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Investigating the Connectivity Between Urban Foodscape and Migrant Women's Food Security: A Case of Greenland Slum, Khulna

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Summary

Cities in the Global South, including Bangladesh, are experiencing the proliferation of informal settlements as a result of rapid urbanization, population growth, and climate-induced migration. These informal settlements are becoming more prevalent, particularly in the coastal cities of Bangladesh, and are exerting greater pressure on the urban landscape, resulting in detrimental impacts on food security. Urban migrants in these settlements, especially women, are the most vulnerable and exposed to food insecurity due to the lack of livelihood opportunities. In order to cope with this food-related vulnerability, they often utilize the limited spaces of their dwelling and neighbourhood to grow food, often referred to as ‘foodscapes’. These women-led foodscapes often transform the spatial environment of housing in informal settlements, which remain understudied in the context of Bangladesh.

To unfold this urban foodscape-food security nexus, this research attempts to examine how the practices of the urban foodscape contribute to migrant women's food security by taking the Greenland slum in Khulna as a case study. This qualitative research is conducted using a qualitative data analysis process that follows a case study-based approach. In this research, face-to-face interviews, Likert scales, focus group discussions, key informant interviews, and observation methods were conducted to collect data from households. Besides, content analysis, descriptive statistical analysis, and spatial analysis were applied to analyze the data.

The research reveals that nature-oriented and built environment-oriented foodscapes are the broad two urban foodscape categories prevalent in the Greenland slum of Khulna, both at the dwelling unit and neighborhood level. The spatial nature of these foodscapes is predominantly home-based and gender-oriented, managed largely by women; therefore, a deep spatial linkage has already been established between the dwelling and foodscapes. Beside this, women are the predominant actors and wield substantial power to make decisions regarding contribution to labor, location of foodscapes, intensity of food management, and participation in food-provisioning activities. Findings also suggest that the presence of foodscapes in this settlement also ensures two pillars of household food security at a certain level: food availability and accessibility. However, the nexus between foodscapes and food security is constrained by three broad categories of factors: socio-political, economic, and physical. Furthermore, the research concludes by offering some recommendations based on those factors. These recommendations will aid policymakers and built-environment professionals in developing some comprehensive policy guidelines and resettlement or upgrading schemes for the Greenland slum by incorporating women-led foodscape practices into the spatial planning of housing.

Keywords

Urban foodscapes, Food security, Migrant women, Influencing factors of foodscapes and food security, Greenland Slum, Khulna

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Abbreviations

BRA	Bangladesh Railway Authority
CDC	Community Development Committee
CSS	Christian Service Society
FGD	Focus Group Discussion
GED	General Economic Division
GOs	Government Organizations
IDI	In-depth interview
IHS	Institute for Housing and Urban Development Studies
KCC	Khulna City Corporation
KII	Key Informant Interview
NFP	National Food Policy
NGOs	Non-Government Organizations
OKP	Orange knowledge Programme
PoA	Plan of Action
SDGs	Sustainable Development Goals
TMSS	<i>Thengamara Mohila Sabuj Sangha</i>
UHES	Urban Housing, Equity, and Social Justice
WFP	World Food Programme

Chapter 1: Introduction

1.1 Background

Over the past few decades, food security has been at the forefront of global development initiatives. Different development frameworks, including the UN Millennium Development Goals and Sustainable Development Goals (SDGs), have been developed to address this issue. The first target of SDG 2 is to "end hunger and ensure access by all people by 2030, in particular, the poor in vulnerable situations. However, accomplishing food security for all is a distant goal, as 124 million people in 51 countries are now enduring severe food insecurity (Dake, 2021). It is further undermined by climate change and urbanisation, especially in cities of the Global South, which have adversely affected the relationship between landscape and food security for the urban poor (Speak, 2018). This effect is the driving force behind rural-to-urban migration, which is leading to the proliferation of informal settlements coupled with urban food insecurity. According to UN-Habitat's (2011) estimation, 60% of the world's population will live in urban areas by 2030, increasing pressure on urban resources and leading to adverse effects on urban food security (Swanepoel et al., 2021).

However, food security issues in urban settings are often neglected by both research and planning policies. It has resulted in policies and programs that fail to recognize urban food security as they often consider urban landscapes as modernized, homogenous, and globally recognizable sites for investment. It eventually placed urban migrants in a precarious situation regarding their access to land and food. Urban migrants living in informal settlements are therefore more vulnerable, especially women, who are, amongst other problems, often exposed to malnutrition and hunger. Most of the women have difficulty coping with the challenges they experience; therefore, they seek alternative survival strategies to secure their food without any state or institutional intervention (Masita, 2016). According to Hammelman (2018), the survival strategies of migrant women living in poverty are embedded in urban food landscapes, often called 'foodscapes.' A significant number of migrant women utilize the extremely limited spaces of informal settlements to operate foodscapes, which, to some extent, contribute to their food security (Hammelman, 2018). Evidence suggests that these foodscapes are not spatially confined within a given dwelling; rather, dwellers perform them in various spaces, starting from domestic realm and extending to the wider neighborhood of the settlement (Ghafur, 2002). However, space utilization is negotiated and contested both at the household and neighborhood levels to attain food production and income generation (Gondwe and Ayenagbo, 2013). Hence, the representations of these foodscapes are continuously shaping and transforming the spatial environment of informal settlements, establishing intertwined relations between gender, place, and food that are still underexplored.

However, much structural adjustment policy has been criticised for being gender-blind, failing to recognise the central role of women in the context of food security. Beside this, built environment professionals often fail to integrate autonomous gendered foodscape practises into the spatial planning of housing, especially for low-income settlements. Thus, it is interesting to examine and analyse how migrant women in informal settlements develop autonomous foodscape practises and how this influences the spatial environment of housing in order to achieve food security.

1.2 Problem statement

Ensuring food security has been one of the major goals of Bangladesh since its independence in 1971. The country has the high population density (834 people per square kilometer), which demonstrates that land scarcity is a crucial impediment for food security (Faisal & Parveen,

2004). The government of Bangladesh has therefore prioritized the provision of food security to its population, and in response, it has set the goal of achieving SDG 2 by 2030, which addresses hunger, malnutrition, and access to nutritious, substantial food (General Economic Division, Bangladesh Planning Commission, 2018). Despite government efforts to tackle food insecurity, almost 25% of population experienced food insecurity in 2019, and rates are considerably higher among migrants from urban slums (Bhattacharjee & Sassi, 2021). It was observed comparing the World Food Programme (WFP) survey results of 2006 and 2013 that more than 50% of slum households were food insecure (WFP, 2015). In Bangladesh, however, the policies and programs targeted at improving food security are mostly concentrated in rural regions, which has marginalised urban food security (Ministry of Food and Disaster Management 2006, 2008).

On top of that, due to Bangladesh's geographical vulnerability, this priority is once again undermined by the climate-induced migration from climate-vulnerable areas to coastal cities (Akter, 2009). The increased frequency of natural disasters over the past few years is not only displacing people physically but also exposing them to poverty by threatening their livelihoods on a temporary and permanent basis. An increasing number of migrants are heading to the city's informal settlements, creating an urban crisis coupled with food insecurity (Akter, 2009). Urban migrant women are therefore more vulnerable and exposed to hunger due to the lack of livelihood opportunities and income-generating spaces within these settlements. To cope with this food-related vulnerability, they often adopt autonomous foodscape practices within their house and neighborhood, which remain understudied in the context of housing in Bangladesh.

Khulna, being the 3rd largest metropolitan city of Bangladesh, has the largest concentration of informal settlements due to massive climate-induced migration from the coastal areas, and the Greenland slum is one of them, positioned on Bangladesh Railway Authority's land, with a high concentration of unemployed migrant women. To adapt to the harsh environment of food insecurity in this slum, most of the migrant women adopted foodscapes (such as small-scale vegetation, livestock farming, poultry, retail, food vending, and community market) as an autonomous strategy without any government intervention. Often, women-led foodscapes transform the spatial environment of housing in this slum, which has not been studied. Despite the contribution of foodscapes to addressing food security, they often encounter hostile policy and regulatory environments. These include exclusionary practices like relocation, large-scale evictions, and destruction of informal food-related activities. Women are disadvantaged by these hostile practices, which undermine their ability to produce food and have serious implications for food security that are not widely acknowledged. Besides, a major gap addressed by this research is that urban housing policy and design interventions do not include these gender and food-related spaces in upgrading and resettlement schemes to achieve food security. Therefore, it is important to examine and analyse how migrant women in urban informal settlements adopt autonomous foodscape practices and how these practices influence the spatial environment of housing to address food security.

1.3 Research Gap

Food security issues in urban settings are traditionally absent in both research and planning policy, being often regarded as a rural matter. Especially urban informal settlements are most exposed to this food insecurity due to a lack of livelihood spaces (Sabry, 2009), but numerous studies have highlighted the rural food security, whereas urban food security and foodscapes didn't receive much focus in the academic realm (Quisumbing et al., 1996; Kiptot et al., 2014; McCarney, 1991). In fact, the role of women in this spatial transformation of housing associated with food security remains poorly defined and unexplored. Furthermore, policy and design interventions in urban housing often fail to incorporate these gendered and food-related

spatial knowledges within their approaches (such as upgrading and resettlement schemes) to accomplish food security, which is one of the major gaps addressed by this research.

1.4 Research objectives

The main objective of this research is to – examine the practices of the urban foodscape that contribute to migrant women's food security in the Greenland slum of Khulna.

1.5 Research question

The main research question is – How does the urban foodscape practice contribute to migrant women's food security in the Greenland slum of Khulna?

And the sub-questions of this research are as follows:

1. How does the urban foodscape manifest spatially according to typology both at the household and neighbourhood level in the Greenland slum of Khulna?
2. What role do migrant women play in contributing to the urban foodscape?
3. To what extent do these foodscapes ensure migrant women's household food security?
4. What are the factors that influence the relationship between urban foodscape and migrant women's food security?

1.6 Academic and societal relevance

- **Academic Relevance**

The research will provide knowledge related to gender and place-based food practices in urban informal settlements that needs to be combined to tackle the complexity of the food-people-territory nexus. Additionally, it will help to minimize the gap between the bottom-up gender sensitive spatial practices and where housing policy (top down) intervenes in order to address household food security.

- **Societal Relevance**

Addressing the context-specific food-related spatial practices of migrant women in informal settlements and examining the provision of such spaces that contribute to their food security, this study provides evidence that can support government officials and built-environment professionals (architects, urban designers, and urban planners) in designing both policy and schemes of housing upgradation, rehabilitation, and resettlement projects. In addition, Greenland slum is currently under threat of resettlement, so deeper insights into foodscapes knowledge may be integrated into the plan of resettlement for sustainable livelihood development of housing.

1.7 Scope and limitations

The scope of this thesis is to study the urban foodscape practices of migrant women in relation to household food security in informal settlements. In terms of food security, this study mainly focused on food availability and accessibility. Food utilization, however, largely addresses nutritional concerns, which is beyond the scope of the study and a limitation of it. Besides, food stability is concerned with sudden shocks and is related to food availability, accessibility,

and utilization. Thus, another limitation is that food stability has been incorporated as a sub-indicator of food availability rather than separately examined to uphold the relevance of the research. Besides, Bangladesh has a variety of settlement types, which differ in terms of foodscapes and tenure forms. Only the six dominant foodscapes selected to represent the extent of food security for this study cannot provide a comprehensive scenario for Bangladesh as a whole.

Chapter 2: Literature review and hypotheses

2.1 Introduction

This chapter covers the key concepts and academic debates pertinent to foodscapes and migrant women's food security in urban informal settlements. Firstly, the food security debates emphasise the importance of examining these issues through an urban lens in developing context. The second section introduces the concept of urban foodscapes in informal settlements. Next, it focuses on how urban foodscapes contribute to household food security in this setting. Finally, it highlights the influential factors that affect both urban foodscapes and food security. The chapter concludes by formulating a conceptual framework for the research by incorporating those concepts to visualize how they are connected to each other.

2.2 Food security

2.2.1 Concept of Food security

*Food security is "a situation that exists when all people, at all times, have **physical, social and economic access to sufficient, safe and nutritious food** that meets their dietary needs and food preferences for an active and healthy life." (FAO, IFAD, UNICEF, WFP & WHO, 2019)*

The aforementioned statement is the most widely acknowledged definition of food security. Interestingly, households are conceived as the optimal level of analysis for assessing food security. Laier (1996) highlights a similar point by stating that achieving household food security involves acquiring sufficient food for all household members at all times and implies freedom from future vulnerability to food related shocks. McCarney (1991) also demonstrated that, food security can only be achieved if individuals can acquire this food by buying it or producing it at the household level. Generally, food security is supported by four fundamental pillars: availability, accessibility, utilization, and stability (FAO et al., 2019) (see fig. 1).

The first pillar refers to the "availability of sufficient food of appropriate quality, supplied through domestic production or imports" (FAO, 2006, p. 1). This pillar has traditionally received a lot of attention due to the fact that "food insecurity must be centrally addressed by producing more food" (Lang & Barling, 2012, p. 313). Besides, accessibility refers not only to access to adequate income for acquiring sufficient food, but also to spatial factors such as the location of food outlets and transportation costs when there is insufficient income to buy food (Battersby & Haysom, 2019). According to Skinner & Haysom (2016), having food outlets at convenient locations meets the demands of the urban poor, whose transportation costs are frequently high, and foods are often purchased in smaller quantities due to low and inconsistent income.

Furthermore, the pillar of utilization considers the ability of individuals and households to utilize "food through an adequate diet, clean water, sanitation, and health care to reach a state of nutritional well-being where all physiological needs are met" (FAO, 2006, p. 1). On contrary, the pillar of stability refers to the fact that food security should not be jeopardized due to sudden shocks (e.g., economic, or climatic crises) or cyclical events (e.g., seasonal food shortages). In an urban context, stability is affected by food price fluctuations, unemployment, illness, or death of breadwinners, and political or economic crises (Crush & Battersby, 2016). Moreover, the focus of the research is food availability and accessibility, as utilization is concerned with nutritional issues (Battersby & Haysom, 2019), which extend beyond the scope of the research

(see fig. 1). Besides, stability encompasses all the pillars of food security, so it is considered one of the indicators of food availability.

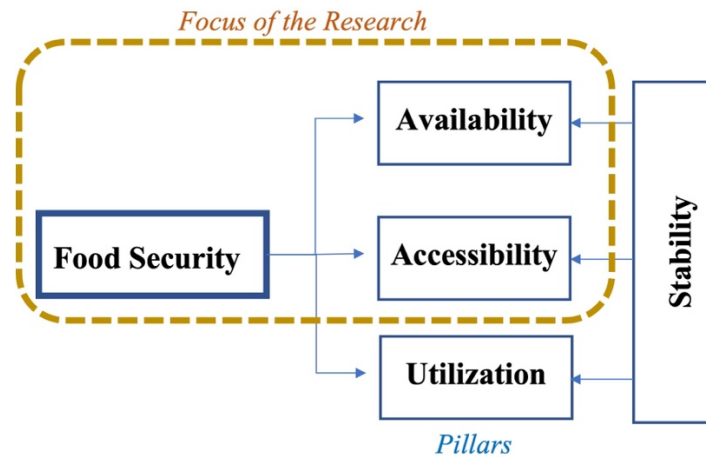


Figure 1: Four pillars of food security (source: FAO, 2019)

2.2.2 Food security in the urban context of developing countries

In the first decade of the twenty-first century, the global population distribution has witnessed a massive transformation due to rapid rural-urban migration. Globally, urbanization is expected to exceed 60 percent by 2030, with developing countries accounting for the majority of urbanization (UN Habitat 2003). Due to this rapid urbanization, urban resources will be under increased pressure, especially in low- and middle-income cities, thereby putting a strain on urban food security (Swanepoel et al., 2021). The urban poor in informal settlements are particularly at risk of food insecurity due to a combination of a myriad of factors, including limited access to budget outlets, land access, and physical accessibility (Dake, 2021). In this urbanized context, the ability to earn a cash income and food prices are paradoxically the two most significant factors influencing household food security since urban households are increasingly dependent on market purchases (Kiptot et al., 2014). Taylor and Goodfellow (2009) draw attention to a similar point by stating that more than half of the nation's food poor live in slum settlements, in which the poorest urban dwellers may spend up to 80% of their income on food. Apart from these factors, the cost of food is also affected by some influential factors, such as the efficiency of marketing and distribution systems, household purchasing patterns, the ability to produce their own food, and access to public transfers (food subsidies or aid) or private transfers (exchange with relatives) (Kiptot et al., 2014).

Therefore, the preceding discussion indicates that the factors contributing to household food security in urban areas are multi-dimensional, requiring holistic interventions to combat this looming issue. Considering the challenges faced by the urban poor, alternative methods of putting food on the table are explored in the following section from the perspective of urban foodscapes.

2.2.3 Urban food security status in Bangladesh

Bangladesh is a rapidly urbanizing and densely populated developing country with nearly 161 million people (UN, 2015a, b). As reported by the World Bank (2017), 32 percent of the total 155 million people lived in urban areas in 2012, and 56 percent are expected to reside in urban areas by 2050. Besides, climate-induced migration has also triggered urban population growth during the past few decades. Due to frequent exposure to natural disasters, coastal communities

are often forced to migrate into urban areas in search of livelihoods, leading to the proliferation of informal settlements (Akter, 2009). According to the most recent slum census of 2014, Bangladesh has 2,23 million slum populations, which constitute 6.33% of the urban population, living in 13,935 slum settlements (Bhattacharjee & Sassi, 2021). As a result of this dynamic population growth, the ratio of land to people is decreasing, which raises further concerns about urban food security.

Despite government's commitment to achieving food security as its top development priority, overpopulation and climate-induced migration make achieving this goal challenging. Based on the Global Food Security Index 2021, it ranks 84 out of 113 countries globally and scores the lowest among South Asian countries (Sultana et al., 2023). In addition, a recent projection for 2018-2020 indicates that 31.9% of the population experiences moderate or severe food insecurity, while 9.7% of the population is undernourished (Sultana et al., 2023). However, urban food insecurity is particularly prevalent in areas of extreme destitution, such as informal settlements which lack sufficient space for proper food production, storage, or utilization. Therefore, linkages between food security-related strategies and the spatial planning of housing are imperative to address this growing crisis in informal settlements in Bangladesh.

2.2.4 Urban planning and policies towards food security

In Bangladesh, urban population growth and climate change threaten the government's commitment to poverty alleviation and access to food security (Akter, 2009). It is however the dwellers of informal settlements living in urban areas who are most vulnerable and highly exposed to food insecurity. Although Bangladesh's National Food Policy (NFP) acknowledges that urban slums have higher rates of malnutrition, and households are considered the most vulnerable in the context of food security (Bhattacharjee & Sassi, 2021). As a means of alleviating this food-related insecurity, Bangladesh has set a goal of achieving SDG 2 by 2030 by ending hunger and malnutrition and ensuring that all people have access to substantial, safe, and nutritious food (Bangladesh Planning Commission, 2018). Despite these efforts, the number of people living in food insecurity in Bangladesh has risen to 25% in 2019, and 36% of children under five suffer from stunting, a symptom of chronic malnutrition (USAID, 2019).

Considering the severity of the situation, the NFP's Plan of Action (PoA) does not include specific initiatives tailored to the urban poor in informal settlements. Urban food security is one of the foremost neglected facets of development planning and intervention, with most policies and programs intended to improve food security concentrating on rural areas. This has resulted in policies and programs that fail to address urban food security. Therefore, urban food policy, especially for informal settlements, should be considered separate from rural policy due to their diverse physical manifestations and societal dynamism.

2.3 Urban foodscape

2.3.1 Urban foodscape definitions: Complex meanings and understandings

The term 'foodscape', which integrates food and landscape, has been employed in numerous academic studies since 1995. The definition of foodscapes varies from a more materialistic perspective to a holistic approach. Previously, multiple authors defined foodscape as an amalgam of food and physical landscape (Brembeck and Johansson, 2010; Vonthron et al., 2020). However, recent studies suggest that foodscape is the interaction between people (practices, social values, and norms), place (the context in which they exist), and food (ways of production, distribution, and consumption) (Arciniegas, 2021). That indicates that the role

of people has an impact on the juxtaposition between the spatial environment and the food typology that persists in a particular context.

Foodscares can be spatially distributed in both rural and urban areas. While focusing on urban foodscares in Dar es Salaam, Wegerif & Wiskerke (2017) prioritised two important elements: one is socio-cultural, economic, and political aspects (along with the spatio-physical factors), and the other is scales (both macro and micro levels) where these influences happened (see figure 2). Food landscapes at the microlevel are influenced by global or regional marketscares that determine food choices via international food systems and by built environments at the community level that represent food outlets (Wegerif & Wiskerke, 2017). In contrast, the microlevel is concerned with the domestic foodscape, which refers to the physical manifestation of the food, how and where food is prepared and stored. Furthermore, the authors argue that foodscares are interrelated, so a domestic foodscape is nested within a neighbourhood foodscape, which is then integrated within a regional food marketscape. For the sake of simplicity, this research concentrates solely on urban foodscares at the household and neighbourhood levels.

Based on the variety of definitions presented above, ‘urban foodscape’ is not merely a spatial distribution of food outlets, but also a people-based concept whose dynamics are often driven by several factors in the context of an urban environment. Thus, the people-food-territory nexus should also be explored in relation to other socioeconomic, political, and cultural factors to better understand the foodscape in urban settings.

