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Rethinking Urban Food Systems in Nairobi: Embracing Local Context for Sustainable Transformation

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Abstract

Urban food systems are crucial for addressing sustainability, equity, and resilience, especially in rapidly growing cities of the Global South. Yet, urban planners have long neglected them. In Nairobi, where up to 60% of residents live in informal settlements and many spend over half their income on food, the food system remains fragmented despite extensive interventions. Drawing on research in Kasarani, a constituency of Nairobi, this article explores how residents navigate and use the social, economic, and infrastructural dynamics of their neighborhoods to secure food and their livelihoods. We show that policy approaches centered on formalization and large-scale projects often ignore the value of everyday practices and local networks. Informal actors, such as *mama mbogas* (fresh produce traders), are vital for food security and community resilience. We advocate for urban food governance that embraces the coexistence of on- and off-grid systems and recognizes informal economies as central to urban resilience. By emphasizing residents' lived experiences, we highlight pathways for more inclusive and transformative urban food planning.

Keywords

governance; local context; peri-urban development; sustainable transformation; urban food systems

1. Introduction

Urban development is intrinsically linked to food systems, which shape consumption, waste management, and interactions with other infrastructures such as energy and housing (Steel, 2013). Despite widespread recognition of the importance of urban food systems research, these systems are generally considered to be unsustainable, leading to urgent calls for their transformation. Furthermore, recent crises have raised political interest in transforming food systems, with sustainability and resilience as key objectives (von Braun et al.,

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2023). Ideally, sustainable food systems take into account social equity, environmental integrity, and economic justice (Blay-Palmer, 2010). A definition of sustainable food systems is provided by Hendriks et al. (2023, p. 38):

> Productive and prosperous (to ensure the availability of sufficient food); equitable and inclusive (to ensure access for all people to food and to livelihoods within that system); empowering and respectful (to ensure agency for all people and groups, including those who are most vulnerable and marginalized to make choices and exercise voice in shaping that system); resilient (to ensure stability in the face of shocks and crises); regenerative (to ensure sustainability in all its dimensions); and healthy and nutritious (to ensure nutrient uptake and utilization).

This broad definition extends beyond food security to include regenerative capacity and the agency of all actors involved.

In sub-Saharan Africa (SSA), urban food systems are crucial not only for food security—defined by availability, access, utilization, and stability—but also as major sources of employment and income (Resnick & Swinnen, 2024). In Nairobi, over half the population faces food insecurity, with two million residents spending more than half their income on food (Owuor, 2019). Vulnerable groups such as women, children, the elderly, and people with disabilities are particularly affected. Colonial legacies still shape Nairobi's urban landscape through segregation and gating practices, leaving the city materially, socially, and politically fragmented (Owuor & Mbatia, 2012). Though semi-autonomous, these fragments result in uneven development across the city. Structural issues, such as low incomes, food losses from technological gaps, and middleman-driven price increases, exacerbate the situation (Owuor et al., 2017). Rapid urbanization intensifies challenges related to soil sealing, the loss of agricultural land, river pollution, and waste crises (Nairobi City County, 2022), with peripheral areas suffering most due to inadequate infrastructure and mounting settlement pressure. Transforming Nairobi's food system to ensure greater effectiveness, equity, and environmental sustainability is essential.

Unlike gradual change, transformation is driven by specific intentions and goals. Sonnino (2023, p. 1) defines food system transformation as a "fundamental change in the structural, functional, and relational aspects of the food system that leads to new patterns of interactions and outcomes." Such transformation requires the comprehensive restructuring of the food system and its interdependencies with other urban systems. However, conflicting priorities among stakeholders—NGOs, multinational corporations, traditional leaders, and civil society organizations—often result in power struggles (Pfister et al., 2016; Smit, 2016). Central debates revolve around whether environmental sustainability, social equity, or economic growth should take precedence, underscoring the need for policymaking informed by research, grassroots perspectives, and inclusive stakeholder engagement. Moreover, top-down urban development projects, such as large-scale infrastructure projects (K'Akumu & Gateri, 2022), often pursue different logics, prioritizing connectivity for goods, people, and services over environmental protection or community welfare.

In response, new theoretical perspectives have emerged that highlight the interdependencies between infrastructure, urban governance, and food systems. These approaches stress that:

> Urban food systems cannot…be theorised and studied as separate from urban systems because a lack of understanding of the realities facing urban dwellers and urban systems will only lead to

> maladaptive policies, including those that criminalise existing coping strategies and ways of living which do not conform to a planned ideal. (Living Off-Grid Food and Infrastructure Collaboration [LOGIC] et al., 2024, p. 438)

Drawing on urban studies, the LOGIC introduces the concept of infrastructure assemblage—socio-material configurations linking people, ideas, and objects (LOGIC et al., 2024, p. 441)—to analyze urban food systems. This perspective shows how urban populations rely on both on- and off-grid infrastructures, offering insights for local authorities to move beyond rigid planning and engage more effectively with community-driven practices (LOGIC et al., 2024, pp. 443–444). Inspired by assemblage theory, we adopt McFarlane's (2021) view of urban contexts as compositions of fragments—"bits and pieces" (p. 4) that shape cities materially, socially, and spatially. Our focus lies on locally specific socio-material arrangements shaped by social, economic, and infrastructural conditions that enable food trade and consumption. Building on these theoretical insights and our empirical data, we advocate recognizing local specificities, particularly social, economic, and infrastructural characteristics, as key factors in shaping urban food systems. This raises two guiding questions: How are these characteristics formed, and how can they support sustainable food system transformation? To address these questions, this article is structured as follows: (a) We begin with an overview of existing research on urban food system governance and transformation, particularly in SSA; (b) we then examine our own empirical data on the everyday practices of residents living, working, and eating in Kasarani, a northeastern Nairobi neighborhood, to illustrate the locally specific interplay of social, economic, and infrastructural factors—highlighting the crucial role of informality in enabling sustainable transformation; and (c) finally, we apply our analytical framework to show how a deeper understanding of local contexts can guide more inclusive policy interventions, beyond formalization efforts.

