle to keep food prices stable, disproportionately affecting Nairobi's poorer households.

Challenges of Ensuring Food Security in a Rapidly Growing City

Nairobi's rapid population growth and urbanization present significant hurdles to food security, with the city's food systems strained by increasing demand, land pressures, and inadequate infrastructure. The city's population is projected to reach 5 million by 2030, placing immense

stress on food supply chains that are already facing various obstacles (WORLD BANK, 2020). This growth rate intensifies the demand for food resources and complicates the logistics of transporting, storing, and distributing food efficiently throughout the city.

Urban sprawl further complicates the issue, as it reduces available land for urban agriculture and limits areas for potential food distribution centers. Rapid urbanization has led to encroachment on peri-urban areas where much of the city's local food production used to take place. In Nairobi, peri-urban areas that once supported small-scale farming are increasingly being developed for residential and commercial use, pushing food producers further away from urban centers and increasing transportation costs (MAZZUCATO & ARNDT, 2021). For example, in areas like Kasarani and Ruai, where significant food production was once feasible, rapid development is displacing agricultural activities. This contributes to a heavier reliance on imports and lengthens the supply chain, making the food system less resilient and more vulnerable to external shocks.

Moreover, Nairobi's food distribution infrastructure remains underdeveloped, with limited storage and cold-chain facilities leading to high levels of post-harvest losses. According to the Kenya National Bureau of Statistics (KNBS, 2023), a significant portion of perishable goods goes to waste before they can be sold, further driving up costs and limiting the availability of affordable food. Infrastructure challenges are particularly pronounced in informal markets, where inadequate storage facilities and poor road connectivity exacerbate food loss and contribute to fluctuating food prices in areas where affordability is already an issue (NJENGA ET AL., 2020).

Climate change also poses a major threat to Nairobi's food security. The region is highly susceptible to climate-induced disruptions, such as droughts and irregular rainfall patterns, which can reduce agricultural productivity and affect local food supplies (MUTUNGA & DAMALAS, 2019). Droughts in neighboring agricultural areas, such as those in Central and Rift Valley regions, disrupt the steady flow of produce into Nairobi, causing price spikes and food shortages. A recent drought in 2023, for example, reduced the availability of vegetables and grains, particularly affecting low-income households which are most sensitive to price changes.

Policy Implications and Recommendations

Given these challenges, there is a pressing need for Nairobi to adopt policy measures that can strengthen the resilience of its food systems. First, encouraging investments in urban and peri-urban agriculture can help improve the local food supply. Policymakers could provide incentives for urban farming through subsidies, land grants, or zoning adjustments to support local production in high-density areas (BATTERSBY & WATSON, 2019). Developing infrastructure to improve the storage and distribution of food, such as cold storage facilities in informal markets, would also help reduce post-harvest losses and stabilize food prices.

Furthermore, Nairobi's informal markets require supportive policies that address sanitation, regulation, and security challenges to improve food safety and access. Such policies could include reducing licensing fees for vendors, improving market infrastructure, and offering financial support to informal food traders who serve critical roles in low-income neighborhoods (MAZZUCATO & ARNDT, 2021). Acknowledging and supporting informal markets as essential

food distribution networks is necessary to ensure that the urban poor have reliable access to affordable food.

Women's Role in Household Food Security

In many Nairobi households, especially in informal settlements, women are chiefly responsible for acquiring, preparing, and allocating food, a role that directly impacts the food security of their families (NJUKI, 2019). This responsibility often involves managing limited household budgets and making daily decisions about how to stretch food resources to feed family members. Given Nairobi's rising cost of living and fluctuating food prices, these decisions can be challenging, with many women forced to sacrifice the quality and quantity of meals to make ends meet (KANSIIME ET AL., 2021). Women in such settings tend to be more vulnerable to food insecurity, as they experience both the pressures of household food provision and the economic challenges of limited access to income-generating opportunities.

For instance, in Nairobi's informal settlements, women frequently engage in low-paying or informal jobs, such as domestic work or small-scale vending, which do not provide stable incomes. The precarious nature of these jobs makes it difficult for women to maintain a steady food supply for their families, especially when food prices rise. Moreover, the expectation that women shoulder primary responsibility for food security at home often leaves them with little time for formal employment, reinforcing their dependence on unstable sources of income (CRUSH & RILEY, 2019). When food prices spike or household incomes drop, women are typically the first to reduce their food intake to prioritize children and other dependents, further illustrating their vulnerability within the household (FAO, 2021).

In Nairobi's Kibera slum, one of the largest informal settlements in Africa, women are key players in the local food economy. They run small stalls selling affordable produce and prepared food, providing crucial access to food for residents who may not afford supermarket prices (WAWERU ET AL., 2020). However, these small businesses are often limited by access to credit, a lack of formal training, and the high cost of fresh produce, factors that make it difficult for these women to grow their businesses and provide sufficient food for their families (NJUKI, 2019). Consequently, the food insecurity that affects women in Kibera has ripple effects on the broader community, where women's roles in the food economy are essential but hindered by structural limitations.

Economic Empowerment and Barriers to Resource Access

Economic empowerment is vital for women's ability to contribute to household food security; however, women in Nairobi face considerable barriers when attempting to access resources like capital, land, and training, all of which are critical for successful food-related ventures. Studies show that women are less likely than men to own land or have access to credit in Nairobi, limiting their capacity to engage in small-scale urban farming or food businesses (WORLD BANK, 2019). This lack of resources is further exacerbated by traditional gender roles that often confine women to caregiving and domestic tasks, reducing the time and freedom they have to pursue economic activities (KANSIIME ET AL., 2021).

Access to capital, particularly for small-scale farming or microenterprises, is crucial for women's economic empowerment and by extension, for household food security. Yet, financial institutions in Nairobi have historically been reluctant to extend credit to women, who often lack formal employment or collateral (NJUKI ET AL., 2019). Additionally, women entrepreneurs in Nairobi's food sector report facing high interest rates and restrictive loan conditions that make borrowing inaccessible. Without adequate capital, women are unable to invest in business growth, equipment, or bulk food purchases, all of which could reduce their operational costs and improve food affordability for their communities (WAWERU ET AL., 2020).

A 2020 study by WAWERU ET AL. revealed that women living on Nairobi's periphery, who typically engage in small-scale farming, struggle to access capital for basic agricultural inputs like seeds and fertilizers. This situation constrains their agricultural productivity, ultimately limiting their contribution to the urban food supply. Moreover, the seasonal nature of their income leaves these women more exposed to food insecurity during off-peak periods, underscoring the need for gender-responsive financial services that cater to their unique economic patterns.

Addressing Gender Inequities in Food Access and Affordability

The gendered disparities in Nairobi's food security landscape highlight the need for policy interventions that support women's economic empowerment and improve their access to food resources. Current policies addressing food security in Nairobi tend to overlook the specific needs of women, often focusing instead on generalized food availability or agricultural productivity without considering gendered access issues. However, evidence suggests that gender-sensitive policies could significantly enhance food security by empowering women, who play a central role in Nairobi's food systems (FAO, 2021).

One policy intervention that has shown promise is the Women's Enterprise Fund, an initiative aimed at providing women with affordable credit to start or expand their businesses. Although impactful, the reach of such programs remains limited, particularly in informal settlements where most women lack awareness or face bureaucratic barriers to accessing these funds (WORLD BANK, 2019). Expanding the accessibility and scope of similar programs, particularly for women involved in food-related enterprises, could enhance their purchasing power and ability to engage in the food economy.

Furthermore, Nairobi's policy framework should promote training and resources for women in the food sector. Programs that offer technical skills, agricultural training, and financial literacy are crucial for empowering women to manage food insecurity within their households and communities. In addition, policies that support land rights for women could allow those in peri-urban areas to establish more productive urban farms, contributing to the local food supply and stabilizing food prices (NJUKI ET AL., 2019).

Economic Disparities and Household Affordability in Nairobi's Food System

Economic disparities in Nairobi have a profound impact on household food affordability, with the city's rapid urbanization further deepening the income and social divides. Rising food prices,

inflation, and uneven income distribution contribute to varying levels of food security across neighborhoods, directly influencing the nutritional quality and food accessibility for different economic classes. This section explores the influence of Nairobi's economic stratification on food affordability, highlighting specific examples and case studies that illustrate the differences between low-income and affluent neighborhoods.

Rising Food Prices and Inflation

Food prices in Nairobi have steadily increased over recent years due to inflation, supply chain disruptions, and environmental factors like droughts. Inflation impacts basic commodities, including staple foods such as maize flour, rice, and vegetables, pushing many essential food items out of reach for lower-income households (KNBS, 2023). Nairobi's inflation rate, which averaged 8% in 2023, has a severe impact on food prices, as nearly half of household budgets in low-income communities are spent on food alone. This inflationary pressure particularly affects households in informal settlements, where daily wages are inconsistent and insufficient to cover rising food costs (WAWERU ET AL., 2022).

For instance, the price of a kilogram of maize flour, which serves as a staple for many Nairobi households, has increased by over 50% between 2021 and 2023. With income levels remaining stagnant, this price increase has forced low-income households to reduce their consumption of more nutritious foods, opting for cheaper, high-calorie, low-nutrient options to stretch their limited budgets (MOSE, 2022). These dietary compromises not only affect immediate food security but also have long-term consequences on public health, increasing susceptibility to malnutrition and related diseases.

Income inequality is stark in Nairobi, with neighborhoods like Westlands and Kilimani representing affluent, high-income areas while informal settlements like Kibera and Mathare reflect some of the lowest household incomes in the city. The high-income households in Westlands, for example, have access to supermarkets and high-quality fresh produce markets, while residents in Kibera rely predominantly on informal vendors who often charge more for basic goods due to supply chain inefficiencies (KNBS, 2023). As a result, the difference in income levels translates directly into contrasting levels of food security.

In Westlands, household food expenditure makes up a relatively small portion of income, allowing residents to afford a diverse, balanced diet that includes fresh fruits, vegetables, and animal proteins. Conversely, in Kibera, the average household income is less than 20,000 KSH (Kenya Shillings) per month, with food expenses consuming around 60% to 70% of household budgets (WAWERU ET AL., 2022). This economic strain makes it difficult for low-income households to afford nutritious food, leading to a diet predominantly composed of cheap, energy-dense foods that lack essential vitamins and minerals.

Contrasting Food Security Levels in Kibera vs. Westlands

A comparison between households in Kibera and Westlands vividly illustrates the impact of economic stratification on food security. In Westlands, a typical household might purchase groceries from supermarkets such as Carrefour or Chandarana, where food quality and hygiene

standards are higher, and a wide range of healthy food options is available. In contrast, Kibera residents depend on informal food vendors who offer limited choices and often at prices that reflect additional layers of middlemen and transportation costs (MOSE, 2022). Additionally, households in Westlands can stockpile food supplies due to their disposable income, helping them cope better with price volatility, unlike those in Kibera who buy food in small quantities due to cash constraints, which limits their ability to handle sudden price increases (KIMANI-MURAGE ET AL., 2019).

Impact on Nutritional Security in Low-Income Households

The economic disparities in Nairobi not only affect food affordability but also directly influence nutritional security. Due to limited budgets, low-income households in neighborhoods like Kibera and Mathare often cannot afford nutrient-dense foods such as fruits, vegetables, and proteins, leading to diets that are high in carbohydrates but low in essential nutrients. This phenomenon has been documented in several studies, which show that lower-income households are more likely to experience micronutrient deficiencies, contributing to poor health outcomes, especially in children and pregnant women (KIMANI-MURAGE ET AL., 2019).

Many low-income families resort to staples such as maize flour, rice, and potatoes, which provide energy but lack the vitamins and minerals necessary for a balanced diet. For instance, the Kenya Demographic and Health Survey reports that children in low-income households in Nairobi are more prone to stunted growth due to inadequate nutrition, a trend that is significantly lower in high-income areas (KNBS, 2023). In contrast, high-income households in areas such as Karen and Runda can afford a variety of food options that meet daily nutritional requirements, resulting in better health outcomes.

A study by WAWERU ET AL. (2022) found that in informal settlements, the most frequently consumed meals consist of starchy foods with minimal additions of vegetables or proteins due to cost. In contrast, high-income areas benefit from consistent access to balanced diets, with residents able to include meat, dairy, and fresh produce. These dietary patterns in low-income neighborhoods are associated with higher incidences of non-communicable diseases, such as diabetes and hypertension, as residents rely heavily on energy-dense but nutrient-poor foods (KIMANI-MURAGE ET AL., 2019).

Recommendations

To address the challenges of food security and economic disparities in Nairobi, the following recommendations are necessary. They aim to create a more equitable and sustainable food system, focusing on gender-sensitive policy solutions, economic equity, and strengthening local food production.

Gender-Sensitive Policy Solutions to enhance empowerment of Women in Food Systems. Policies aimed at empowering women are crucial for enhancing household food security and improving community nutrition. The government should invest in female-led urban agriculture initiatives by providing financial assistance, training programs, and resources tailored to women. For instance, programs similar to the Women's Empowerment in Agriculture Index

(WEAI) can be implemented to assess women's roles in agriculture and identify barriers to their participation in food systems (FAO, 2022).