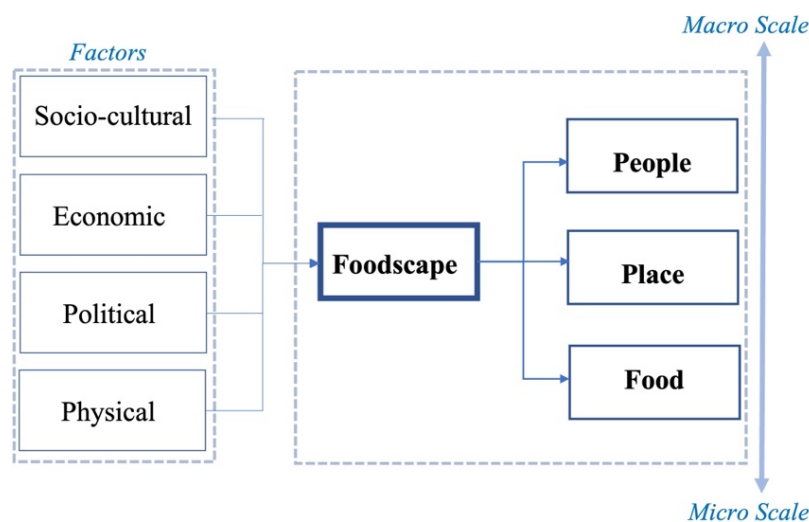


Figure 2: Components of urban foodscape (source: Author, 2023)

2.3.2 The urban foodscape in the context of informal settlements

In cities of the Global South, urbanization and economic growth have negatively impacted the relationship between urban landscape and food security (Speak, 2018). A further significant driver is the unprecedented rural-urban migration, which leads to the proliferation of urban informal settlements and puts strain on the urban food system (Swanepoel et al., 2021). Despite the perception that informal settlements are places of marginalization, urban dwellers have manipulated such spaces into income-generating activities (Gondwe and Ayenagbo, 2013). Thai et al. (2018) argue that in developing countries, a house is more than a shelter and becomes an important basis for a household’s livelihood. The lack of sustainable wage labor and local policy initiatives exposes a significant number of informal dwellers, particularly women, to food insecurity. A growing number of women are thus conducting informal food-related

activities as a survival strategy by using the extremely limited dwelling and neighborhood space, often referred to as "urban foodscapes" (Hammelman, 2018).

Bangladesh is an example of a country with informal economic activities that are instrumental in reducing poverty and ensuring food security (Ghafur, 2002). Women-led foodscapes (such as small-scale agro-farming, food vendors, retail shops, etc.) are predominant in the landscape of informal settlements, which are often regarded from an economic perspective, but few consider them from a housing perspective. It is also noteworthy that current housing development initiatives lack a gender and place-based approach and have not considered the impact of urban foodscapes on migrant women's household food security. However, such informal food-related activities violate planning regulations and zoning rules regarding economic activities within residential areas (Kellett and Tipple, 2003). Consequently, municipalities frequently refer to them as "obstructionists" because their actions exacerbate overcrowding in the limited publicly accessible areas of the settlements (Ahmed et al., 2015). Occasionally, these dwellers suffer from forced evictions by the city authorities, which not only jeopardize their livelihoods but also their ability to obtain food (Ahmed et al., 2015).

The above discussion demonstrated that informal settlement serves as a metaphor for self-help development, representing the dynamism of spaces to ensure food security where actors are active transformers with innovative survival skills. Therefore, further research is required to produce a sufficient body of knowledge regarding the contribution of foodscapes to urban food security.

2.3.3 Components of urban foodscape

- **Typology of foodscape**

Migrants in the cities of developing countries are susceptible to food insecurity combined with spatial complexity, and gender vulnerability. Thus, foodscape has been adopted by these migrants, mostly women, as a survival strategy in this harsh urban landscape. A food environment (synonymous to foodscapes) typology has been proposed by Downs et al. (2020) as comprising two overarching types of food activities: natural and built environments (see fig. 03). Natural food environments, also known as subsistence foodscapes, include cultivated foodscapes such as small-scale gardens, closed pastures, and aquaculture, from which consumers directly produce food for their own household consumption (Downs et al., 2020). On the contrary, built food environments include retail shops, street vendors, kiosks, and community markets.

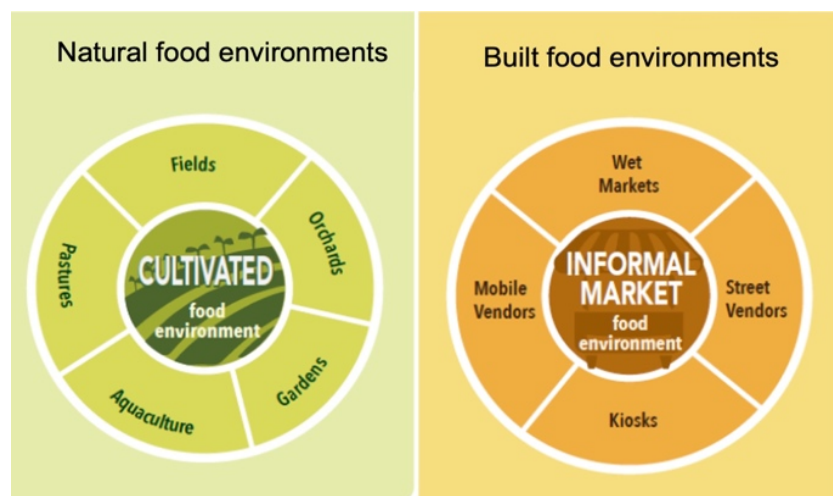


Figure 3: Food environment typology (Downs et al., 2020)

According to Gough & Kellett (2001), these activities differ considerably regarding scale, space, time, and motivation. For instance, the types of foodscapes can vary based on the time of operation, such as on a seasonal basis, an hourly basis, or may be on an occasional basis. Many are small-scale, part-time extensions of everyday domestic activities, whereas others are much larger in scale, using special equipment in defined spaces, and may employ a few people beyond household members (Gough & Kellett, 2001). Additionally, the perceptions of households regarding the operation of specific food typologies are determined by their motivations (Gondwe and Ayenagbo, 2013). This usually implies that heterogeneous urban foodscapes are closely associated with household food security to a certain extent in informal settlements. Thus, to unfold this association, the spatial morphology and the role of women are analyzed briefly in the following section.

- **Spatial morphology**

The domestic space of households in informal settlements is increasingly being utilized for income generation and the provision of food as a part of their survival strategies (Kellett and Tipple, 2003). Numerous authors have referred to these food-related activities as ‘foodscapes’, as they contribute substantially to urban food security (Arciniegas, 2021; Dake, 2021). However, these foodscapes have significant implications for the spatial planning of housing. According to Tamés (2004), the informal settlements continue to consolidate, providing a flexible environment for those who cannot access "formal" options. Therefore, the dwelling unit is the only place where fundamental cultural beliefs, for instance, the public-private sphere, are articulated and regenerated. Evidence suggests that these activities are not spatially restricted to a particular dwelling; rather, their relative positioning may extend from the immediate domestic sphere and wider neighbourhood space to the broader urban area (Ghafur, 2002) (see fig. 4). Given the magnitude of the research, this study only focuses on foodscapes located at the domestic and neighborhood levels.

Typically, these productive activities are functionally well integrated into reproductive routines and generate potential conflicts, especially where dwellings are smaller than the household size (Kellett and Tipple, 2003). They occasionally consume a substantial amount of domestic space, alleyways, or streets, as well as the neighbourhood spaces (Gondwe and Ayenagbo, 2013). The spatial environment of informal settlements is therefore continually shaped by the practices of urban foodscapes, which are still under-researched (Arciniegas, 2021).

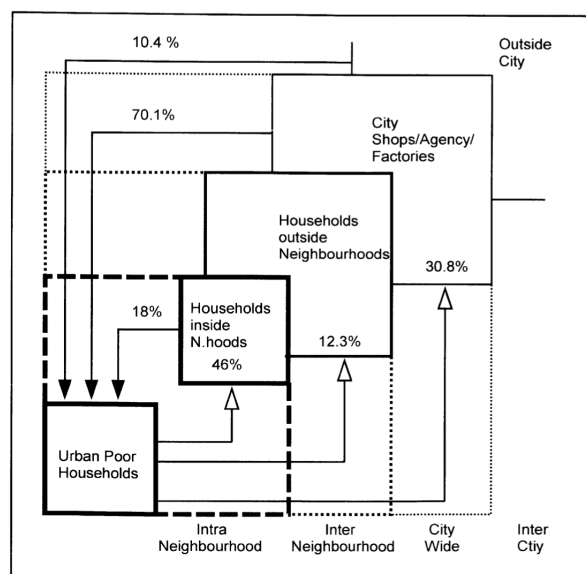


Figure 4: Positioning of home-based work at different spatial levels (Ghafur, 2002)

Therefore, the preceding discourse demonstrates that food is no longer extraneous to the spatial planning of housing. Moreover, the unbuilt spaces in a neighborhood, such as streets and shared open spaces, along with domestic spaces, have the potential to address food security, which should be considered by built environment professionals and policymakers.

- **The role of women**

A growing body of research acknowledges the essential role played by women in urban foodscapes and household food security. Ghafur (2002) points out that women are the dominant actors in almost all informal economic activities found in low-income housing in developing countries. Similarly, Laier (1996) points out that 75% of African women work in agriculture, which provides 80% of the country's food needs. Women's role in urban foodscapes, however, depends on their contribution to labour (Laier, 1996), decision-making power (regarding timing, location of activities, and control over crops or foodstuffs), and participation in food provisioning activities (McCarney, 1991). In the pursuit of food security, the household division of labour is both sex-sequential (gender-oriented tasks at different times) and sex-segregated (gender-biased production of crops or foods) (Laier, 1996). According to McCarney (1991), women have considerable decision-making power regarding timing, location of crops, and crop management intensity. In fact, the role of women throughout the entire food cycle (production, processing, exchange, and consumption) is highly gendered (Laier, 1996). Despite women's highly dominant role in foodscape and food security, most of the spatial planning in housing in a developing context is gender blind. Therefore, this research concentrates on migrant women residing in informal settlements to reveal their hidden role in food security.

2.4 Urban foodscape and food security

Foodscape is an essential component of an urban livelihood strategy; numerous research investigations have demonstrated that it has significant implications for household food security, especially in informal settlements (Downs et al., 2020; Swanepoel et al., 2021). In order to increase household food security, several studies have identified different aspects of urban foodscapes that can be categorised into four pathways: source of food (Gallaher et al., 2013; Crush et al., 2011), source of income (Quisumbing et al., 1996; Kiptot et al., 2014); food affordability (Dake, 2021; Tamés, 2004); and reciprocal exchange (Arciniegas, 2021; Hammelman, 2018) (see fig. 05). However, food availability includes the source of food, whereas food accessibility comprises money, reciprocal exchange, and food affordability.

- **Food availability**

- i. **Source of food**

The urban household has become increasingly engaged in food production (such as small-scale farming and livestock raising) to achieve a greater degree of food security (Crush et al., 2011). According to Swanepoel et al. (2021), foodscapes contribute to increased food availability for households by offering a greater diversity of food. Similarly, McCarney (1991) found that the production of a household is seldom sufficient for feeding a family across the year. It has the potential to increase food supply and reduce reliance on food purchases in the face of food shortages and high food price inflation, hence enhancing households' food security (Kiptot et al., 2014).

- **Food accessibility**

- ii. **Source of income**

Economic accessibility to available food is the second pillar of food security. Numerous studies suggest that urban foodscapes provide dwellers with additional incomes, either by selling or not purchasing domestically grown surplus crops, allowing them to spend the extra cash on staple foods (Gallaher et al., 2013). As indicated by Kiptot et al. (2014), the proportion of total household food expenditures is influenced positively by foodscape income. As most

foodscapes are owned and operated by women, they play an important role in generating household income. Quisumbing et al. (1996) asserted that, in comparison to men, women's earnings possess a stronger correlation with increased household food security.

iii. Reciprocal exchange

Food accessibility depends not only on household income but also on the patterns of reciprocal exchange that exist within a neighborhood of low-income settlements. To influence this reciprocal exchange to obtain food, social networks are critical (Hammelman, 2018). According to Arciniegas (2021), intra-neighborhood food allocation is a mechanism by which exchanges of goods and services ensure food security. These exchanges take place within a social network of individuals who play mutually beneficial roles as neighbors and relatives. Another advantage of this pattern of exchange is that it assists impoverished urban households during times of crisis.

iv. Food affordability

The affordability of food is frequently regarded as a potentially significant indicator of food security. According to Dake (2021), the urban poor have greater physical and financial access to food outlets (foodscapes) in informal settlements. These foodscapes are not only essential for generating income but also for providing supplies within walking distance and reducing transportation costs (Tamés, 2004). Another indicator of food affordability is the purchasing pattern of poor households. Yet emerging studies argue that most food outlets always sell the quantity that the urban poor can afford (Gondwe and Ayenagbo, 2013; Wegerif & Wiskerke, 2017). Additionally, the food prices are lower because of the lack of overhead costs, enabling sufficient quantities of food to be purchased.

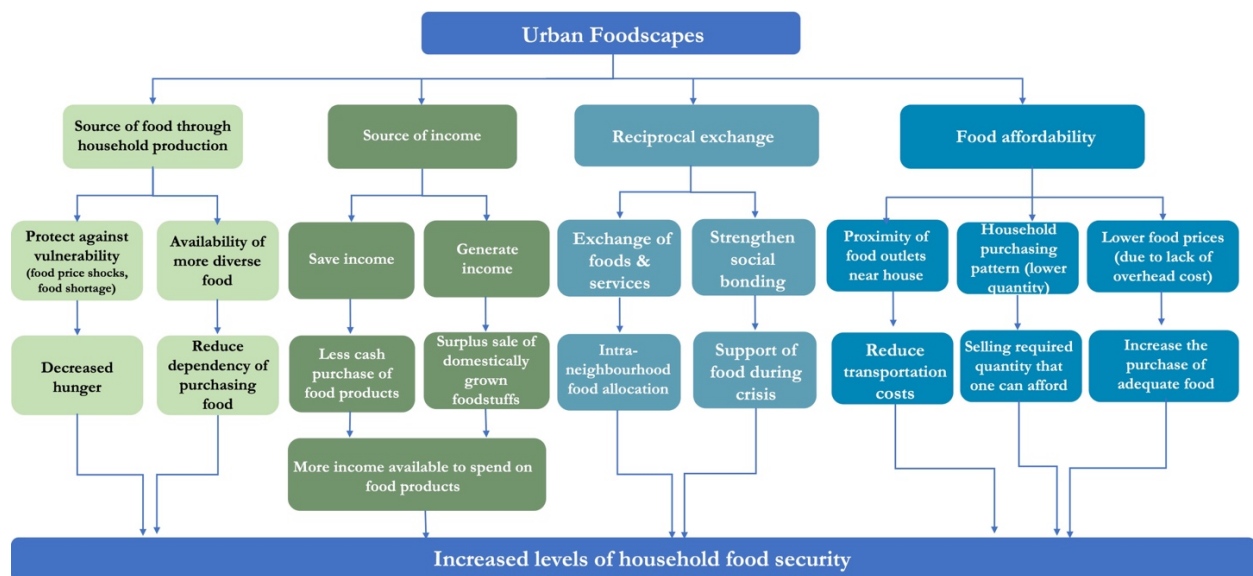


Figure 5: Urban foodscapes four pathways to increase household food security (Source: Author, 2023)

2.5 Factors influencing urban foodscapes and household food security

Women's role in developing countries is fundamental to maintaining all pillars of food security, particularly food availability and accessibility. Wegerif and Wiskerke (2017) contend that women's decisions to participate in urban foodscapes are influenced by socio-political, economic, and physical factors (see fig: 06). A socio-political factor, however, is comprised of access to land, spatial negotiation, social norms, and access to support programmes. Economic

factors include access to credit and ease of access to the market, whereas physical factors include the availability of space and the provision of services and infrastructure.

2.5.1 Socio-political factors

- **Access to land**

Access to food as a form of access to land is widely acknowledged as crucial to household food security. Laier (1996) argues that the entitlements of an individual reflect gendered inequalities that are determined by existing cultural and social norms. For instance, since land is traditionally handed down patrilineally in Africa, the title is limited to a possessory right (McCarney, 1991). By providing formal titles only to men, some resettlement projects have eroded women's land rights, reducing the likelihood of investing in usufruct land for food production (Quisumbing et al., 1996). Therefore, the complexity of land titles and the negotiation and renegotiation of them determine the level of food security among urban households.

- **Spatial negotiation**

Several strategies are employed by urban dwellers in informal settlements in order to negotiate space for both earning and food production. Gondwe and Ayenagbo (2013) argue that informal settlements provide a space for grassroots entrepreneurship, enabling them to demonstrate inventiveness and creativity while struggling to survive in urban landscapes. Kellett and Tipple (2003) raise a similar point that space can also be viewed as a representation of power relations, and these conflicts can manifest themselves when space is small, both on the domestic and neighbourhood scales. In addition, the way urban households overlap their domestic and foodscape activities demonstrates that space is not static but can be produced, reproduced, consumed, and manipulated in a variety of ways (Gondwe and Ayenagbo, 2013).

- **Social norms**

There is growing evidence that socio-cultural norms constrain the participation of women in urban foodscapes (Islam et al., 2022; Kiptot et al., 2014). A study conducted on slums in Bangladesh by Ghafur (2002) revealed that women are spatially confined within courtyards due to deeply rooted social customs and religious doctrines such as purdah. Islam et al. (2022) made a similar argument, stating that religious-cultural values and a degree of privacy were influential in the space selection used by women to generate income. For instance, women are not permitted to vend on the road or in a van since it is not considered culturally acceptable (Kiptot et al., 2014). In this regard, urban women are subject to sociocultural norms that are detrimental to their household food security.

- **Access to support programmes**

Access to support programmes is also crucial for urban foodscapes and household food security. The development of support programmes is expected to increase the capacity of urban poor women to produce both food and income (Quisumbing et al., 1996). A study conducted in Nairobi by Gallaher et al. (2013) indicates that the NGO Solidarites' provision of seeds and sacks to the urban poor facilitates close relationships and fosters participation in urban agriculture. Nevertheless, the selection process for this programme is frequently prejudiced, and it does not always benefit the most disadvantaged people (Islam et al., 2022).

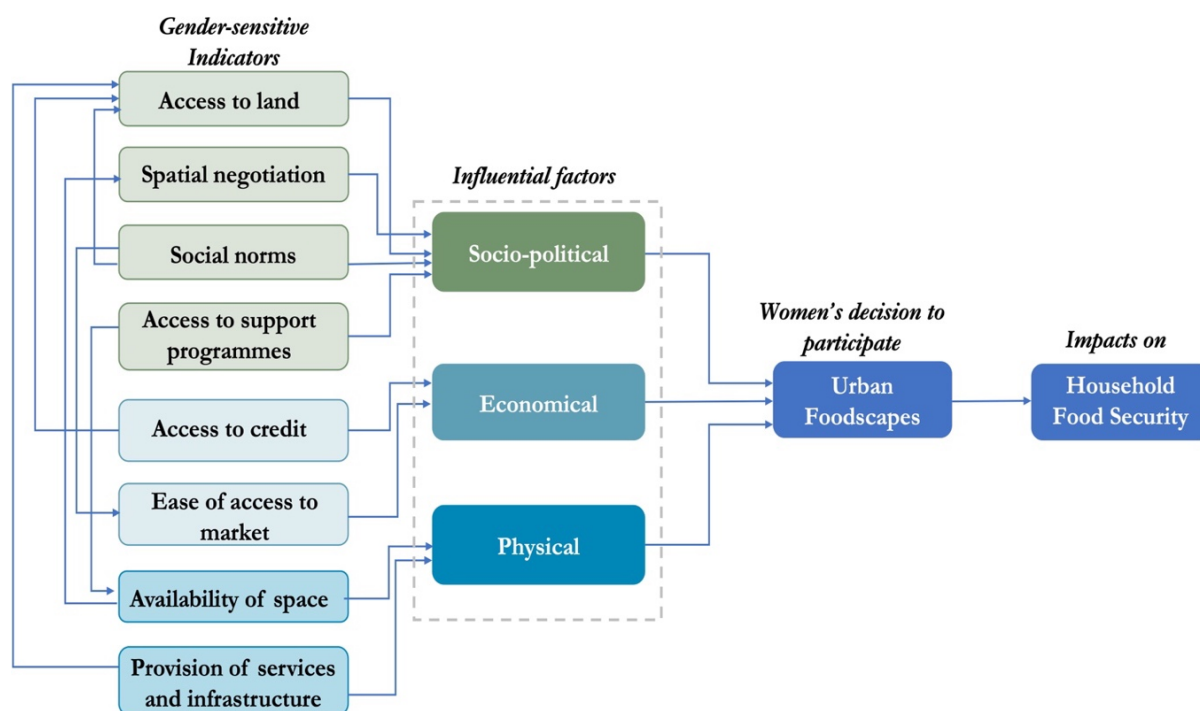


Figure 6: Factors influencing women's participation in urban foodscape and food security. (Source: Author, 2023)

2.5.2 Economic factors

- **Access to credit**

Inadequacies in the land rights of women result in their inability to use their land as collateral for credit (Quisumbing et al., 1996). In developing contexts, land constitutes the main collateral for bank credit (McCarney, 1991). A woman without a permanent address is not qualified for bank loans or NGOs' aid sufficient to generate an income (Islam et al., 2022). Thus, people living in informal settlements in this situation often resort to unofficial sources of financing, which have astronomical interest rates (Chiodelli, 2016). Additionally, this lack of access to credit resulting from the insecurity of land may also affect the choices made regarding food production (McCarney, 1991).

- **Ease of access to market**

Women's access to the market for food is strongly associated with the existing social norms of the prevailing context. According to Ghafur (2002), women engaged in retail shops typically rely on male family members in order to buy products from the market for trading purposes. He argues that this dependency can be considered a contradiction in which access to the market is determined by the power of the men's monetary gains.

2.5.3 Physical factors

- **Availability of space**

Informal settlements are considered as spaces of poverty where rural migrants to urban areas are marginalized by structural adjustment and deindustrialization (Davis, 2006, as cited in Gondwe and Ayenagbo, 2013). Urban food security is impacted significantly by these non-income determinants of poverty, such as space (Sabry, 2009). For instance, the practice of urban agriculture provides food access for the poor but is barely prevalent in highly crowded

slums that lack sufficient land (Gallaher et al., 2013). Another study carried out in Bangladesh by Islam et al. (2022) discovered that despite being trained by different government and non-government organisations, women encounter challenges in implementing their skills with scarce household space.

- **Provision of services and infrastructure**

The provision of services and infrastructure is crucial to the functioning of foodscapes in informal settlements and is intricately linked to land entitlements. According to McCarney (1991), food production is strongly correlated with water technology and availability. The availability of water facilitates the expansion of cultivable plots and the raising of livestock. Downs et al. (2020) contend that inadequate storage conditions frequently result in significant food loss. Therefore, inadequate services and infrastructure hinder the growth of foodscapes.