2. Navigating Sustainability, Governance, and Informality in Urban Food Systems of SSA

From a policy perspective, designing, implementing, and monitoring sustainability policies and strategies poses a major challenge, especially given the unequal power relations both at the global level and within nations (Lawrence et al., 2015). To date, academic and policy discussions on the transformation of urban food systems have been primarily restricted to the macro level, supported by limited empirical evidence (Sonnino, 2023). A review of the literature highlights structural differences between urban spaces that we believe are essential to consider when implementing sustainable characteristics (LOGIC et al., 2024; Owuor et al., 2017).

2.1. Contested Dimensions of Sustainability in Urban Food Systems

Sustainability rests on three key dimensions: social, environmental, and economic. Sustainable economic development meets present needs without compromising those of future generations; social equity safeguards rights, health, culture, and social norms; and environmental sustainability protects natural resources to ensure long-term productivity (Magidi, 2022). In the context of food and nutrition, social justice is critical as food insecurity is closely linked to income levels (Resnick & Swinnen, 2024). Economic sustainability in SSA requires recognizing informal work as essential, while environmental sustainability must respond to the effects of fragmented urban development, including informal settlements, inadequate infrastructure, and environmental degradation.

These dimensions are often contested among stakeholders operating at different action levels, and sustainability in one area can lead to unintended, unsustainable consequences in another (Pfister et al., 2016). Critics argue that contemporary food systems harm both human and planetary health (Sonnino, 2023) and that ecological sustainability efforts, shaped by modern capitalist agendas, can exacerbate social inequalities (Neckel, 2017). However, especially in studies from the Global North, there is evidence that local food movements operate at the local level in response to government inaction, which is often attributed to the influence of neoliberal urban regimes (Birnbaum & Lütke, 2023).

Urban food systems are increasingly shaped by translocal dynamics. Initiatives like the Milan Urban Food Policy Pact promote global cooperation and local action through knowledge sharing and multi-level governance (Moragues-Faus & Sonnino, 2018). As a signatory, Nairobi launched its Urban Food System Strategy (NUFSS) in 2022 (Nairobi City County, 2022). While successes in one city can inspire others, limited network capacities (e.g., in redistributing resources between members; Moragues-Faus & Sonnino, 2018) and ongoing conflicts over land, infrastructure, and economic structures often deepen socio-economic disparities. Best-practice models frequently overlook informal economies and local inequalities, challenges especially pronounced in rapidly growing cities like Nairobi (Nairobi City County, 2022; Watson, 2016). This underscores the need for context-sensitive strategies that build on local capacities and address unequal access to land, resources, and decision-making (Birnbaum & Lütke, 2023; Resnick, 2024). Addressing these issues requires a mix of top-down policies, such as subsidies and food safety regulations (Resnick, 2024), and bottom-up initiatives led by NGOs and local producers. Though small-scale innovations can foster sustainability, community resilience, and ecological regeneration (Sage et al., 2021), they often remain marginalized in research and policy. Sustainable transformation, therefore, is not only complex and contested but must be grounded in local realities.

2.2. Urban Food Governance and Peri-Urban Development

Ensuring food security has long been a core responsibility of urban administrations (Steel, 2013), but in recent decades, other priorities have taken precedence (Wiskerke, 2015). Rapid urban population growth has shifted the focus toward housing, education, and the expansion of infrastructure such as roads, electricity, and digital connectivity. In countries grappling with widespread food poverty, officials must nonetheless constantly address food insecurity (Battersby & Watson, 2018b). Urban infrastructure and food systems are closely interconnected: Food systems influence the layout of a city and how its infrastructure is utilized, while access to infrastructure shapes food choices (LOGIC et al., 2024). A sustainable food supply relies not only on access to resources like energy, water, and land (Wiskerke, 2015) but also on the social and political relationships, ideas, and visions that govern and influence this access (LOGIC et al., 2024).

Yet, urban expansion often converts fertile land, creating trade-offs between development and agriculture. Peri-urban areas, common on the outskirts of large cities in SSA, can be theorized in different ways (Follmann, 2022): as territories to be planned and controlled; as functional spaces defined by flows and interactions; or as transitional zones, "cities-in-the-making," serving as basic resources for urban growth (Brenner & Schmid, 2017). The latter highlights how urban demands drive resource extraction and appropriation, exposing contradictions within capitalist urbanization (Brenner, 2019). Understanding the social, economic, and infrastructural characteristics of these spaces could help authorities better integrate them into urban planning and move beyond a traditional state or market-driven approach, opening up space for community-led development (LOGIC et al., 2024).

2.3. The Informal (Food) Economy

The evolution and development of the informal economy, which is prevalent in both rural and urban SSA (Skinner & Watson, 2020), is influenced by historical processes, global power dynamics, and hegemonic knowledge production:

> The informal economy or informal sector is a broad term that refers to the many aspects of a country's economy that are not taxed or monitored tightly by any form of government and are not included in the GNP of that country. (Ruzek, 2015, p. 6)

Informal economic activities are largely unregistered, labor-intensive, and operate with minimal capital input (Komollo, 2010). They typically occur in unregulated markets without government support, often in poorly serviced and environmentally vulnerable urban spaces, which limits their economic potential. The sector is characterized by small-scale enterprises that use local resources and low technology and is heavily reliant on women and children as labor (Resnick, 2020). We will show that Nairobi's food retail sector is broadly divided into formal and informal markets, although the distinction is fluid. Informality exists on a continuum shaped by taxation, regulation, and working conditions (Etzold et al., 2009). Unlike supermarkets, which rely on modern infrastructure and formal supply chains, informal vendors often operate with flexible business models that adapt to local economic conditions and consumer needs.