Market Access for Women. Improving market access for women in food-related businesses can significantly enhance their economic standing and ability to contribute to household food security. Policies should focus on facilitating women's entry into formal markets by providing training in business management, financial literacy, and agricultural practices. Microfinance programs specifically targeting women entrepreneurs can help them secure funding to start or expand food-related businesses (WORLD BANK, 2023).

Economic Equity and Subsidies. Food Subsidies and Price Controls. To mitigate the impact of economic disparities on food security, the government should implement food subsidies and price controls for essential food items. By stabilizing prices for basic staples such as maize flour, rice, and beans, households in low-income neighborhoods can afford sufficient and nutritious food.

Strengthening Social Safety Nets. Additionally, enhancing social safety nets for vulnerable populations, such as cash transfer programs, can provide immediate relief for food insecurity. Programs like the Inua Jamii initiative, which offers cash transfers to elderly and disabled individuals, could be expanded to include food vouchers or direct financial support for low-income families.

Strengthening Local Food Production. Sustainable Urban Farming Initiatives. Encouraging sustainable urban farming initiatives is vital for reducing Nairobi's reliance on imported food and improving food security. The city should promote community gardens, rooftop gardens, and vertical farming projects to enhance local food production.

Policy Support for Urban Agriculture. Furthermore, local governments should develop policies that support urban agriculture by simplifying land access for urban farmers and offering tax incentives for businesses engaged in local food production. Recognizing the role of urban agriculture in food systems can lead to integrated urban planning that accommodates agricultural spaces within urban development.

Public Awareness Campaigns. Public awareness campaigns highlighting the benefits of consuming locally produced food can help shift consumer preferences towards local products. Collaborating with local chefs, nutritionists, and food influencers to promote local produce can encourage residents to prioritize fresh, locally sourced food options.

Conclusion

In conclusion, the exploration of Nairobi's food systems reveals a complex interplay between food security, gender dynamics, and economic disparities. The analysis underscores the critical importance of a robust and resilient food system that can meet the needs of a rapidly growing urban population. The findings highlight that while Nairobi boasts diverse food sources ranging from imports to urban agriculture significant challenges remain in ensuring equitable access to food for all residents, particularly among vulnerable populations. The gendered aspects of food security reveal that women play a critical role in maintaining household food security, yet they face systemic barriers that hinder their contributions. Issues such as wage disparities, limited

access to resources, and gender-specific roles exacerbate food insecurity for many households. Addressing these gender inequalities is not just a matter of social justice; it is fundamental to enhancing food security for all.

Economic disparities further complicate the food landscape in Nairobi. The stark differences in income distribution mean that lower-income households are disproportionately affected by rising food prices and inflation, often resulting in limited access to nutritious food. The case studies from various neighborhoods illustrate that food security is not uniform across the city; instead, it is deeply influenced by socioeconomic status. This economic stratification necessitates targeted policy interventions to ensure that all communities can access affordable and nutritious food. As we move forward, it is essential to build a food system that reflects the values of equity, sustainability, and resilience one that serves as a model for other urban centers facing similar challenges across the Global South.

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Strategies for Adaptation to climate change in urban agriculture in Kiambu County, Kenya

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Abstract

Over the past few years, urban agriculture has played a vital role in boosting food supply and income in metropolitan areas of Kenya. However, the impact of climate change poses a significant challenge to its effectiveness in addressing social and economic issues in urban regions. This research investigates the responses of urban farmers in Kiambu County to climate change. The researcher collected data from household heads in Kiambu County using a semi-structured interview tool and analysed it thematically. The findings revealed that most urban farmers in Kiambu County experienced climate change through prolonged droughts, flooding during the rainy season, and increased crop pests and diseases. To adapt, urban farmers in Kiambu County have been embracing modern farming techniques and utilising specialised equipment to lower production costs. Additionally, they are focusing on cultivating drought-resistant crops due to unreliable rainfall and limited water supply. The study highlighted that the level of adaptation among urban farmers in Kiambu County varied based on their social and economic status. Ultimately, this research underscores the significant impact of climate change on urban agriculture's ability to address food security challenges. As a result, the government of Kenya and food security stakeholders should support urban farmers in mitigating the complex effects of climate change.

Keywords: Urban agriculture; climate change; adaptation; Kiambu County

Introduction

The global community recognises the urgent issue of climate change and its impact on urban poverty and food security (ZIERVOGEL & ERICKSEN, 2010, p. 1). As cities are the primary cause of and most affected by climate change, they play a critical role in finding practical solutions (DUBBELING, VEENHUIZEN, & HALLIDAY, 2019, p. 32). Recent surveys show that the population of urban areas is rapidly increasing worldwide. The percentage of people living in cities in Africa is thought to be 40% (CHARI & NGCAMU, 2022, p. 22). Literature indicates a demographic movement towards a more urban population throughout the continent, notwithstanding differences in urbanisation trends between and within nations or regions (BELAY, 2020).

Due to rapid urbanisation, food scarcity is becoming more concentrated in cities and towns. This has led to a surge in urban people's total cost of living due to their greater need for food-stuffs. For those worried about these emerging tendencies of rising urbanisation and urban food scarcity, the question of whether urban agriculture (UA) can enhance urban access to food has become more critical (DAVIES ET AL., 2021, pp. 1-2). People who live in cities are increasingly turning to agriculture to reduce their living expenses. The current upsurge in urban agriculture operations coincides with long-term changes in rainfall patterns, temperatures, and overall weather.

In Kenya, urban farming has been an integral part of economic strategies for metropolitan residents for quite some time. Despite relying on the market for their food, the recent price increase has made it unattainable for many. As a result, impoverished urbanites have turned to farming to meet their urgent food needs. Notwithstanding the vital role it serves in food security, urban agriculture in Kenya has not gotten sufficient scrutiny when it comes to how climate change is affecting it. This study examines the strategies that urban farmers in Kiambu County have implemented to adapt to the impact of climate change on their livelihoods.

Literature Review on Urban Farming and Climate Change

Urban Agriculture (UA) specifically entails growing crops and raising small livestock within the urban boundaries of cities and towns, such as backyard gardens, empty lots, wayside ditches, and balcony gardens for personal use or retail in city markets (LADAN ET AL., 2022, p. 2). The definition of urban agriculture is not its physical setting but rather its integration and interaction with the urban surroundings and requirements (CHARI & NGCAMU, 2022, p. 25). UA is often viewed as a solution to some of the social, economic, and environmental issues that cities face. However, critics have highlighted the challenges associated with UA, pointing to cases where it has yet to be a viable livelihood option for urban middle-class families who rely on cash as their primary source of income.

A study of urban farming in Harare highlights its growing importance as a vital source of fresh produce for low-income families. However, the full potential of urban agricultural growth is hindered by resource scarcity, significant health risks, and policy gaps. It is worth noting that women are the primary drivers of urban agriculture, as revealed by the study. While urban farming does enhance family food availability and access, its capacity to improve food utilization and nutritional diversity and alleviate poverty should be viewed realistically (KUTIWA ET AL., 2010).

NAAZIE ET AL. (2024) noted that several obstacles prevent Ghana's agricultural sector from reaching its full potential to promote food security, reduce impoverishment and foster sustainable urban growth. These difficulties may be divided into several categories, such as land accessibility, environmental elements, the consequences of climate change, laws and policies, and societal and cultural concerns. Ghana's inadequate agricultural land supply is one of the main obstacles to urban agriculture. Farming has become unproductive due to the rapid urbanization that has transformed farming fields into homes and business districts. Water shortage resulting from changes in precipitation patterns is another major issue facing Ghanaian urban agriculture due to climate change. Farmers utilize irrigation and water harvesting to mitigate this issue. Furthermore, decreasing yields and heightened susceptibility to pests and illnesses might result from warmer temperatures and shifting rainfall patterns (NAAZIE ET AL., 2024).

Peri-urban agriculture is essential to maintaining income and food security in Zimbabwe. Despite being essential to food availability, peri-urban farming in Zimbabwe needs to get more focus on how climate change affects it. According to research conducted in Bulawayo, peri-urban farmers felt that significant changes in the climate and related factors were detrimental to their farming operations. Lower rainfall levels, rising air temperatures, and declining borehole output were among the alterations that were noticed. Farmers used various adjusting strategies, such as sowing crops again, irrigating them at night, leasing out livestock quarters on

other farms with access to more water, and buying extra feed for their cattle (DUBE ET AL., 2021).

Study Location

Kiambu County, a peri-urban area in Kenya's former Central Province, is the focus of this study. The county, with its headquarters in Kiambu town, shares borders with Murang'a to the north and northeast, Nairobi and Kajiado Counties to the south, Nyandarua to the northwest, and Nakuru to the west. The county is located between 360°31' and 370°15'E longitude and latitudes 00°25' and 10°20'S of the equator. It spans a total area of 2,543.5 square kilometers, with 649.7 square kilometers of unarable land, 1,878 square kilometers under agriculture, 476.3 square kilometers covered in forests, and 15.5 square kilometers under water.

With a population of 2,417,735, Kiambu County is the second most populous county in Kenya, following Nairobi County, as per the 2019 Kenya National Census (KENYA NATIONAL BUREAU OF STATISTICS, 2019, p. 7). The county's population is evenly distributed, with 51% women and 49% men. Despite the steady northward expansion of Nairobi, Kiambu County remains 40% rural and 60% urban. The county's metropolitan areas are diverse, but the Kikuyu population is the largest among the ethnic groups. The county is divided into twelve sub-counties: Gatundu North, Gatundu South, Juja, Kikuyu, Thika Town, Ruiru, Githunguri, Kiambaa, Lari, Limuru, Kabete, and Kiambu Town.

The selection of Kiambu Town Sub-County as the study location is purposeful because it is a peri-urban area dramatically affected by climate change and the growth of human settlements, mainly due to its proximity to Nairobi City. This distinctive setting offers an intriguing backdrop for the study, which allows the researcher to examine how farmers in an urban environment respond to climate change. The results of this study have significant potential, as they may help shape future policies and strategies for sustainable development in similar contexts, providing hope for the future.

Methodology

The study's empirical framework draws on secondary data on climate change, food security, and urban farming obtained from reputable online journal repositories. Additionally, primary data was collected from urban farmers in Kiambu County to provide insight into the farmers' understanding of and experiences with climate change.

A qualitative research design was applied to gather and analyse data on strategies for adaptation to climate change in urban agriculture in Kiambu County. The researcher applied a purposive sampling technique to identify households practising urban farming as a livelihood in Kiambu Town Sub County. The researcher began data collection by randomly selecting six household heads who were involved in various farming activities. Through the snowballing technique, the respondents linked the researcher with other farmers; 40 interviews were conducted in Kiambu Town Sub County.

A semi-structured interview guide was used to gather data from farmers on their experiences with urban farming and climate change. This approach allowed them to provide valuable

information by sharing personal insights and observations. The oral interviews focused on the farming activities of each selected household head and their observations on how climate change has impacted their practices. The research also aimed to uncover the strategies farmers used to address the challenges posed by climate change to their agricultural production. Additionally, 7 key informants, including agricultural extension officers, officials from the Ministry of Water and Natural Resources, and leaders of women farmers' groups in Kiambu town, were interviewed in-depth about urban farming and climate change.

The researcher diligently recorded oral interviews with farmers and key informants and later transcribed them for in-depth analysis. A thematic analysis was used to examine the data collected from these interviews. The researcher meticulously reviewed each transcription by comparing responses from different farmers and key informants and identifying commonalities and unique perspectives. This rigorous approach was essential in establishing the credibility and accuracy of the findings.

Study Findings and discussion

Characteristics of Peri-Urban Agriculture in Kiambu Town

The study findings indicated that all households surveyed in Kiambu Town were involved in some form of peri-urban agriculture. Of those surveyed, 65% practised mixed farming by cultivating crops such as beans, maize, cabbages, Irish potatoes, bananas, kale, tomatoes, snow peas, carrots, and spinach. Additionally, herbs and spices such as rosemary, parsley, asparagus, coriander, and basil were grown for both local consumption and commercial purposes. Mixed peri-urban farmers also participated in dairy production, poultry keeping, and pig farming. Only 5% of the interviewed households specialised exclusively in livestock, while 30% focused solely on crop cultivation. Most peri-urban farmers rely on domestic labour but occasionally hire commercial labourers for planting and weeding.

In the past, coffee and tea served as the main cash crops. However, a shift towards livestock production, especially in dairy and poultry, occurred in the mid-1990s due to the decreasing coffee and tea markets and the growing need for milk and poultry products in adjacent urban centres such as Nairobi. Recently, there has been an increase in fish farming, predominantly catfish and tilapia, and a rise in honey production through beekeeping in Kiambu County.

The incentives for farming varied among various households; however, a general pattern could be established. Most respondents reported that they engaged in peri-urban farming to overcome food insecurity. High food prices in Kenya due to rising inflation made access to food difficult for most households since they needed other reliable sources of income. Farming was, therefore, a viable mechanism to achieve food security. Farmers were also motivated to make money due to lucrative markets for farm produce in the neighbouring Nairobi City, Ruiru, and Thika towns. In addition, farmers in Kiambu town had access to agro-based industries like Kenchic, Farmers Choice Limited, Ndumberi Dairies, and Brookside Dairy Company. As one middle-aged farmer noted:

I am engaged in urban farming as a means of self-employment. I have secured a quarter-acre plot where I raise poultry and pigs for sale to hotels and markets in Nairobi City. The income from my farm is used to meet household financial needs and save additional

funds. I am also considering expanding into fish farming soon (Interview with a peri-urban farmer in Kiambu Town).