2.6 Conceptual framework

Figure 7 demonstrates the conceptual framework of the research for analysing how urban foodscapes contribute to migrant women’s household food security in the Greenland slum of Khulna, Bangladesh. As portrayed in literature, that foodscape implies the interaction of people, place, and food. (Arciniegas, 2021). To explore the existing practises of foodscape, the study focuses on food typology, spatial morphology, and women’s role in this process. Numerous studies have also shown that urban foodscapes have a substantial effect on household food security, particularly food availability and accessibility (Downs et al., 2020; Gallaher et al., 2013). Therefore, this study only focuses on food availability and accessibility to assess the extent of household food security in the prevailing context. In the conceptual framework (Fig. 07), the dependent variable is food security, while the independent variable is urban foodscape, and there is a strong causal relationship between these two variables. Here, influential factors act as a moderating variable that influences the relationship between urban foodscape and migrant women’s food security. According to Wegerif and Wiskerke (2017), these factors fall into three distinct categories: socio-political, economic, and physical. Therefore, the research is conceptualized in a way that illustrates how the practice of urban foodscape contributes to migrant women's household food security and is subsequently influenced by the socio-political, economic, and physical factors of informal settlements.

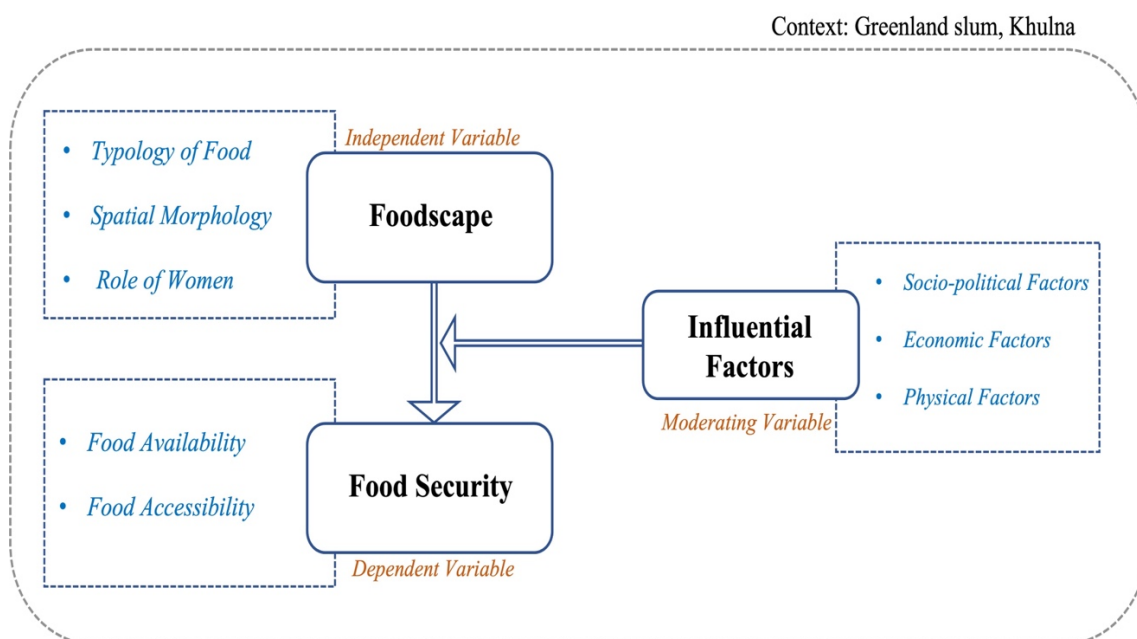


Figure 7: Conceptual framework of the research

Chapter 3: Research design and methodology

3.1 Introduction

An overview of the research methodology adopted to collect valid data is presented in this chapter, which focuses on research strategy, data collection, and data analysis methods in order to draw conclusions and recommendations. Firstly, it represents the research strategy, operational definitions of various concepts, and operational procedures for measuring variables and indicators. Secondly, it discusses the selection criteria of the case study, the sampling process, and the analytical framework of the study. Furthermore, it outlines which data will be collected and analyzed. This is followed by limitations as well as the validity and reliability of the research.

3.2 Research Strategy

A research strategy is an integral part of a research design. “A research strategy is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose (Kothari, 2004, p. 31).” The selection of the research strategy depends on the nature of the research problems and questions, the source and type of data required, existing scientific knowledge, and the research aim. This research will examine the practices of the urban foodscape that contribute to the migrant women’s food security. Thus, an in-depth analysis is required for this research to understand how urban foodscape contribute to migrant women’s food security.

Primarily, this is qualitative research, where case study approach was adopted as a research strategy. It is useful to conduct case study research when a hypothesis is intended to be tested and to investigate whether the theory holds up or not (Yin, 2003). According to Creswell (2007), Case study research is a qualitative approach that involves the investigation of a case over time through the collection of in-depth data using multiple sources of information (including observations, interviews, audio-visual materials, documents, and reports) (p.73). Nonetheless, the research aims to investigate how does the urban foodscape practice contribute to migrant women’s food security by adopting the ‘Greenland slum’ in Khulna as a case study. In order to understand the concept of urban foodscapes, migrant women’s household food security, and influential factors associated with them, a case study approach was required. The research units in this study are women-led households involved in foodscapes within the Greenland slum.

3.3 Operational Definition of Variables

Urban foodscapes:

Foodscape implies the interplay between people (practices, social values, and norms), place (the context in which they exist), and food (ways of production, distribution, and consumption) (Arciniegas, 2021). However, the research considered this synergy between food, place, and people as a typology of food, spatial morphology, and role of women.

Food security:

Food security is “a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO et al., 2019). It has four fundamental pillars: availability, accessibility, utilisation, and stability. However, food availability and accessibility are directly impacted by urban foodscapes (Gallaher et al., 2013; Arciniegas, 2021). Thus, this study concentrates solely on food availability and accessibility.

- **Food availability**

Food availability implies the “availability of sufficient quantities of food, supplied through domestic production (source of food)” (FAO, 2006, p. 1).

- **Food accessibility**

Food accessibility refers to having access to an adequate income (Gallaher et al., 2013), food affordability (Swanepoel et al., 2021), and the patterns of reciprocal exchange that exist within a neighborhood to obtain sufficient food (Arciniegas, 2021).

Research Questions	Variables	Sub-variables	Indicators	Sub-Indicators	Authors	Data Collection Methods	Data Analysis Methods	Respondents / Samples								
Sub-question 01: How does the urban foodscape manifest spatially according to typology both at the household and neighbourhood level in the Greenland slum of Khulna?	Foodscape	Typology of foodscape	Types of foodscapes	<ul style="list-style-type: none"> • Small-scale vegetation • Livestock farming • Retail shop • Food vending • Home-based restaurants • Community market 	(Downs et al., 2020)	Close-ended and open-ended Questionnaire	Content analysis (Atlas.ti)	Female Households (Involved in foodscape) Small-scale vegetation (n=4) Livestock farming (n=4) Retail (n=4) Restaurant (n=4) Food vending (n=4) Community market (n=4)								
				Description of activities	<ul style="list-style-type: none"> • Categories of food items for production or sale 				(Kurniawati et al., 2021); (Downs et al., 2020)							
				Location	<ul style="list-style-type: none"> • Household level • Neighbourhood level • Both 				(Thai et al., 2018)							
			Scale of Foodscapes	<ul style="list-style-type: none"> • Small-scale (part-time extensions of every day domestic activities) • Larger scale (using special equipment and employ a number of people) 	(Gough & Kellett, 2001); (Thai et al., 2018)											
			Timing of operation	<ul style="list-style-type: none"> • Most days and often for many hours a day • Holidays • Seasonal basis 	(Gough & Kellett, 2001); (Thai et al., 2018)											
			Targeted customers	<ul style="list-style-type: none"> • Within neighbourhood • Outside neighbourhood • Both 	(Thai et al., 2018)											
			Motivation of operators	<ul style="list-style-type: none"> • Reasons for operating Foodscape 	(Gondwe & Ayenagbo, 2013)											
			Spatial morphology • Household level • Neighbourhood level	Relative positioning	• Proximity to dwelling unit • Proximity to street and alleyways • Proximity to services and infrastructures				• Uses of space for foodscapes • Spaces shared with domestic activities • Multiple uses of spaces • Changes of activities at different times of the day	(Kellett and Tipple, 2003); (Thai et al., 2018)	Observation Photography Video Recording Free hand sketching	Spatial analysis (Hand-sketches)	Foodscape at Household level & Neighbourhood level Small-scale vegetation (n=4) Livestock farming (n=4) Retail (n=4) Restaurant (n=4) Food vending (n=4) Community market (n=4)			
														Space utilization	• Linkages between domestic spaces and foodscapes • Linkage between foodscapes and services	(Kellett and Tipple, 2003)
														Functional linkage		
Space requirement																

Research Questions	Variables	Sub-variables	Indicators	Sub-Indicators	Authors	Data Collection Methods	Data Analysis Methods	Respondents / Samples
Sub-question 02: What role do migrant women play in contributing to the urban foodscape?	Foodscape	Role of women	Contribution to labour	<ul style="list-style-type: none"> Involvement of labour by time Involvement of labour by gender 	(McCarney, 1991)	Close-ended and open-ended Questionnaire	Content analysis (Atlas.ti)	Female Households (Involved with foodscape) Small-scale vegetation (n=4) Livestock farming (n=4) Retail (n=4) Restaurant (n=4) Food vending (n=4) Community market (n=4)
			Decision-making power	<ul style="list-style-type: none"> Timing Location of foodscapes Control over crops or foodstuffs 	(McCarney, 1991)			
			Participation in food provisioning activities	<ul style="list-style-type: none"> Description of foodscape activities Participation of women 	(McCarney, 1991)			
Sub-question 03: To what extent do these foodscapes ensure migrant women's household food security?	Food security	Food Availability	Source of food	<ul style="list-style-type: none"> Frequency of Production Protection against vulnerability 	(Quisumbing et al., 1996); (Swanepoel et al., 2021); (Gallaher et al., 2013)	Close-ended Questionnaire	Descriptive statistical analysis (Likert Scale)	Foodscape at Household level & Neighbourhood level Small-scale vegetation (n=4) Livestock farming (n=4) Retail (n=4) Restaurant (n=4) Food vending (n=4) Community market (n=4)
			Source of income	<ul style="list-style-type: none"> Linkages between domestic spaces and foodscapes 	(Dake, 2021); (Quisumbing et al., 1996); (Swanepoel et al., 2021); (Kiptot et al., 2014)			
		Reciprocal exchange	<ul style="list-style-type: none"> Relationship with neighbours Types of food exchanged Frequency of exchange Number of household cover 	(Arciniegas, 2021); (Gallaher et al., 2013)				
		Food Affordability	<ul style="list-style-type: none"> Proximity of foodscapes Households purchasing pattern Households Perception of food cost 	(Quisumbing et al., 1996); (Swanepoel et al., 2021)	Focus group discussion			
Sub-question 04: What are the factors that influence the relationship between urban foodscape and migrant women's food security?	Factors	Socio-political factors	Access to land	<ul style="list-style-type: none"> Entitlement status Resident's perception of tenure security 	(Quisumbing et al., 1996); (Swanepoel et al., 2021)	Open-ended Questionnaire	Content analysis (Atlas.ti)	Female Households Small-scale vegetation (n=4) Livestock farming (n=4) Retail (n=4) Restaurant (n=4) Food vending (n=4) Community market (n=4)
			Spatial negotiation	<ul style="list-style-type: none"> Negotiation of domestic space Negotiation of neighbourhood space 	(Wegerif & Wiskerke, 2017); (Gondwe & Ayenagbo, 2013)			
			Social norms	<ul style="list-style-type: none"> Conservative cultural upbringing Religious ideology (notion of purdah) 	(Kiptot et al., 2014)			
			Access to support programmes	<ul style="list-style-type: none"> Form of support programme Subject matter of programme Targeted participants Selection process for trainee 	(Quisumbing et al., 1996); (Swanepoel et al., 2021)			

Research Questions	Variables	Sub-variables	Indicators	Sub-Indicators	Authors	Data Collection Methods	Data Analysis Methods	Respondents / Samples
Sub-question 04: What are the factors that influence the relationship between urban foodscape and migrant women's food security?	Factors	Economic factors	Access to credit	<ul style="list-style-type: none"> Source of credit Types of loan Form of collateral Gender oriented credit 	(Quisumbing et al., 1996); (Swanepoel et al., 2021); (Kiptot et al., 2014)	Open-ended Questionnaire	Content analysis (Atlas.ti)	Female Households (n=4) Small-scale vegetation (n=4) Livestock farming (n=4) Retail (n=4) Restaurant (n=4) Food vending (n=4) Community market (n=4)
				Ease of access to market	<ul style="list-style-type: none"> Physical access to market Involvement of Agents 			
		Physical factors	Availability of space	<ul style="list-style-type: none"> Space for foodscapes Conflict concerning space utilization 	(Gallaher et al., 2013); (Sabry, 2009)			
				Provision of services and infrastructure	<ul style="list-style-type: none"> Availability of services & infrastructures Fundamental services and infrastructures for foodscapes 			

Table 1: Variables and indicators of the research

3.4 Population and sampling design

In this study, a purposive sampling of 24 respondents was adopted for an in-depth interview (IDI) based on a pilot survey, allowing the research to identify households that are involved in different types of foodscapes. All these 24 respondents were female (age above 18 years), and they were selected to better comprehend women's roles in the fields of urban foodscapes and food security. This selection, however, was based on six sub-typologies of foodscapes (four cases per foodscape typology) (see table. 2). The reason behind the equal sub-division of respondents among this typology is the lack of ample research in the field of urban foodscapes.

Data collection methods	Foodscape typology	Gender	Sample size	Selection criteria
In-depth interviews (IDI)	Small-scale vegetation	Female	4	<ul style="list-style-type: none"> Gender Age (above 18 years) Involved with 'Urban foodscapes' Equal sub-division of respondents (among foodscape typology)
	Livestock farming	Female	4	
	Retail shops	Female	4	
	Home-based restaurants	Female	4	
	Food vendors	Female	4	
	Community market	Female	4	
Total			24	
Data collection methods	Respondents	Gender	Sample size	Selection criteria
Focus group discussion (FGD)	Dwellers of Greenland slum	Female	1 (Six respondents under 1 FGD)	<ul style="list-style-type: none"> Not-involved with 'Urban foodscapes'
Total			1	
Data collection methods	Organization and Position	Gender	Sample size	Selection criteria
Key informant interview (KII)	BRAC (Bangladesh Rural Advancement Committee) Position: Deputy manager	Male	1	<ul style="list-style-type: none"> Working with the Greenland slum dwellers to facilitate them with foodscape-related support programmes
Total			1	

Table 2: An overview of the sample size of the study

Again, tenure is a factor considered when determining the sample size. It was also noticeable during the pilot survey that, in the Greenland slum, most of the residents are the owners, while a few live there on a rental basis. Though only a few tenants are involved with foodscapes, the ratio of owner and tenant is taken as 4:1. Additionally, the selection of the scale of foodscapes for the sample is essential for comprehending the extent of household food security in the prevailing context. Thus, during sample selection, those foodscapes whose scale is larger than others were selected.

Furthermore, one focus group discussion (FGD) consisting of six female respondents was conducted to understand how food affordability as an indicator is associated with urban foodscapes. To minimize potential biases in the research, respondents for the FGD were selected who were not affiliated with foodscape. Besides this, to understand the socio-political factors, one key informant interview (KII) was conducted with a deputy manager from an NGO called BRAC, who works closely with the Greenland slum dwellers to facilitate them by providing food-related support programmes.

3.5 Analytical framework

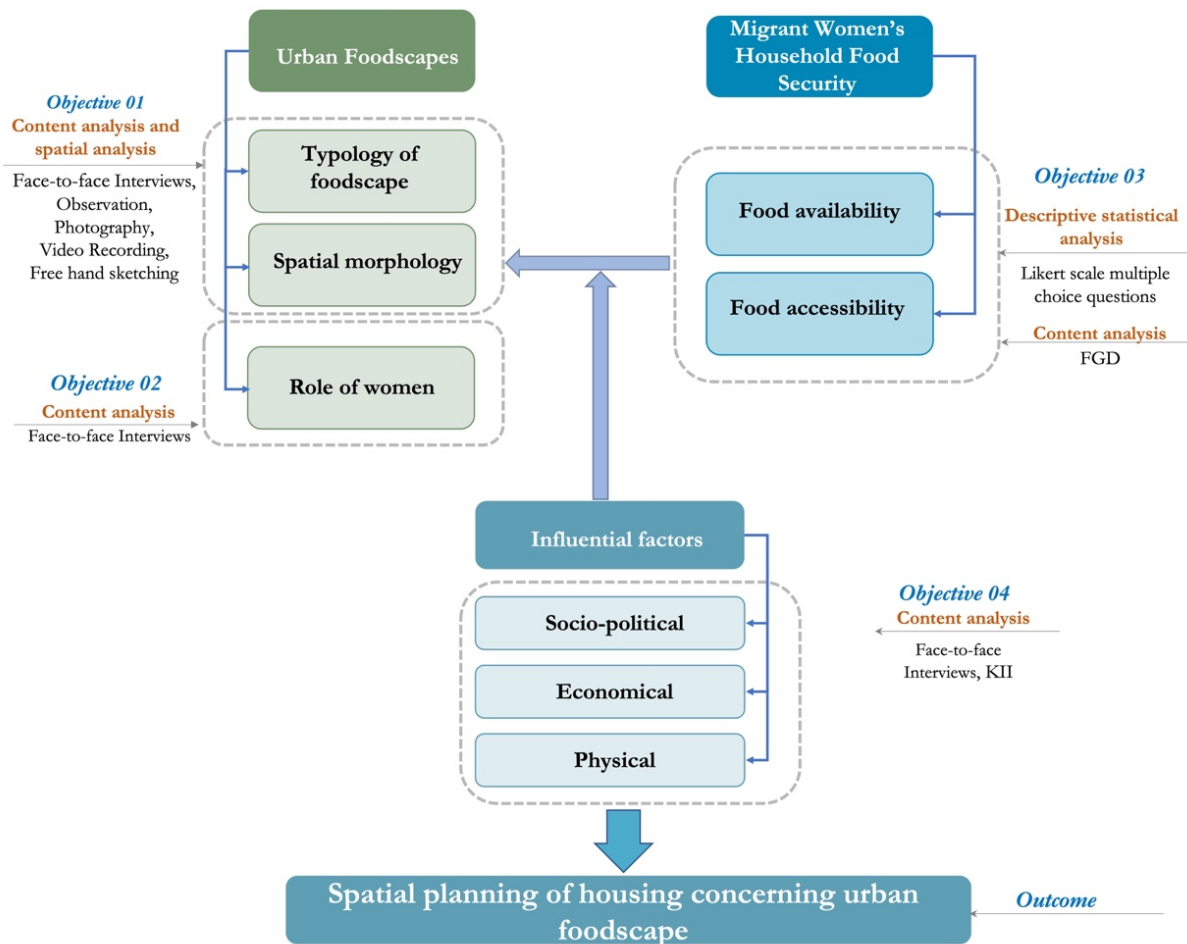


Figure 8: Analytical framework of the study (Source: Author, 2023)

An analytical framework is developed to address the study objectives by collecting data on specific variables of urban foodscapes and food security, analyzing the collected data, and interpreting the output of the analysis (see Fig. 8). Detail methods are categorized according to the objectives. Interviews, photography, video recording, and free-hand sketching are

conducted to explore the spatial manifestation of foodscape based on typology both at the household and neighborhood level. Besides, interviews are carried out to identify the role of migrant women and to find out the factors that influence both urban foodscapes and household food security. Furthermore, a Likert scale and FGD are implemented to assess the extent of migrant women’s household food security. Later spatial mapping, content analysis, and descriptive statistical analysis of collected data help to understand the connectivity between two variables.

3.6 Data Collection Methods

In this empirical study, both social and spatial data were collected for further investigation. Social data was required to identify the typology of foodscape with a focus on women’s role in this field, assess the extent of household food security, and also find out the factors affecting both variables. While spatial data will give a full picture of the spatial manifestation of urban foodscapes both at the household and neighbourhood level.

Interviews using both open-ended and closed-ended questionnaires were conducted to identify the foodscape typology and women’s role in it. Additionally, a Likert scale has been implemented to assess the extent of household food security. Apart from the Likert scale, one FGD was carried out with women not involved in foodscapes to cover the qualitative data about food affordability as a determinant of food security. Face-to-face interviews were conducted with women involved with foodscapes to determine the sociopolitical, economic, and somatic factors affecting both variables. Besides this, one KII was conducted to comprehend the food-related support programmes in the Greenland slum.

To collect the spatial data, direct observation methods, photographs, video recording, and free-hand sketching were conducted to explore the existing spatial patterns of foodscapes both at household and neighborhood levels.

3.7 Data Analysis Methods

Research Sub-questions	Spatial level	Analysis methods and tools
<i>Sub-question 01</i> How does the urban foodscape manifest spatially according to typology both at the household and neighbourhood level in the Greenland slum of Khulna?	Household and Neighbourhood level	Content analysis (Atlas.ti) Spatial analysis (Free hand sketching)
<i>Sub-question 02</i> What role do migrant women play in contributing to the urban foodscape?	Household and Neighbourhood level	Content analysis (Atlas.ti)
<i>Sub-question 03</i> To what extent do these foodscapes ensure migrant women’s household food security?	Household level	Descriptive analysis (Microsoft excel) Content analysis (Atlas.ti)
<i>Sub-question 04</i> What are the factors that influence the relationship between urban foodscape and migrant women’s food security?	Household and Neighbourhood level	Content analysis (Atlas.ti)

Table 3: Analysis method and tool of the study

- i. **Spatial analysis:** The spatial analysis method places spatial patterns at the forefront of data analysis by using maps to specify space for research objectives. Rucks-Ahidiana & Bierbaum (2015) demonstrate that maps represent a visual representation of the spatial dynamics of a societal phenomenon, allowing researchers to identify how that

phenomenon is distributed across the territory. Thus, to investigate the actual spatial distribution of the urban foodscape at both the household and neighborhood levels, spatial analysis was conducted. Photographs, observations, video recording, and hand sketches were accomplished during the survey to produce these spatial maps and analyze them.