City governments need to assess food systems and identify intervention points for food security, but the informal food sector is often overlooked in policy (Crush & Young, 2019). When it is included, regulations based on Western models (Kinyanjui, 2019) can exacerbate inequalities and food insecurity. Effective integration of informality into local policy is critical for sustainable urban food systems in SSA. Policy approaches to informality vary (Crush & Young, 2019): Dualist views see it as a sign of underdevelopment and therefore an obstacle to development, structuralists see it as exploitation, and neoliberals see it as entrepreneurship in need of regulatory support. We explore the interplay between formal and informal markets, emphasizing their interconnectedness rather than treating them as separate entities. The potential to support the local informal structures that are already working could therefore provide new opportunities to transform food systems in a locally specific way.

3. Case Study and Methodology

Kasarani was selected as the research site based on theoretical and methodological considerations. Since the 1990s, the area has undergone significant transformation, increasingly being integrated into Nairobi's urban fabric. Located about 17 kilometers northeast of the central business district, Kasarani typifies a peri-urban zone characterized by rapid spatial and socioeconomic change.

Fieldwork was conducted over three periods between November 2022 and March 2024, totaling 12 weeks, in collaboration with local field assistants with long-standing ties to the area. This allowed for an in-depth understanding of the heterogeneous population's experiences, focusing on the social ties, economic structures, and infrastructural elements supporting the local food system. To understand the spatial dynamics of food access, we used a mixed-methods approach (Fülling et al., 2024), combining quantitative mapping of 296 food outlets with qualitative observations and interviews. Mapping data included shop

location, type, product range, number and gender of employees, special features, and pricing. We also conducted 40 qualitative interviews (indicated in the text as I and the number, e.g., I1, I2, etc.), including three group interviews (4–6 participants), with traders, customers, and food system experts, each lasting 30 minutes to two hours. To address the lack of literature on area development, some interviews were conducted as narrative historical interviews with long-term residents.

While the primary focus was on the evolution of food retail and consumer behavior, additional insights emerged that are critical for conceptualizing sustainable urban food systems. Interview analysis followed a two-step coding process: first, inductive coding to capture perspectives on local food trade and consumption; second, clustering findings into social, economic, and infrastructural dimensions according to our framework. The analysis begins with Nairobi's broader urban development, narrows to its food system, and then focuses on Kasarani's food landscape. Emphasizing the informal sector's crucial role in food provision, employment, and social support, the study argues for policies grounded in a nuanced understanding of local dynamics, recognizing spatial diversity and the enduring significance of informality in Nairobi's food system.

4. Results: Recognizing the Locale

4.1. Nairobi's Growth Trajectory: Colonial Roots, Neoliberal Shifts, and Future Visions

Over the past 120 years, Nairobi has evolved from a simple railway station into Kenya's capital and a major East African megacity (Owuor & Mbatia, 2012). Selected for its access to water, flat terrain, and cooler climate, the city soon developed into an administrative and commercial center under British colonial rule. Early colonial planning established a segregated urban structure, with distinct zones for Europeans, Asians, and Africans—a spatial division that continues to shape the city's development today (Kinyanjui, 2019; Ogot & Ogot, 2020).

Following independence, Kenyan policymakers pursued growth and welfare strategies aimed at integrating African urban areas, including investments in public housing, social infrastructure, and essential services. However, the dominant "catch-up" development approach also promoted slum clearance and the regulation of informal activities (Kinyanjui, 2019). Particularly during the late 1970s and early 1980s, it became apparent that state institutions were unable to manage Nairobi's rapid population growth. Top-down planning approaches contributed to the expansion of informal settlements and increased urban fragmentation (Owuor & Mbatia, 2012).

The 1980s and 1990s marked a discursive and political shift toward neoliberalism in Nairobi's urban governance (Carmody & Owusu, 2016; Morange, 2015). Local authorities struggled with unresolved debts, growing dependence on the central government for capital investments, weak leadership, and deteriorating service delivery (Owuor & Mbatia, 2012, pp. 123–124). Structural adjustment programs imposed by international lenders reshaped the city's development (Rono, 2002), drastically reducing public housing previously managed by the National Housing Corporation and opening the sector to private developers (Mwau et al., 2020). Public utilities such as the Nairobi City Water and Sewerage Company and Kenya Power were also partially privatized. These austerity measures fueled a surge in informal sector employment, which has dominated Nairobi's labor market since the 1990s. The informal housing market likewise expanded, particularly in the city's peripheral areas, reinforcing broader trends toward informality. Today, approximately 70% of Nairobi's population lives in informal settlements (Fodde, 2022). Many residents rent from

unregulated landlords and are often compelled to spend a substantial share of their income on poor-quality housing, leaving little for other essentials. Rising rents within informal settlements, compounded by nearby housing projects targeting the small middle class, have further exacerbated social inequalities and placed additional strain on already fragile infrastructure. Moreover, informal settlements, often characterized by insecure tenure, are typically located on unsuitable land, frequently contaminated and thus poorly suited for food production or livestock keeping (Fodde, 2022).

