The Impact of Urban Development on Peri-urban Agriculture in Beijing

A case study in Sujiatuo township

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Swedish University of Agricultural Sciences, SLU
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Abstract

Urbanization is transforming the landscape of food production and consumption globally. With over 55% of the world's population residing in urban areas, and an anticipated increase to 68% by 2050, the urban-rural divide in food systems is becoming increasingly pronounced. This paper explores the intricate relationship between urban development and peri-urban agriculture, particularly in the context of Beijing's Sujiatuo Township. The study examines how urban expansion impacts peri-urban agriculture, leading to shifts in land use, farming practices, and the broader food supply chain.

The research employs a qualitative study and case study approach, analyzing primary data through semi-structured interviews with stakeholders, including farmers, government officials, and urban planners, complemented by secondary data from policy documents and academic literature. Key findings reveal that urban development has led to a decrease in available arable land for peri-urban agriculture, yet it has also heightened the demands for locally produced food. The paper discusses the challenges faced by peri-urban agriculture, such as policy inconsistencies, market competition, and the need and impediments for technological adaptation.

The paper concludes by highlighting the need for a balanced approach to urban planning that integrates peri-urban agriculture as a key component of the urban food system. It suggests that with appropriate policy support, technological innovation, and market development, peri-urban agriculture can thrive, contributing to food security, environmental health, and the socio-economic well-being of urban populations.

Keywords: Urbanization; Peri-urban agriculture; Urban development; Beijing; Agricultural policy; Land using Policy; Urban agriculture; Urban and peri-urban agriculture

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1. Background

1.1 Urbanization

There are now 7.7 billion human beings to feed in all of the world. The urban population in the world has outnumbered the rural areas since 2007, with 55% of this huge population living in cities. It is expected that by 2050 the world population will grow to 9 billion and the proportion of urban dwellers will increase to 68% (Bailey 2011; Ebenso et al. 2022; UN-DESA 2018; Wiskerke & Viljoen 2012). This means that in 2025 the urban population will be almost four billion which is larger compared to 2007. But only about 2% of the land can be described as urban. Urban land is home to more than half of the world's population. The vast majority of economic activity also takes place in cities, which account for more than 60% of natural resource use (UN-Habitat 2019). However, cities, which account for 2% of the global area, also include built-up and non-built-up areas. People in areas led by developing countries are rapidly moving from the countryside to the cities. High-density slums have formed on the urban fringes (Elsey et al. 2019). Rapidly expanding slums are characterized by poor housing conditions, and lack of clean water, short of sanitation facilities which result in the easy spread of viruses such as cholera, salmonellosis, SARS, and Ebola (Rao et al. 2022; Fan et al. 2019).

Huge urban areas coupled with the industrialization and commercialization of the food system, has fundamentally changed the relationship of food to the urban landscape, and to urban food consumers, and exacerbated the urban-rural dichotomy (Speak 2018). By 2025, 80% of the food produced globally will be consumed by urban dwellers. However, the issue of food planning, even in the last 20 years, has not been a strong focus of urban planning, development, and decision-making (Wiskerke & Viljoen 2012).

Urban development is also influencing the development of the food supply chain in reverse. In London in the 20th and 21st centuries, urban space changed dramatically with industrialization and city building. Urban dwellers gradually moved away from agricultural production participating into food-only purchases as they moved away from food-producing spaces (Parham 2012). Modern urbanization, in turn, has undoubtedly further lengthened the distance between people and food outlets (Parham 2018). If public transportation facilities to these suburbs are underdeveloped or non-existent, then vulnerable populations will not have access, or at least easy access, to

nutritious food (Wiskerke & Viljoen, 2012). Supermarkets are located far away from poor areas for logistical reasons. The increase in 'food deserts' in urban areas that lack easy access to fresh food is also associated with an increase in malnutrition. Food deserts lack grocery stores and supermarkets and are filled with fast-food restaurants. (Cummins & Macintyre 2006; Wrigley 2002; Wrigley et al. 2002).

1.2 Issue of the Food System

> The City Regional Food System (CRFS) approach seeks to promote cities and their rural hinterlands (including small towns and urban clusters) as areas of food system governance and action, where people, goods, finance, natural resources, and ecosystem services flow. Through evidence-based and integrated planning, local governments and food system stakeholders across all sectors can make important contributions to improving the long-term resilience of food security frameworks. This will help to improve economic, social, and environmental conditions in cities and nearby rural areas, and significantly reduce the risk of harmful impacts from various shocks and stresses.
>
> FAO (2023)

There is a growing understanding of the problems of food production and the impact on nature in agricultural activities. People need to feed all human beings under conditions that protect biodiversity and maintain sustainable production. The UN Agenda 2023 and the Sustainable Development Goals (SDGs), Zero Hunger, Sustainable Cities, Climate Action, and Life on Land are key objectives in the food production process (Biasi & Brunori 2023).