- ii. **Content analysis:** Content analysis is the method widely employed for qualitative data analysis on both graphical and textual data (Stemler, 2001). According to Matthews & Ross (2010), "content analysis determines the frequency of words in a text; the words chosen would depend on operational definitions and research questions as well as endeavors to understand their meanings and relationships to each other (p. 395)". A content analysis was conducted in this study to analyse social data, including foodscape typology, women's roles, food affordability, and the factors influencing both concepts. With the aid of Atlas.Ti qualitative software, the full transcriptions of the interviews, KII, and FGD were analysed. The primary data collected from the field was collected in text format, and then was transcribed, edited, and uploaded as separate files into Atlas.TI. Data were categorized using codes and presented in the format of charts, tables, and graphs.
- iii. **Descriptive statistical analysis:** Descriptive statistics, often referred to as "descriptive," are an essential data analysis method in qualitative research (Woodrow & Woodrow, 2014). It describes, illustrates, and summarizes the fundamental characteristics of data sets in a particular study, thereby facilitating the researcher's comprehension of the data (Descriptive statistics ~ definition & types, 2023). In this study, the extent of household food security is assessed using descriptive statistical analysis. Therefore, under descriptive statistical analysis, a frequency analysis was conducted on the primary data obtained from Likert scale multiple-choice questions associated with food security indicators. Findings from the data were portrayed in the form of graphs.

3.8 Scope and Limitations

This study has been limited in its scope and objectives due to the following facts:

1. Firstly, one limitation of this research is that foodscapes are sometimes difficult to distinguish from domestic activities. Besides, instead of having a predominant role in foodscapes, women sometimes don't consider themselves owners due to men's involvement. To overcome this limitation, a pilot survey was conducted to identify the involvement of female respondents in foodscapes.
2. Secondly, the sample size for the research is 26 (24 IDIs, 1 FGD, and 1 KII), which is not possible to increase due to the time limitations of the study. There is a low likelihood of generalizing these findings due to the small sample size. To address this issue, the researcher attempted to develop a more detailed operationalization table in order to extract in-depth information from the study area.
3. Finally, due to time limitations, the researcher couldn't conduct the study by herself. To address this limitation, both audiovisual recordings were collected from the study area to understand both social and spatial information.

3.9 Validity and Reliability

Reliability refers to the probability that repeated operations will produce similar outcomes (Yin, 1994). According to the author, reliability is intended to minimize the magnitude of errors in the study. For the purpose of ensuring the reliability of the data collection, the questionnaire guidelines were carefully developed with great attention and precision.

An important method for enhancing the validity of research findings is triangulation (Cohen et al., 2007). An array of sources is used to ensure the validity of the information, including face-to-face interviews, FGD, KII, observation, video recording, freehand sketching, and aerial photographs. For this research, triangulation has been done by conducting face-to-face interviews with female respondents and observing foodscapes at different times of the day. Besides, focus group discussions also helped in the process of triangulation by validating the data collected from respondents (see fig. 9).

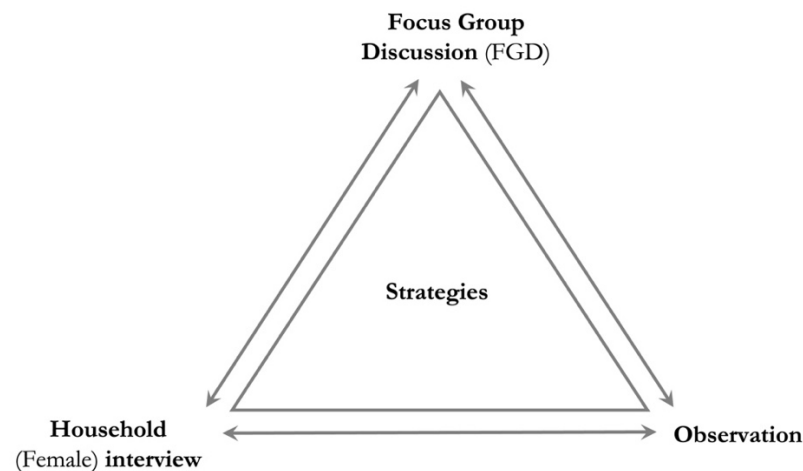


Figure 8: Process of data triangulation (source: Author, 2023)

Chapter 4: Results, analysis and discussion

4.1 Introduction

The aim of this chapter is to discuss the data collected from the study area and present an analysis. The primary purpose is to demonstrate how the urban foodscape practice contributes to migrant women's food security in the Greenland slum of Khulna. Firstly, it represents the spatial manifest of foodscapes based on typology both at the household and neighborhood level. Secondly, it discusses the role of migrant women in contributing to the foodscape. Thirdly, it portrays the extent of household food security as a result of foodscapes. Finally, it concludes with a discussion of the influencing factors of foodscapes and food security, followed by a summary of the entire chapter that serves to draw some recommendations for the next chapter.

4.2 Description of the case

This research has been carried out in Khulna, the third-largest city in Bangladesh with a population of 1.5 million, where 20% are slum dwellers (Roy et al., 2018). Slum-dwellers live in 1,134 slums within Khulna City Corporation (KCC), comprising 8.14% of its land area (BBS, 2015). At present, there are approximately 520 informal settlements in Khulna, and among them, the Railway slum is the second-largest one, located on the land of the Bangladesh Railway Authority (BRA). The whole settlement is renowned for a huge concentration of climate-induced migrants from the south coastal district of the country (Jabeen, 2019) and can be divided into three parts: 1) Montu Colony, 2) Greenland slum, and 3) Sweeper Colony. In this research, the Greenland slum is taken as the 'unit of analysis' (see fig. 10). This slum was established in 2002 with the help of the local ward commissioner and the city mayor, who supported some floating destitute people from different parts of Khulna city. The local commissioner brought in a verbal commitment (absence of legal tenure) from the BRA to provide an unused parcel of land for these people (Roy & Islam, 2007).



Figure 9: Location of Greenland slum in Khulna (Source: Author, 2023)

The selection of the Greenland slum as a case study is motivated by the fact that, currently, the total number of populations is 5806; among these, the male-female ratio is 30:70 (Akter et al., 2021). Although the study concentrates on migrant women’s food security, this selected area corresponds most effectively to the study topic. Besides, despite no legal tenure, this area still possesses a lot of migrant women who are actively involved with foodscapes to survive in harsh urban landscapes, which is another crucial reason for selecting the Greenland slum as a case study.

4.3 General characteristics of the sample

In this section, the general characteristics of the respondents are described, which include respondent age, sex, educational background, and the years of operation of urban foodscapes. Among 31 respondents (including 24 IDIs, 1 FGD consisting of 6 respondents, and 1 KII), 97% are female and only 3% are male (see table 04). Another characteristic of the respondent is their age group. It is found that the majority of women operators (42%) belong to the age range of 31–40 years, and another 13% belong to the 61–70 age range (see table 05). In addition, more than half of the women (54%) are illiterate, and another half of the women have a primary school certificate (see fig. 11). The average household size is 5, and all the respondents are Muslims. Furthermore, after dividing the foodscape’s years of operation into a 5-year range, the result suggests that most of the foodscapes (33%) are 6–10 years old and 25% are 1–5 years old. However, the percentages of years of operation indicate that the practices of foodscape are expanding over time in the Greenland slum (see fig. 11).

Serial	Sex	Frequency	Percentage
1.	Female	30	97%
2.	Male	1	3%
Total		31	100%

Table 4: Number and percentages of male and female respondents (Source: Survey, 2023)

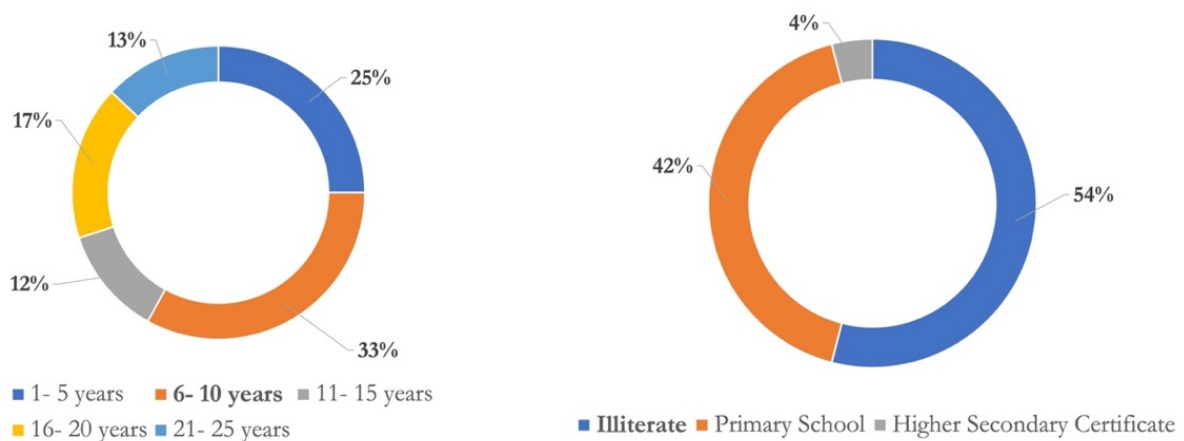


Figure 10: Left graph shows the percentages of foodscape’s years of operation, and the right graph shows the percentages of educational background of respondents (Source: Survey, 2023)

Serial	Age Group (years)	Frequency	Percentage
1.	19-30	6	19.5%
2.	31-40	13	42%
3.	41-50	5	16
4.	51-60	3	9.5
5.	61-70	4	13%
6.	Total	31	100%

Table 5: Number and percentages of different age group of respondents
(Source: Survey, 2023)

4.4 Spatial manifestation of urban foodscape based on typology

4.4.1 Typology of urban foodscape

A growing number of migrant women living in informal settlements in developing countries are adopting 'urban foodscapes' as part of their survival strategies to ensure food security. The utilization of dwelling and neighbourhood spaces for urban foodscapes is also prevalent in the context of the Greenland slum of Khulna. Different types of foodscapes are adopted by migrant women as a crucial survival strategy for their livelihoods. During the survey, it was found that there are six types of urban foodscapes that exist most frequently in the Greenland slum, both at the dwelling unit and neighbourhood levels. These types include small-scale vegetation, livestock farming, retail shops, home-based restaurants, food vendors, and community markets. However, these types can be categorized under two broad typologies: nature-oriented and built environment-oriented urban foodscapes (see fig. 12). Nature-oriented foodscapes include small-scale vegetation and livestock farming, whereas built-environment oriented foodscapes comprise retail shops, home-based restaurants, food vendors, and community markets. Appendix 02 portrays the broad and sub-types of urban foodscapes and the descriptions of the activities performed by each sub-type.

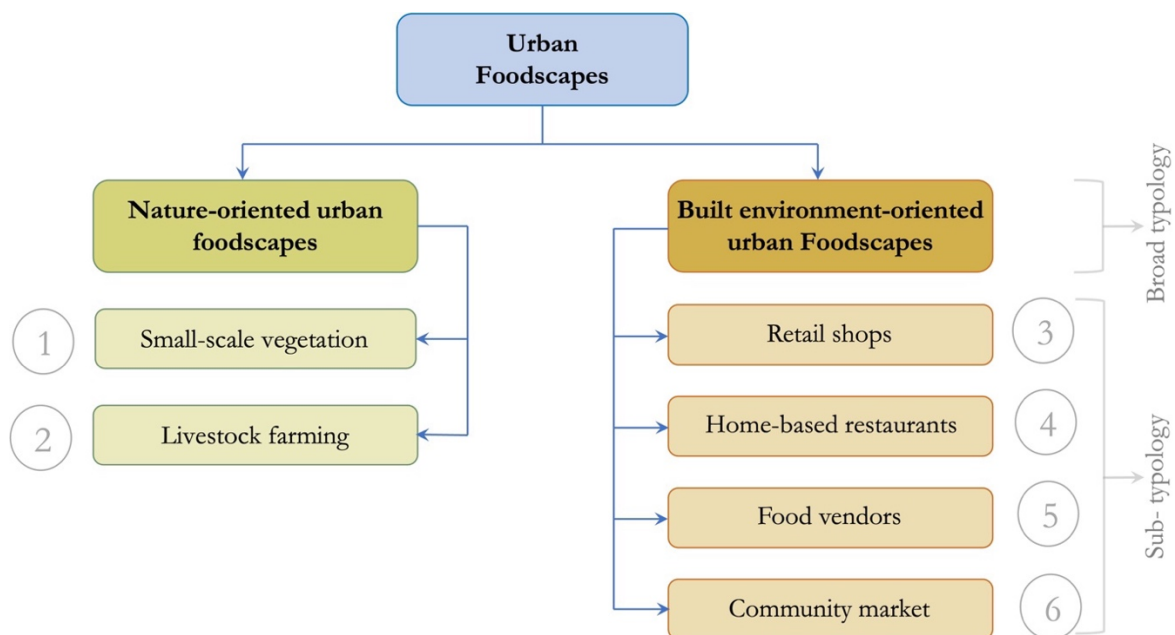


Figure 11: Typology of urban foodscapes in Greenland slum of Khulna (Source: Author, 2023)

However, these activities vary greatly in terms of scale, location, time, and motivation. For instance, many of the foodscapes in the Greenland slum, particularly vegetation, retail, and food vendors, are small-scale and extend everyday household domestic activities on a part-time basis. In contrast, others (livestock farming, home-based restaurants) are comparatively larger, use specialized apparatus (benches, seating) in defined spaces, and may employ a few people beyond household members. In addition, some of these foodscapes are located at the household level, such as retail and restaurants, and are intricately linked with domestic activities. Others, particularly food vendors and community markets, are located within the neighborhood level. Nevertheless, the targeted customers are people both within and outside the neighborhood but people within the neighborhood are the predominant customers due to their proximity, lower prices, and strong social bonds.

Foodscapes can also vary according to the time of operation. In the Greenland slum, most foodscapes operate daily, throughout the day, particularly from 7 a.m. to 10 p.m. Some activities, such as livestock farming, are laborious and require substantial physical involvement at multiple times of the day, which results in the extension of operation hours beyond 10 p.m. Whereas other activities such as food vendors and community markets depend on daylight, weather conditions, and the surrounding community activities.

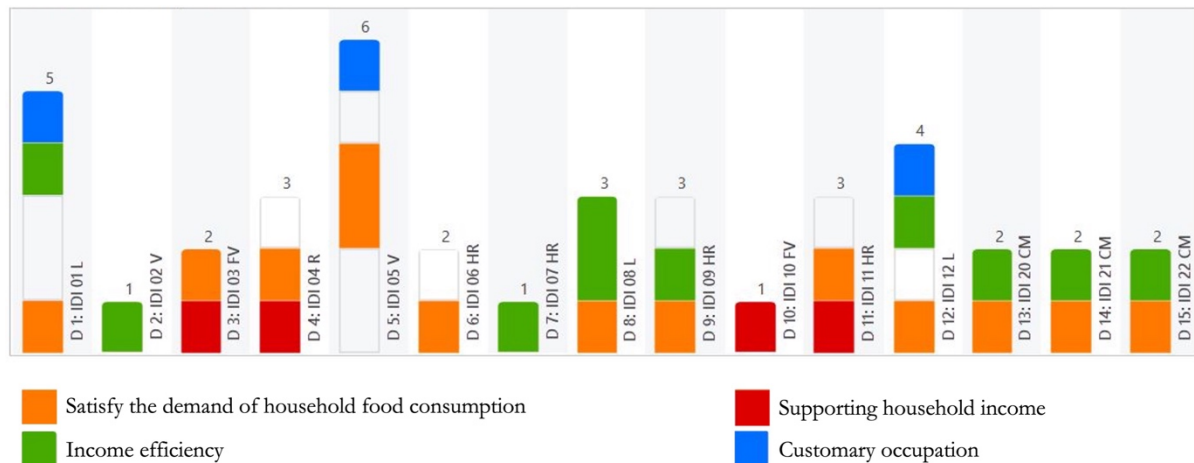


Figure 12: Distribution of motivation by the respondents contributing to participate in urban foodscapes (Source: Processed by author using Atlas.ti, 2023)

Empirical findings also reveal that the most general consensus among households regarding the reasons behind the operation of these foodscapes is income efficiency and satisfying household food consumption (see Fig. 13). Some urban foodscapes are fundamental to household income, whereas others may only provide supporting income. There are, however, some operators who are conducting this business as a customary occupation without considering its financial implications. Interestingly, a few operators articulated that the main motivation behind the operation of foodscapes is to strengthen societal ties. As indicated by one of the respondents:

My farming yield is high. I can sell the vegetables and fruits but don't. One reason for this farming is to keep the relationship good by distributing food to everyone. (35-year-old women involved in small-scale vegetation)

In extreme cases, women's economic self-reliance is another crucial factor behind the decision to conduct foodscapes, particularly when women are the only earning members of the household and where the male's income is insufficient to support a family. Additionally, respondents indicated that expansion of business, leisure-time activity, profitability, and loan

repayment are other factors contributing to their decision to participate in urban foodscapes (see figure 14).

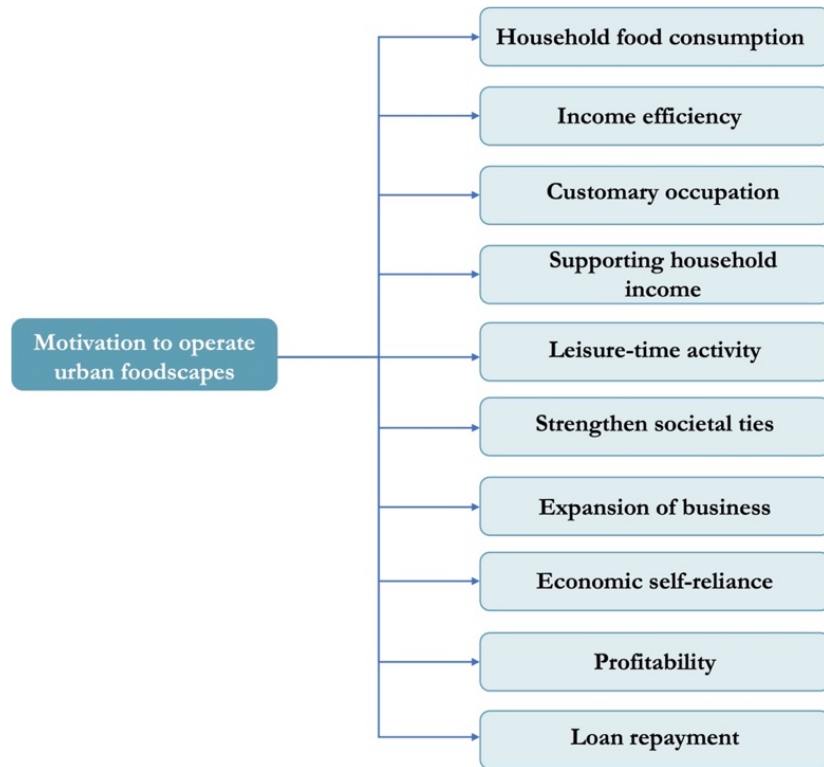


Figure 14: Motivation of the respondents contributing to participate in urban foodscapes (Source: Author, 2023)

4.4.2 Spatial morphology of the urban foodscape

In informal settlements, households are increasingly utilizing their domestic and neighborhood spaces for informal income-generating activities. Urban foodscapes constitute a significant portion of these activities and serve as a survival strategy for migrant women. However, this study already identified two broad foodscape typologies to understand how these typologies manifest spatially both at the household and neighbourhood levels in the context of the Greenland slum.

- **Household level**

Urban foodscape at household level refers to those that are spatially dependent, well-connected, or attached to the dwelling for the efficient functioning of the foodscape. To investigate the existing spatial manifestation of foodscape at household level, the relative positioning of foodscape, space utilization, functional linkage, and space requirement have been taken into consideration.

The spatial phenomenon in the Greenland slum demonstrates that the nature of the foodscape in this settlement is predominantly home-based, where dwelling units play the role of both productive and reproductive activities. The majority of foodscapes, including livestock farming, small-scale vegetation, retail stores, and home-based eateries, are spatially attached and functionally dependent on dwelling units' spaces. Ethnographic observation reveals that the relative positioning of livestock farming is largely dependent on the location of available space and the position of services, especially water sources and drainage facilities. If the scale of the foodscape is small, these farming areas may be attached to houses; however, to mitigate

the smell of manure, they are typically placed opposite the dwelling and are spatially well-connected by internal alleyways (see fig. 15). Besides, there is a strong spatial and functional connectivity required among the cattle shed (cattle house), tube well, internal alleyways, and sometimes the community pond. In most cases, operators not only use the domestic spaces but also the internal alleyways in front of their dwelling for the storage of cattle feed (see fig. 15). Water is a fundamental utility that needs to be accessible when conducting a farm. The proximity between the cattle shed, community tube well, and pond facilitates those households that don't have their own pump water or tube well and are actively engaged in the manufacturing of dried dung and the sweeping of cattle houses.