In 1999, Nairobi's fiscal situation began to improve with the introduction of the Local Authorities Transfer Fund (Owuor & Mbatia, 2012), which aimed to strengthen municipal finances and expand planning capacities. From the mid-2000s onward, urban policy increasingly focused on transforming Nairobi into a "World Class City" (Myers, 2015; Owuor & Mbatia, 2012). This shift marked a renewed interest in master planning, alongside continued decentralized planning efforts by NGOs dating back to the 1990s. These developments were driven by factors such as record resource export revenues, China's growing role as a lender and infrastructure partner, and revived international support for infrastructure-led development (Gillespie & Schindler, 2022). The construction of the Thika Road highway exemplifies this new phase, connecting Nairobi with its peripheries and beyond and aiming to attract investments in industry, logistics, housing, and infrastructure. Such projects are expected to stimulate private sector growth but also have profound implications for urban spatial structures, food systems, and social equity.

4.2. Nairobi's Urban Food System

Today, Nairobi exemplifies typical food security challenges faced by cities in SSA. According to the Food Insecurity Experience Scale, 60% of residents have experienced some form of food insecurity (Nairobi City County, 2022), and one-third cannot afford a balanced, healthy diet due to high prices (Owuor, 2019). Although 20% of Nairobi County's food is produced locally (Fodde, 2022), scholars largely agree that affordability, not availability, is the core issue (Battersby & Watson, 2018a; Smit, 2016). This is especially evident in informal settlements, where staples are sold at small kiosks and by mobile vendors (Downs et al., 2022).

Over the past two decades, supermarkets have expanded across Kenya. Nairobi hosts large international chains (e.g., Carrefour), national chains (e.g., Tusky, Naivas), and smaller local chains (Sonntag & Kulke, 2021). Yet, informal vendors still dominate the market. Their importance is partly explained by the inclusion of subsistence and care work, accounting for 20–60% of urban labor output (Komollo, 2010), often carried out near or within households (Skinner & Watson, 2020). Research highlights that informal food trade is essential for the food security of the urban poor and shifting employment patterns (Battersby & Watson, 2018b). Unlike supermarkets, mainly located in wealthier areas, kiosks are more accessible, offering lower prices, small quantities, and credit options, supporting what is termed the *kadogo* (small) economy (Fodde, 2022).

State-designated markets, such as Nairobi's Wakulima Wholesale Market, are crucial for urban food security. However, despite rapid population growth since the country's independence in 1963, public market development has been neglected (Gründler et al., 2024). Plans for 55 new markets since the 1970s never materialized, leading to the rise of informal markets on precarious or disputed land. Political interference and forced evictions have further destabilized these spaces. Traditional markets, while still the main source for fresh produce, suffer from poor sanitation, congestion, and infrastructure deficits. Informal economic activities dominate, and governance remains a challenge.

Recently, Nairobi's county government has begun formalizing trade by building and upgrading markets to improve infrastructure, security, and food safety. These efforts are part of the NUFSS, focusing on six pillars: sustainable diets, social and economic equity, food production, supply and distribution, and food waste (Nairobi City County, 2022).

Given that Kenya has the highest rate of informal sector employment in East Africa, absorbing around 77% of workers, Brown (2019) argues against formalizing the informal sector. Instead, he advocates for food-focused social programs such as microcredit, food banks, school feeding programs, education initiatives, employment programs, and cash transfers. While urban agriculture has shown largely positive effects, Brown notes that spending remains inadequate, particularly in cash-driven urban economies where land for farming is limited.

The analysis of our own data from Kasarani will shed light on the specific challenges and potential in this area for sustainable urban food system transformation.

4.3. Kasarani: A Diverse and Fragmented Part of Urban Nairobi

A specific catalyst for the rapid urbanization in northeastern Nairobi was the construction of the Thika Road highway between 2009 and 2012 (K'Akumu & Gateri, 2022). This not only improved connectivity for Kasarani with the rest of the city but also facilitated the relocation and establishment of important urban institutions, such as Kenyatta University, as well as the generally uneven growth in various middle- and low-income neighborhoods. Our field research in Kasarani highlights it as a typical peri-urban settlement. While Kasarani 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 highway to the Mwiki Location, encompassing a variety of neighborhoods. As of 2019, the Kasarani Location was home to approximately 138,000 inhabitants (Kenya National Bureau of Statistics, 2019), with an estimated half residing in the neighborhoods under review. The specific areas of our research include Clay City, City Chicken Estate, Sunton, and Gituamba, all depicted in Figure 1.

While some areas, like Clay City, have historical roots from the colonial period as small villages near the Nairobi-Nanyuki railway line (Kinuthia et al., 2021), significant urbanization did not occur until the 1990s. Therefore, the oldest information about the other three neighborhoods under review—City Chicken Estate, Sunton, and Gituamba—can be traced back to the late 1980s. The chosen neighborhoods exhibit significant diversity in terms of their socio-economic composition, building structures, and access to public and private infrastructure, including schools, water supply, and paved roads. Clay City, City Chicken Estate, and Sunton represent typical middle-class areas, each with distinct characteristics with regard to their construction, demographics, and historical development.

Since the early 2000s, Clay City, along Thika Road, has seen significant investment in mid-rise (five to seven-story) residential complexes, largely occupied by middle-class residents. Its strategic location ensures easy access to the central business district and western employment centers. Originally developed around a brick factory in the 1960s, the area did not experience significant population growth until the late 1980s. The area is now home to several supermarkets and a mix of formal and informal food retailers.