Another farmer shared a similar sentiment that:

In response to a lack of consistent employment, I made the decision to explore pre-urban farming. I focus on cultivating food crops and vegetables for personal use, while also selling any excess produce in Kiambu town. Engaging in farming has allowed me to better manage my household finances, particularly since my earnings as a casual laborer in the construction industry are limited (Interview with a peri-urban farmer in Kiambu Town).

Farmers' insights on how climate change is affecting urban agriculture

In Kiambu Town, peri-urban farmers are well aware of the impacts of climate change on agriculture. Those involved in the study reported observing shifts in ecological patterns over time, including a noticeable decrease in precipitation levels during the rainy season and a corresponding increase in air temperature. Each respondent admitted to experiencing various shocks, such as the emergence of new crop pests and diseases and soil erosion during the planting season, all attributed to climate change. Farmers also expressed the devastating effects of lower precipitation and higher temperatures on their crops and livestock, reducing harvests and animal output.

Based on the observations of farmers, key informants, and academic research, it is clear that climate change is affecting peri-urban farmers. Decreased rainfall, higher temperatures, and the growing unpredictability of seasonal rainfall patterns were all cited by key informants as signs of this global phenomenon, mirroring the experiences of farmers. Key informants highlighted that the significant rise in atmospheric warming is responsible for these new climatic patterns. One respondent succinctly summarised the situation: "There has been a departure from the usual climate. The length of dry seasons and the occurrence of dry spells are increasing. Nowadays, when it does rain, it is intense and often accompanied by flooding" (Interview with a farmer in Kiambu).

The past few years have seen a lot of rain, which has caused floods and destroyed farm harvests. For instance, growers of Irish potatoes blamed the significant rains that fell between late 2019 and mid-2020 for their exceptionally poor harvests. They said that potatoes rotted as a result of floods in their gardens. Farmers also mentioned that excessive rains and flooding had made it harder to apply fertiliser, insecticides, compost, and other pharmaceuticals. Farmers' efforts are rendered inefficient when inputs are swept away. Additionally, irregular precipitation patterns have changed cultivation schedules.

The respondents drew parallels between the present environment and their understanding of it from decades ago, expressing their observations. Their findings align with the views of professional scientists. According to the participants, in the past, farmers could accurately predict the start of the rainy season, preparing for cultivation relatively straightforward.

The findings in Kiambu peri-urban farms were consistent with other empirical studies, which indicated that many African urban areas experienced high atmospheric temperature and erratic

weather patterns. For example, the main issues facing urban farmers, according to a research done in Lagos, Nigeria, are the city's rapid urbanisation and unpredictable climate conditions. (LAWANSON, ORELAJA, & SIMIRE, 2014, pp. 514-517). The responses of the farmers and agricultural officers interviewed coincided with those of DAVIES ET AL. (2021) who observed that in various parts of Sub Saharan Africa the second annual rainfall season moved from October to November, a clear indication that climate change was already taking its toll on African farmers. Due to Africa's substantial reliance on agriculture based on rainfall and climate-sensitive resources, these factors, together with heating trends, are predicted to make land increasingly unsuitable for agriculture. This poses a serious danger to the continent's economy and the sources of income of the impoverished.

KOM ET AL. (2023) noted that climate variability and change present risks to agricultural production and challenges to smallholder farmers in the Vhembe district. Adaptation to climate risks includes anticipating change, planting new crops and taking action to reduce the adverse impacts on crop yield. However, scientific models are expensive for indigenous farmers to counter climate risks for the local communities. Hence, a low educational background and lack of climate information and financial resources slow the adoption of intelligent agricultural techniques, principally those that require modern systems of operation and where investment costs are high (KOM ET AL. 2023).

The findings resonate with other African studies demonstrating farmers' awareness of the climate shifts in their surroundings. Based on research on farming in Lesotho, farmers face challenging weather conditions, including irregular and unexpected rainfall patterns, severe frosts and cold temperatures, and sporadic droughts leading to water bodies drying up. These conditions have significantly affected smallholder farmers, resulting in lower crop yields, increased pest and disease infestations, and below-average yields. Fruit tree planting, sustainable farming, rainwater harvesting for use in drought, and implementing local technologies for infection and pest treatment were some farmer adaptation strategies used to lessen the effects of climate change (DICK-SAGOE ET AL. 2023).

Farmers response to climate change's effects on crop production

Peri-urban farmers were finding it more difficult to cultivate their crops on time because the rainfall seasons were unpredictable. One farmer reported that the rainfall pattern was becoming increasingly erratic and that it was now usual to have a prolonged dry spell following the first rains between March and May. Horticulture farmers in Kiambu town were the most affected because their crops demanded a steady water supply, yet rainfall patterns were inconsistent.

A horticulture farmer specialising in commercial kale production observed that recent high temperatures have impacted vegetable yields. She has resorted to drip irrigation to address this challenge but needs more water supply. Additionally, she has noticed a significant increase in vegetable pests, particularly whiteflies resistant to pesticides, requiring her to regularly fumigate crops at a considerable cost (Interview with a farmer in Kiambu).

Farmers relying on rain-fed farming are the most affected according to the following submission by a maize farmer:

I have had poor crop yields in the last few years due to the prevalence of armyworms, which have increased significantly due to high temperatures. Last season, I incurred heavy losses due to a dry spell that dried up the entire maize plantation (Interview with a farmer in Kiambu).

As farmers have observed, the cost of farming has not just increased but skyrocketed. The expensive climate change mitigation measures have disproportionately burdened low-income peri-urban farmers in Kiambu town, exacerbating their financial strain. According to the respondents, setting up irrigation systems was expensive, and the situation was exacerbated by the limited water supply in Kiambu town due to the high urban population. Irrigation of crops was also labour-intensive, which increased the overall cost of food production. Some farmers reported that they were often compelled to use contaminated water to irrigate their crops due to the high cost of borehole water. This practice, which involves pumping water from roadside ditches into farms, poses a significant health risk to both the farmers and the consumers. Therefore, the biosafety of crops grown by peri-urban farmers in Kiambu town is an emerging issue that needs further investigation.

Despite the consistently unfavourable dry season, the peri-urban farmers in Kiambu town have displayed remarkable resilience. They have embraced climate-smart farming methods, such as planting kales in sacks to reduce soil moisture loss. Mulching is also widely practised in vegetable gardens to reduce soil moisture loss. Some farmers have even made the challenging decision to shift from producing vegetables like cabbages and spinach, which require constant irrigation, to producing traditional vegetables like cowpeas, which are drought-resistant and can thrive without fertilisers.

Adapting to the effects of climate change on livestock

The survey participants highlighted the significant impact of dry spells and heavy rainfall on dairy production in Kiambu County. Many expressed concerns about pastures' deteriorating quality due to climate change. They observed that essential grasses and maize stalks were not reaching their full potential due to prolonged periods of low rainfall. This has led to a shortage of grazing land during the dry season, prompting farmers to purchase supplementary feeds to ensure the survival of their livestock. However, some farmers need help to afford these additional resources.

Consecutive poor harvests meant farmers needed more fodder crops like maize to provide supplementary feed for their cattle. One livestock farmer pointed out that:

Over time, our animals' pastures have been declining. There have been numerous periods when the rainfall has not been as consistent as anticipated. We now have famished livestock. Their condition does not appear to be in good shape because of this. We do not get outstanding returns, even when we sell them (Interview with a livestock farmer in Kiambu Town).

Since feeds account for the most significant percentage of the expenses associated with producing dairy products, these supplements are less readily available and more expensive. Dairy farmers also reported that dry spells had an impact on the estrus cycle of cows, causing low conception and high spontaneous abortion rates. Undernourishment in dairy cows also lowers

milk yield and quality, making them more susceptible to disease and other infections because their immune systems are weakened. These results are consistent with research conducted worldwide, which has demonstrated that warmer temperatures and less rainfall negatively impact livestock feed due to their impact on pasture conditions (BELAY, 2020). Adjusting to the impacts of climate shifts come with additional costs.

Key informants noted increased diseases associated with drought and other opportunistic infections, such as foot and mouth infections, since cattle are compelled to eat extremely poor grass. These results align with earlier research indicating that livestock diseases and pests will rise due to climate change (CHARI & NGCAMU, 2022). Although the key informants agreed with the interviewees regarding the impact of environmental changes on urban livestock, they also pointed out that excessive milking of cows contributed to the undernourishment of the calves. In order to earn the money, they desperately needed to support their family, the farmers acted to sell the milk. As a result, the calves lost their nutritional supply. According to the key informants, farmers often overlook the significant role that management methods like vaccination and dosage have in producing healthy cattle. Overstocking was also an issue that many farmers overlooked.

Kiambu County farmers employ various strategies to mitigate the effects of climate change. For instance, they plant livestock feed that can withstand extreme weather, including desmodium, Brachiaria, and Boma Rhodes grass, which thrive in regions with less than 1000 mm of annual precipitation (Interview with a livestock farmer in Kiambu Town).

Poultry farmers have noticed that increasing temperatures are causing heat stress issues for their chickens. The need to control temperatures is driving up housing costs during hot seasons, and the heat stress also affects the design and layout of chicken coops. Additionally, the heat stress severely impacts the quality of the feed. The shortage of raw materials like rice and maize, also affected by heat stress, is leading to a decrease in feed supply. This, in turn, is causing a significant increase in feed expenses, especially for small-scale peri-urban producers. As a result, farmers are forced to use commercial feeds, increasing production costs. Reduced feed consumption due to heat stress also impacts egg production, resulting in lower returns on investment (Interview with a poultry farmer in Kiambu Town).

Poultry's water needs increase during dry seasons, while extreme temperatures affect egg delivery to some extent, necessitating cool trucks. Heat stress limits meat and egg production, and building structures on elevated foundations during floods increases production expenses for farmers. Floods also cause road closures, delaying feed supply, raising costs, and significantly impacting incubation, requiring additional materials and altered structures. Farmers using artificial environments for egg production must invest in sturdy facilities to withstand floods, driving up expenses. Additionally, flooding increases costs associated with Newcastle disease, requiring veterinary care (Interview with a livestock farmer in Kiambu Town). These challenges highlight the pressing need for infrastructure improvements to ensure the sustainability of poultry farming.

Conclusion

The study revealed that peri-urban farmers in Kiambu town are well aware of the destructive effects of climate change, with a primary concern being the impact of erratic rainfall patterns and temperature surges on crop yields. While many farmers have implemented measures to mitigate these effects, various factors influence the specific actions taken by individual farmers. For example, many peri-urban farmers in Kimabu town have turned to mixed farming to reduce production costs by using by-products from crops such as maize, bananas, and potatoes as cattle feed while utilizing animal manure for cultivation. Additionally, modern drip irrigation has been widely adopted to prevent crop failure during dry seasons, and water conservation strategies have been implemented to reduce irrigation costs, including rainwater harvesting and storage in private water pans and tanks. Livestock farmers have also adapted by storing grass during wet seasons and purchasing feed from agro-vegetarians during dry seasons to ensure a consistent feed supply for their animals. However, the high cost of adopting innovative farming practices has been a significant obstacle for many farmers, leading to reduced profit margins and challenges in implementing some adaptation strategies due to the smaller scale of peri-urban farms.

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Fresh Fruit and Vegetables for the Urban Poor of Nairobi – Permanent Crisis of Food Insecurity, Logistics Challenges and Urban Agriculture

CHRISTIAN SONNTAG

Abstract

Insufficient supply of fresh fruit and vegetables for the urban poor of Nairobi, Kenya is about unequal distribution, limited access to resources of the poor, high post-harvest losses and extreme marginalization - not the shortage of goods per se.

This paper seeks to provide an approach to connect different inevitably relevant aspects of a complex debate of food insecurity with the aim of putting the focus on providing the urban poor in Nairobi with healthy fresh food. Fresh fruit and vegetables travel through many different routes from production areas to various forms of retail in Nairobi and other cities. The Kenyan capital is no exception. Just as diverse and complex the supply networks are, involving producers, intermediaries, logistics and forms of retailing for fresh fruit and vegetables, is the knowledge and perception of these products and the trade and marketing that goes with it among different stakeholders and population, the consumers. While price, quality and traceability play crucial roles within that problematic situation, the urban poor take their chance and grow their own food to a growing extent. Every crisis hit the urban poor hardest, because they find themselves in a food insecurity crisis in general. Approaches of action concerning this complex situation need to be accordingly carried out on different steps along the agricultural value chain. Some ideas are expressed in this article in form of an initial agenda.

Keywords: food insecurity, urban poor, agricultural value chains, retail, Kenya

Introduction

This article takes up topics that were addressed by the two top candidates in the previous general election campaign in Kenya as follows. Current President William Ruto said in December 2021: "We will put enough money in agriculture, produce enough food, reduce the cost of seeds and the cost of fertilizer, reduce the cost of food so that we can lower the cost of living in Kenya, so that we can ensure every Kenyan can feed his family" (KIPROP, 2022). His campaign opponent at the time, Raila Odinga, said the following: "A nation's greatness is judged by how it treats its poor and vulnerable" (ibid.).