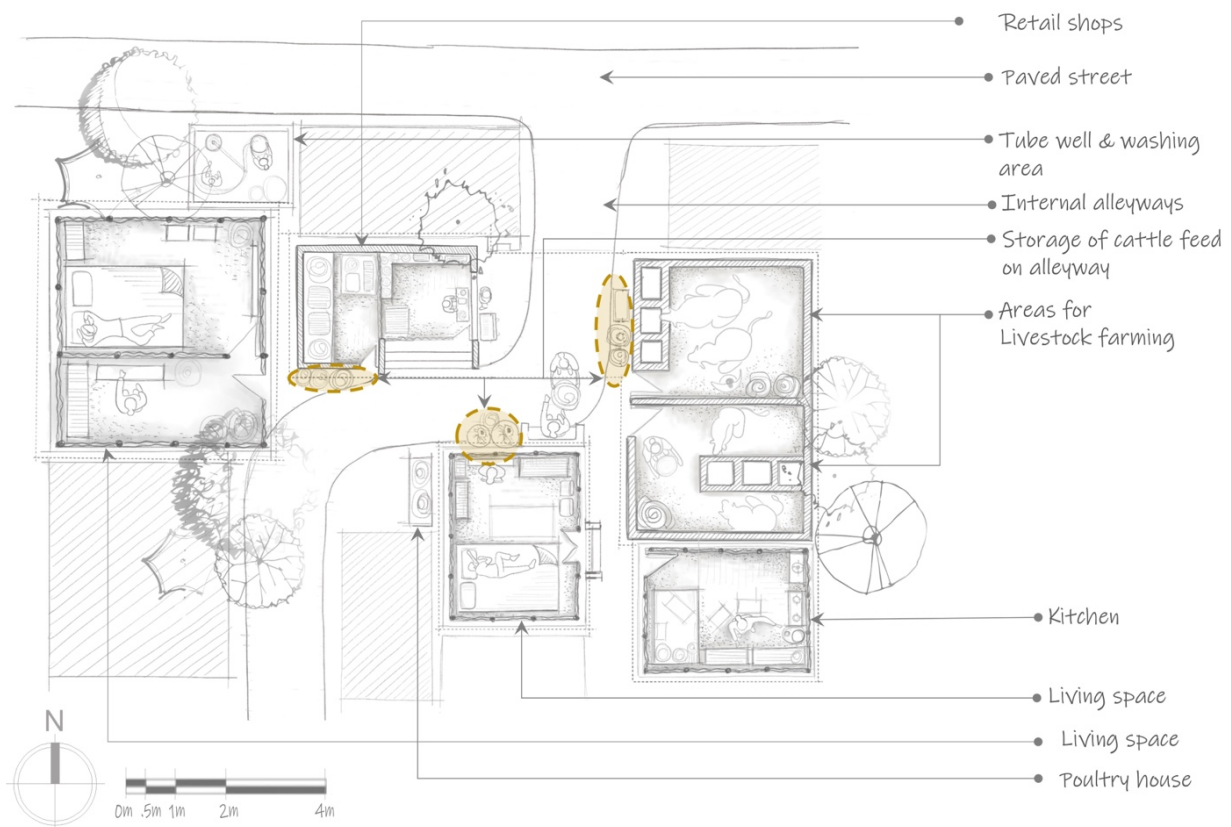


Figure 13: Spatial morphology of livestock farming in Greenland slum (Source: Survey,2023)

Similarly, the relative positioning of small-scale vegetable farming is primarily reliant on the location of available space, solar orientation, available vertical and horizontal surfaces of the dwelling unit, and the proximity of community spaces (especially streets, alleyways, and ponds) (see fig. 16). Generally, households cultivate crops according to the prevailing solar orientation within the available space around their house. Utilization of vertical and horizontal surfaces, in particular the roofs and façades of dwellings, is also prevalent where the plot size is small (see appendix 3). Findings also reveal that this community utilizes every available inch of space in a highly productive manner to ensure food security for its residents. For instance, some households share a common space on the edge of the community pond for the cultivation of vegetables (see fig. 16), and others share the spaces of alleyways and streets to place a sack for gardening provided by different NGOs. Occasionally, people also utilize the 5- or 6-inch spaces quite efficiently between the street and house for cultivation (see appendix 3). However, there is a strong functional connectivity required between the farming areas and the water sources, such as tube wells and ponds, for irrigation purposes. Most women prefer to cultivate near ponds due to the suitability of irrigation and the availability of soil. In addition, functional

connectivity between cultivation areas and domestic spaces is only necessary when there is a need for storage of harvest, equipment, and fertilizers.

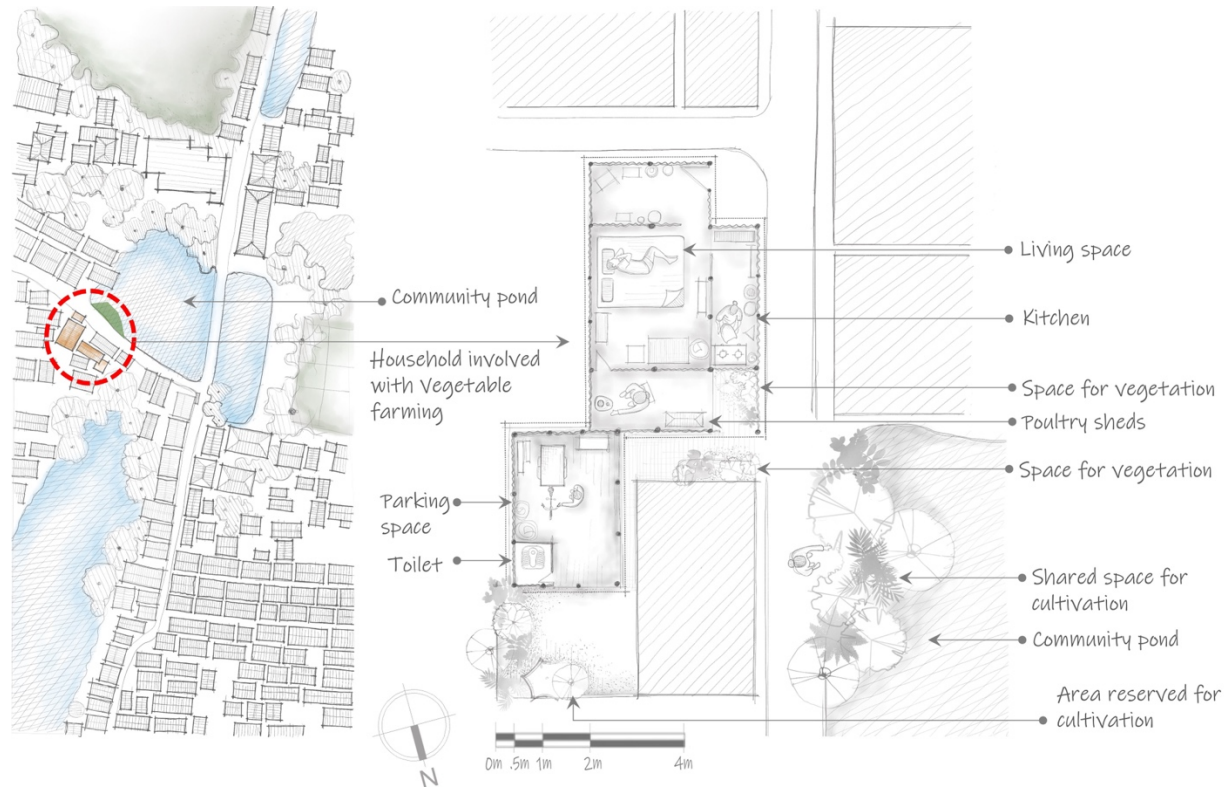


Figure 14: Left image shows the location of small-scale vegetation in neighbourhood mapping, and the right image shows the spatial morphology of vegetation at dwelling unit level in Greenland slum (Source: Survey, 2023)

The relative positioning of retail shops and home-based restaurants is primarily dependent on the volume of vehicular and pedestrian traffic, accessible streets to transport heavy goods, junctions and the surface quality of the streets and alleyways. Both retail shops and home-based restaurants are located on the ground floor towards the front part of the dwelling and are highly agglomerated along the paved streets, which are connected to the main thoroughfares of the settlement (see fig 17). In the Greenland slum, the majority of retail shops and restaurants are located at the junction of the streets, which not only allows for visual permeability but also attracts a pool of potential customers, ensuring the financial viability of foodscapes. However, the relative positioning of home-based restaurants also depends on the proximity of the fundamental services such as placement of kitchen, washing areas for utensils and also the location of tube-wells.

In terms of space utilization, both retail and restaurants share domestic space for food storage. The operation of a home-based restaurant is among the simplest businesses someone can operate if they have the time, a few cups, and a street front space attached to the dwelling. Ideally, customers are provided a few tables and chairs for food consumption when domestic spaces are available (see Fig. 18). Occasionally, they also occupy neighbourhood spaces (such as street) to install chairs, or stools, particularly when the nature of the foodscape demands the setting up of special equipment, but the private space is limited (see Fig. 17).

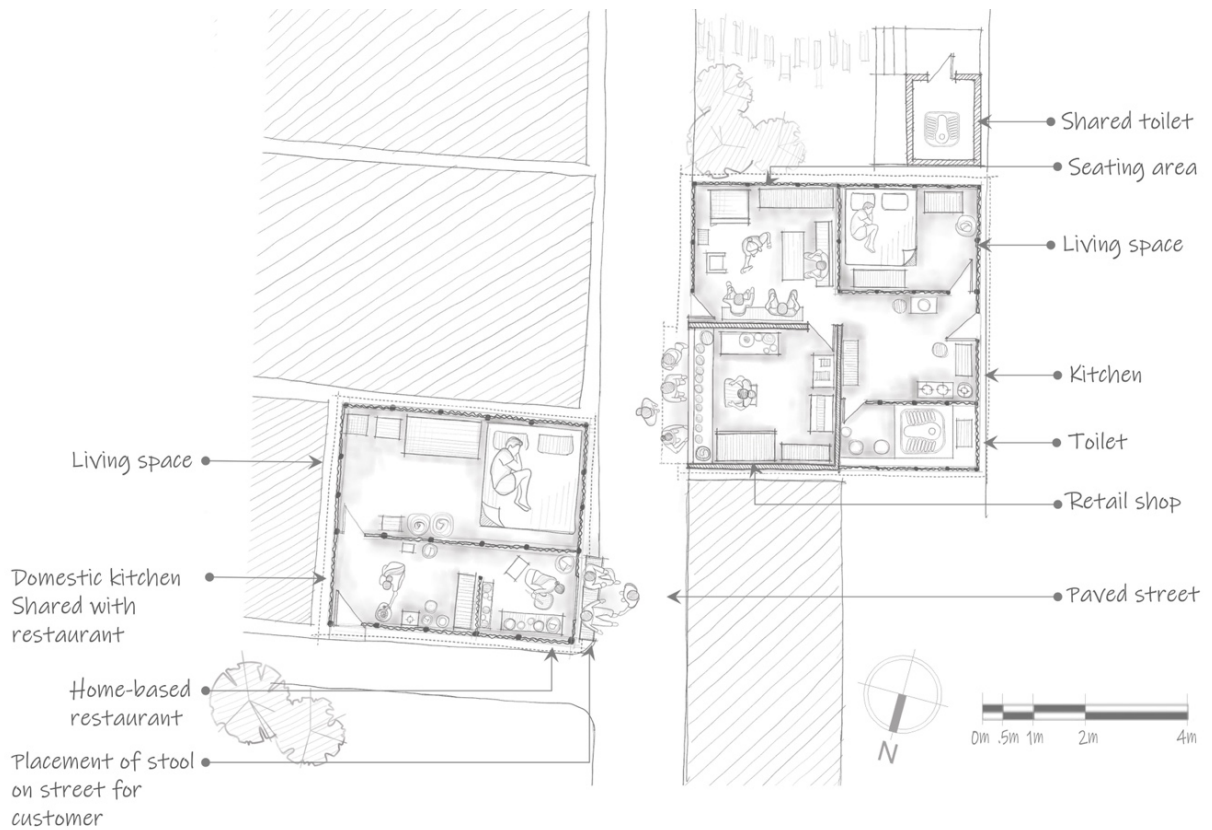


Figure 15: Spatial morphology of retail shop and home-based restaurant in Greenland slum (Source: Survey, 2023)

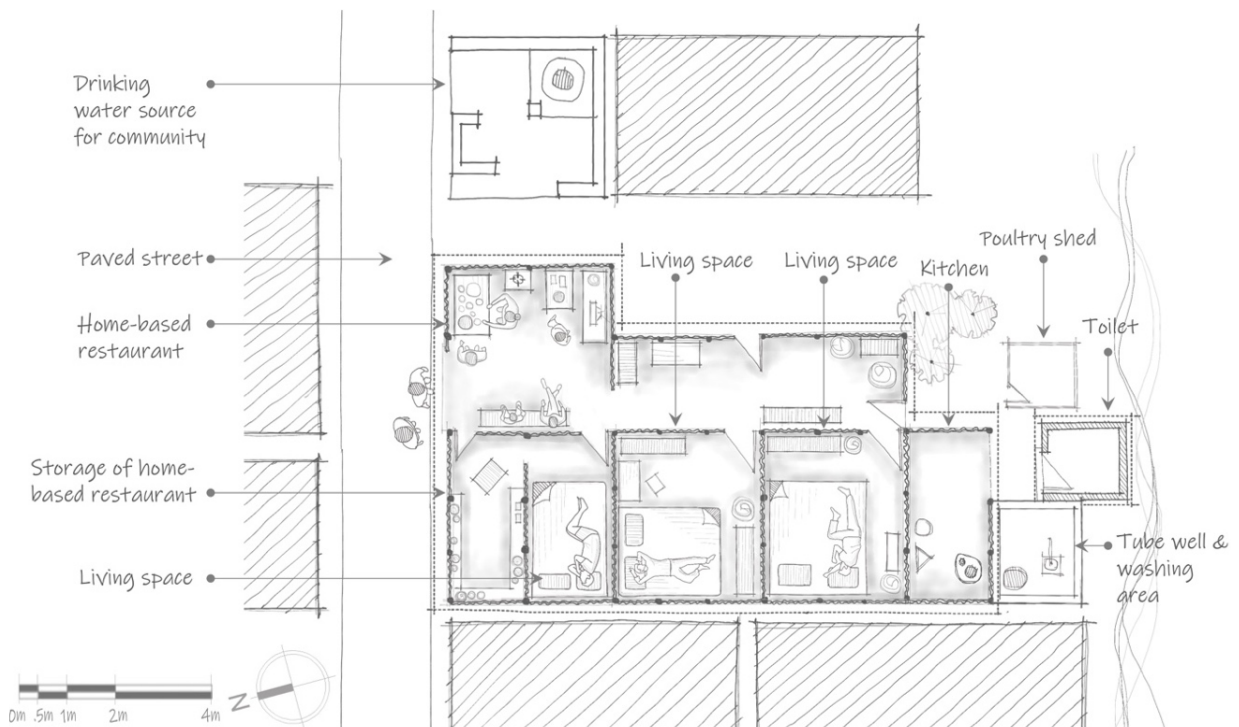


Figure 16: Spatial morphology of home-based restaurant in Greenland slum (Source: Survey, 2023)

The findings also suggest that the spatial nature of the foodscapes is home-based and managed largely by women; therefore, a deep functional linkage has already been established between

the dwelling and the foodscapes. In most cases, a partition wall divides the retail shop's spaces, but a door spatially connects them to the domestic space. On the contrary, it is substantially difficult to operate a home-based restaurant without functional linkages to domestic space. Most of the operators use a clay oven or stove inside the shop to prepare the food. But occasionally they also occupy the domestic kitchen for the preparation of food when there is a huge traffic of customers in the shop. In addition, most food processing activities (chopping, blending, splitting wood, etc.) happen in the living room, the domestic kitchen, and sometimes in the common alley. A few operators occupy the common alley for the storage of cooking fuel and splitting wood. Besides, there are also strong functional linkages required among the restaurant, the washing areas, and the drinking water sources.

On the space requirement issue, data collection includes measurement of the amount of dwelling space, including foodscapes, and the amount of space used for the foodscapes, both exclusively and shared with domestic space. The area of foodscapes is then deducted from the area of the total dwelling unit to generate the percentage of spaces occupied by foodscapes of the total dwelling unit (see table 06). Table 6 illustrates that a minimum of one-fourth of domestic space is required to operate a foodscape attached to a dwelling unit. Typically, livestock farming occupies almost half of the dwelling space due to the types of domesticated animals (mostly cows and goats) and the special equipment (feeding houses, storage areas) needed for it. Households that have occupied this one-half space are essentially those that first resided in this community.

Subtype of foodscape	Area of total dwelling unit in m ² (mean)	Area of foodscape in m ² (mean)	% of area occupied by foodscape of the total dwelling unit
Livestock farming	60.02	28.98	48.3%
Small-scale vegetation	40.13	11.61	29%
Retail shops	30.28	8.17	27%
Home-based restaurants	49.24	16.07	32.6%

Table 6: Availability of dwelling space used by sub type of foodscape in Greenland slum (Source: Survey, 2023)

Besides, home-based restaurants utilize one third of domestic space due to the preparation spaces for food and the installation of equipment. Similarly, approximately one-third of the space is occupied by most of the small-scale vegetation. The survey reveals that this amount of space is efficient only for household consumption and not for income generation. Interestingly, only one-fourth of domestic space is enough to run a retail shop. The agglomeration of this foodscape is relatively greater than that of others in this settlement due to the fact that it generates a greater profit while occupying a smaller area.

- **Neighbourhood level**

An urban foodscape at neighborhood level refers to those that are located in the neighborhood spaces but are spatially adjacent to dwelling units. To investigate the existing spatial manifestation of foodscape at the neighborhood level, such as food vendors and community markets, the relative positioning of foodscape, space utilization, functional linkage, and space requirement have been taken into consideration.

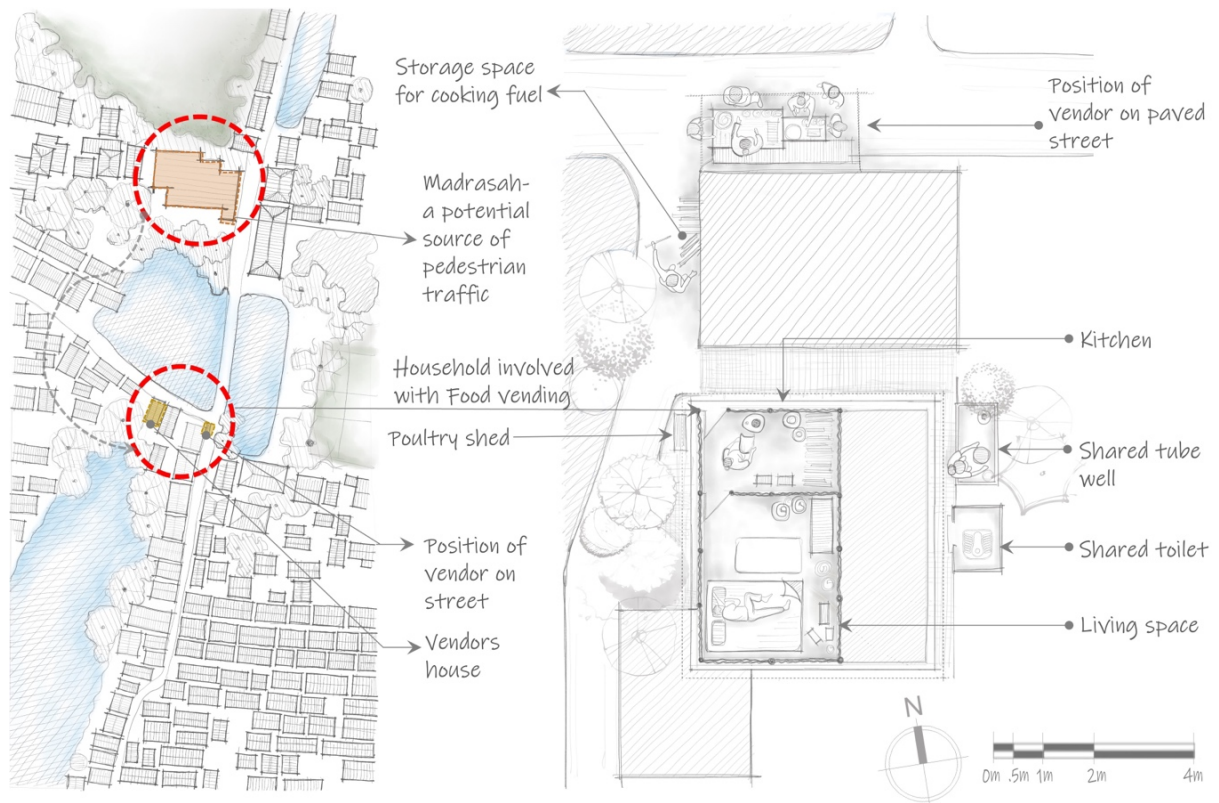


Figure 19: Left image shows the location of food vendor and potential community infrastructure in neighbourhood mapping, and the right image shows spatial morphology of food vendor at dwelling unit level of Greenland slum (Source: Survey, 2023)

The ethnographic observation reveals that the relative positioning of food vendors is primarily reliant on the volume of pedestrian traffic, surface quality, and width of the streets, as well as the proximity of community infrastructures such as schools, madrasahs, playgrounds, etc. Food vendors are primarily located at the intersection of these two streets, where the streets are relatively wide (see Fig. 19). Most vendors are floating (mobile) and adaptable in nature, occupying a small space on the neighbourhood's streets (approximately 2.78 m²) and located adjacent to the dwelling unit to conveniently transport their products from the house to the street. A portable kiosk with a light tent over it is placed on the street to exhibit the food. This adaptability is justified by the fact that they can relocate their kiosk at any time based on passenger traffic.

The community market, on the other hand, is situated at the front of the settlement, adjacent to the main thoroughfare and opposite the Rupsha River, to capture traffic from both within and outside the neighborhood and also facilitate the loading and unloading of products (see fig 20). The daily market typically takes place in a semi-outdoor setting with a small amount of space allocated delicately for the community women to sell dry and wet products. The local name of the daily market is "*Bou Bazar*" (women's market), which sells a combination of food grown in the neighbourhood and purchased from a wholesale market located outside of the neighbourhood. The approximate space provided for this market is 5,000 sq. ft. Spaces are clearly dedicated here, both for the dry and wet zones, which are divided by an eight-foot-wide pathway for the efficient circulation of the buyers. Besides, services such as drainage, tube wells, and toilets are properly organized and distributed to efficiently operate the whole market. Several retail shops, shoe stores, cooking fuel stores, and offices of NGOs have been also developed in the immediate vicinity of this market.

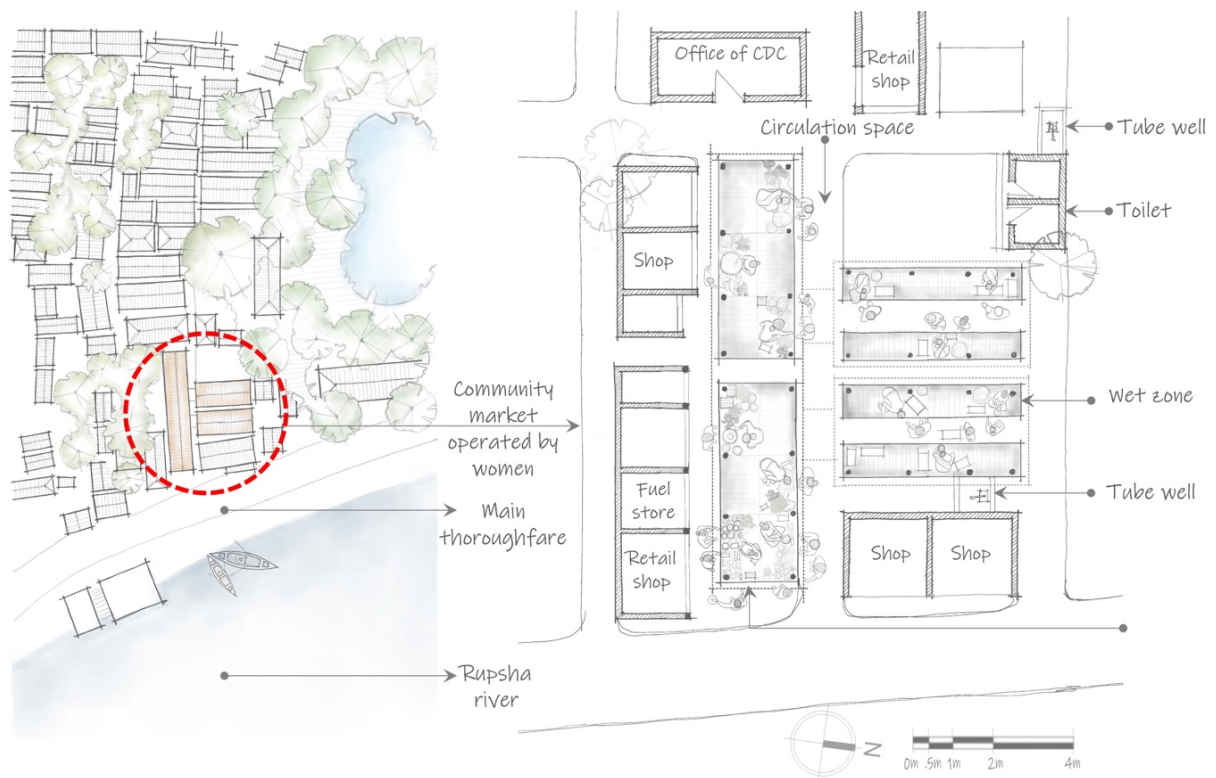


Figure 17: Left image shows the location of community market in neighbourhood mapping, and the right image shows spatial morphology of community market in Greenland slum (Source: Survey, 2023)

The above discussion reveals that the Greenland slum offers great potential for utilizing limited spaces for food production. Beside this, flexibility and adaptability are the key characteristics of the built environment, which accelerate the agglomeration of foodscapes within this settlement. In addition, unbuilt and leftover spaces in the neighbourhood have economic potential that built environment professionals should take into consideration.