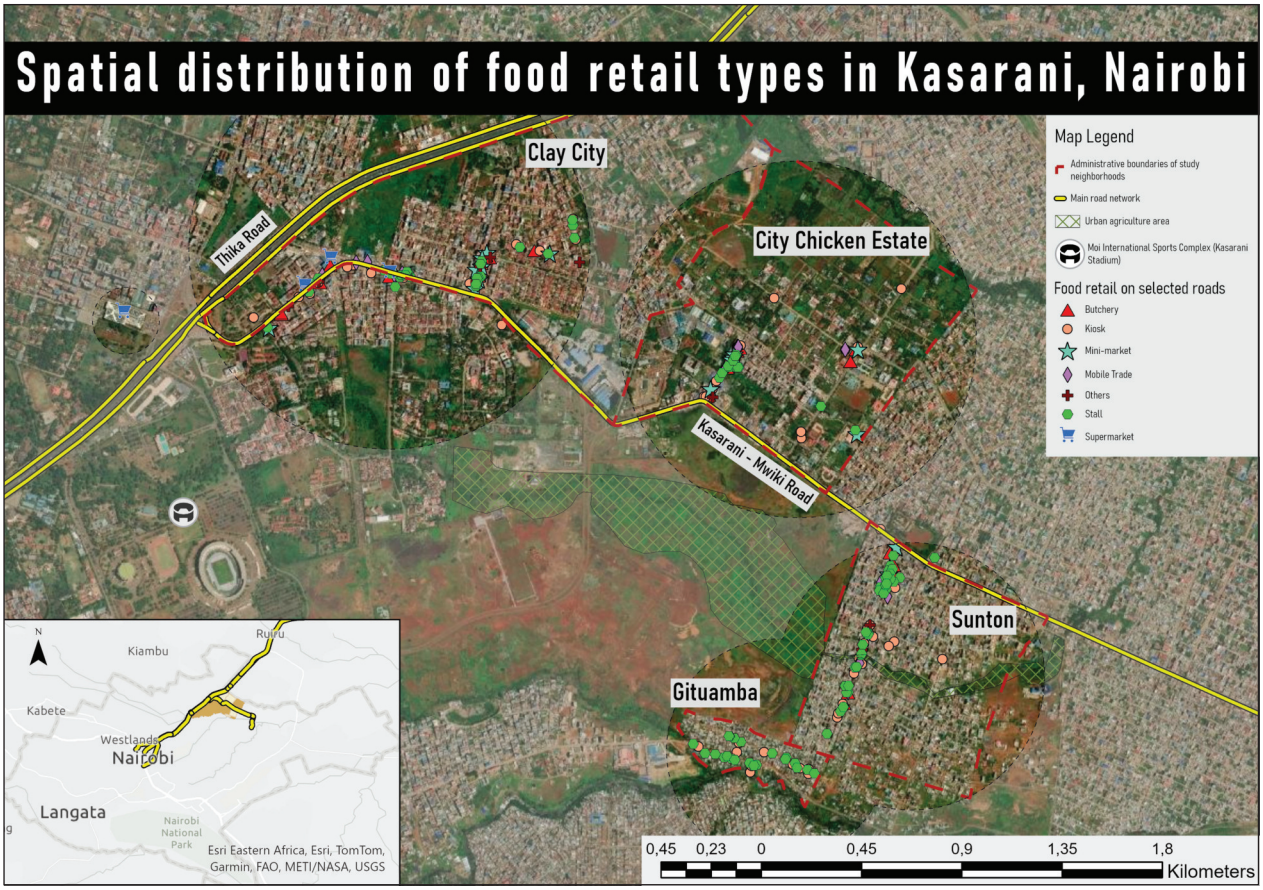

Figure 1. Overview of the distribution of food retailers based on type of business.

City Chicken Estate, developed from the 1980s, was established by a poultry farming cooperative that sold large plots of land to high-level employees and middle-class buyers, including civil servants (I24; Mwau et al., 2020, p. 40). The area consists mostly of upscale single-family homes with large gardens, although recent developments along Kasarani-Mwiki Road show a shift toward multi-story apartments. The neighborhood maintains a low population density due to the prevalence of large residential plots and the relative absence of commercial street activity.

Established in the late 1980s, Sunton serves middle- and lower-middle-income groups. It features dense apartment blocks alongside older single-story houses and has a vibrant informal economy, especially along Kasarani-Mwiki Road, with stalls and small vendors fueling a dynamic local food market that reflects the ongoing infrastructural transformation.

Gituamba, an informal settlement dating back to the early 1990s, is home to over 10,000 people in dense, self-built stone houses on the hillside. It operates on a micro scale, mainly through small kiosks, street vendors (*mama mbogas*), and mobile traders: a *kadogo* economy of small transactions. Despite the robust housing, the area faces food insecurity, low income, and socio-economic marginalization.

Kasarani Location emerges as a highly fragmented urban space, encompassing peri-urban zones and exhibiting staunch variations in social, economic, and infrastructural characteristics at a micro-spatial level.

5. Taking the Local Context Seriously: Kasarani's Diverse Food Landscape

As outlined above, Kasarani is made up of diverse and fragmented neighborhoods characterized by different social relations, economic structures, and access to infrastructure, including the availability of roads, water, sewerage, electricity, and food vending, which can vary significantly even within the same street (see Figure 1). These urban structures significantly shape the local food system, affecting mobility, food access, storage possibilities, and preparation techniques. Furthermore, food retailing serves both as an important source of income for local vendors and as a means of food redistribution, affecting social relations and possible futures. The following section briefly explores these dynamics.

5.1. Supermarkets and Street Vendors: Parallel Urban Food Systems

On the retail side, several supermarket chains have strategically positioned themselves along the key north-south Thika Road highway. Close to the highway's access point, the Thika Road mall hosts a high-end Carrefour supermarket. Supermarkets like Naivas, along with smaller chains such as PowerStar and Kassmatt, are located about one kilometer further into Kasarani Sub County. These supermarkets offer a wide range of products, from staples such as unga, rice, beans, and cooking oil to indulgent items such as cakes, meat, and fresh produce, often with special offers. A key feature of these retail systems is their proximity to central urban nodes, providing convenient access for wealthier, more mobile customers. They also utilize modern infrastructure, including refrigerators, uniform shelving, and advertising, selling goods of national and international value.