Urban poverty is often described as living in a city in precarious conditions and having to make a living with less than a certain amount of income (OZTURK 2020; RAVALLION et al., 2007). This results often in limited access to healthy food. However, urban poverty is more far-reaching and includes the exclusion of social services such as school access, health care, poor housing and forced evictions (LOKURUKA, 2020; WALNYCKI, 2014).

Over half of Nairobi's residents (55 percent) live in poverty (BROWN, 2015). That are more than two million people if you consider only the Nairobi City County and not the larger metropolitan

area which includes merged urban areas and cities of Counties like Limuru, Kiambu, Kajiado and Machakos (OWUOR ET AL., 2017; OMWENGA, 2010). According to predictions (HOORNWEG & POPE, 2014:9) Nairobi City County will count approximately 14.2 million inhabitants in 2050 (2019: approx. 4.4 million; KENYA NATIONAL BUREAU OF STATISTICS). This is relevant, as it has a direct impact on the challenges surrounding the cultivation, logistics, sale and consumption of fresh fruit and vegetables (FFV) and is likely to increase with a growing population (ABRAHAMS 2010; BATTERSBY & CRUSH, 2014). The Greater Nairobi Metropolitan Area has a population in 2022 already of around 10.8 million people (OMWENGA, 2010, p. 2). These numbers become even more extreme when you consider that the “income-based poverty lines are usually set too low in relation to the costs of food and non-food needs for urban populations” (WALNYCKI 2014). This aspect plays a major role, because “poverty lines have to reflect the real cost of food and non-food needs in each location, recognising that in urban areas all goods and services are commodified, and avoiding extreme poverty needs more than \$1.25 per person per day” (ibid.). Finally, in 2015 within their Sustainable Development Goals, the United Nations have put urban poverty “Sustainable Cities” (Goal 11) and “reduced inequality” (Goal 10) more firmly on the agenda next to “no poverty” (Goal 1) and “zero hunger” (Goal 2) (UNITED NATIONS, 2020).

This article deals with the food insecurity of the urban poor in Nairobi focusing on FFV. Defining food security, a lot of redefinition took place in the last decades, but the core “dimensions are access, availability, adequacy, safety, affordability and stability” (LOKURUKA, 2020, p. 2).

Important staple dry food like maize (for example for the preparation of *ugali*), rice and wheat are not considered in this article. Even though they are fundamental for food security (OWUOR et al., 2017). Neither are animal products considered here. This is due to the complexity of value chain aspects of different products and the importance of FFV for a healthy diet (GANRY, 2007), since malnutrition is extreme among the urban poor in Nairobi (OLACK, 2011; OWUOR et al., 2017). Another reason is, that unlike other food products, FFV are perishable and seasonal and react more sensitive with price soars in the event of disruptions in production or logistics which makes forecasting more difficult (GEBREGEWERGS & HADUSH, 2017). Especially the indigenous vegetables and leafy greens which are fundamental for a healthy, nutritious diet in Kenya, such as Sukuma Wiki, African Nightshade (or Managu/Mnavu) and Amaranth (GIDO ET AL., 2016), but also Swiss chard, are very sensitive and require adequate postharvest handling.

A main argument of this article is that the insufficient supply of FFV for the urban poor of Nairobi, Kenya is mainly about unequal distribution, high post-harvest losses, limited access to resources and extreme marginalization - not the shortage of goods per se. Residents who are poor, are most vulnerable to food insecurity (OWUOR, 2017). It is important to mention, that the terrible drought situation in Kenya and other African countries, which is not overlooked here, is a disaster with some similar but also very different challenges and geographies (LOKURUKA, 2020). For Kenya, most affected by droughts are “the pastoral, semi-arid and arid areas of the country located in the North, Northeast and Northwest of the country” but big droughts always have crucial impacts of the food systems of other counties, too (LOKURUKA, 2020, p. 6).

The article starts after a short description of the used methodology and based on empirical data from Kenya, with the discussion of quality, prices and traceability of FFV as crucial aspects in the debate of urban food insecurity. This is followed by a brief discussion of what influence

external shocks (e.g. COVID-19 pandemic) have on this urban food system. The focus is subsequently on one direct coping strategies of the urban poor to counteract the undersupply of FFV highlighting different methods of urban agriculture. This article aims finally to explore connections between different aspects of the food chain and raise important questions and an initial agenda for action. It is a better understanding necessary to tackle the major challenges of the urban poor to support a rethinking in a field of economy which feels to consists of parallel worlds within Nairobi which are still connected and/or dependent over the fresh food market.

Methodology

Based on empirical research in Kenya (six field trips in total) the different aspects of that article are addressed (KULKE & SONNTAG, 2020; SONNTAG & KULKE, 2021; SONNTAG, 2021; KULKE ET AL., 2022). The data was collected as part of research for my doctoral thesis in 2017/2018 and three further postdoctoral field research stays in 2021 and 2022. A mixed methods approach was used (FLICK 2018). Regular survey of prices and origin of FFV via a value chain mapping (MONTEIRO ET AL., 2017; ILO, 2009) were carried out since 2017 in various retail forms such as market stalls, street stalls, wholesale markets, greengrocers and supermarkets. Furthermore, expert interviews were carried out on the other topics discussed in the article: traceability, the role of urban agriculture, the influence of external shocks and logistics problems with fresh produce. These qualitative guided interviews with different stakeholders along the agricultural value chain (farmer – intermediaries – retailer) and customers are used to develop an initial pro-poor agenda for a supply of FFV to the largest urban area in Kenya. All qualitative interviews were conducted with adapted guidelines, recorded if possible and transcribed. Subsequently the data was sorted and structured with the help of the qualitative content analysis according to MAYRING & FENZL (2019).

Quality, Prices and Traceability of FFV in the streets of Nairobi

Kenya has a rather functioning production of FFV with a long history before the colonial period, where land use was predominantly a combination of pastoralism and subsistence agriculture (CONE & LIPSCOMB, 1972). Even if a lot of scholars were focusing on the good performing export horticulture in Kenya since the 1980s as the third largest foreign exchange earner (FPEAK 2021) “the Kenyan fresh fruit and vegetable (FFV) industry is considered a success story” (DANNEBERG & NDURU, 2015, p. 15). Kenya’s agricultural sector plays an important role on different levels: 22 percent of Kenya’s GDP, employs 40 percent of total population and 70 percent of the rural population (CBK, 2021).

However, sufficient FFV is not accessible for the urban poor of Nairobi because the food is not affordable for the majority of households (cf. OWUOR ET AL. 2017). That is the basic statement that will now be pursued in this section. Next to quality, price is the most important economic attribute for goods. This is particularly relevant in areas where many households have little income and spend a large proportion of their income on food (OWUOR ET AL., 2017). Surveys by the World Food Programme (WFP, 2009) in many regions “indicate that poor households had a higher share of total expenditures going towards food compared to wealthy households” (NYAKUNDI ET AL., 2020, p. 7). This is of course very true for households who have to buy food rather than produce it themselves, which is true for large parts of the urban population in the

Nairobi metropolitan area (NYAKUNDI ET AL., 2020, p. 7-8). The poorest households of Nairobi spend around 50 percent of their total spending on food (KAMAU ET AL., 2011). So, Kenya and Nairobi are no exception. The price is central. This was precisely expressed by Prof. Samuel Owuor in an Interview in March 2022 at the Geographical Department of the University of Nairobi: “The poor do not buy quality; they buy prices”.

Quality of FFV in Nairobi

In a report by the International Center for Tropical Agriculture (CIAT) in Nairobi, the following is an outcome: “More non-slum vendors are sensitive to food safety concerns than slum vendors.” (CHEGE ET AL., 2021, p. iii). That doesn’t mean, these vendors or households in poorer areas are not aware or worried about food safety, but it is obviously not focus number one, when you worry that your family has enough food on the table. Of course, there are other aspects that matter in the field of food retail systems: markets and market contact is more than shopping, anywhere in the world. It's about acquaintances and social contact as well as the culture of barter. It's also about personal relations, and not just about buying goods cheaply. A classic statement that you hear everywhere is: “my mama mboga has the best and cheapest vegetables” or “open-air markets offer fresher quality and cheaper products than supermarkets or greengrocers” (Interviews with customers). This is the perception of most people in the study area from the lower income and lower middle-income areas and possibly in some cases correct. A broker from Kikuyu Town also described in 2017 that supermarkets are much more expensive and offer less fresh products than conventional markets (broker\12). For a long time this was definitely the case. But the market is dynamic and adapting. It is difficult to objectively judge the degree of “freshness”, the quality. Contaminations of vegetables and the use of pesticides play a big role according to customers. The trust to your vegetable seller, your mama mboga or vendor or hawker is really important. According to collected data and observations, the difference in quality between different retailers, in different markets and in individual supermarkets and chains is also significant. It is impossible to give a general answer at this point about the quality. But still, this article aims to focus on significant aspects concerning prices, quality and traceability to get a more nuanced understanding of the under supply of FFV for the Urban Poor and point out to possible fields of action.

Prices for FFV

Most open air markets upcountry or in Nairobi offer a rich quantity of fresh fruit and vegetables, but most products are still not “reachable” for the urban poor of Nairobi. An example is the Toi market in proximity to Kibera, one of Nairobi’s largest informal settlement. The traders at Toi offer a large assortment of FFV to “their fair prices”, but products are still too expensive for many Kibera residents (Photo 2). The same counts for the households in informal settlements like Viwandani, Kangemi, Mathare, Korogocho and Kawangware for example but also for households from non-Slum areas of low and lower-middle income. What are the reasons for that in detail? Another observation often seen: there are vegetable traders in slums and other low income areas per se (CHEGE, 2021, p: iii), but vendors in these areas often offer less varieties and more expensive vegetables than on the market, where they purchased the products (Photo 1 and 3, Figure 2). Moreover, due to a lack of income poor customers purchase only

little amounts at their neighbourhood vendors (e.g. 1 Tomato, Photo 4) at often higher prices than on the markets or sometimes even retail forms like supermarkets or greengrocer (Photo 5), if you consider the kg price. Access to the more distant markets is however limited for the poor household due to transport costs for *boda-boda* or *matatu* (OWUOR, 2017). Supermarkets are out of reach for the poor due to their predominant location in high and middle income areas (SONNTAG, 2021).



Photos 1 - 5: Cabbage Vendor in Viwandani; Wide variety of different nutritious leafy greens at Toi market; Veg Vendor in Viwandani; Vendor with Handcart in Kasarani; Leafy Greens in a Greengrocer in Westlands

Photos: C. Sonntag 2021; L. Hering 2022; E. Kulke 2021; P. Budenz 2022; E. Kulke 2022

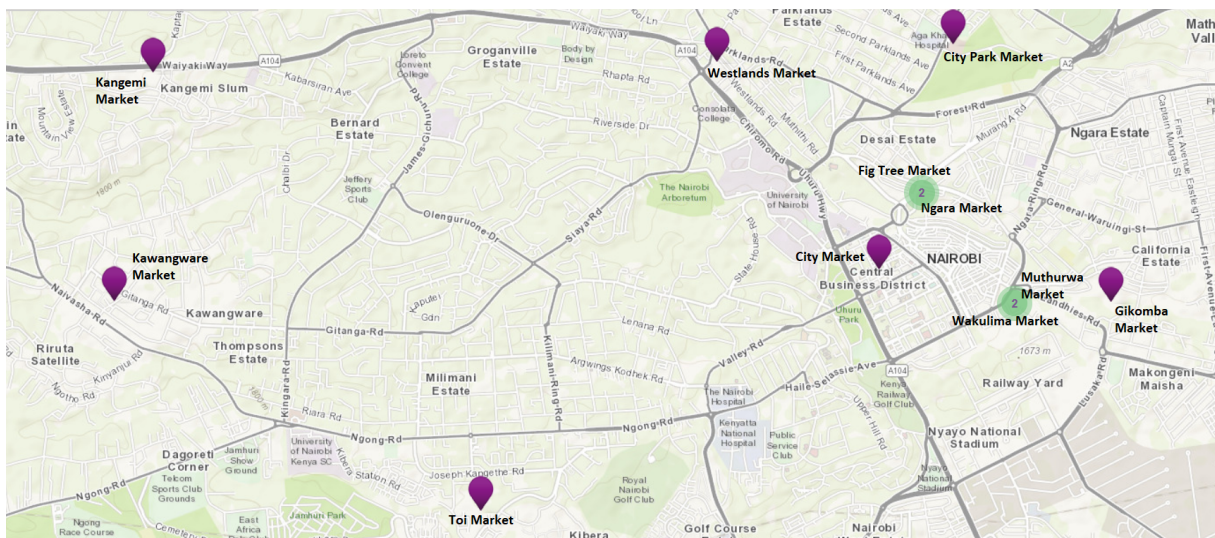


Figure 1: (Simplified) overview of retail/wholesale markets in Central Nairobi

Source: own map; c.f. KULKE ET AL. (2022, p. 222)

Large scale and contract farmers are included in the lucrative value chains like export production and delivering to formal retailers like greengrocers and supermarkets (DANNENBERG &

NDURU, 2013; SONNTAG, 2021). Small scale farmers are still mostly having to rely on the domestic markets to sell their products with a complex network of intermediaries, wholesale markets, retail open air markets and street traders (Fig. 1).