4.5 Women's role as contributors to urban foodscape

A growing body of research acknowledges the significance of gender roles by asserting that women are the dominant actors in the context of informal economic activities prevalent in low-income housing in developing countries. However, to determine the role of women in foodscapes, this study takes into consideration their contribution to labour, decision-making power, and participation in food provisioning activities.

4.5.1 Contribution to labour

Determining the role of women in urban foodscapes in informal settlements requires an understanding of who participates in labour and how much time is allocated to these activities. Empirical evidence suggests that women play a highly variable role in the labour contribution of foodscapes in Greenland slum. While they dominate food production but their contribution to labour is a factor of many interacting variables: the nature of foodscapes, types of labour, and the prevailing socio-cultural norms. The nature of spatial organisation in urban foodscapes has become so intricately intertwined with domestic activities that determining labour contributions in this field is extremely challenging. Additionally, considering the family-oriented nature of the labour and the flexible activity pattern, it is difficult to determine how much practical contribution women make to this field. However, it is evident that the most prominent types of labour they employ to operate foodscapes are own account and family

labour because of the small profit of the business. In contrast, if the scale of the foodscape is large and the activities are laborious (such as livestock farming, home-based restaurants), they may occasionally hire a paid employee to run the foodscape. Though it is mostly run by family labour, in most cases, both males and females are involved as labourers to operate the foodscapes.

Sub-types of foodscapes	Types of labour	Involvement of labour by gender	Time allocation for labour (hrs per day)
Livestock farming	Own account	Male	3 – 4
	Family labour	Female	7 – 8
	Paid labour		
Small-scale vegetation	Own account	Male	2
	Family labour	Female	5 – 6
Retail shops	Own account	Male	1 – 2
	Family labour	Female	8 – 10
Home-based restaurants	Own account	Male	6
	Family labour	Female	10 – 12
	Paid labour		
Food vendors	Own account	Male	2
	Family labour	Female	10
Community market	Own account	Male	1 - 2
	Family labour	Female	5 - 6

Table 7: Involvement of labour in different foodscapes by time and gender
(Source: Survey, 2023)

However, the pattern of labour involvement is gender-biased and associated with the prevailing socio-cultural norms of the context. According to the survey results, women allocate substantially more time per day to foodscape-related activities than men, as the home is a private sphere largely governed by women (See table 07). In contrast, if the foodscape is relatively large and the activities are laborious, such as livestock farming and home-based restaurants, then males tend to dedicate more time to these activities as compared to other foodscapes.

4.5.2 Decision-making power

Women have substantial decision-making power concerning timing, location of foodscapes as well as crop and foodstuff management. In terms of time allocation, empirical evidence from Greenland slum reveals that women wield substantial power to make decision regarding who will devote how much time to their foodscape (see table 08). One of the reasons for the power of time allocation is the location of foodscapes in the private sphere, where women have substantial control over it. Similarly, women have significant power over the intensity of food/crop management for foodscapes. In this study, food management intensity refers to the types and monthly amounts of food (crops, foodstuffs) that must be grown or purchased for foodscapes. The decision-making power of women over the intensity of food management is due to the socio-cultural norms that assign women the role of ensuring the food security of household members. Furthermore, there is a considerable difference in decision-making power between genders in terms of the location of the foodscape. Women are primarily responsible for determining the location of foodscapes, particularly in households headed by women. Designing an effective spatial zoning encourages women to determine the position of foodscapes, as they are the predominant unitizers of the space. In extreme cases, a male person

is also accountable for determining the location of foodscapes, especially where the household is male headed.

Sub-types of foodscapes	Decision making power		
	Time allocation	Location of foodscapes	Intensity of food/crop management
Livestock farming	Male, Female	Male, Female	Female
Small-scale vegetation	Female	Male, Female	Female
Retail shops	Female	Female	Female
Home-based restaurants	Female	Male, Female	Female
Food vendors	Female	Female	Female
Community market	Female	Female (selection of shop space)	Female

Table 8: Decision making power of women involved with foodscapes in Greenland slum (Source: Survey, 2023)

4.5.3 Participation in food provisioning activities

The women of the Greenland slum are predominantly participating in a large number of the activities associated with each of the six subtypes of foodscapes identified in this study. There are, however, some instances in which men are found to be involved in specific activities such as collecting and carrying grass for livestock, purchasing food from the market, collecting soil for cultivation, applying fertilizers, harvesting, and carrying heavy tools for foodscapes. Male participation in these activities is driven both by existing social norms and by the laborious nature of work. For instance, existing social norms prohibit women to carry grass on their heads from the grazing area to their dwelling. Similarly, some activities that are highly laborious in nature and burdensome for women require men's involvement, such as the collection of soil for cultivation, carrying heavy tools for foodscapes, etc. Furthermore, the lack of market exposure of women also leads to men's involvement in foodscape specific activities. Table 9 illustrates the position of women in different food provisioning activities to illustrate the participation of women in urban foodscape.

Livestock farming	Activity	Farm cleaning	Grass Collection	Cattle bathing	Purchasing of cattle feed	Cattle feed collection (From neighbours)	Preparation of cattle feed	Feeding	Milking	Selling dairy products	Purchasing of cattle
	Women's participation	√	0	√	0	√	√	√	√	√	√

Small-scale vegetation	Activity	Land selection	Space cleaning	Soil collection	Weeding	Bed preparation	Collection of seeds	Sowing	Irrigation	Application of fertilizer	Support arrangement	Harvesting
	Women's participation	√	√	0	√	0	√	√	√	0	√	√

Retail shops	Activity	Shop opening	Shop cleaning	Pick up the product at store	Arrangement of products	Inventory management (2 to 3 times per week)	Receiving products from agents	Purchasing products from market	Product selling	Cost accounting	Shop closing
	Women's participation	√	√	√	√	√	√	√	0	√	√

Home-based restaurants	Activity	Shop opening	Shop cleaning	Furniture rearrangement	Oven preparation	Vegetable chopping	Preparation of food	Purchasing products from market	Cooked food selling	Utensils washing	Cost accounting	Shop closing
	Women's participation	√	√	√	√	√	√	√	0	√	√	√

Food vendors	Activity	Street cleaning	Carrying furniture and food up to the road	Spices preparation (for 1 week)	Purchasing products from market	Vegetable chopping	Food selling	Utensils washing	Cost accounting	Shop closing
	Women's participation	√	0	√	0	√	√	√	√	√
Community market	Activity	Shop cleaning	Inventory management	Purchasing items from wholesale market	Product sorting and packaging	Arrangement of products	Product selling	Cost accounting	Product storage after sale	
	Women's participation	√	√	√	√	√	√	√	√	
Poultry farming	Activity	Poultry feeding	Poultry shed cleaning	Putting the chickens into the shed	Selling poultry products					
	Women's participation	√	√	√	√					

Table 9: Women's role in different food provisioning activities of urban foodscapes (Source: Survey, 2023)

4.6 The extent of migrant women's household food security

4.6.1 Food availability

Food availability in the field of household food security refers to the source of food through household cultivation. For this study to comprehend existing household food security in the Greenland slum, it is essential to assess the extent to which existing foodscapes assure migrant women's food availability.

- **Source of food**

In informal settlements, the term source of food is primarily related to food cultivation at both the household and neighborhood levels. In Greenland slum, the main source of food is obtained from nature-oriented foodscapes, such as livestock farming and small-scale vegetation. According to the field survey, most respondents (63.6%) involved in nature-oriented foodscapes agreed that household food production contributes to the supply of food. Aside from that, more than half of the respondents also agree that this household production reduces their dependency on food purchases. Despite their agreement regarding food supply, the majority of respondents (34%) disagree with the assertion that household food production is seldom enough to feed a family throughout the year. The scarcity of land adjacent to dwellings leads to an insufficient production rate, which is one of the main factors contributing to this disagreement. Furthermore, more than half of the respondents agree that foodscape has the capacity to protect households against seasonal unavailability, higher food prices, and COVID-19 (see fig. 21). In the context of unemployment and high food-price inflation during COVID-19, it has the potential to improve food security by increasing household food production and decreasing dependency on food purchases.

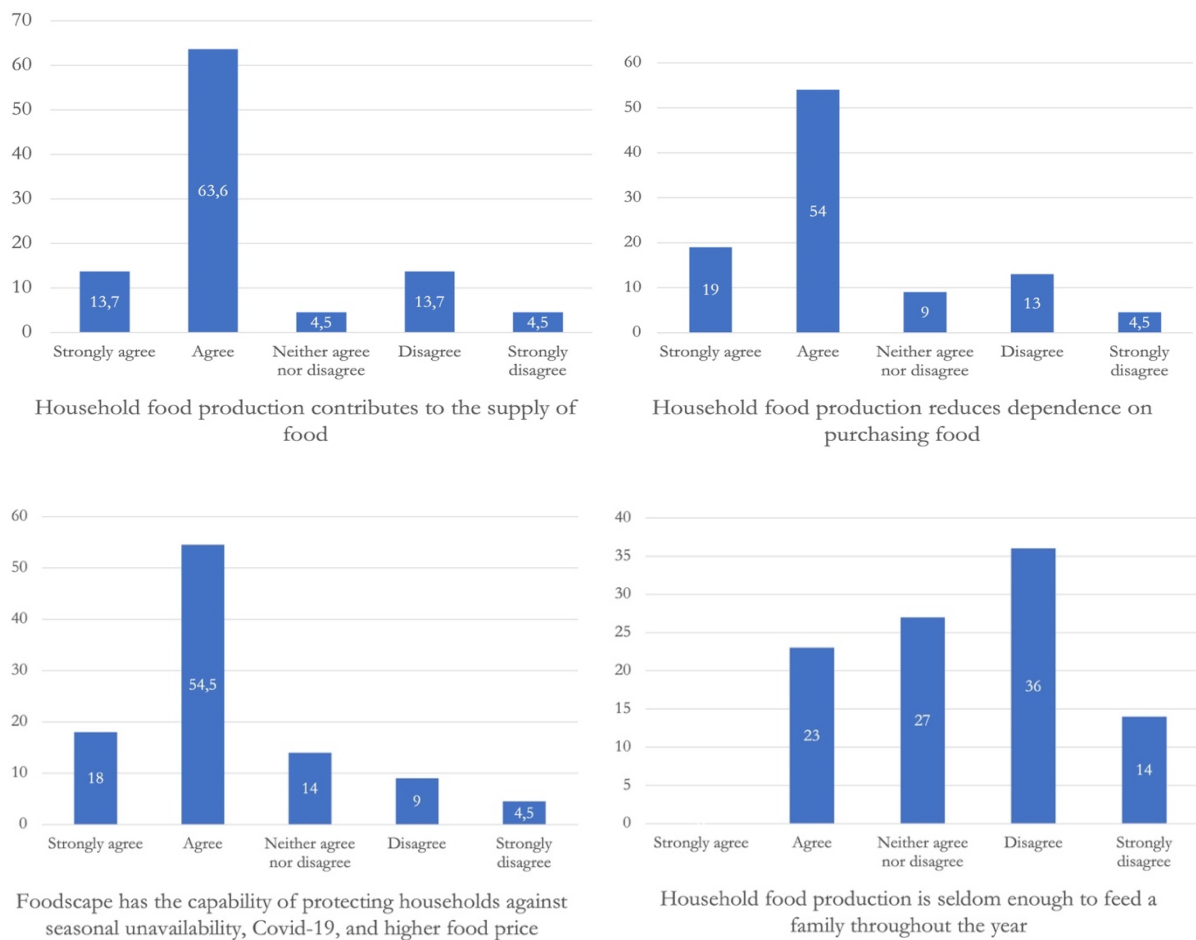


Figure 18: Household responses regarding the contribution of foodscape as a source of food in Greenland slum (Source: Survey, 2023)

4.6.2 Food accessibility

Food accessibility, as a second pillar of household food security, depends on the source of income, reciprocal exchange, and food affordability. In Greenland slum, both nature- and built environment-oriented foodscapes are associated with these variables of food accessibility. Nevertheless, it is crucial to assess the level of food accessibility in the prevalent context to gain a deeper understanding of existing household food security.

- **Source of income**

Economic accessibility to available food is considered a second pillar of food security. Numerous studies suggest that urban foodscapes provide dwellers with additional incomes, either by selling or not purchasing domestically grown surplus crops, allowing them to spend the extra cash on staple foods (e.g., sugar, maize flour, cooking fat) (Gallaher et al., 2013). According to the survey, a similar result can also be drawn: the amount of crop or food production is sufficient for sale, as agreed by most respondents (54.5%). Beside this, more than half of the respondents agree with the fact that the amount of crop production contributes to the overall household's income. Additionally, income from this foodscape has a positive effect on the total share of household food expenditure, as agreed by the majority of respondents (68%). Apart from this, more than half of the respondents also agreed that the amount of household income increased after the operation of foodscapes (see fig. 22). Even though foodscapes are female-dominated in informal settlements, nearly half of the respondents agree

with the fact that women’s income from foodscapes is more strongly associated with improvements in household food security than men’s income.

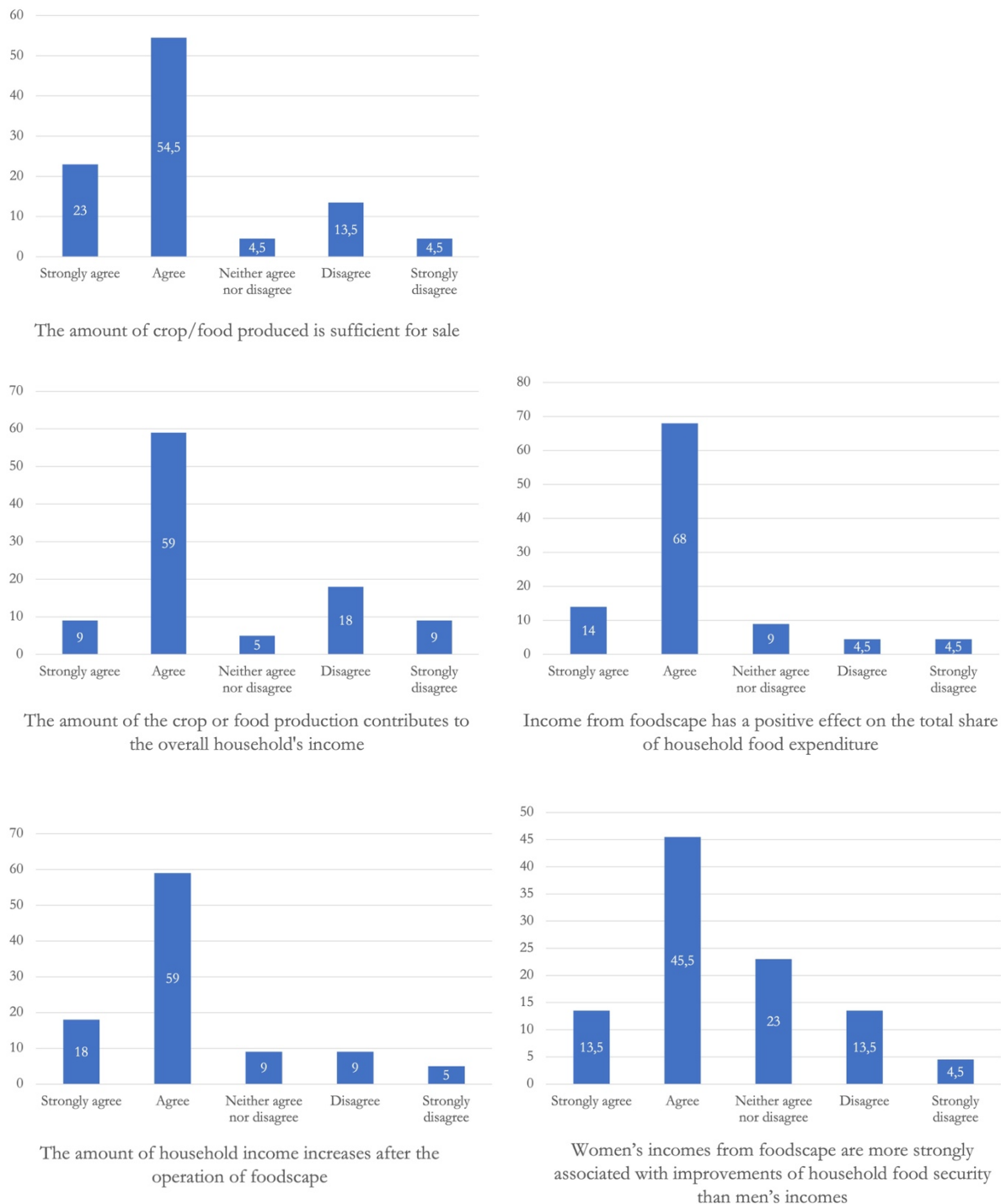


Figure 19: Household responses regarding the contribution of foodscape as a source of income in Greenland slum (Source: Survey, 2023)

- **Reciprocal exchange**

Food accessibility as a second pillar of food security depends not only on household income but also on the patterns of reciprocal exchange that exist within a neighborhood of low-income settlements. This exchange of food among neighbors ensures food security at a certain level. To access this reciprocal exchange, social relationships or networks are thus crucial. Empirical

evidence reveals most of the women (54.5%) involved with foodscapes in the Greenland slum have a good social relationship with their neighbors (see fig 23). Foodscape has fostered a sense of community and established a network among neighbors, which not only facilitates women operators but also customers in an interchangeable manner. Therefore, the majority of the operators (68%) reported that their relationship with the neighbors has considerably improved since beginning foodscapes (see fig 23).

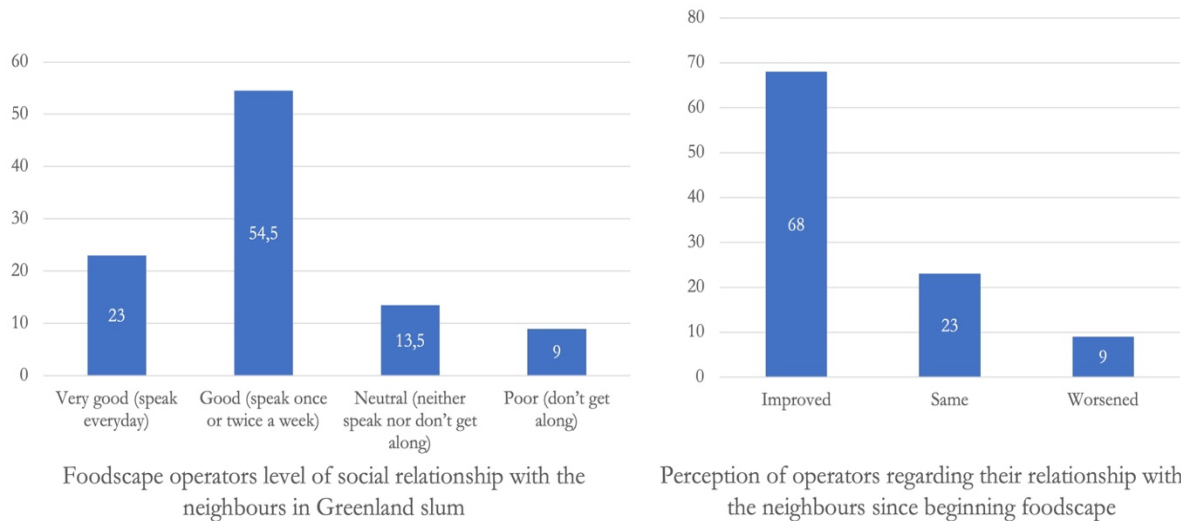


Figure 20: Left graph shows the operator's level of social relationships with the neighbours, and the right graph shows their relationship with neighbours since the beginning of foodscape in the Greenland slum (Source: Survey, 2023)

It is also found that social ties are deeply entrenched within the vicinity of the Greenland slum through trust, mutual assistance, and family ties. One of the important aspects of these social ties is the non-monetary exchange of goods and services among the households. In cases of reciprocal exchange, women operators largely distribute their goods and services associated with foodscapes with their neighbors, such as surplus food (processed or cooked food), yield (fruits and vegetables), dairy products (milk, eggs), cash loans, and informal credit systems. On the contrary, in exchange for goods and services, the women operators receive yield (fruits and vegetables), cow fodder, fertilizer (chemical, cow dung), cash loans, physical labor (for food making and conducting shops), and social security (keeping an eye on the garden) from neighbors. In some instances, the pattern of reciprocal exchange is widespread, which eventually minimizes the overhead costs associated with foodscapes. For example, women operators involved with livestock farming often collect cattle fodder (rice starch, rotten fruit, and vegetable peels) from 10 to 15 households around them (see Fig. 24). Because of these social ties, one-third of the cattle fodder comes from the neighbors without any cost. In reciprocity, the operators also provide milk to the neighbors, as stated by one of the respondents:

Every time, when a cow gives milk for the first time, I distribute 1/2 kg of free milk among the 10 to 15 households that provide me with rice starch, rotten fruit, and vegetable peels for cattle feed. The distribution depends on the amount of milk produced per day. "It is very difficult to operate this business if you are not united." No one will buy milk from me if there is no good relationship with the neighbour. (50-year-old women involved in livestock farming)

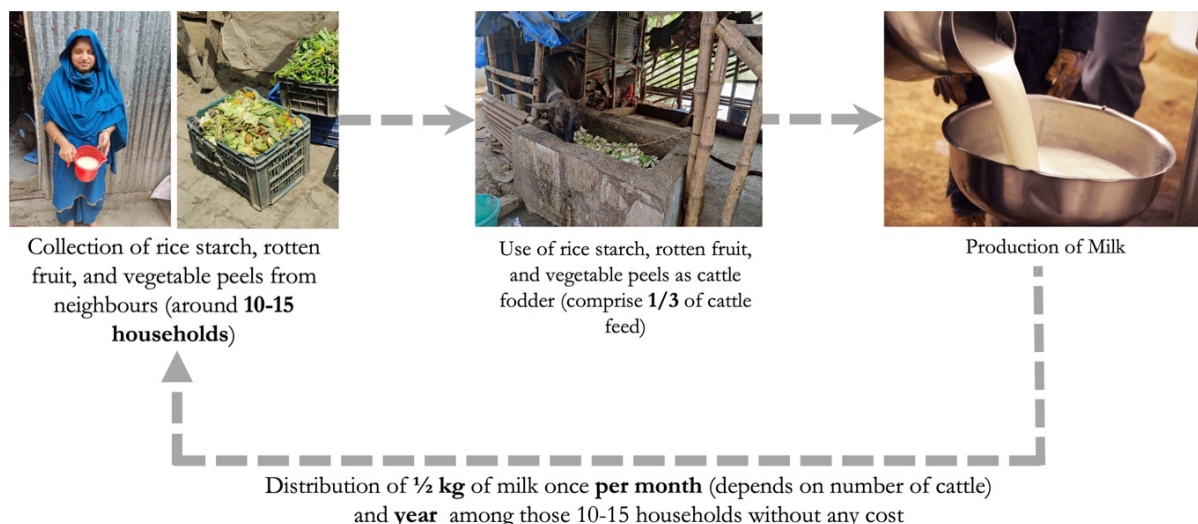


Figure 21: The pattern of reciprocal exchange prevails between the livestock farmers and the neighbours in the Greenland slum (Source: Survey, 2023)

It is clear from the above discussion that migrant women always utilize their social network as a key mechanism to maximize their limited resources in a more efficient manner. Therefore, the larger the scale of the foodscapes, the greater the number of social networks they possess, which also facilitates greater sharing and exchange of goods and services within the settlement (see fig 25).