In more peripheral urban areas, such as Kasarani Location, which is farther from central infrastructure and mainly inhabited by middle- and lower-income groups, these supermarkets do not adequately serve all customers. While our data shows that nearly all interviewees shop at supermarkets, the frequency of visits and the types of goods purchased differ significantly. For example, middle-class interviewees typically visit supermarkets once a week to buy processed everyday items like unga, rice, and beans, along with other products. In contrast, the supermarket plays a subordinate role for lower-income interviewees, who face challenges in accessing supermarkets due to distance and financial constraints. They also struggle to purchase large packages of goods, which they cannot afford or store properly.

Regardless of income, all respondents confirmed that they rely on street vendors, particularly for fresh produce (*mama mbogas*). Informal vendors in kiosks and small stalls are crucial to neighborhood resilience, especially in times of crisis. Even in middle-class areas like Sunton, residents maintain personal relationships with one to three preferred vendors. This fosters loyalty and mutual expectations: Customers expect fair prices, and vendors may extend credit through tab systems, ensuring continued food access during economic hardships. It is not surprising that two vendors from the informal settlement of Gituamba explained:

> You cannot say that you will not give products on credit. I might have 10 shillings and I want greens, but I don't have enough for tomatoes and onions. I will tell you to give me, and tomorrow or the day after, I will give you, you, see? (Group Discussion Participant 1, I12)

> But you cannot let someone sleep hungry when you have food there. (Group Discussion Participant 2, I12)

These informal practices go even further. For instance, one vendor provides free water to the neighborhood during supply shortages as she is the only one with access to a privately installed pumped water storage system for her shop (I19). While such practices are not uniform and depend on individual circumstances, it is clear that reducing informal stalls would make it especially difficult for marginalized residents to access affordable food. This is particularly critical in times of economic instability when affordable food is essential for maintaining a nutritious diet. Rising and fluctuating food prices often force households to reduce consumption or skip meals entirely. As one respondent explained, he stopped buying tomatoes and onions because the prices had doubled, saying: "As long as I have salt, vegetables, and cooking oil, let's call it supper" (I19).

In general, these examples show that in Nairobi's urban food system, formal, grid-connected infrastructure overlaps with informal infrastructure. However, it is the latter that plays a crucial role for the urban poor in terms of food security. Even better-off residents report relying on their *mama mboga*. Informal infrastructure, therefore, not only benefits the urban poor by providing access to food but also serves as an essential aspect of the local food environment in general. Consequently, formalization, which typically involves strict rules, regulations, and regular inspections, is not a viable approach unless it includes *mama mbogas* and allows them to operate within the spaces where their social networks are situated.

5.2. Social Relations to Support Individual Benefits

The significance of the social dimension in sustainable urban food systems is clear. A key element of this is the considerable impact that *mama mbogas* and other informal food market actors have on the local communities within their areas of operation. Their role goes beyond food distribution; they are vital social and economic actors, fostering local networks, enhancing food security, and contributing to the resilience of urban communities. As one interviewee explained:

> So you just struggle yourself because sometimes life is very hard. But you still survive. When you have that *mama mboga* of yours, you go and tell her today, each and every person has that worst day. So that *mama mboga* you used to buy for her, she will give you. Because that is why, you see, you won't go Githurai [a big wet market] all the time. I must go to that *mama mboga*, I must go to that kiosk. The moment I don't have anything they give me, so that when I have money I give them. (I15)

Informal practices by *mama mbogas* and other small traders are crucial for the daily survival of the urban poor. Even though some items may cost slightly more than at larger markets like Githurai, there are compelling reasons for customers to visit their *mama mboga* regularly. In times of crisis, these traders offer immediate support, such as access to food and water, sometimes without direct payment. This creates a codependency, where vendors rely on their regular customers to return. During tough times, such as the 2023 economic crisis in Kenya, small vendors reduced package sizes and, consequently, profits due to decreased demand.

Furthermore, *mama mbogas* serve as role models in the community, demonstrating that running a small business can lead to economic success, which enhances their social status and offers the possibility of a more diverse diet (by consuming their own products). We found many examples of mutual aid, such as merry-go-round savings groups in Kasarani, where members can borrow money (with interest) and share savings at the end of the year (I19, I29). Several traders also viewed their stalls as platforms for gaining business knowledge, as well as life lessons:

> Yeah, I can say I get profits. Since I started there, I used to have life stress. But now I don't have because I get many people, we talk. They can share their problems there. I also get business ideas there. (I9)

Regular interactions strengthen solidarity, even amid competition, which is crucial for improving social sustainability. Like other alternative food systems, the informal trade of *mama mbogas* at the local level plays an important role and needs sustained support, particularly during periods of transition. Our interviewees (I23, I34), especially those with fewer financial resources, noted that informal structures helped them survive, especially in crises when a steady income was uncertain (e.g., buying on credit or in smaller packages). The evidence shows that routine interactions based on trust and empathy can foster personal growth and benefit society, including the development of sustainable behaviors and initiatives through a bottom-up approach.

5.3. Vulnerabilities of Informal Traders

The urban reality of Nairobi cannot be understood without informality, in the economy but also in terms of access to infrastructure and the housing market as described above. In general, policymakers in Nairobi have adopted an antagonistic approach to the informal sector, in line with a Western understanding of development (Berger & van Helvoirt, 2018; Kinyanjui, 2019), sometimes even involving the eviction of street vendors (Smit, 2016).