Several studies on value chains of agricultural products in Sub-Saharan Africa address the effects of cooperation with supermarket chains on agricultural producers (ABRAHAMS, 2010; RAO ET AL., 2012; CAMPBELL, 2017). These important studies deal with the power asymmetries in access to the value chain - e.g. on the quasi-exclusion of many small-scale farmers from supplying supermarkets (ABRAHAMS, 2010; CAMPBELL, 2017). Yet it is not observed, that the majority of small-scale farmers benefit from these lucrative value chains. This leads also to the situation, that powerful retailers have contracts with large-scale farmers and effects of economies of scale which results (sometimes) in relatively low prices of agricultural products in successful retail chains like *Carrefour* (SONNTAG, 2021). This is even more crucial, seeing that the vast majority of the products consumed locally are produced by small-scale farmers and inclusion of them seem to be smarter than exclusion (FPEAK, 2021; WILSHAW, 2013).

High post-harvest losses, informal traders and complex middlemen structures leads to increasing prices for FFV, that is a common point of view (Interviews with FFV broker). But it is worth to look a bit more detailed on these aspects. The now very successful company *Twiga Foods* started in 2014 to simplify the middlemen structure, improve logistics and connect (small) farmers and vendors directly to get them registered on a web application (GHOSH ET AL., 2020). Thus, farmers should get better prices and more stable purchases and vendors get high quality products at cheaper and stable prices. The economic success proves *Twiga Food* right on one side. This is certainly true from a certain perspective, but small-scale farmers also complain about the asymmetric access today to the company *Twiga Foods* due to growth-related required amounts of FFV (Interview with farmer in Lower Kabete). Not every small-scale farmer can match their requirements. In addition, it is certainly wrong to criticize everything informal, to demonize middlemen per se and to carry out a differentiated analysis of the advantages and disadvantages with a focus on caring for the poorest. There needs to be a more complex understanding of informality that also emphasizes its strengths and potentials for a functioning economy and supply with FFV (KATHAGE, 2018).

Reducing post-harvest losses is a key tool here. Challenges in transport and handling logistics result in high 'post-harvest losses' in the countries of East Africa, i.e. loss and spoilage of harvested fresh products, which often account for more than half of production (FLORKOWSKI ET AL., 2014; WANYONYI, 2018). More goods push prices down, in theory. But these prices must also reach the poor people. Informal traders are currently by far the largest supplier of poor people in urban areas (over 90%) (CHEGE, 2021). Without an alternative, managing the supply without them is simply absurd or would be tantamount to a catastrophe, and the significant socio-cultural components and networks also play an important role.

However, these crucial challenges are also the starting point for business ideas and opportunities that open up in fruit and vegetable logistics for new or existing players, *Fresh and Juicy* and *Twiga food* are two example (GLOBAL SME FINANCE FORUM, 2018). Tackling the crucial challenge of the insufficient supply of FFV for the urban poor is may not on the agenda in the first place. It is helpful for an improvement of FFV logistics, that many transport infrastructure projects are realized or in the process of realization (roads, highways, bypasses), most

prominent the Nairobi Expressway constructed as a PPP by the Kenyan Government and the China Road and Bridge Corporation (CRBC) linking the Mombasa Road/Jomo Kenyatta International Airport with the Westlands Area. However, the expressway is a toll road.

Furthermore, I would like to go into price fluctuations which is related to the seasonal availability of fresh fruit and vegetables and their influence on prices. FFV seasonality plays an important role in Kenya, affecting prices and availability (Interview with Geographer at UoN\17). If large quantities of a product are available, the price decreases normally. Our price comparison of selected products in formal retail formats at different times (April/May and October/November/December) confirmed this, but only to a limited extent (SONNTAG, 2021). The prices for most products did not vary significantly over the year. There are various reasons for this. Banana, mango, papaya and also Sukuma Wiki and Managu can be harvested, in different locations, almost all year round. Nduma (Arrowroot) can also be harvested up to three times a year. As a result, prices remain relatively constant. For potatoes, onions and tomatoes there are high harvest periods. During this periods, the products were slightly cheaper. Potatoes and onions, in particular, can be stored for longer and thus lead to relatively stable prices. This also shows the importance of high-quality post-harvest handling (FLORKOWSKI ET AL., 2014).

The following Figure 1 shows prices for different vegetables and fruits at different times in different market and retail formats. This is for guidance only as the prices at the open air markets and street traders are sometimes difficult to collect as they are sold per item and not sold in kilo prices. Leafy greens are sold in bunches with a big difference in bunch size. This data is not intended to serve as a complete, reliable statistical analysis, as the number of cases in some formats is low and the prices are very dynamic. But patterns and stereotypes can be recognized, critically questioned and discussed.

The first figure is intended to show that there are also retail open air markets that do not really offer cheaper goods than cheap supermarket chains (Fig. 2a). Before the corona pandemic, the goods at the Fig Tree Market in Ngara were no cheaper than in the supermarket chains *Naivas* and *Carrefour*, which are dominant today. The Fig Tree Market is considered to be a well-stocked and high quality market. However, a look at individual products (African Nightshade or Managu/Mnava in Fig. 2b, Tomato in 2c and Potato in 2d) and the respective supply channels conveys a more differentiated picture. The wholesale market prices (e.g. Muthurwa, Dark Green) are always the lowest. Different retail prices at markets and street vendors vary widely, but generally the goods at the markets (e.g. Muthurwa) and in their immediate vicinity are the cheapest. It is also noticeable that products in informal settlements (e.g. Kibera) are not/hardly cheaper than in middle-income areas such as Kasarani. In addition, the officially determined, average retail prices (blue) show that prices have generally increased from 2021 to 2022 (Figure 2a, 2b, 2c). The prices in the *Naivas* and *Carrefour* (orange) supermarkets are within the range of the officially determined, average retail prices and slightly above them.

Various reasons lead to the limited access to FFV for the urban poor. The further one moves away from the markets, the less diverse FFV is offered, the prices, although relatively low, are hardly affordable. These factors are mutually dependent, why offer something that cannot be bought. The food basket for the poor therefore consists of a lot of maize flour (for *ugali*) and a few FFV such as cabbage or indigenous vegetables (e.g. African Nightshade). "They eat for

bare survival", how it is formulated by KIMANI-MURAGE ET AL. (2014, p. 1098, quoted in OWUOR, 2017, p. 52).

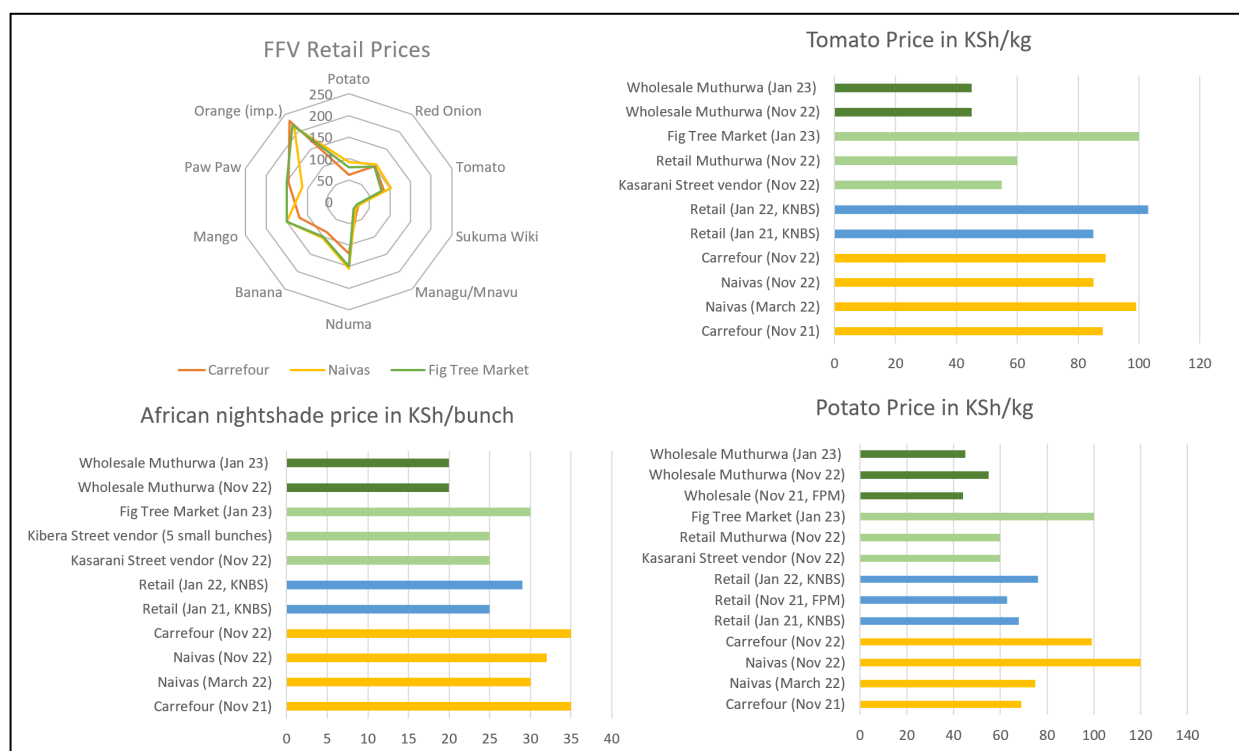


Figure 2: a) FFV retail prices 2017/2018² b) African Nightshade prices on different markets c) Tomato prices on different markets d) Potato prices on different markets. Source: own compilation, data: own survey, FPM = Food Price Monitor; KNBS = Kenyan National Bureau of Statistics

In summary, the perception that FFV are more expensive in supermarkets than in conventional open air retail markets is not always correct (RETRAK\66). While goods are on average more expensive in supermarkets, prices between individual supermarket suppliers are too variable to identify a clear and general price differential between supermarkets and traditional retail channels. There are a large number of comparatively expensive supermarkets, but there are also supermarket chains with relatively cheap FFV offers (e.g. *Naivas*, *Carrefour* in Kenya). The same accounts for retail/wholesale markets and street stalls, there are well stocked ones with a huge range of varieties and good prices, and the opposite in each case. However, what is here more significant than the price is the access to the different retail formats. And this shows that the poorest of the population still have little or no access due to no monetary means for transportation and purchase (OWUOR, 2017). So, there is actually an observable asymmetrical access of the different income-classes of the population to the FFV.

In fact, on every market the FFV prices are too high for the poor urban households of Nairobi. The future price development is difficult to predict. Developments in agriculture, transport, logistics and other areas, such as platform-based business models, could also lower the prices

² ¹ During the period from April 2017 to November 2018, the average exchange rate was: 1 € = 117.5 KSh, in January 2023 1€ = 135 KSh. All figures are prices per kilo. For Sukuma Wiki and African Nightshade (Managu/Mnavu) the price is given per bunch (bunch size differs, 5 small bunch equals 1 big bunch). Prices are rounded.

for fresh fruit and vegetables on conventional markets, in supermarkets and on street stands. It can be assumed that economies of scale will increase and that the large supermarket chains will be able to offer cheaper fruit and vegetables in the future.

Traceability

Overall, traceability is a very complex and sensitive topic and closely linked to the aspects of quality described earlier in the text. There are still no uniform standards for FFV for the domestic market (Interview with Tradecare Africa). Various institutions are working on standards similar to those of e.g. GlobalGAP (ibid.). Without standards often leads to distrust and problems related to contamination and food safety. There are different delivery systems with often the same players and products on the markets or the same suppliers, i.e. products that come from the formal wholesale or retail market are sold on the informal food market (SONNTAG, 2021; OWUOR, 2018). Traceability is a general problem. The provenance of formal retail products is often better known due to direct contracts to farmers, but not in every case as sometimes the procurement systems involves wholesale markets too (SONNTAG, 2021). Another problem arises around the term “organic”. Organic products are often mixed with conventionally farmed products on markets (Interview with Farmer from Kabete). A uniform label for ‘organic production’ is currently missing.

These different aspects in Chapter 3 lead to the situation, that the urban poor have insufficient access to FFV and the more affluent neighborhoods have ‘better’ and sometimes even cheaper access to a wide assortment of FFV. Food security is tied to access and in the case of the urban poor of Nairobi to earned income, then most FFV is purchased (OWUOR ET AL., 2017:52). That is crucial and leads to hunger and malnutrition. That can be even worsened through crisis and shocks, which is discussed in the next chapter due to recent developments concerning COVID-19-Pandemic and the war against Ukraine (see next Chapter 4).