The current world's global food system is out of balance. 820 million people around the world are suffering from hunger. Food insecurity, malnutrition, lack of micronutrient intake, and high incidence of obesity are all problems faced worldwide (WHO 2018). Millions of people are underfed every day, but millions of others are overfed. Diseases such as these caused by unhealthy diets are also on the rise. People need to invest more efforts and resources to deal with the nutritional deficiencies caused by "insufficient intake of fruits, vegetables, and nuts" as well as chronic diseases such as coronary heart disease, diabetes, and other chronic illnesses caused by "overconsumption of red meat, dairy products, and over-processed foods" (Willett et al. 2019; Brazilian Ministry of health 2014). The World Health Organization (WHO) has also identified the growing obesity epidemic as one of the emerging health problems of concern in many European countries (WHO 2024). The increase in healthcare due to the obese population in Europe accounts for 25% of the increase in expenditure, and healthcare and related problems cost society up to hundreds of euros per year (van Baal et al. 2006; Thorpe et al. 2004).

In the food system. Consumption of food is closely linked to humans and the production of food in Earth's ecosystems. C40 cities is a global network of nearly 100 mayors of

the world's leading cities that are united in action to confront the climate crisis. In the study of C40 Cities Climate Leadership Group (2021) points out the current food production system causes a number of problems such as reduced biodiversity, soil erosion, freshwater use, increased greenhouse gas emissions, and disruption of the global nitrogen and phosphorus cycles. If there is no substantial change in the global food system by 2025, greenhouse gas emissions from the food system alone will increase by 38%. This will be the cause of a series of climate crises such as droughts, floods, and desertification, reducing the planet's productive capacity (C40 Cities Climate Leadership Group 2021). The issue of Urban greenhouse gas (GHG) emissions from food consumption is of worldwide concern. In 2017, emissions associated with food consumption in C40 cities (C40 Cities Climate Leadership Group 2021) were estimated to account for 13% of total GHG emissions, with the consumption of food of animal origin accounting for about 75% of these food emissions. It is estimated that one-third of all food produced globally is lost or wasted, with an estimated value of more than $900 billion, equivalent to the GDP of Indonesia or the Netherlands. If food waste were a country, it would be the world's third-largest emitter after China and the United States. Food loss also means a huge waste of labour, water, energy, land, and other natural resources, as well as emissions, used to produce it (Ibid.). Food and Agriculture Organization of the United Nations (FAO) also stated the importance of safety in food production as a "core principle" of health. FAO emphasized that the transformation of food systems should increase biodiversity, enhance ecosystem services, and focus on environmental health and food security (Oecd & FAO 2022).

Today's agricultural production is also faced with decreasing agricultural land but increasing human demand for food. Especially in industrialized countries, in addition to the loss of farmland, the erosion of soils by agriculture and industry is significant (Biasi & Brunori 2023). the FAO projections for the year 2030 indicate that farmland will continue to decline as a result of climate change, soil erosion, and socio-economic factors. The impacts are not only limited to agriculture but also affect the quality of the landscape and the stability of the soil and water. In addition to this, the soil strategy is a key strategy for the sustainable development of agriculture in the European Green Deal, Biodiversity 2023, from farm to fork (Ibid.).

1.3 Advantages of Urban Agriculture

One of the most frequently used definitions of urban agriculture (UA) is this one（FAO et al. 2022）：

> Urban agriculture is located within or on the fringe of a town, a city or a metropolis, and grows or raises, processes and distributes a diversity of food and non-food products, (re-) uses largely human

> and material resources, products and services found in and around that urban area, and in turn supplies human and material resources, products and services largely to that urban area.
>
> Mougeot (2000)

In the review of papers from Evans et al. (2022), found that edible green infrastructure has 28 different types of services mentioned in various studies. Among these services, water flow regulation, temperature control, and ease of exercise and recreation were the most mentioned. Growing food in cities can help in many different ways, in addition to producing food and increasing the resilience of urban food supplies for cities. The different services provided depend on how and what is precisely grown, the three-dimensional spatial and base nature of urban agriculture (UA), and how people interact with UA (Evans et al. 2022).

UA is believed to reduce greenhouse gas emissions, control microclimate as well as improve habitat health environment, and people's well-being (Kulak et al. 2013, Oberndorfer et al. 2007; Brown & Jameton, 2000). Ecologically, urban food cultivation is beneficial in increasing urban ecological diversity. Especially, in terms of insect biodiversity, and plant diversity. Crops provide food and shelter for insects which, in turn, promote plant pollination (Lin et al. 2015; Clucas et al. 2018).