In line with ambitions to formalize street vending with by-laws and regulations, and to upgrade facilities, new marketplaces were constructed as part of a wider plan by Nairobi Metropolitan Services and the Nairobi City County government to improve food safety, ensure hygiene standards, and implement a functioning taxation system (Berger & van Helvoirt, 2018). However, alongside the positive effects (e.g., access to proper infrastructures), traders also experienced alienation and the disruption of pre-established links with their local neighborhoods. As a result, the implementation of government policies aimed at relocating and regulating trade has led to conflicts between the government and local informal traders, and even roads are being built without warning, destroying workplaces (I12) and sometimes the homes of our interviewees (I22). These conflicts have the potential to impact the food security of individuals who rely on informal trade as a source of subsistence (Crush & Young, 2019) and ignore the potential for sustainable behavior that is already in the hands of informal traders.

5.4. Strengthening Urban Food Access Through Infrastructure and Social Policy

As shown in Figure 1, areas near the Thika Road highway and other major roads feature a mix of formal and informal vendors. Some benefit from amenities like parking spaces next to their stalls (I9). However, as we move further away, especially toward the outskirts of the informal settlement in Gituamba, the diversity and number of stalls decrease. Infrastructure issues, such as regular power outages (I21) and poor road conditions, are prevalent throughout these areas. Roads, in particular, are either congested with traffic or difficult to access (I13). Our interviewees expressed a desire for better roads to improve, for example, food delivery to their stalls (I12). In addition, the local workforce often lacks proper training, leading to a high proportion of unskilled workers (I38).

A significant portion of Nairobi's population, especially in low-income areas, faces food insecurity. Initial steps toward social protection, such as identifying vulnerable groups, providing food aid, establishing early warning systems for price shocks, and creating subsidized food markets, are essential for meaningful change (Nairobi City County, 2022). A promising solution could be the introduction of a free, universal school meal program, particularly in disadvantaged neighborhoods. While initiatives like the 4K clubs have had a limited impact, they offer valuable platforms for promoting urban agriculture and nutrition education. However, none of our respondents could identify examples of free meals provided through schools, NGOs, churches, or other public institutions. In peri-urban areas, off-grid infrastructures are crucial in supporting daily activities and have the potential to drive sustainable social transformation within the community.

5.5. Undeveloped Land for Urban Agriculture

While fertile land is a scarce resource, it is utilized wherever possible to support subsistence or, in optimal circumstances, to generate income. Informal settlements, often located on the city's periphery, have the potential for urban agriculture. In the 1990s, the first residents of Gituamba benefited from access to large plots of land near rivers, enabling them to engage in subsistence farming (I25). This not only supported household livelihoods but also contributed to the settlement's growth. However, farming was never the sole means of livelihood as residents also sought additional income through small-scale trade and casual labor (I22, I25).

The Moi International Sports Complex, Kasarani, built for the Pan-African (Olympic) Games in 1987, exemplifies early urbanization through mega-events (I39; K'Akumu & Gateri, 2022). However, like many such projects, it was not completed, leaving behind public wastelands and open spaces. A significant portion of this land, located near a minor river, is used for urban agriculture. The plots are informally divided and can be cleared at any time (I25). One major challenge is the use of contaminated water for irrigation, leading to negative perceptions of the crops grown there. These vegetables, often considered watery and even smelly, have become stigmatized, and the farmers are also marginalized. One interviewee described how the greens grown in this area were of poor quality, with reported stomach issues attributed to the contaminated water being used (I13). Urban agriculture has significant potential to transform urban food systems beyond food provision.

6. Discussion: Connecting Urban Food Systems and Local Realities

Urban food systems are deeply embedded in urban spaces and their corresponding infrastructure. Building on this, we advocate for an integrated perspective that connects transformation projects more explicitly with urban development processes. In this section, we discuss our findings through the lens of our analytical framework, focusing on the social, economic, and infrastructural dimensions at the local level. This integrated approach is crucial for addressing issues of sustainability and resilience, and we suggest this perspective to policymakers and scientists as a way forward in shaping more effective and context-sensitive urban food systems.

6.1. The Infrastructure Dimension: On/Off-Grid Access and Equity

Our own findings confirm that access to both formal and informal food sources varies significantly across different parts of the city, shaped by economic disparities and differences in access to on- and off-grid

infrastructure. A study by Downs et al. (2022) in Nairobi highlights how the food environment plays a significant role in shaping decisions about what to eat and where to buy food. Beyond personal preferences, factors such as income, convenience, and time constraints are critical. Local governments could play a pivotal role by regulating the placement of supermarkets and their integration into urban landscapes (Smit, 2016). Currently, supermarket distribution tends to favor middle- and high-income areas (Sonntag & Kulke, 2021). In addition, potential employers should be persuaded to settle in the peri-urban areas of the city by means of attractive offers, as was the case with the local slaughterhouse. This creates jobs and increases food security (I38) and is even linked to the construction of a paved road, which is already benefiting the entire Gituamba area (I29).

In informal settlements, however, residents rely on small-scale traders like *mama mbogas* and kiosks, especially when limited financial resources or the need to buy on credit restrict their options. Rather than pushing for formalization, as suggested by the NUFSS, policies could be designed to support traditional and small-scale traders (Berger & van Helvoirt, 2018) in the areas where they operate. This could include helping them access public infrastructure or legalizing self-constructed ones. Such a shift would help maintain accessibility and ensure food security for marginalized communities.

Addressing environmental challenges, such as the pollution of the Ngong, Nairobi, and Kibuthi rivers, is crucial as their current water quality renders them unsafe for both domestic and agricultural use (Nairobi City County, 2022). Restoring these waterways and improving wastewater treatment would significantly boost the potential for urban subsistence agriculture.