Impact of Shocks and Crisis

COVID-19 has played a crucial role in food price dynamics. This is also evidenced for Nairobi by the following quote: “Prices for almost all food commodities increased between the period before COVID-19 (December 2019) and first lockdown period (April–August, 2020) and then decreased again post lockdown (August–December, 2020)” (CHEGE ET AL., 2021, p. iii). The poorest were hit hardest: “Price increments are observed during lockdowns for most commodities with greater increases seen for the vendors in the slums compared to those in non-slum locations” (ibid.). After a normalization of prices, in 2022 the war against Ukraine can also be added which had an impact on food commodities around the globe (see also Fig. 2). The vulnerable (the poor, the elderly, children, single household heads, women) are always hit hardest. This was also seen in 2007/08 and 2017 with the economic and political crises after the elections and the post-election violence in Kenya (OWUOR, 2017, p. 52). In addition, there are crises like the droughts and crop failures already mentioned. However, to put it more bluntly, it doesn't take a crisis for the poor people of Nairobi to be in crisis, it's a structural catastrophe. The situation becomes even more extreme for the poor due to the mentioned crises and shocks, but they are stuck in a permanent crisis of food insecurity. The Kenyan social protection spending

is increasing but still low by international standards (OWUOR ET AL., 2017) and do not promise a quick improvement in the situation.

The urban poor know ‘crisis’ and show themselves to be innovative, creative and adaptable actors do deal with the challenging situation. As a direct reaction of the urban poor to that food insecurity with FFV the next section highlights coping strategies which focus on urban agriculture.

Urban Agriculture – coping strategy of the urban poor

This paragraph is intended to deal with a coping strategy that the urban poor use to deal with the situation, the agency in terms of ‘structure and agency’ (e.g. GIDDENS 1984). Even if there is little FFV to buy per se for the poor in their neighbourhood, not much can be bought because limited financial means. A coping strategy for the urban poor is urban agriculture for self-sufficiency and generating income (TORNAGHI, 2014; KULKE ET AL., 2022). There is a legal framework (The Nairobi City County Urban Agriculture Promotion and Regulation Bill of 2015) for urban agriculture since 2015 and the topic is on the political agenda, but implementation and especially access to usable land and water is still problematic. Urban agriculture on the other hand can make a contribution to sustainable lifestyles and local economic cycles (OMONDI ET AL., 2017). Developments in urban agriculture is also an important element in achieving various UN Sustainable Development Goals: food security/sovereignty (SDG 2), reduced resource consumption/sustainable production and consumption (SDG 12), climate protection and adaptation to climate change (SDG 13), Sustainable business/entrepreneurship (SDG 1 and 8) or sustainable cities and settlements (SDG 11) (UNITED NATIONS 2020; KULKE ET AL., 2022).

Various studies point out to the relevance of urban agriculture (TORNAGHI 2014), 20 percent of Nairobi households grow FFV (LEE SMITH, 2010, cited in OWUOR ET AL., 2017:48). Urban agriculture in Nairobi takes many different forms (KULKE ET AL., 2022). From small sack gardening in the informal settlements (Photo 6), to hanging vertical cultivation methods (Photo 7) to larger areas on undeveloped areas (Photo 8, e.g. in Kasarani) and areal extensive production systems. Especially fast growing leafy vegetables (e.g. Sukuma Wiki, Managu, Swiss Chard) are grown, but also pumpkin, melon, potato and onions. Often it is a temporary use of vacant lots, where the land owners allow cultivation to prevent undesired uses (e.g. spontaneous squatters), but if construction investors have other plans the urban farmers have to leave. There are also small farms (about 0.25 acres) which are owned by the urban farmers. The urban poor we met, who often drive these developments in urban agriculture are creative and innovative, adaptable and persistent.



Photos 6 – 9: Sack gardening in a Community Garden in Viwandani; hanging, vertical gardens in Viwandani; farming in Kasarani; Hydroponic farm in Kibera

Photos: C. Sonntag 2021, 2022

But the same applies here: Not every household is the same as another. Not every slum is the same. The majority of the poor continue to live in dense areas without access to land and water (OWUOR ET AL., 2017). The question of food safety must be asked. Studies pointed out the risk of heavy metal contamination in sack gardening in Kibera (GALLAHER ET AL., 2013, quoted in OWUOR ET AL., 2017, p. 50) and there is the often cited public common knowledge, ‘food from the slums is polluted’. There are many food safety problems and concerns (OWUOR ET AL. 2017) and I don’t want to say anything else at this point. Because of these risks, it is important to have an informed debate about the adequate promotion of urban agriculture practices (GALLAHER ET AL., 2013). However, a generalization does not lead to the goal here neither. The urban areas differ, soil and water are contaminated differently. There are also approaches such as hydroponic farms e.g. in Kibera (Photo 9) to produce food in a small space with limited resources as a reaction of limited access to land, water and contamination. Fieldwork samples in Kibera and Viwandani showed, vegetables from interviewed farmers seem to be aware of the pollution/contamination problematic. Aware of the contamination of soil and water, farmers use plastic containers with topsoil from outside Nairobi and capture rain water with complex self-built systems. They often bring knowledge about this with them from home, since the urban farmers often grown up in the countryside in the agricultural environment before they migrated to Nairobi.

The potential of urban agriculture is massive and exemplary projects play a major role for inspiration and training. Community centres with their community gardens within the neighbourhoods are of great significance (Photo 6). But fairly it is to mention, that urban agriculture can't solve all problems related to food insecurity of the poor urban population, but it can be a corner stone in the process to achieve that goal. A main potential for this is certainly the short distances and thus the reduction of post-harvest losses and transport costs.

Conclusions

In this text I try to define a scope for a critical view on the food insecurity of the urban poor of Nairobi. Many possible fields of action result from the need for change concerning the supply with affordable nutritious fresh food in the urban poor regions of Nairobi, the 'challenge of the last mile'. The following list is an initial agenda without any claim to completeness and serves as the conclusion of this article. All segments of the agricultural value chain represent potentials for improvement.

- All activities and policies should target the poorer, most vulnerable groups of the population.
- Central is the inclusion of small-scale farmer in efficient value chains. Small holder farmers need support with connections and access to market channels to ensure their sales. UA farmer need access to land, for example, and (technological) solutions to water scarcity and the problem of contamination are needed.
- There is also potential in efficient logistics and infrastructure – post-harvest losses must be reduced. Transport and organization of intermediaries need to be more efficient in order to ensure a decentralized supply of all people in the metropolitan region of Nairobi (SONNTAG & KULKE, 2020). It helps that important infrastructure projects are already realized or in the phase of realization (roads, highways, bypasses).
- The debate about the 'formal' and the 'informal' must be conducted in a much more differentiated manner. Combine the strengths of informality (e.g. barter, credit, small amounts, close to work and home (OWUOR ET AL., 2017, p. 57)) with commitment and the security of formality. I argue for a new understanding of informality – informal traders and logistic networks have knowledge and capacities, but they are often described as ineffective and a 'problem', rather it would be helpful to keep the strength and reduce the weaknesses of the 'informality of the FFV market'.
- Not the shortage of products per se, but access to FFV is the main issue for the urban poor. It needs solutions for retail formats with a wide assortment of affordable FFV in low-income areas. There are successful entrepreneurial ideas which tackle challenges of the urban food systems (e.g. *Twiga Foods*). The entire food market is exposed to constant dynamics.
- The state has been striving for years to improve the market infrastructure and has also partially implemented it, also with development assistance (SONNTAG, 2021).
- In general, there is a need of more reliable data and studies, especially on consumer behaviour and the interaction between retailer and consumer as well as on prices, quality and traceability.

Within the poor population of Nairobi there is a lot of talent, inspiration and entrepreneurship as well as creativity, constantly looking for innovative solutions - political and economic elite, research institutions, NGOs and Western AID agencies must finally understand and support this potential and they should focus on the poor and their efforts. So that the food market can be really revolutionized and for everyone.

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The Social Impact of the COVID-19 Pandemic on Commodity Chains for Fruit and Fresh Vegetables.

A Comparison of Conflicts between Resilience and Social Sustainability in Chile & Germany

BEATRIZ BUSTOS GALLARDO AND NINA BAUR

1 Commodity Chains and Social Sustainability

The COVID-19 pandemic represented a disruption in social commodity trades. Since its beginning, several research studies have emerged focusing on the effects of the pandemic on agro-food chains (ASEGIE ET AL., 2024; ESPETER & RETAMAL, 2024; HALMAI, 2022; HAQUE ET AL., 2022; MAHMOOD ET AL., 2024), labour (DJOUMESSI, 2021; FLOCKS, 2020; LOPEZ-RIDAURA ET AL., 2021; RADULESCU ET AL., 2020) , and the distribution of time within households (BLAZKOVÁ ET AL., 2023; ENETE & MUKAILA, 2024) within urban contexts. The first topic has three concerns: the effects of the pandemic on labour, its implications for logistics and future changes brought about by the different effects (FOLLMANN ET AL., 2024). As such, the increased awareness of consumers concerning health-related consumption and the environment in which goods are produced translated into more attention to local markets and consumer demands, such as changes in packaging sizes and more regional products (FÜLLING, 2022). Across the board, there is consensus that commodity chains are vulnerable to travel restrictions, which result in freight costs and labour shortages on production sites (primarily in the Global South). Regardless, production remained uninterrupted after the first wave and the resulting shock was successfully handled. Interestingly, the main long-term transformation in global food supply chains is the digitalisation of production and distribution. Another consensus in the literature pertains to the need for more public policies to support food supply chains.

In this context, we will focus on two areas that significantly affect trade but remain unexplored, inviting attention and research. One is the effect of the COVID-19 pandemic on wage policies implemented by governments. The second is to observe how government measures affect care practices within households' workers' families.

We understand by care the practices and actions taken by someone in the household to provide food and security to the people living inside the house. Sociological research shows that there is typically a gendered household division of labour, with women doing most of the housework (such as cooking and cleaning) and care work (such as caring for children, the sick and the elderly) (GRUNOW & BAUR, 2014; GRUNOW, 2019; KIBEL ET AL., 2025). However, different countries have different gender and care regimes. That means, regardless from individual household preferences, a countries' governance structures, formal institutions as well as the organization e.g. of the labour market, educational and health system assume a specific household division of labour. Both an individual family's household division of labour and the care regime differ concerning e.g. which women are typically do the housework and care work (e.g. a family member or a paid maid), if and to what extent much caring women also do participate in the labour market as well as if and to what extent men also participate in housework and care

work (AULENBACHER & RIEGRAF, 2018). While sociology points to governance structures and formal institution, feminist geography, focusses on understanding the spatiality of caring (scale, proximity), emotional attachments and responsibility, the private and social division of provision, bodily experiences from either the recipient and the provider, emphasising the relational nature connecting the private sphere with public spaces (ATKINSON ET AL., 2011; MCEWAN & GOODMAN, 2010). As such, both sociology and geography point out that how each household distributes the labour embedded in caring for others is better of concern for the economy. By defining who cares for others, the availability of the workforce at each time and place is connected. Furthermore, some economies have created industries of care work (BAUR, 2001; MCDOWELL, 2015), whereas non-familial networks have become a site of support and income.

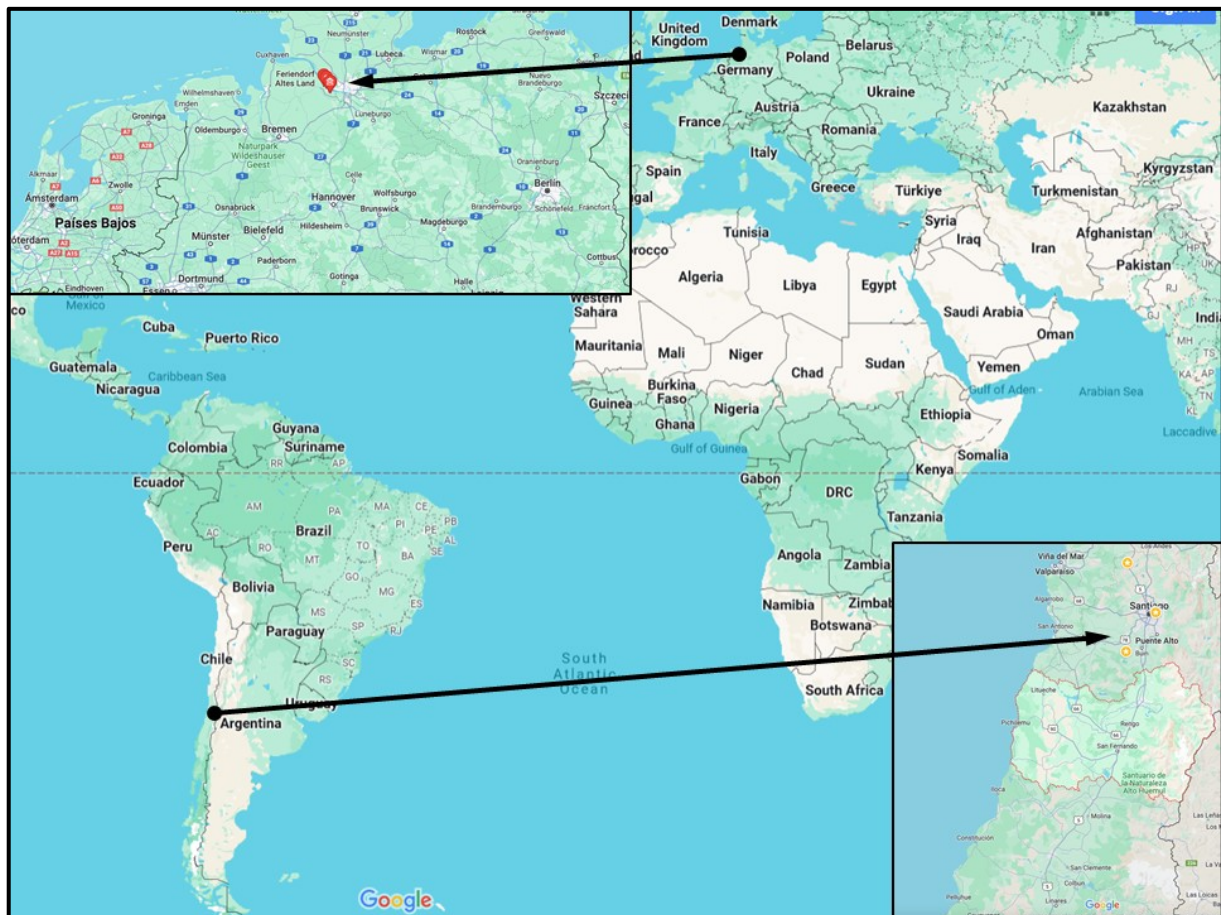
ESPETER & RETAMAL (2024) have shown for the labour force that the same crisis or external shock (in this case: the pandemic) can have very different effects for companies concerning the availability of labour-power in the agricultural areas, depending on the respective country's institutional response. BAUR & HERING (2017) have shown that institutional responses matter also for regions' economic structures, and ESPETER & HERING (2025) have illustrated the same for commodity chains. Against this backdrop, in this paper we ask what effects the pandemic had on families and households. We do this by comparing two agricultural regions in two countries with seemingly comparable economic structures and gender regimes. Using these case studies, we will show that, depending on local institutional response, external shocks do not only have different effects on commodity chains, companies and regional economic structures but also on families, household and social inequality. We will do this by first comparing the geographical situation, the work and care regimes before the pandemic (section 2). We continue to discuss health-and family-related policy interventions in two areas (section 3) and discuss what social effects the pandemic had (section 4): The first one is how family dynamics were affected, for example, by lockdown policies regarding who does what, where, and how. The second relates to infrastructure, where the focus is on the places where caring is realised. The guiding question for our enquiry was: What assumptions about who does domestic labour underscore the existence of these institutions and these places?