In addition to this, the services provided by UA could increase neighborhood communication, reduce crime, enhance social relationships, and improve human health (Olivier 2019; Park et al. 2019; Brown & Jameton 2000, Russo & Cirella 2019). In Cape Town, UA not only provides fresh and nutritious food but also reduces the consumption of processed food, which reduces health risks (Olivier 2019). Reducing the divergence between ecology and society through the development of alternative food networks in Australia (Canal Vieira et al. 2021).

However, food provision was not frequently mentioned as a major contribution of UA in various studies. Evan et al. (2022) consider this as a neglect of the contribution that UA makes to food growing and food sovereignty. In Russia, UA farmers note that 30-90% of their annual fruit and vegetable needs are met through their produce. Although the contribution may seem small at times, it is still crucial for the food security of the most vulnerable and food-poor groups (Gasperi et al. 2016; Pungas 2019). So, while focusing on the contribution of UA, the agricultural production services provided by some other common green spaces should not be overlooked.

What is more, Redwood (2012) argues that while there is consensus that UA is becoming increasingly important in helping to produce food in cities. However, research should not neglect to examine who the beneficiaries of UA are and under what conditions UA can bring about benefits in a variety of ways, including public health, social, economic, and environmental.

1.4 Definitions

The policies and the way in which they are implemented by each country's government are slightly different from those of other countries. It is very likely that some of the terms mentioned in this study will be confusing. Therefore, some terms that are specific to China are explained and defined here to facilitate the understanding of the results.

1.4.1 "Crossing the River by Groping the Sones" and Non-compliance

Therefore, the Chinese government's approach to policy implementation is to "follow the law". However, when faced with a new problem or challenge that has not yet arisen, the government usually takes a more "wait and see" and "experimental" approach in the early stages because it does not know whether the results will be good or bad. When a certain level of development is reached at a certain time, if there are good results, it will be strongly supported; if there are bad results, it will be actively stopped and corrected.

In 1981, Chen Yun, Vice Premier of the People's Republic of China, referred to the concept of "crossing the river by touching the stones" in a meeting to describe the gradual practice and reform of policies that should be considered and experimented with many times as China carries out reforms. 1986 the Chairman of the Central Military Commission of the People's Republic of China, Deng Xiaoping, was interviewed by the President of the Central Military Commission of the People's Republic of China. In 1986, Deng Xiaoping, the President of the Central Military Commission of the People's Republic of China, gave an interview about China's reform policy, in which he also mentioned that China's approach was to constantly summarize its experience and correct any mistakes, so as not to let small mistakes turn into big ones. In 2012, Xi Jinping, the current President of the People's Republic of China, also pointed out in a meeting that crossing the river by groping stones is a reform method rich in Chinese characteristics and in line with China's national conditions. (Guang'an Daily 2018)

So policies or plans may be experimental at the time they are made, and the results are not always what they were thought to be at the time they were made. Changes in policy may leave behind some non-compliant behavior or results. But non-compliance is not necessarily illegal, because the corresponding laws may still be gradually and experimentally formulated.

1.4.2 Five-year Plan

The full name of the five-year plan is the Central Committee of the Communist Party of China's Five-Year Plan for the Formulation of National Economic and Social Development. Its main purpose is to set out the country's strategic intentions, clarify government priorities, and regulate market behavior. It serves as a program document

for the common action of the national government and people (Xinhua News Agency 2021). Each province and city will have a detailed local plan based on the five-year plan published by the State, which may include different aspects such as finance, climate change, preservation of cultural heritage, energy, transportation, cultural industries, urban development, etc.

1.4.3 Territorial Spatial Planning

Territorial spatial planning refers to the planning of land and space within a specific region. It primarily needs to align with the national five-year plans, which guide the development direction of the country and the local area. Beijing's territorial spatial planning is also formulated based on the national five-year plan as a guideline. As a district of Beijing, Haidian District's planning is developed in accordance with Beijing's territorial spatial planning. The two most recent plans for Haidian District cover the periods 2004-2020 and 2017-2030. The three-year overlap between these periods is primarily due to the time required for policy formulation and planning implementation (Beijing Municipal Commission of Planning and Natural Resources 2018; Beijing Municipal Commission of Planning and Natural Resources 2022). Therefore, a typical territorial spatial plan for the Haidian District generally remains in effect for about 10 years.

1.4.4 “18th Congress” and Anti-Corruption Action

The 18th National Congress of the Communist Party of China (CPC) was held in 2012. In addition to the election of national leaders in various industries, the 18th Congress was influenced by the fact that the work report of the Central Discipline Inspection Committee of the 18th Congress stated that there would be increased scrutiny of corruption and strict examination of acts of corruption and abuse of power, including those occurring between the people and government officials. There will also be a strict control of public spending and the political CPC's internal extravagance and wastefulness (Xinhua News Agency 2012). This political measure strictly limits the amount of money that can be spent by government departments. The main manifestation in this study is that some of the clients from the government that used to exist no longer appear after the 18th Congress. All government purchases that could result in corrupt behavior were limited to strict scrutiny. Many government purchases are no longer made to avoid mistakes. Therefore, farmers will need to find more customers on their own after 2012 to cope with this change in sales channels.