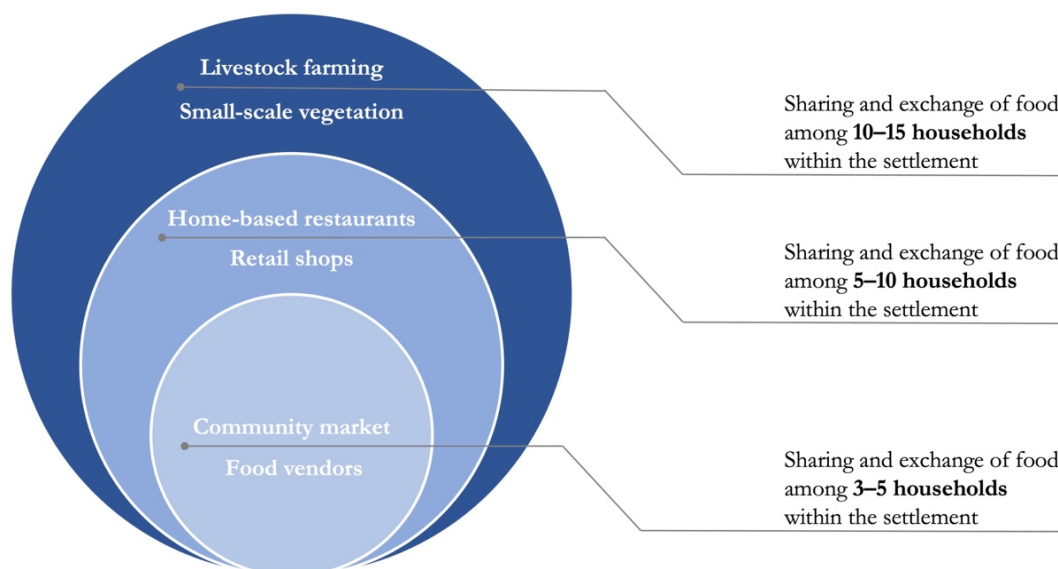


Figure 22: The extent of the social network of women involved in foodscapes in the Greenland slum (Source: Survey, 2023)

- **Affordability of food**

Food affordability is a crucial factor in determining food security since most urban households are largely reliant on purchased food. Thus, to assess the food affordability of households in the Greenland slum, food costs, household purchasing patterns, and the proximity of foodscapes are taken into consideration, all of which are intricately interconnected. However, to assess food affordability, a FGD was conducted with households that are not involved in foodscapes. During the FGD, most of the respondents stated that shops inside the neighbourhood are less expensive than shops outside. In fact, the cost of food is highly

associated with the unique purchasing patterns of households in this settlement. The informal livelihood system of the dwellers primarily determines their household purchasing pattern, which is mostly on a daily and weekly basis. To increase food affordability, households give priority to smaller quantities over quality, which forces the operators to sell the amount that they can afford. The reasons behind this smaller quantity are that larger quantities require more money at once, which they cannot afford, as well as the lack of food storage capacity within the dwelling. The operators basically use two types of measuring systems to increase affordability: one is a '*muithe*', or grip system (one or two grips), and another is a bunch (5 or 10 taka per bunch or grip). Products are bought and sold here according to the purchasing power of households and their visual estimations.

Food affordability may also differ based on the location of the foodscapes. The distribution of foodscapes has implications for both the physical and economic accessibility of food for urban households. Urban households in informal settlements chose food sources based on the calculation of food cost, transportation cost, travel time, location of foodscapes, quantity, and availability of food types. In the Greenland slum, foodscapes not only serve as a catalyst for households' fundamental income but also benefit the community at large by providing supplies within walking distance. Lastly, the presence of foodscapes within a neighborhood also reduces the travel time and transportation costs associated with food, thus increasing household affordability.

4.7 Factors influencing urban foodscapes and migrant women's food security

In developing countries, women play a crucial role in maintaining food security, particularly food accessibility and availability. But they accomplish these roles despite considerable socio-political, economic, and physical constraints (Quisumbing et al., 1996). The decision to participate in the urban foodscape is driven by three broad categories of factors: socio-political, economic, and physical. Yet, these factors are intertwined and influence one another within the broader context of informal settlements.

4.7.1 Socio-political factors

- **Access to land**

Access to food as a form of access to land is widely acknowledged as crucial to household food security. In informal settlements, land tenure complexity is prevalent, and its negotiation and renegotiation determine urban households' food security. Findings from the study reveals that the residents of Greenland slum don't have any legal entitlements as the land belongs to the BRA. Despite having no legal tenure security, residents in this settlement are still operating different types of foodscapes both at the dwelling and neighborhood levels. The operation of these foodscapes in this settlement is due to the fact that the residents, especially women, experienced perceived tenure security due to the absence of forced eviction by BRA, their increasing length of stay on the railway land, and the acquisition of some basic services and infrastructures such as water supply, sanitation, roads, etc.

Their sense of tenure security is further buttressed by the efforts of female community leaders, who are lobbying with the local ward councilor for protection against eviction. Over the years, Greenland slum's residents and community leaders have nurtured political relationships with these leaders, who consider this area as a voter bank. A few residents also claim that now a days residents are illegally purchasing house from other residents or councilor. Even, the

current ward councilor is taking money illegally and give permission in the form of a written format to many people to enter in this settlement. This sort of illegal entitlements is also strengthened women's land tenure security at a certain level to operate foodscapes. Furthermore, few indicate that a sense of territory has developed among them, which in turn stimulates them to run foodscapes, since many foodscapes are spatially located within dwellings.

- **Spatial negotiation**

In informal settlements, space is negotiated by the urban poor in a variety of ways for both earning a living and food production. To survive in an urban landscape, women in informal settlements use the very limited space in a creative and inventive way. However, the negotiation of space and conflicts arise when space is small, both on the domestic and neighborhood scales. Empirical evidence reveals that, the spatial negotiation of Greenland slum can be viewed as a representation of power relations, conversion of domestic and productive space, initial possession and mutual sharing of space, relationship with homeowners, scale, and floating nature of foodscapes. Spatial negotiation for the utilization of neighborhood spaces (such as street, community pond etc.) often depends on the power relation between the dwellers and the political or religious leaders of the community (see fig 26). As stated by one respondent:

We have a good relationship with the Emam shaheb of the mosque. I can cultivate in the common space of the pond with his support. My husband always cleans the mosque. That's why Emam shaheb gives us the permission to cultivate that space. (35-year-old women involved with vegetable farming)



Figure 23: Left image shows the mutual sharing of street for sack gardening, and the right image shows the use of community pond edges for cultivation in the Greenland slum (Source: Survey, 2023)

In most situations, the negotiation leads to the exclusion of domestic spaces and the conversion of one productive space (cultivation space) to another (retail shops). In addition, the control over land is determined by the initial possession of space by dwellers in the settlement. In most cases, the limitation of space is overcome by the mutual sharing of community spaces (streets for cultivation, community kitchens, etc.) among the dwellers (see fig 26). Occasionally, the control over spaces is also reliant on the tenant's relationship with the homeowners. High rental charges and threats of eviction also happen due to an unbalanced power relationship between tenant and homeowner. Furthermore, a few operators negotiate their space by upholding the small-scale and floating nature of their foodscapes, rendering them physically invisible to others (see appendix 4).

- **Social norms**

Women are more actively involved in foodscapes than men, but their level of participation is constrained by social norms such as conservative cultural upbringing and the religious ideology of a given context. It is evident from the survey that male dominance and sociocultural unacceptance uprooted from conservative cultural upbringings impede women's ability to actively participate in the foodscape of the Greenland slum. For instance, the male household member's approval is required for women to utilize the road for food vending. Beside this, the use of vans to increase the mobility of food vendors and bicycles for trading is not considered socio-culturally acceptable for women. On the contrary, a few respondents claim that social norms don't exist for them because of their sense of empowerment engendered by female community leaders. Besides, women are obliged to maintain a certain level of purdah (privacy) in Bangladesh due to their religious ideology as Muslims, which influences their selection of work types. For instance, a few women who maintain purdah in Greenland slum used to operate nature-oriented foodscapes for privacy in the workplace. In contrast, this settlement contains a large number of Muslim women who are destitute, and this is the primary reason why the privacy of the workplace or spatial confinement does not exist for them. As noted by one respondent:

I have no problem with purdah. Since I don't have a husband and son, so this purdah doesn't work for me. (48-year-old women involved in retail shop)

4.7.2 Economic factors

- **Access to support programmes**

Access to support programmes is crucial to increasing the capacity of urban women to produce food and household income. From the survey, it is evident that there are multiple types of support programmes (such as donations, grants, and trainings) offered by different GOs and NGOs to enhance women's capacity and facilitate foodscape-related activities within the Greenland slum. The organizations that are involved with these programmes are the Ministry of Agriculture, Department of Animal Husbandry, Women's Cooperation Society, Poverty Alleviation Women Welfare Society, Caritas, BRAC, etc. In-depth interviews with the respondents reveal that most of the organizations provide donations to start up small-scale businesses such as retail shops, restaurants, livestock farming, etc. Trainings are provided on knowledge about efficient techniques of cultivation, environment-friendly farming, the preparation of compost, fast food preparation, and managerial skills for entrepreneurs. After training, occasionally they also provide donations for small food-related businesses so that the women can utilize their skills. The KII also reveals that BRAC is working in this settlement to scale up urban agriculture, with the notion that a certain portion of food security for the impoverished derives from local initiatives. The main task of urban agriculture is to utilize the limited open spaces within the community for food production on a small scale. As a part of

this programme, training and seeds are given to the women to grow in sacks or by making scaffolds (see fig. 27).



Figure 24: Left image shows the seeds provided by BRAC, and the right image shows the drum provided by Caritas for cultivation in the Greenland slum (Source: Survey, 2023)

To maximize the utilization of limited resources in an efficient way, all these programmes target women as participants. However, the selection process for these participants involves a lack of transparency and accountability. Most of the respondents claim that corruption, nepotism, and age barriers are the major challenges that limit women's access to support programmes. Most community leaders are responsible, on behalf of the organizations, for preparing the list of destitute women for the programmes. While nepotism and corruption both persist here, they prioritize those who support government political groups. The community leaders also take a certain amount of money from them as a bribe for the selection of the donations. Therefore, it is evident that, a lot of support programmes are available for migrant women to improve household food security. In contrast, the extent of food security depends not only on the availability of support programmes but also on the transparency of the selection process for the participants.

- **Access to credit**

The operation of urban foodscapes in informal settlements largely depends on women's access to credit. Most of the women in informal settlements start their foodscapes on a small scale with a limited amount of capital. In the context of the Greenland slum, it is very difficult for the women to manage this amount of money from their own pockets. Thus, the sources of credit they access to obtain this capital are micro-credit institutions, community savings groups, personal savings, and loans from relatives, friends, and neighbours. The absence of land tenure security for women in this settlement impedes them from utilizing land as collateral for formal credit. Due to a lack of access to formal credit, most women in the Greenland slum have obtained loans from microcredit institutions (such as NGO's), while others go to relatives, friends, and neighbours. Among these, NGOs Asha, BRAC, *Nobolok*, CSS, Shakti, and TMSS are the most common sources from which women can obtain loans. Most of the loans are yearly schemes for small business investment purposes, such as retail shops, restaurants, farming, and so on. Women are prioritized for the loan because they are the main actors in small credit savings. But widowed women don't have access to this loan because it requires the signature of the husband as a guarantor. The form of collateral required to obtain this loan is savings, a

national identity card, and two guarantors from the neighbourhood. Thus, a strong societal tie within the neighbourhood is also required to manage two guarantors to access the credit. Despite having a high interest rate compared to formal credit institutions, these micro-credit institutions are the only vehicle for these migrant women to support the foodscape and ensure food security because they don't require legal entitlements as collateral.

- **Ease of access to market**

Women's access to the market for food is strongly associated with the existing social norms of the prevailing context. In the Greenland slum, women's lack of market exposure is rooted in existing social norms, such as domestic space for women and workspace for men, which subconsciously confine women spatially within the neighborhood. Most women who are engaged with nature-oriented foodscapes have less exposure to the market. While they always buy products from the community market and sell dairy products and vegetables from their house, sometimes they go door to door within the neighborhood. However, this social norm does not work for people who are hungry or destitute. Thus, a few destitute women who are engaged with built environment-oriented foodscapes have access to markets outside the community. In most cases, the lack of women's exposure accelerates various agents' movements within the settlement to come and deliver products to the retail shops. However, this lack of exposure also increases the dependency of women on middlemen. As most of the women rely on their husbands, sons, and fathers to purchase commodities from the market. Thus, this form of dependency occasionally gives men control and power over monetary assets. In extreme cases, gender discrimination in the market outside the community leads to the involvement of middlemen in this field. For instance, a woman is always offered a lower price by a shopkeeper when they sell commodities in the market. Sometimes, the reduction in profitability also happens because they must pay some money to the middleman.

4.7.3 Physical factors

- **Availability of space**

Informal settlements are regarded as spaces of poverty with significant implications on urban food security. In the Greenland slum, this scarcity of space is one of the crucial factors affecting the migrant women's household food security. Lack of adequate space for foodscapes hinders the level of food production (crop) both at the dwelling and neighborhood level. In extreme cases (for instance, small-scale vegetation), it only supports household food consumption to a certain extent whereas income from surplus production is severely impacted by this scarcity of space. Respondents also claim that the subtraction of their domestic and productive spaces occurred due to infrastructural development projects such as paved street constructed by Caritas. However, this scarcity of spaces generates several challenges associated with foodscapes, such as the exclusion of domestic space, functional disorders, overcrowding, and thermal discomfort. In most cases, the operation of foodscapes results in the exclusion of domestic spaces. In some instances, the quantity of space allocated to foodscapes is significantly higher than domestic spaces (such as livestock farming). Occasionally, the limited dwelling spaces lead to the placement of foodscapes far from the domestic spaces, resulting in functional disorder for productive activities. Besides, operators also lose customers due to a lack of circulation and overcrowding of spaces. The operators of the home-based restaurants utilize the same shop space for cooking, this overcrowding additionally triggers thermal discomfort for the customers. Moreover, the limited space also hinders the women's ability to

implement the skills they have acquired from different GOs and NGOs. Therefore, the absence of space renders training and donations useless. As mentioned by one respondent:

There are different types of training happens all the time in this community especially for female. But what will we do with these trainings if we don't have a space to do business in the settlement. (45-year-old women involved in home-based restaurant)

- **Provision of services and infrastructure**

In informal settlements, the practices of foodscapes are strongly correlated with the availability of services and infrastructure and are intricately linked to land entitlements as well. In Greenland slum, the dwellers have access to certain services and infrastructure, such as shared tube well, shared toilet, sewerage connection, drainage, paved streets, electricity, and refuse collection. In-depth interviews reveal that some basic services and infrastructure are required to start a foodscape in its initial stages. For instance, most of the nature-oriented foodscapes in this settlement originated from water sources such as those adjacent to the community pond and tube well. On the contrary, most of those built environment-oriented foodscapes are large-scale and well established, located along the major wide streets of the settlement. Dwellers who have access to shared services and infrastructure noted that these are provided by KCC, CDC, Nobolok, Urban Prokolpo, BRAC, Caritas, and so on. Despite the lack of tenure security, the availability of services and infrastructure stimulates the accumulation of foodscapes within the settlement. However, this absence of tenure security also affects the foodscape by hindering women's access to some fundamental services and infrastructure. For instance, pumping water and electricity are mandatory for livestock farming. But most of the electricity connections are illegal due to the absence of legal entitlements. Additionally, a lack of streetlights or lamp posts also halted the activity of street vendors after evening. Furthermore, inadequate electricity connections and cold storage facilities in community markets frequently result in high levels of food loss. Therefore, it is evident that the effective functioning of a foodscape depends not only on the availability of services and infrastructure but also on the land tenure status of the settlement associated with it.

4.8 Summary of the findings

The empirical findings delineate how place-based and women-led urban foodscape practices at both dwelling and neighbourhood level can be an effective and sustainable solution towards addressing household food security in the Greenland slum of Khulna. Findings from the case study reveal that two broad typologies of foodscapes exist within the Greenland slum: nature-oriented and built environment-oriented foodscapes. The spatial manifestation of these foodscapes demonstrates that most of the activities are small-scale home-based businesses, which are flexible or adaptable by nature and spatially integrated with the dwelling (see table 10). On top of that, unbuilt and leftover spaces of the neighbourhood (ponds, streets, set back spaces between street and house) have the potential for both income generation and food production. Additionally, migrant women are the predominant actors in this sector and contribute substantially to the labour force, decision-making processes, and food provisioning activities (see table 10). Nonetheless, these foodscape practises also ensure some extent of household food security, specifically food availability and accessibility, by addressing source of food, source of income, reciprocal exchange, and food affordability. Apart from being facilitating by food and income source, strong societal ties, unique purchasing pattern and presence of foodscapes within neighbourhood also ensure household food security. Furthermore, the findings reveal that both foodscapes and food security are influenced by several influential factors, specifically socio-political, economic, and physical factors. Table 11 demonstrates an overview of empirical findings concerning those factors.

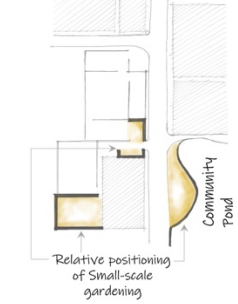
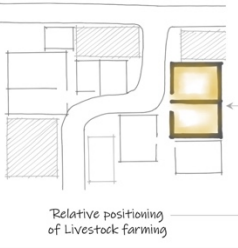

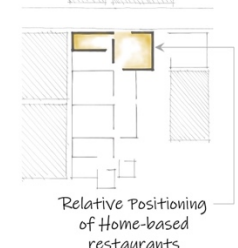


Broad typology of foodscapes	Sub-typology of foodscapes	Spatial Morphology	Role of women	Extent of household food security
Nature-oriented foodscapes	Small-scale vegetation		<p>Contribution to labour</p> <ul style="list-style-type: none"> Types of labour: Mostly own account, family labour and sometimes paid labour Substantial allocation of time by women Involvement of men only in the large-scale and laborious work of foodscapes <p>Decision-making power</p> <ul style="list-style-type: none"> Substantial power of women to make decision regarding time allocation Decision-making power of women over the intensity of food management due to sociocultural norms 	<p>Food availability</p> <p>Source of food</p> <ul style="list-style-type: none"> Contribution of domestic production to household food supply Insufficient production to feed a family throughout the year (such as small-scale vegetation) Capacity to protect against future shocks <p>Food accessibility</p> <p>Source of income</p> <ul style="list-style-type: none"> Sufficient amount of food production for sale Contribution to overall household income Contribution to household food expenditure Contribution of Women's income to household food security
	Livestock farming			
Built environment-oriented foodscapes	Retail shops		<p>Participation in food provisioning activities</p> <ul style="list-style-type: none"> Higher participation of women in different food provisioning activities Existing social norms, laborious nature of work, and women's lack of market exposure lead to men's involvement 	<p>Reciprocal exchange</p> <ul style="list-style-type: none"> Good social ties ensure intra-neighbourhood food allocation Non-monetary exchange of goods and services Sharing of food depends on scale and typology of foodscapes <p>Availability of food</p> <ul style="list-style-type: none"> Less expensive food cost Unique household purchasing pattern: Daily or weekly basis (smaller quantity) Unique measuring system to increase affordability: grip and bunch system Supply of products within walking distance
	Home-based restaurants			
	Food vendors			
	Community market			

Table 10 : Empirical findings of urban foodscapes and migrant women's food security in the Greenland slum (Source: Author, 2023)

Variables	Sub-variables	Indicators	Empirical findings
Influencing factors of urban foodscape and migrant women's food security	Socio-political factors	Access to land	<ul style="list-style-type: none"> • Absence of forced eviction • Increasing length of stay on land • Acquisition of basic services and infrastructures • Political relationship with local leader (Ward councillor) • Illegal entitlements • Sense of territory
		Spatial negotiation	<ul style="list-style-type: none"> • Representation of power relations • Conversion of domestic and productive space • Initial possession of space • Mutual sharing of space • Relationship between tenant and homeowner • Small-scale and floating nature of foodscapes
		Social norms	<ul style="list-style-type: none"> • Male dominance • Sociocultural unacceptance (uprooted from conservative cultural upbringings) • Privacy of the workplace (due to religious ideology)
	Economical factors	Access to support programmes	<ul style="list-style-type: none"> • Donations, grants, and trainings from different GOs and NGOs • Implementation of context-specific support programmes for small-scale foodscapes • Women-led development programmes • Lack of transparency and accountability in the selection process of participants
		Access to credit	<ul style="list-style-type: none"> • Microcredit institutions (MCI) as a major source of capital • Yearly schemes loans for small business investment (MCI) • Prioritization of women to access the loan (MCI) • Lack of access to formal loan due to absence of tenure security
	Physical factors	Availability of space	<ul style="list-style-type: none"> • Lower food production rate due to scarcity of space • Subtraction of domestic and productive spaces due to infrastructural development projects • Scarcity of space also causes exclusion of domestic space, functional disorders, overcrowding, and thermal discomfort
		Provision of services and infrastructure	<ul style="list-style-type: none"> • Growth of foodscapes due to availability of services and infrastructure • Lack of access to some fundamental services and infrastructure (such as legal electricity connection) due to absence of land tenure

Table 11: Empirical findings of factors influencing the relationship between urban foodscape and migrant women's food security in Greenland slum (Source: Author, 2023)

Chapter 5: Conclusions and Recommendations

5.1 Conclusion

The study aims to investigate the connectivity between urban foodscapes and migrant women's food security in the Greenland slum of Khulna. As a data collection method, IDIs, FGD, KII and observation are conducted to gather qualitative data. Furthermore, it concentrated on the spatial manifestation of foodscapes based on typology, the role of women, the extent of household food security, and the influencing factors affecting both variables. However, this chapter outlines the key findings and draws recommendations based on these findings.