2 Work and Care Regimes in Agriculture before the Pandemic

2.1 Location and Geographical Properties

Chile is this long and narrow country in South America. The country's economy has been grounded on exporting natural resources to Europe and other industrial poles. Through industrialisation policies of the 1940s, the agrarian reform of the 1950s and 1960s and the neoliberal project (starting in Chile's 1970s onwards), Chile's commodities, being nitrate, copper, maize, fruits or salmon, have provided markets in the Global North with high-quality products, counter seasonality and lower prices. Currently, the country has a population of nearly 20 million inhabitants, and according to figures provided by the WORLD BANK (2025), a GDP per capita of US\$15,355, with an annual growth of 2,4% (2022). In 2023, unemployment rose to 9.1% of the workforce, and inflation reached 11.6% in 2022. Regarding social indicators, the country enjoys a life expectancy of 79 years and a Human Capital Index (HCI) of 0.7 in 2020.

Germany is located in Central Europe. Its economy has a strong industrial base and highly skilled labour. With a population of 83 million inhabitants and a median age of around 47 years of age, an ageing population poses challenges for current and future social security policies and the labour market. Regardless, its GDP per capita of US\$48,718 and annual growth of 1.8% (FEDERAL STATISTICAL OFFICE, 2022) shows a vibrant economy where innovation and technology lead the investment. However, agriculture remains an important part of the economy, concentrated in wheat, barley and livestock.



Graph 1: Location and Geographical Properties of the Case Studies
Source: GOOGLE MAPS

2.2 The Role of Agriculture in the Economy

Although the weight of agriculture in each national economy varies widely, in Chile, it represents 4.2% of the GDP, while in Germany, it is only 0.7%. Both countries rely on it for food production. The number of employees in Chile by 2021 in agriculture was about 2 million, considering both direct and indirect labour; 88% are seasonal (non-contract workers). Meanwhile, in Germany, there are less than a million workers. Land tenure shows an unequal distribution in both countries: in Chile, only 6% of the agricultural self-employed workers are landowners, as opposed to 46% in Germany. Regarding the gender proportion of labour, most permanent agricultural work is taken by men, and most women work in seasonal labour.

Table 1: The Role of Agriculture in the Economy

Dimension	Chile	Germany
Economic Relevance	– 4.2% of GDP (2017 est.)	– 0.7% of GDP (2017 est.)
No. of Employees	– 2,165,000 persons (2021)	– 937,900 persons (2020)
Structure of Employees	2021 <ul style="list-style-type: none"> – 6% self-employed landowners & family members – 6% permanently employed – 88% seasonal labour 	2020 <ul style="list-style-type: none"> – 46% self-employed landowners & family members – 24% permanently employed – 29% seasonal labour
Gender Proportion of Labour	<ul style="list-style-type: none"> – permanent: almost only men – seasonal labour: 35% women 	– 30% Women (2020)

Sources: Chile: INE, 2024. www.ine.cl

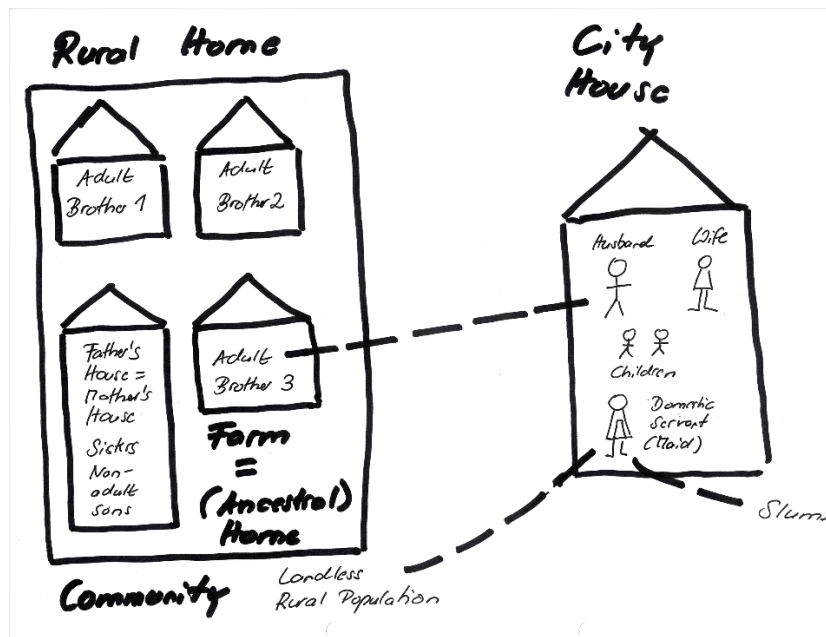
2.3 Family Structures and the Household Division of Labour

In sociology, we distinguish between gender regimes (PFAU-EFFINGER, 1999, 2001; BAUR, 2007; HOFMEISTER ET AL., 2009) and care regimes (AULENBACHER & RIEGRAF, 2018), which explains that state policies assume who will be working and who does the care work. Although there are many different family models in both countries, (in contrast e.g. to Kenya), both Germany's and Chile's institution assume a nuclear family male-breadwinner-female-homemaker model, that is, institutions assume a “traditional” family consisting of heterosexual parents and children (no grandparents, no domestic servants) with the husband being responsible for earning the family income and the wife being responsible for unpaid household chores and care work (Graph 2). In comparison, some other European countries assume that both parties will be employed and share the care work. Other countries have state provisions for care work.

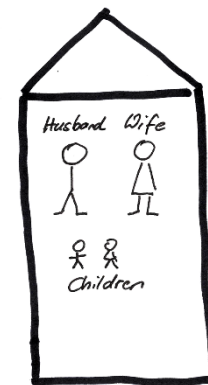
However, regardless of institutional assumptions, in reality, this just means that most women do the majority of the household chores and care work (GRUNOW, 2019) but also do have an employed work.

More specifically, the traditional family structure in Chile consists of a two-parent household with two children. Pushed by low birth rates (4.7 in 1960 to 1.3 in 2024), family structure has been shrinking from 4-person homes (30% of the total by 1990) to two-person homes (39% in 2022) (FUENTES ET AL., 2024). Similarly, women are gaining weight as the primary income providers (from 32% in 1990 to 48% in 2022). Extended family (grandparents and other relatives) typically live in the same city, but support networks are weaker than in the past century. However, in a 2024 report, the Chilean government acknowledged that the country is going through a “crisis of caring” pushed by family structure changes, work market changes and the recent COVID pandemic (MIDESO, 2024).

(a) Kenya



(b) Germany & Chile



Graph 2: Family Structures and Housing
Source: BAUR ET AL., 2023.

In brief, there is a change in the recipients of care from children to the elderly (9,8% of the adult population in the country demands caring) and persons with disabilities (55% of people with disabilities require caring). Women entering the workforce rose from 43,5% in 2006 to 52% in 2022, yet women earn 26% less than men for similar labour. At the same time, 35,3% of women declared responsibilities of care as the main reason for not entering the workforce. Regarding COVID, the same MIDESO report states that during the pandemic, the percentage of women between 30-59 years old assuming house chores rose to 76,5%. Considering that during the pandemic, children were home-schooled via internet access, the situation of the agro-exporting regions O'Higgins, Maule and Ñuble, which concentrate the highest percentage of people with total dependence (Children under 14) with 59,7, 60,6 and 62,4% of its population within this range, was challenging.

In Germany, between 2013 and 2023, the number of adults living as couples (with or without children) has only slightly increased from 20,4 Mio. to 20,8 Mio. persons. In contrast, the number of adults living alone has increased from 15,8 Mio to 17 Mio. persons and the number of single parents (which are typically single mothers) has increased from 2,8 Mio. to almost 3 Mio. persons (DESTATIS ET AL., 2024, p. 54). When it comes to families with underaged children, the proportions have remained more or less stable between 2013 and 2023: 20% of children live with a single parent (usually the mother) while 80% of children are brought up by a (married or unmarried) couple (DESTATIS ET AL., 2024, p. 60). In 2023, there were 7.2 Mio. mothers and 6.2 million fathers (aged between 15 to 64) who lived together with at least one child under the age of 15.

The institutional assumptions on the male-breadwinner-female-homemaker model reflect in that (more or less irrespective of the child's age) 92% of father work – and almost all of them work full time. In comparison (and in contrast to the institutional assumptions that mothers are

only homemakers), around 68% of mothers work. However, due to care responsibilities, female employment rates vary depending on the age of the youngest child: Only two in five mothers (40 %) whose youngest child was under the age of three were in employment. When the youngest child reached the toddler age of three to five years, around twice as many (74%) were already in employment. The highest employment rate of 84% was achieved among mothers with a youngest child aged 10 to 14. Moreover, working mothers have much lower working hours – if they work, mothers typically work part-time because they also need time for care work. How much mothers worked depended on family status: Only 27% of wives worked full-time, while 37% of single mothers and cohabiting partners (37%) worked full time (DESTATIS ET AL., 2024, p. 63-65). Moreover, if a family member gets sick or elderly and needs long-term care, it is usually the women who does the carework – and women are much more likely to become caretakers for the sick and elderly, if they were homemaking housewives (CZAPLICKI, 2020). While the German government offers financial aid, it is expected that with an ageing population, the demand for care will increase. As such, state policies assume a typical household where women stay home and take most of the caring provision for the family.

3 Policy Interventions during the Pandemic

3.1 Health-Related Policy Interventions

To analyse the effects the COVID-19 containment measures had on commodity chains, the first step is to consider the health interventions implemented by the states to prevent the population from dying. However, as we will show, the policy interventions in both countries were different and had very different social effects. One commonality between both countries is that all health interventions focused on keeping up production, putting families and social lives in a secondary position. Regardless of this commonality, the specific interventions were concrete and depended on the historical ground institution and local knowledge system.

In the case of Chile, when the pandemic hit, the country faced two years of social conflict. Starting in 2018, the women's movement raised awareness and put issues of care, inequality, working hours for women on the public agenda, and the need to introduce and extend the responsibilities of domestic labour on the public agenda. In October 2019, a massive social revolt led to a three-year process of changing the constitution because of the unequal economic conditions that mainly affected the working and middle class. At the core of that revolt was a negative assessment of the provision of social security (health, pensions, education, housing) provided by the private sector (CALQUÍN; URZUA & CALDERÓN, 2020), leaving the state to care only for the lowest income tier through an underfunded public system. The combination of higher demands for care added to the negative evaluation of public social security provides the support upon which Chilean society experienced the COVID pandemic.

In the case of Germany, three underlying factors to understanding COVID experience are the historically robust worker orientation, which translated into men only having a family when they had a working position (KIBEL ET AL., 2025). The second factor that always lingers in all policy interventions is the experience of two dictatorships, namely National Socialism and the Democratic Republic of Germany (GDR), both of which inhibited people's mobility and used data on citizens to control people (and even to commit genocide). The result is that up to today,

restricting citizens' free movement is a sensitive issue, and Germans have very strong data privacy policies which make it hard to collect data on individuals and use them for public policies.