1.4.5 Village Collective

The full name of the village collective is Rural Collective Economic Organization. It mainly undertakes land contracting, capital accumulation, and other services. It can legally represent the members of the village collective form collective asset ownership (Rao 2019). In this study, farmers, as residents within the village, need to rent land from the village collective.

1.4.6 Agricultural Household and Non-agricultural Household

Agricultural household registration refers to the population that produces its own food. In the planned economy of 1979-1982, people were divided into agricultural and non-agricultural household registration on the basis of whether or not they produced their own food (People's Daily 2018).

The State Council issued “on further promoting the reform of the household registration system of the views of expenditure by 2020, while protecting the livelihood of residents, efforts to realize about 100 million agricultural transfer population and other permanent residents in the town settled. Similar to Beijing's megacities will be legal and stable and gradually help all non-urban households registration population into urban household registration. Non-agricultural household registration includes urban household registration, rural household registration, collective household registration, etc. (Fuzhou Gulou District People's Government 2022) (Figure 1).

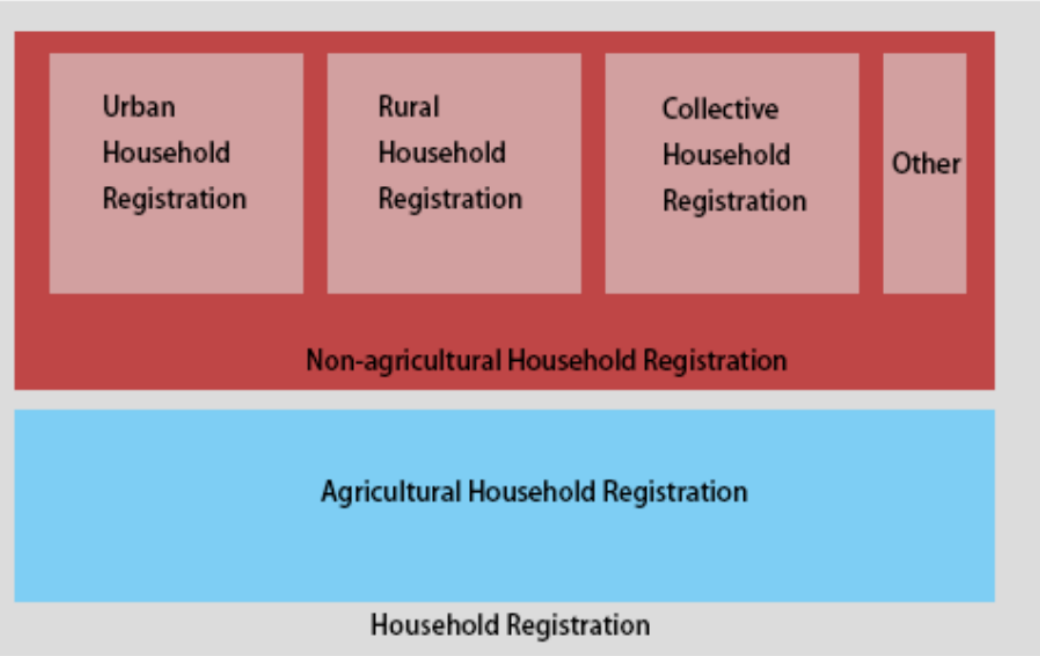

Figure 1. Household registration classification.

The non-agricultural household registration in the policy is actually the conversion of rural and agricultural non-agricultural households into agricultural households in the non-agricultural household. Data source: Fuzhou Gulou District People's Government (2022). (Image made by me).

In this study, the conversion of agricultural household registration to non-agricultural household mainly refers to the agricultural household registration and rural household registration in Sujiatuo township. The household registration system, which distinguishes between urban and rural areas, will also be gradually abolished. One of the specific measures implemented in Sujiatuo Township includes pension insurance for non-agricultural household registration on top of agricultural household registration

to provide protection for the elderly (Central People's Government of the People's Republic of China 2014).

1.4.7 Pension Insurance

The full name of pension insurance is the basic social pension insurance. It is a social insurance system designated by law in China to provide basic livelihood security for workers beyond their legal working life. Employees who work for a company, the company will pay the insurance, while farmers pay for their own insurance. The amount of contribution may vary from city to city and from job to job. The amount of pension received upon retirement also varies. For example, a farmer in Beijing pays far less than a company employee and receives a smaller pension after retirement.