This study was attempted to find out: **‘How does the urban foodscape practice contribute to migrant women’s food security in the Greenland slum of Khulna?’** To address the above question, this research focused on four sub-questions. A detailed discussion considering the key findings of these four sub-questions will answer the overarching research question, which is summarised in the following section.

5.1.1 Spatial manifestation of urban foodscape based on typology

Empirical findings reveal that there are two broad typologies of urban foodscapes: nature-oriented and built environment-oriented foodscapes that exist most frequently in the Greenland slum of Khulna. The spatial manifestation of these foodscapes is primarily home-based, flexible, and adaptable in nature, and administered largely by women; therefore, a strong spatial linkage is required between the dwelling and the foodscapes. In contrast, some foodscapes, such as food vending and community markets, are located at the neighbourhood level but often spatially adjacent to dwelling units. However, dwellers occasionally extend their foodscape-related activities beyond domestic space to adjacent neighbourhood spaces (such as streets and ponds), particularly when conflict arises regarding limited dwelling space for productive activities. Findings from this observation also complement the arguments of Kellett and Tipple (2003), who claim that in households with limited dwelling space and large household sizes, productive activities appear to support reproductive routines, whereas others may create potential conflicts. The study also reveals that dwellers are transforming the spatial environment of the Greenland slum by utilising unbuilt and leftover spaces, including the streets, tiny spaces between street and dwelling unit, vertical and horizontal surfaces of infrastructure (see appendix 3), and even shared open and community spaces, for income generation and food production. This finding supports the argument that the flexible spatial environment of these informal settlements is perpetually shaped and transformed by the practices of urban foodscapes (Arciniegas, 2021).

5.1.2 Women’s role as contributors to urban foodscape

Based on the survey findings, women allocate substantially more time per day to food-related activities than men. Beside this, they wield substantial power to make decisions regarding time allocation, as most of the foodscapes are located in the private sphere, where women have considerable control over them. This finding reinforces the arguments of Gough and Kellett (2001), who asserted that the socio-cultural concepts of space separation, in which the workplace is viewed as male-dominated and the home as a private sphere controlled by women, are one of the reasons why women contribute more labour in foodscapes. Similarly, women have significant power over the intensity of food/ crop management and are primarily responsible for determining the location of foodscapes, particularly in households headed by women. Furthermore, the women of the Greenland slum are more likely to participate in several activities associated with foodscapes than men. This finding substantiates the assertion that the

participation of women in food provisioning activities associated with foodscapes is comparatively higher than that of men (McCarney, 1991).

5.1.3 The extent of migrant women's household food security

To assess the extent of migrant women's household food security, two pillars, namely food availability and accessibility, were analysed. According to the field survey, most respondents involved with nature-oriented foodscapes agreed that household food production contributes to the supply of food and reduces the dependence on purchasing food. This result accords with the assertion of Swanepoel et al. (2021), who claimed that foodscapes contribute to increased food availability for households through domestic production. On the contrary, due to lack of space, this food production is not seldom enough to feed a family throughout the year.

Additionally, the amount of food production contributes to the overall household income, where women's income is more strongly associated with household food security than men. Besides, social ties are deeply entrenched within the vicinity of the Greenland slum, accelerating the non-monetary exchange of a variety of goods and services among the households, and ensuring a certain level of household food security. Furthermore, foodscapes ensure food affordability by reducing food prices, facilitating a unique purchasing pattern (grip and bunch systems), and rendering neighbourhood food outlets physically accessible. This finding also complements the assertions of several authors who suggested that foodscapes ensure food affordability by lowering food prices, providing supplies within walking distance, and selling quantities that the urban poor can afford (Gondwe and Ayenagbo, 2013; Tamés, 2004).

5.1.4 Factors influencing urban foodscapes and migrant women's food security

Women's decision to participate in the foodscape is influenced by three interconnected categories of factors: socio-political, economic, and physical. The study reveals that despite having no legal tenure, women in this settlement are still operating different types of foodscapes due to the absence of forced eviction by BRA, their increasing length of stay, the acquisition of some basic services and infrastructure, political relationship with local leaders, illegal entitlements, and sense of territory. It is therefore clear that complexity of land titles and the negotiation and renegotiation associated with it determine the level of urban household food security (Laier, 1996). Additionally, the spatial negotiation related to foodscapes can be viewed as a representation of power relations, conversion of domestic and productive space, initial possession and mutual sharing of space, relationships with homeowners, scale, and the floating nature of foodscapes. It is also evident that conservative cultural upbringings and religious ideology impede women's mobility and their ability to actively participate in the foodscape of the Greenland slum. Islam et al. (2022) made a similar argument, stating that religious-cultural values are influential in the selection of workspace by women to generate income.

In the case of economic factors, it is found that a lot of support programmes are available for migrant women to enhance household food security. But the extent of food security depends not only on the availability of support programmes but also on the transparency and accountability of the selection process for the participants. Besides, the availability of micro-credit institutions is the only vehicle for these migrant women to access the loan for foodscape, as they don't require legal entitlements as collateral. In contrast, the absence of land tenure security in this settlement impedes women from utilizing land as collateral for credit from formal financial institutions. This finding supports the claim that lack of land entitlement

results in women's inability to use land as collateral for credit (Quisumbing et al. 1991). Additionally, women's lack of market exposure is rooted in existing social norms, such as domestic space for women and workspace for men, which subconsciously confine women spatially within the neighborhood.

In terms of physical factors, the study further reveals that scarcity of space for foodscapes hinders the level of food production. Besides, this scarcity generates several challenges associated with foodscapes, such as the exclusion of domestic space, functional disorders, overcrowding, thermal discomfort, and a lack of safety and security. Moreover, the availability of services and infrastructure stimulates the accumulation of foodscapes within the settlement. But it is also evident that the effective functioning of a foodscape depends not only on the availability of services and infrastructure but also on the land tenure status of the settlement associated with it. Therefore, the provisions of services and infrastructure is crucial for effective functioning of foodscapes and is intricately linked to land entitlements (McCarney, 1991).

5.2 Recommendations

5.2.1 Recommendations for settlement planning concerning women-led foodscapes in the Greenland slum

The empirical study discloses that urban foodscape and migrant women's household food security is strongly connected with each other in the context of Greenland slum. But the connectivity between these two variables is affected by some socio-political, economic, and physical factors. Thus, to strengthen this connectivity some recommendations are required focusing on those factors. This will facilitate government officials and built-environment professionals (architects, urban designers, and urban planners) in developing some comprehensive policy guidelines and resettlement or upgrading schemes for the Greenland slum by integrating women-led foodscape practices into the field of housing. The following recommendations regarding the Greenland slum are derived from the findings:

Socio-political factors

- i. Empirical evidence reveals that despite having no legal land tenure, respondents are still operating foodscapes within the settlement. However, in some cases, the absence of legal entitlements constrains the level of women's participation in foodscapes. Therefore, the study recommends that the government should provide legal land tenure among the dwellers of Greenland slum so that it will encourage more women to participate in foodscapes. Where legalization of tenure is difficult, the government should provide *de facto* tenure for several years as an alternative strategy for the development of foodscapes.

Economic factors

- i. Government should provide guidelines to different micro-credit financial institutions regarding the formulation of urban foodscape friendly credit policy.
- ii. Microcredit financial institutions should organise special funding and lending requirements for widowed women who are the only wage earners in the household and actively involved in foodscapes.

- iii. To mitigate the challenge regarding women's spatial confinement due to socio-cultural norms and religious ideology, the local government should create a wider market opportunity for the food produced by women within the neighbourhood.
- iv. Policy makers should introduce more context-specific and gender-oriented trainings for the migrant women to improve their capacity to operate foodscapes with limited resources.
- v. Accountability and transparency should be ensured by local government and the NGOs while delivering food-related support programmes among the women of the settlement.

Physical factors

- i. Empirical evidence reveals the percentage of space occupied by foodscapes of the total dwelling unit depends on the nature of activities (see Table 6). Therefore, the spaces of the dwelling unit should be provided based on the required space of the foodscapes to support household food security.
- ii. The design and layout of the dwelling unit should be flexible so that the women can autonomously transform the domestic space for productive activities based on their spatial organization of the foodscapes.
- iii. The housing upgradation initiative in the Greenland slum should be implemented without sacrificing domestic and foodscape spaces.
- iv. Findings also suggest that unbuilt spaces in the Greenland slum (such as ponds, streets, alleyways, and set-back spaces between street and house) have the potential for both income generation and food production. It is therefore imperative that urban designers and policymakers take these spaces into consideration during the spatial planning of housing to ensure household food security.
- v. Policies should be taken to promote agriculture in compact spaces, for instance, through vertical farming, scaffolding, and sack gardening, which are more accessible to women and have the capability to enhance the food security of households.
- vi. Provision of fundamental services and infrastructure (such as drainage connections, cold storage facilities, and legal electricity connections) should be ensured for the efficient functioning of foodscapes.

5.2.2 Potentials for the further study

This research is highly context-specific and concentrated on two broad typologies of foodscapes from one particular informal settlement in Khulna, Bangladesh. Hence, further study is required for a more comprehensive understanding of foodscape typologies in numerous informal settlements in Bangladesh. Besides, the empirical findings are portrayed based on the women's perspectives. Other gender dimensions are not incorporated into this research. Additionally, it concentrates on a settlement that lacks land tenure security. Thus, further research has the opportunity to compare the nature of foodscapes and the extent of household food security in relation to different land tenure forms in urban informal settlements.

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Appendix 1: Questionnaire

General Information

IDI No:	Occupancy type: Owner/ renter
Gender:	Number of household member:
Age:	Head of the house:
Religion:	Education: I/PS/SSC/HSC/BD
Years of operation (foodscape):	* I- illiterate; PS- Primary School; SSC- Secondary School Certificate; HSC- Higher Secondary Certificate; BD- Bachelor Degree

Sub-question 01: How does the urban foodscape manifest spatially according to typology both at the household and neighbourhood level in the Greenland slum of Khulna?

Variable: Foodscape

Sub-variables: Typology of food
(Semi-structured and open-ended Questionnaire, Observation)

01. Types of foodscapes

- Small-scale vegetation
 Livestock farming/ pastures
 Small grocers/Retail shop
 Food vendors
 Home-based restaurants
 Community market

02. Would you kindly provide a brief description of the food related activities you are currently conducting?

03. Location of foodscapes

- Household level
 Neighborhood level
 Both

04. Scale of Foodscapes

- Small-scale (part-time extensions of every day domestic activities)
 Larger scale (using special equipment and employ a number of people)

05. When do you run your enterprise? (Most days, holidays & seasonal basis)

06. Targeted customers

- Within neighbourhood
 Outside neighbourhood
 Both

07. What are the considerations that motivate you to operate this type of foodscape?

Sub-question 02: What role do migrant women play in contributing to the urban foodscape?

Variable: Foodscape

Sub-variables: Role of women
(Semi-structured and open-ended Questionnaire)

08. Labour information

SL No.	Name (Household labour)	Sex	Owner of Foodscape	Time allocation for labour	Decision maker for time allotment

09. Who determines the location of the foodscapes at household or neighbourhood level?

Male

Female

10. Who determines the monthly amount of food that must be grown or purchased within the household?

Male

Female

11. Who determines which foodstuffs or crops must be grown or purchased within the household?

Male

Female

12. What activities need to be performed in order to run this enterprise effectively? And where do women participate?

List of food related activities	Participation of women

Sub-question 03: To what extent do these foodscapes ensure migrant women’s household food security?

Concept: Food Security

Sub-variables: Food Availability & Accessibility
(Semi-structured and open-ended Questionnaire)

Source of food

13. Household food production contributes to the supply of food.

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

14. Household food production reduces dependence on purchasing food.

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

15. Household food production is seldom enough to feed a family throughout the year.

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

-
16. Food enterprise has the capability of protecting households against seasonal unavailability, Covid-19, and higher food price.
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly disagree
-

Source of Income

17. The amount of crop/food produced is sufficient for sale.
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly disagree
18. The amount of the crop or food production contributes to the overall household's income.
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly disagree
19. To what extent do you agree that income from food enterprise has a positive effect on the total share of food expenditure?
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly disagree
20. The amount of household income increases after the operation of your food enterprise.
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly disagree
21. Women's incomes from food enterprise are more strongly associated with improvements of household food security than men's incomes.
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly disagree
-

Reciprocal exchange

22. How do you rate the quality of your relationship with your neighbours?
- Very good (speak everyday)
 - Good (speak once or twice a week)
 - Neutral (neither speak nor don't get along)
 - Poor (don't get along)
-

-
23. What is your perception about your relationship with your neighbours since beginning food enterprise?
- Improved
 - Same
 - Worsened
24. Have you ever exchanged any goods and services related to your food enterprise with the neighbours?
If yes, then what are those goods and services? (Such as cash, cash loans, dry foods, cooked foods, information, and harvested foods)
25. What did you receive as an exchange for those goods and services?
26. Regarding the exchange of goods and services, approximately how many households do you serve in your neighbourhood and on what basis?

Sub-question 04: What are the factors that influence the relationship between urban foodscape and migrant women's food security?

Concept: Factors

Socio-political, economical & Physical factors
(Semi-structured and open-ended Questionnaire)

Land tenure status (FGD)

27. Do you have any legal entitlements of land in this settlement?
28. If not, then which considerations motivate you to operate this type of food enterprise within your house or neighborhood?

Spatial negotiation

29. How do you negotiate with your household member for the utilization of domestic space for food enterprise?
30. Do you utilize any neighborhood spaces (such as streets, alleyways, open spaces, community bazaars, etc.) in the slum? If yes, then how do you negotiate with your community members or next-door neighbors for the utilization of that space?

Social norms

31. Do you believe that our society's conservative mentality (such as home for women and workplace for men) confines the development of women's food enterprises? If yes, then how?
32. In our Muslim society, women are required to do *pardah*; is this somehow preventing you from selecting space for food enterprises within your neighborhood? If yes, then how?

Access to support programmes

33. Do you have access to donation and training related to food activities? If yes, then what kind of training or donation (like money, a loan, seeds, etc.) are those?
34. Which organizations are offering those donations and training?

Access to credit

35. What available sources of credit are you utilising to initiate or support your food enterprise?
-

-
36. What kinds of loans do these credit providers offer? Specify if there are any special loan programmes for women.
 37. Who can access those loans? (male/ female)
 38. Which form of collateral is required to obtain those loans?
 39. Briefly describe the interest rate and loan repayment system of those credit sources to which you have access.
-

Exposure to market

40. Do you have physical access to market for selling and purchasing foods or commodities for your food enterprise? If no, then why?
 41. Is there any middleman involved in your food enterprise to facilitate market connections? If yes, then who are they? And how do they work?
 42. How does the presence of this middleman affect the development of your food enterprise? (Optional)
-

Availability of space

43. Do you think, your household space is adequate to operate the type of food enterprise you are currently doing? If not, then why?
 44. What challenges do you face in utilizing the spaces for both domestic and food-related activities?
-

Provision of services and infrastructure

45. What infrastructure and services are presently available at the household and neighbourhood level?

Infrastructures and services	Availability
Attached piped water	
Attached Tube well	
Shared Tube well	
Pond	
Attached toilet	
Shared toilet	
Sewerage connection	
Electricity	
Paved alleyways	
Paved road	
Lamp posts (Adjacent to foodscapes)	
Storage facilitates (for community market)	
Refuse collection	
Cooking fuel	

*Provide a tick mark (√) if available.

46. Are the available services and infrastructures that you mentioned above adequate to run your food enterprise?
47. If not, then how does the absence of services and provisions affect your food enterprise?
48. Which of these services and infrastructures are fundamental for the operation of your food enterprise? And explain why?

Guidelines for Focus Group Discussion

To assess the extent of migrant women's household food security, the following questions will be asked to get in-depth information from the respondents (not involved with Foodscape).

Affordability of food

01. How is your household's purchasing pattern for food?

Household purchasing pattern	Number of respondents
Smaller quantity (Daily/ Weekly basis)	
Larger quantity (Monthly basis)	

02. Do you think that the food enterprises within the neighbourhood selling the required quantity of food you can afford? If yes, then how?
03. As a resident of this slum, what is your perception about the food prices of food enterprises in the neighbourhood?
04. Does the closeness of neighbourhood food enterprises to your house help you afford food? If so, how?

Guidelines for Key informant interviews

Access to support programmes

KII no:

Name of organizations:

Position of respondents:

01. What types of support programmes (donations, trainings) do you offer to facilitate the food related activities within the settlements?
02. What are the subject matters of those donations/ training?
03. Who are the targeted participants of those donations / training?
04. What are the selection processes of recipient or trainees for these donation or training programme?

Thanking Note: I'd like to convey my appreciation for accepting to participate in the interview and for your valuable time. Thank you again!

Sub-variable: Spatial Morphology (Observation, Photography, Video Recording, Free hand sketching)	
<p style="text-align: center; color: #4F81BD;">Household level indicators</p> <p>01. Relative positioning</p> <ul style="list-style-type: none"> • Proximity to dwelling unit • Proximity to street and alleyways • Proximity to services and infrastructures <p>02. Space utilization</p> <ul style="list-style-type: none"> • Uses of space for foodscapes • Spaces shared with domestic activities (furniture rearrangement) • Multiple uses of spaces • Changes of activities at different times of the day <p>03. Functional linkage</p> <ul style="list-style-type: none"> • Linkages between domestic spaces and foodscapes • Linkage between foodscapes and services (kitchen, toilet or bathroom, water) <p>04. Space requirement</p> <ul style="list-style-type: none"> • Amount of available domestic space • Areas used for foodscapes • Ratio of spaces between domestic and foodscapes <p style="text-align: center; color: #4F81BD;">Neighbourhood level indicators</p> <p>01. Relative positioning</p> <ul style="list-style-type: none"> • Proximity to street and alleyways • Proximity to services & infrastructures • Proximity to community spaces (School, mosque, playground) <p>02. Space utilization</p> <ul style="list-style-type: none"> • Furniture arrangement <p>03. Space requirement</p>	<p style="color: #4F81BD;">Spatial mapping (Household Level/ Neighbourhood level)</p>

Appendix 2: Description of activities based on sub-typology of urban foodscapes in Greenland slum of Khulna (Source: Author, 2023)

Broad type of urban Foodscape	Sub-type of urban Foodscape	Description of activities based on sub-typology
Nature-oriented urban foodscape	Small-scale vegetation	Open spaces of dwelling units, communities, and rooftop gardens cultivated for small-scale farming, mostly fruit trees and vegetables. Fruit trees include mango, melon, wood apple, orange, lemon, dragon fruit, banana tree, etc. Whereas vegetable farming includes red leaf, basil, stem amaranth, sweet gourd, drumstick, etc.
	Livestock farming	Farming areas involve the nurturing of domesticated animals. Breeding and raising both cattle (cows and goats) and poultry (hens and ducks), especially for the production of meat, milk, and eggs, serves both the inner and outer neighborhoods demands.
Built environment-oriented urban foodscape	Retail shops	Retail shops are small stalls that sell mostly grocery items (rice, oil, salt, sugar, lentils, etc.), baked food (biscuits, cakes, bread), and factory-manufactured goods (toothpaste, bottled drinks, water) at retail prices. Occasionally, they also entail preparing tea, selling cigarettes, and operating televisions with one or two benches in retail stores.
	Home-based restaurants	Casual dining for breakfast and evening snacks where homemade foods are prepared and sold for sit-down service or takeaway. The breakfast meal usually includes bread, fried vegetables, khichuri, egg fried, and curry, whereas the evening snacks include fried food, <i>pitha</i> , etc. Beside this, they also sell bakery items, tea, cigarettes, betel leaf, etc.
	Food vendors	Floating vendors occupy space on the streets of the neighbourhood to sell food. They mostly produce mixtures of different foods, like mixtures of fruit with spices, mixtures of puffed rice with spices, <i>chaats</i> , boiled potatoes, boiled eggs, <i>chanachur</i> , etc. A portable kiosk is placed on the street to display the food.
	Community market	Daily markets typically take place in semi-outdoor locations where the women of the settlement sell primarily fresh vegetables, grocery items, spices, fish, meats, and eggs in relatively small quantities.

Appendix 3: Left image shows the use of the dwelling façade and roof for vegetation, and the right image shows the use of the tiny space between the dwelling and street for plantation in the Greenland slum (Source: Survey, 2023)



Appendix 4: Small-scale and floating nature of food vending (Source: Survey, 2023)



Appendix 5: IHS copyright form

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