Moreover, integrating circular economy principles, such as using treated wastewater for fertilizer production, could further strengthen sustainable urban food systems while minimizing ecological impacts. As Wiskerke (2015) highlights, such measures not only help regulate urban temperatures, support climate change mitigation, and enhance rainwater storage but also reduce the need for long food transport routes, enable the productive reuse of waste, and foster community development and sustainable livelihoods, especially in peri-urban areas.

6.2. The Economic Dimension: Empowering Local Economies

Our findings show that while informality is often viewed as a marker of vulnerability, it can, in fact, contribute significantly to resilience and sustainability by offering opportunities for skill-building and income generation, particularly for underemployed and unemployed individuals (Magidi, 2022; Ruzek, 2015). Especially during times of crisis, when formal systems are strained or fail, informal economies play a crucial role in maintaining food access and supporting livelihoods (Ruzek, 2015). While our research does not focus on this aspect, we acknowledge that the expansion of informality can also lead to challenges, such as the proliferation of unregulated markets or the emergence of social tensions. These ambivalences underscore the need to strengthen the positive aspects of informality while mitigating its potential risks. To fully realize this potential, we suggest that informal skills and practices be formally recognized, supported, and fairly regulated—both to enhance their legitimacy and to prevent negative effects like cartel formation or the deterioration of social cohesion.

Building on these insights, we caution that the push for formalization and efficiency improvements in food logistics and trade, as envisioned in the NUFSS, could unintentionally exclude many small vendors who lack the resources to meet stricter standards, such as investment in refrigerated transport or compliance with hygiene regulations. Recognizing the critical role these small-scale traders play, not only for their own livelihoods but also for the overall resilience of urban food systems, is essential. Therefore, we recommend supporting them through access to financial resources, targeted training, and infrastructural improvements, rather than simply enforcing formalization.

Finally, aligning such support strategies with the Sustainable Development Goals—particularly SDG 1 ("No Poverty") and SDG 8 ("Decent Work and Economic Growth")—offers a path toward more inclusive and sustainable urban development. By actively strengthening small-scale and informal traders within this framework, local governments can foster broader economic participation, reduce inequality, and lay the groundwork for the resilient and sustainable transformation of urban food systems.

6.3. The Social Dimension: Mobilization of All Social Groups

Supporting small traders aligns with broader efforts to strengthen local economies and meet the needs of urban populations living in informal settlements (Fodde, 2022). Recognizing the potential of the informal sector, it can be understood as a platform for collective action against perceived injustices and economic exclusion. In line with our findings, Magidi (2022) highlights how informal practices significantly contribute to social cohesion and the development of social capital, which is particularly important for individuals in disadvantaged circumstances as they promote both economic and social well-being. Drawing on the African Ubuntu philosophy (Magidi, 2022) and the Kenyan principle of Harambee, which emphasizes mutual support and collective resilience, informal networks help foster a sense of community and shared responsibility in times of adversity.

While Nairobi's urban agriculture initiatives (Nairobi City County, 2022) demonstrate potential, they have primarily benefited wealthier neighborhoods so far. Persistent challenges such as land access and peri-urban governance continue to limit broader participation (Smit, 2016). Other examples from Nairobi reveal that urban farmers frequently face displacement, threats, deliberate destruction, extortion, and corruption (Kituku & Kitata, 2023). To promote greater inclusivity, local governments should support bottom-up, participatory approaches such as community-driven urban gardening, which can also serve as valuable educational tools for both children and adults. However, achieving this requires adapting land use rights to secure long-term access for marginalized groups.

7. Transforming Urban Food Systems: Considering Local Realities for Inclusive and Sustainable Change

Our findings demonstrate that social, economic, and physical infrastructure elements combine in fragmented, locally specific ways to create socio-material arrangements that present both opportunities and challenges for sustainable food system transformation. In Nairobi, historical and spatial analysis reveal a fragmented city, where unique, place-based food system processes and infrastructure have emerged. Yet the transformative potential embedded in peri-urban areas and informal economic structures remains neglected.

Nairobi's fragmented infrastructures, economic constraints, and complex social geographies reveal the critical role of informal markets in ensuring food supply, social cohesion, and economic resilience. Yet, current strategies—often guided by global frameworks like the Milan Urban Food Policy Pact—prioritize productivity over equity and sustainability, risking further exclusion.

Our findings highlight the importance of acknowledging the lived realities and coping strategies of low-income urban residents. A locally grounded framework revealed how self-constructed, alternative practices already support transformation in more adaptive and less conflict-prone ways. Limiting the operating space of small-scale traders and farmers undermines both livelihoods and access to affordable, nutritious food. Recognizing the informal food economy is vital for equitable access and income generation in marginalized communities. Decentralized, self-organized practices are essential for building resilient food systems, especially in unplanned peri-urban areas.

To enable inclusive and sustainable transformation, urban food policies must better address local conditions, foster coexistence between formal and informal systems, and integrate locally grounded strategies into broader development frameworks. This includes securing land rights, improving on- and off-grid infrastructure, providing targeted subsidies, and investing in youth education.

Ultimately, meaningful transformation starts with a deeper understanding of local contexts. A historical perspective on national development pathways can further inform future research by helping to explain why certain socio-material arrangements persist—and how they might be reshaped to create a more just and sustainable future.

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Conflict of Interests

The authors declare no conflict of interests.

Data Availability

If you are interested in the research data associated with this article, please contact the CRC 1265 research data repository by email repository@sfb1265.tu-berlin.de.

Supplementary Material

Supplementary material for this article is available online in the format provided by the authors (unedited).

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