While the limitation distinction between agricultural and non-agricultural household registration has been abolished, the government has introduced a number of policies to try to facilitate the implementation of this policy. These include employment, education, health care, housing, pension insurance, and social assistance. These safeguards are designed to help the agricultural population face the different challenges of life when they move to the cities. In particular, the pension insurance policy change is mainly to bridge the gap between the urban and rural pension systems. It promotes the equalization of pension services. In this study, the village collectives directly pay the full amount of pension insurance premiums that villagers who have changed from agricultural to non-agricultural household registration have not paid before.

1.4.8 Urban agriculture and Peri-urban agriculture

Urban and Peri-urban agriculture (UPA) is not a China-specific definition, but defining the two will help inform the rest of the article and help other researchers to define the difference more clearly when conducting further research.

> UPA can be defined as practices that yield food and other outputs through agricultural production and related processes (transformation, distribution, marketing, recycling...), taking place on land and other spaces within cities and surrounding regions. It involves urban and peri-urban actors, communities, methods, places, policies, institutions, systems, ecologies, and economies, largely using and regenerating local resources to meet the changing needs of local populations while serving multiple goals and functions. strategy for building the resilience of a city's food supply.
>
> FAO et al. (2022)

The definition of FAO et al. (2022) differs from that of Mougeot (2000), mentioned earlier, in that it defines urban agriculture separately from peri-urban agriculture. FAO et al. (2022) emphasize the geographic distinction between UA and peri-urban agriculture (PA). This amounts to a further detailed breakdown of Mougeot's (2000) definition. UA is the practice of farming at any scale within the city, either on the side of the road or on a balcony or in a park. PA, on the other hand, is defined as a transition

zone between the city and agriculture, where PA can change dramatically over time. For example, land prices increase. Population influx, different aspects such as land use patterns, buildings, production methods, and scale. Often urban to urban-to-peri-urban is as continuous a system as urban-to-rural (van Vliet et al. 2020; FAO et al. 2022). Although the role played by UPA from urban to rural may be different. Note that Mougeot's (2000) definition of UA is widely used (FAO et al. 2022). Therefore, the next phase of the literature review will try to respect the designation of UA or UPA by the original authors of each citation, even if their original intention of UA may mean UPA, even though those two words describe the same concept. While in this study PA will be distinguished from UA and UPA as much as possible. When quoting the Interviewee, the term usually used is “urban agriculture” because it is more common and understandable in Chinese, and the actual meaning included is Mougeot's (2000) definition, which states that urban agriculture encompasses peri-urban agriculture. Discussing peri-urban and urban agriculture separately will help to further understand the differences between the three.

2. Literature Review

2.1 Relationship between Urban Planning and Food Systems

> Food systems encompass the entire range of activities involved in the production, processing, marketing, consumption, and disposal all goods that originate from agriculture, forestry, or fisheries, including the inputs needed and the outputs generated at each of these steps. Food systems also involve the people and institutions that initiate or inhibit change in the systems as well as the socio-political, economic and technological environment in which these activities take place.
>
> ---- FAO (2018)

This definition from FAO covers all segments and aspects of the food value chain. It includes people and institutions emphasizing the need for human and institutional processes. It does not discuss the food system in isolation but places the food system in the context of the socio-environmental environment and the economic. However, this definition from FAO about Food system might lacks the content to discuss the differences and linkages between urban and rural food systems and it does not discuss the spatial dimension in which food systems exist (Cabannes and Marocchino 2018).

2.1.1 Food Systems in Urban Planning

Research in urban planning continues to largely ignore food issues. The underlying reason for this is that in many countries, especially developed ones, people take it for granted that food is on the table (Pothukuchi & Kaufman 2000). The reason people are so unfamiliar with the food system is that people, especially those who consume the vast majority of food in cities, are becoming increasingly distant from food production or processing. Both in terms of distance and perception, people are paying less attention to food production. Food processing and rapid industrialization, as well as improvements in transportation and warehousing technology, have made it possible to move farther and farther away from the place of production and the place of consumption. People can consume food before they know how and where it is produced. Food is not considered to be a function of the public areas of the city. In the process of urbanization, some problems are defined as urban and some as rural. The production of food is clearly classified as a rural problem (Wiskerke & Viljoen 2012). Morgan (2009)

notion that food production is an exclusively rural activity fails to recognize the importance of UA.