This mattered during the pandemic because impinging on any freedom of movement for even a short period is a susceptible issue. As a result, any lockdown was not a central part of the German response to the pandemic. Put differently, although there were officially several “lock-downs”, compared to other countries, they were not real lock-downs. They meant that people were not allowed to do long-distance traveling and to socialize, e.g. in restaurants, clubs and museum. However, people were allowed to shop groceries and other essential needs for everyday life, to continue to do gardening and go outside with their families, as long as they kept 1,5 metres distance to other family members. Persons living alone were allowed to pick one person outside of their household whom they could regularly meet outside, e.g. for walks (KNOBLAUCH, 2020). Concerning work, the “lock-downs” implied mandatory home office for everyone who could work in home office. However, in practice, this meant that the number of people working from home rose from 12% to only 25% of all employees during the pandemic – in other words, even during the lock-downs, 75% of employees still commuted to the workplace and worked there (LPB-BW, 2021) – and the home office rates haven't decreased since then. However, they vary largely between different job types. While in 2022, between 70 and 80% of employees in (male-dominated) highly paid office jobs such as IT, consulting or insurances worked in home office, in (female-dominated) health, elderly and social care jobs, (female-dominated) retailing jobs and (male-dominated) construction, less than 10% of employees worked in home office (DESTATIS, 2023).

Also, from National Socialist times, the strong motherhood cult that frames women as the caring parts affected expectations of caring responsibilities during COVID. This reflects that – while workplaces were not shut down – schools and elderly people's homes were shut down very early during the pandemic to prevent the pandemic from spreading. This meant that children and the elderly were sent home and the families (that is: the women in the household) were supposed to take over the care work of the elderly and help teaching the children (LPB-BW, 2022).

Finally, the recent emergence of a policy debate regarding vaccination and medical interventions resonated significantly during the pandemic, confronting the historically strong support of Germans toward public health policies which polarised society: Vaccine was available very fast, as the most effective vaccine (Comirnaty by BioNTech/Pfizer) was developed in Germany and Germany is a major global pharmaceutical producers, so all effective vaccines (Astra Zeneca, Moderna and Comirnaty) were available very soon. Against this backdrop, a vast majority of Germans was pro-vaccine and was fully vaccinated very early in the pandemic. However, a hardened minority is anti-vaccine and refused vaccination. This was highly politicized by the right-wing parties. As regions varied in their vaccination policies, there is huge regional variation concerning vaccination rates.

3.2 Family-Related Policy Interventions

Table 2 compares five dimensions that affected families during the pandemic in Chile and Germany. In the case of work/COVID, both countries promoted mandatory lockdowns. However, as elaborated above, the lockdown in Germany was never a “real” lock-down, even where we were supposed to have it in the first two months. Only a maximum of 25% of the labour force was doing home office; everybody was still going to work. Chile, in contrast, enforced a longer and stricter confinement. Remote work was promoted for those able to do so, except for workers in essential areas (health, security, and exporting industries) who had a special pass to move from home to work.

Table 2: Family-Related Policy Interventions during the Pandemic

Dimension	Chile	Germany
Work	– “Lock-Down”	– “Lock-Down”
Loss of Income	<ul style="list-style-type: none"> – Workers-self employed: COVID-19-bonus, emergency income, universal income, soft loans. – SME: soft loans, special subsidies – Housing: freezing of instalment. prohibition of canceling contract 	<ul style="list-style-type: none"> – Workers: short-time allowance – self-employed: Corona aids – companies: short-time allowance or Corona aids – housing: prohibition of canceling contracts
Transport	– critical infrastructure (but with curfews)	– critical infrastructure (no lockdown for first months)
Shopping for Daily Needs (e.g. Groceries)	<ul style="list-style-type: none"> – once a week 2-hour permit – deliveries allowed (and encouraged) 	– critical infrastructure no lockdown (new urban underclass)
School	– Lockdown for nine months (2020) and six months (2021) remote teaching.	– Lockdown took over the majority of childcare and education themselves

Source: Own Compilation

Consequently, export-oriented industries in Chile, such as apple growing, did not suffer substantial losses. However, they did face a labour shortage due to the implementation of the universal income subsidy, which was higher than the average payment for agricultural workers, which led them to decide to stay home because they had better income without facing the risk of contagion, which created tension about who does the working in their fields. For most self-employed, both states provided bonuses and subsidies to compensate for loss of income. Both countries also granted particular loans for SMEs.

In Germany, the pre-existence of the so-called law for short-term allowance (“Kurzarbeit”), created in the early post-war years to help with the loss of income for seasonal workers in agriculture and construction by providing state compensation to the workers to prevent their dismissal, helped to quickly adapt and contain the rapid and massive unemployment caused by

the abrupt end of work due to mandatory confinement. Thus, the Federal government just extended this allowance to all companies and for the self-employed, complemented with corona aids and heavy subsidies, meaning that the income effects of the pandemic have only shown after the pandemic and are more robust due to the gain work than the pandemic.

The second dimension is transport. In both countries, transport was defined as critical infrastructure allowing workers to leave their confinement to secure continuity of service. However, in Chile, the movement was controlled with electronic permits that people needed to obtain via e-government sites and display when asked by police officers. Also, there were mandatory curfews for everyone, which reduced mobility by night. In Germany, in the early months of the pandemic, long-distance traveling (outside one's home city) was completely forbidden, and later on, long-distance travellers had to have a severe reason for long-distance travelling, and it was strongly recommended to use the car or bike instead of public transport. However, local public transport was always running (and needed to allow workers without a car especially in the cities to commute to work).

The same goes for shopping for daily needs. The supermarkets and shops were open during the hard lockdown. However, in Chile, there were restrictions such as a maximum of two hours per week for grocery shopping, which helped provide delivery services which Germany didn't have. Chile saw an explosive boom, mostly led by migrant labour. In Germany, people were allowed to shop all the time. However, before the pandemic, the working population typically took their main meal (lunch) at a canteen at work. Also, especially the urban middle classes went to restaurants regularly, and the restaurants were locked down for about a year. As a result, people had to resort to cooking themselves, adding to the household chores but also, after a couple of months, resulting in home delivery of food for two reasons: people being fed up with cooking and restaurants being afraid of going out of business. However, food delivery on a regularly basis is only affordable to the middle classes, and it resulted in the development of a new urban underclass – the delivery workers.

Schooling was one of the most impacted dimensions in both countries. Schools worked remotely for almost two years, with children returning to in-person classes in Chile only in mid-2021 with mandatory masks and half the class in person and the other by Zoom, similarly in Germany. However, there were no educational concepts for doing it at that time because there wasn't a tradition of remote teaching. Neither the teachers nor the students had devices. There were no materials and no educational concepts. So, it very often worked because the teachers sent some materials to the parents, and the families had to struggle. It meant that the parents took over most of the childcare and education.

In Germany, also, most elderly live in elderly people's homes. As these homes were severely hit very early in the pandemic and as this is a high-risk population, a lot of elderly people's homes simply shut down and sent the elderly back to their families. Likewise, when people are sick or injured and go to hospital, if needed, there are professional rehabilitation centres where recovering people can do exercises and are cared for several weeks or even months, depending on the illness or injury. These were also mostly closed down, resulting in the care work being transferred to the families (meaning: women).

4 Social Effects of the Pandemic

In terms of class, in both countries the educational differences increased for what we just explained about the access to infrastructure for remote teaching: low-income households in both countries were worse off than middle and upper-middle-income families to equip their children for better learning experiences as well as to support learning with their cultural capital. This is a severe issue for the next generation, as educational achievement influences future labour market chances and therefore income prospective. Secondly, concerning the relationship between the classes, in Chile, the COVID crisis affected represented a deterioration of the middle class. Self-employed people such as liberal professions like architects, psychologists, therapists, and so on were unable to work, reducing their income. In the absence of income, there needed to be social infrastructure to support them. While in Chile, the middle classes were mainly negatively affected, in Germany, the working classes were affected on several levels. First, the delivery service expansion resulted in a new urban underclass, which is unregulated labour with deplorable working conditions and a higher risk of infecting middle-class households to delivery persons who had to go out and move around the city. The second issue is that, at a general level, the working classes had a much higher risk for infection rates because typically, the jobs that could be done in the home office were middle-class office jobs, while the working classes are usually in jobs which could not be internalised, like transport system, sales and food and so on. Thirdly, they also had to use public transport where contagion was higher, and the housing conditions were usually worse, so they couldn't self-isolate so much. The most long-term effect is the above-mentioned increased educational differences because the German education system is already very stratified.

Regarding gender, in Chile, there was an increase in working hours for women and a disruption of domestic spaces that affected women more than others (CUCAGNA & FRANCISCO JAVIER, 2021). Houses in Chile are no longer made for living there; they are just for sleeping. Such traditional spaces like the kitchen and dining rooms were converted into classrooms and offices, affecting women in their traditional use of the house, and that caused anxiety and depression, which studies show affected primarily women (CZEPIEL ET AL., 2024).

Concerning gender in Germany, there were many gender effects, for example, an increase in domestic violence. The results are mixed about the labour market and household division of labour. On the one hand, more women became full-time housewives. On the other hand, this new situation also affected gender equity because many parents wanted to share responsibility. Before the pandemic, there was a rigorous division between personal and work life, and you could never bring up personal issues at work. Nowadays, it is acceptable to bring those issues up, and you see it in little things, like in a Zoom session, there suddenly might be little kids being covered by their father who's working and so on, so you can have this active parenting. However, all in all, the pandemic resulted in a retraditionalisation of the household division of labour, pushing women more strongly back into the role of the homemaker (LPB-BW, 2022).

Over the past decade, migratory flows to Chile have come from South America, Venezuela, Colombia, and the Dominican Republic. These migrants struggled during the pandemic because they were living in deplorable work conditions, with 76% stating that they did not have enough income to sustain their needs, but also because their legal status meant they were the first ones to lose their work: 34,8% declared they were dismissed immediately, although the state actively

promoted migrants to approach health centres, regardless of their migratory status, the fear of deportation prevented them from early access to healthcare (CENEM-UTALCA, 2020; CEPAL, 2020; RAMÍREZ, 2023).

Table 3: Social Effects of the Pandemic

Dimension	Chile	Germany
Class	<ul style="list-style-type: none"> – Deterioration of middle class – Increase in educational differences 	<ul style="list-style-type: none"> – new urban underclass (deliveries) – higher infection risks and related long-term health risks of lower classes – increase in educational differences
Gender	<ul style="list-style-type: none"> – Rise in working hours. – The disruption of domestic spaces affected women more than others. – Increased cases of depression and anxiety among women 	<ul style="list-style-type: none"> – more women full-time housewives – more shared responsibilities – showing parenting responsibilities openly and letting them influence work-life became possible
Migration	<ul style="list-style-type: none"> – most affected by COVID-19 due to poor living arrangements and legal status – increased entry to the labour market as a delivery service 	<ul style="list-style-type: none"> – resident migrant workers are usually lower-working class, with according to adverse effects – labour shortage: seasonal labour migrants had even higher risks, but also there were not so many
Age	<ul style="list-style-type: none"> – Elderly: extreme isolation; deterioration of social interactions. – Children: mental health crisis associated with prolonged confinement and remote schooling 	<ul style="list-style-type: none"> – Elderly: deterioration of social interactions; relatively low death rates – Children: educational performance, mental health crisis

Source: Own Compilation

As the German economy have been one of the driving forces in Europe for most parts of the last two centuries, there have always been plenty of labour market opportunities and very often labour shortages. Accordingly, Germany has been an immigrant country since the nineteenth century. In 2021, around 23 Mio. people (27.5% of the total resident population) have either migrated themselves or their parents or grandparents have migrated to Germany (DESTATIS ET AL., 2024, p. 273). Although labour migrants a very heterogenous, a majority are working class migrants. One of the fields suffering especially from labour shortages (both permant jobs and seasonal labour) has been agriculture (but also retailing), which therefore is also strongly dependent on migrants. A majority of the working-class labour force of the critical infrastructure (agriculture, retailing, transportation, health and care industries) are migrants, which in turn means that all of the above-mentioned class effects especially affect migrants.

In addition, in agriculture and food production, many companies do not always completely comply to the German labour law, such as ignoring work safety or paying very low salaries. While this had been a structural problem for years, it became apparent to the public during the pandemic because now, this meant that these companies did not take the pandemic-related

health measures for their workers seriously enough which in turn resulted e.g. in higher overall infection rates in the respective regions. A long-term result of the pandemic is an increase of an already severe labour shortage because typically, due to these working conditions, after a season the seasonal labour either return to their home countries or change to better-paid jobs within Germany. Before the pandemic, this system worked, because there were always new migrants coming in. However, as there was less migration during the pandemic, this increased the labour shortage.

Concerning age, in both countries, the very young and very old were the most severely affected. The elderly suffered from extreme isolation and deterioration of social interactions – in Germany, at least their death rates were comparatively low (both compared to the German population and to elderly in other countries). Children are suffering from a mental health crisis associated with prolonged confinement and remote schooling. In Germany, as a result of home schooling, educational performance especially of working-class children went down.

5 Conclusions

In both countries, there was a superposition of economic rationales, typically termed in commodity chain analysis as resilience over social sustainability. We also wanted to show that when chains have the same external shock or crisis, the social effect of the same driver can vary depending on the context. For future research, this implies two things. First, it would help integrate social sustainability into commodity chain analysis. Secondly, it would help take the local context seriously, including how social inequality unfolds in everyday life.

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