In the twentieth century, there were attempts by designers to resolve the conflict between food production and urban development. Howard proposed the Garden City movement in 1902. This prompted architects and planners interested in becoming part of this movement to focus on creating green and livable living environments in overcrowded industrial cities. The Garden City proposed by Howard addressed the four key elements of the food system in a circular city, which were, production, distribution, consumption, and waste recycling (Howard 1902; Cabannes & Ross 2017; Pothukuchi & Kaufman 2000). However, with the exception of the Garden City movement, food is still a "stranger to urban planning" for the vast majority of designers. In 1997-1998, a survey of 22 US organizations concluded that "agriculture is a topic that should not be addressed by cities". Food production is relegated to functions that should not be provided by cities. The problems of the food system should be borne by the countryside. (Pothukuchi & Kaufman 2000; Sonnino 2009). An active changing is happening which is that as concerns about the food system grow, more and more designers are looking at integrating food systems into urban planning (Nasr & Komisar 2012).

2.2 Food Security

FAO identified three pillars of food security in 1996 and added a fourth key element in 2006. Food systems need to have availability, accessibility, utility, and stability (Barrett 2010).
Availability, in that sufficient quantities of something are consistently available;

Accessibility, in that people have sufficient income, good markets and good transportation to get the right kind of food;

Utility, in that they have adequate nutritional knowledge and access to sufficient water, cooking facilities, and sanitation to utilize the food efficiently;

Stability, Both adequate food is available at any given time and is not subject to shortages due to, for example, economic or climatic problems, or unavailability of physical goods due to non-productive seasons. When the food system has these four elements of stability it is a food system that can sustain a long-term supply of food (Ibid.).

2.2.1 Food Sovereignty

The goal of food security is positive, but it has been misused to justify the need to prioritize yields for the effectiveness of providing food to consumers (Alliance for Food Sovereignty in Africa 2014).

The concept of food sovereignty advocates that all individuals have access to sufficient healthy and appropriate food. The process of producing such food should respect the rights of each producer. Control of the food system and food production should be localized to ensure the rights of producers and the health and integrity of the food system. At the same time, food sovereignty advocates that food sovereignty should also provide producers with adequate skills and knowledge, as well as eco-friendly agricultural practices to reduce climate impacts (de Nyéléni & Sélingué 2007).

UA plays an important role in maintaining urban food sovereignty because of its localized nature. Corbusier proposed the creation of food-producing areas in agricultural towns around cities in his 1922 Contemporary City (McManus 2005). Vortex cities to sustainable cities: Australia's urban challenge. unsw Press. Wright also envisioned farmland surrounding modern homes in the wide-acre city (Fishman 1982). The use of urban production in the United Kingdom during both world wars also demonstrates the importance of urban food cultivation in ensuring food sovereignty in the cities themselves (Howe & Wheeler 1999).

2.3 Peri-urban Space

Urbanization, the demographic process by which more and more people live in urban areas, is, by definition, based on a clear distinction between rural and urban areas. (van Vliet et al. 2020) The zone at the edge of the city and the countryside is both peri-urban space.

2.3.1 Urban-rural Boundary Gradient

Before understanding the urban-rural gradient one needs to know how to define urban or rural. The more common concept is the urban-rural dichotomy, whereby a place is rural if it is not urban. Mengedoth (2018) described agencies such as the U.S. Department of Agriculture defining whether an area is urban or rural by using a mixture of population data and land use. However, this way of defining an area often does not accurately describe all situations. In recent decades, rural and urban land systems have become better understood. When an area is no longer an isolated object of study. A single boundary condition may not accurately define what is rural (van Vliet et al. 2020). For example, in the Netherlands, a large part of the population lives near the urban-rural fringe. The areas they live contain both urban and rural areas (Broitman 2020). If one distinguishes between urban and rural simply by the definition of "urbanization, the demographic process by which more and more people live in urban areas" (ibid.), then one would find that a large number of rural areas have urbanized. However, land functions do not fully correspond to the needs of traditional urban functions. So it is difficult to define whether they live in the city or the countryside. Thus, when cities and villages are connected, the boundaries between their land systems become quite blurred and convoluted.

If these urban boundaries are defined through the traditional urban-rural dichotomy, the boundaries become impossible to understand. So it turns out that more and more research recognizes the existence of urban-rural gradients (Kroll et al. 2012; Radford & James 2013). In terms of traditional functions, cities usually assume economic functions, while rural functions are productive, but often land use is multifunctional in reality. This multifunctionality blurs the boundaries between urban and rural functions. An important example of the provision of urban functions in rural landscapes is the increasing use of recreational functions in these landscapes by resting city dwellers who increasingly recreate in nearby rural areas (Zasada et al. 2013).

Therefore, the city boundary is not a clear line, but a functionally graded area consisting of a Mosaic of different functions. People living on the edge of the city enjoy both urban life and rural life. Cairo is a stark example of this. Cairo has a large increase in built-up land within the city's urban fringe. This is coupled with a large population increase in the city. This has led to an increase in housing prices in Cairo and the need for residents to find accommodation in non-urban areas. Thus, resulting in a rich mosaic of peri-urban landscapes at the edges of Cairo (Salem et al. 2020).

2.3.2 Maintaining Peri-urban Spaces

The urban and rural areas of a metropolis are often closely interconnected. They are each not separate pieces of non-aggressive land, but part of the urban system (Magoni & Colucci 2017). In the tight land situation of large cities, often urban expansion must take over agricultural land. They are forces on each other, one side getting more and the other having to get less, but growing and transforming together. Continuously reducing peri-urban and rural land to increase urban land substantially does increase the volume of the city. It provides better space for commercial functions in the city. However, this can only bring short-term economic news. In the long run, the economic benefits of short-term expansion are not as important as sustainable development. Environmental functions and the consideration of recreational functions for the residents are essential for the city. Municipalities should have policies that effectively support the needs of citizens and activities that meet their needs (Maruani & Amit-Cohen 2007; Vejre et al. 2010). In the context of expanding cities, the key factors for maintaining peri-urban spaces are consuming less land and optimizing the spatial structure (van Dorst 2006).

Peri-urban spaces are needed to preserve. This is because preserving peri-urban open space helps to build sustainable cities. Open spaces can be constructed with productive or unproductive green infrastructure to provide environmental functions, productive functions, and recreational functions. Recreational functions are those that can facilitate social contact and communication, as well as citizens' access to nature. It has a positive impact on health and people's well-being. (Piorr et al. 2011; Magoni & Colucci 2017). The environmental functions that peri-urban can provide include climate improvement,

water management and conservation, soil protection, preservation of plant and animal habitats, and disposal of various wastes (de Ridder et al. 2004).

Peri-urban spaces are not valued if they are considered optional by planners. Protecting peri-urban space inherently requires social drivers. The reasons for the existence of peri-urban space can include a variety of factors such as urban issues, cultural, demographic and economic, technological development, social values, climate and environmental change (Magoni & Colucci 2017).

The long-term protection of the peri-urban is divided into three main instruments (Ibid.). First, regulatory policies can be established to ensure that urban sprawl does not encroach on the suburbs by government agencies. Second, products and services from peri-urban areas can be promoted, and if there is a market demand for them then they will naturally be preserved by market choice. For example, traditional agriculture can be given a new role and promoted. In addition to production, provide habitat protection, urban forestry, energy production, solid and liquid waste disposal, local products, recreational services, etc. Third, incorporate into market mechanisms the costs of services that are already implemented but not taken into account. Both charge for services that are currently provided, but not charged for, and potentially charge for services to increase their perception and value (Ibid.).

2.4 Local Food

Secure food systems are strongly needed in the context of soaring global prices and lack of access to food or lack of access to healthy food for parts of the population (Morgan & Sonnino 2010). The presence of UA can provide local food to underserved areas of the food system. Some studies have suggested that UA could account for 15-20% of the global food supply (Smit et al. 1996). As people become more aware of a range of issues such as food safety, food miles, and greenhouse gases. People come to realize that more local food production and distribution can lead to more resources being used rather than wasted (Nasr & Komisar 2012).

2.4.1 Avoiding Local Traps

Localization is often considered synonymous with sustainability. This is because it is associated with lower food miles. However, local food systems can be made just or unjust, safe or safety-hazardous, sustainable or unsustainable (Born & Purcell 2006).

The roots of the local trap lie in the fight against the capitalization of food systems. Increasingly, traditional agriculture under capitalized transformation is accompanied by food injustice, food insecurity, oligopoly, and environmental degradation. (Magdoff et al. 2000; Shiva 2000; Norberg-Hodge et al. 2002). The main strategy for capitalizing on agriculture is globalization. In the context of globalization, local food systems, which stand in the opposite direction to capitalized agriculture, emphasize the local

because their opposite stance to capitalized agriculture, and often sustainability, which capitalized agriculture does not have, is perceived as one of the attributes of local food (Born & Purcell 2006).

There are three main aspects of the local trap:

Ecological sustainability: This includes the minimization of food miles, the use of organic or other sustainable production methods, and the organization of modern food marketing and retailing. Equating localization with sustainability is confusing the carbon footprint with the food journey. Food miles are just one dimension of the multifaceted process of the carbon footprint. The carbon footprint is shaped by many activities from farm to fork. It encompasses every activity in the full flow of the food system, not only the food miles traveled, but the greenhouse gas emissions from the entire process (Edwards-Jones et al., 2008; Morgan & Sonnino 2010).

Social and economic justice and small-scale production is often considered key to agricultural and economic development and reconstruction, community stability, democracy, local empowerment, and food security (Morgan & Sonnino 2010). It is assumed that local-scale food systems are inherently more socially just than national-scale or global-scale food systems.

As well as food quality and human health: the typical argument is that fresh is best or local food is healthier. However, local food may not be the freshest and healthiest food that has not been stored or spoiled (Born & Purcell 2006).

Born & Purcell (2006) also articulate the need to understand that localization is a strategy when studying local issues. It is intended to facilitate the process of solving problems of social justice, oppression, food security, ecological destruction, etc. Localization of food production should not be seen as a goal. Localization should not be done for the sake of localization.

2.5 Urban and Peri-urban Agriculture

UPA is defined as the behavior of a range of activities, including food production, occurring in urban and peri-urban areas (OECD & FAO 2022). UA is a trigger for local food systems. It plays a role in growing, raising, processing, and distributing food in the food system. Using local human and material resources, UA has been re-centered to provide products and services for itself and its surroundings, and at the same time provides human and material resources, products, and services to these areas (Mougeot 2010).

UA can be located within or on the fringes of a town, city, or metropolis (Mougeot 2000). Depending on the land use it can exist in a variety of food growing patterns. It can utilize different spaces in the city and theoretically any place where it can be

cultivated can practice UA. So it is diverse in terms of land use. It includes spaces inside houses, along roads, parks, and open spaces, land that is vacant or will not be developed, unurbanized land around the city, any land that is privately or publicly owned (Cabannes 2012). Based on the space in which it is grown UA can be categorized into indoor farms, allotments, community gardens, etc (Specht et al. 2014). On this basis, UA is increasingly focusing on the use of grey space that will be utilized. Examples include green walls, rooftop planting, and balcony farms. When there is no soil to use conventional growing methods, urban farmers are also adopting soilless cultivation techniques with non-solid substrates. For example, hydroponics, aeroponics, etc. (Sengupta & Banerjee 2012; Samangooei et al. 2016).

2.5.1 Urban Agroforestry

UA may have advantages in terms of ecological resilience when it is used as a form of urban green instruction. UA does not include trees. Trees are resistant to the negative impacts of extreme weather when used as green infrastructure. For example, trees are more resilient to strong winds, heat waves, and flooding than UA consisting of herbaceous plants (Lovell 2020). Urban trees are also a powerful tool in the fight against greenhouse gases. They have the potential to store carbon and reduce greenhouse gas emissions. Lovell (2020) argues that the greenhouse gas emissions of UA in general are due to the need for more fertilizers and maintenance activities. By increasing the number of trees and shrubs of low concern, urban forestry can be brought into line with the fight against global warming.

At the same time, however, urban forestry is one of the more common forms of green infrastructure in cities, even if it does not produce food. The synergistic use of multiple spaces is key to making urban forestry more effective. Linking urban forestry to, for example, marginal lands, open spaces, and interstitial spaces. This allows resources to be utilized more efficiently and allows for inputs that may yield greater benefits than mono-functional lands. For example, implementing UA or UA vegetable plantations around parks can help amplify the effects of irrigation water and increase environmental improvements (Colding 2007).

2.5.2 Uses of Urban Agriculture

UA is often considered a multifunctional and non-traditional form of agriculture. Some studies have recognized the importance of combining productive and cultural functions, mitigating the heat island effect, conserving urban ecological diversity, sequestering carbon, promoting soil formation, recycling urban waste, and absorbing rainwater, among other functions. (Lin et al. 2015; Lovell 2010; Wielemaker et al. 2018; Wortman & Lovell 2013). At same time, UA can be productive (Hodgson et al. 2011; Smit et al. 1996). UA combine good distribution facilities, labor, and low transportation costs in cities can reduce pressure on the food system (Hodgson et al. 2011).

The function of UA is not limited to producing food. It can also create landscapes and put vacant land in cities to use. Improve the dietary health of the poor. Improve the mood of the viewer. Creating better physical and mental health environments for different classes of urban dwellers. Create ecological diversity. Provide opportunities for community exchange. Provide more jobs. As well as visualizing ecological processes for education, among other functions (Taylor & Lovell 2021; Yadav et al. 2012).

The functions of UA are diverse and UA can play different roles in the face of different problems. In the southern hemisphere countries. UA, although none of them are organized through formal forms, provides the function of protecting food and nutrition security (Abdulkadir et al. 2012). In Tanzania, UA takes care of children who lack food diversity as well as food health (Wagner & Tasciotti 2018). In the United States, UA has been used as a way to help provide access to underserved areas of the food supply (Alig et al. 2004). In Cape Town, South Africa, UA reduces the economic challenges of processed food for people while providing fresh food and reduces health risks (Olivier 2019). In Madagascar, the main motivation for UA is to sell for profit (Aubry et al. 2012). In Chile, UA creates shorter food supply chains and in this way defends urban food sovereignty and enhances the resilience urban resilience of urban systems (Delpino-Chamy et al. 2019). In Bologna, Italy, UA is used to repurpose vacant urban space, reduce the economic pressures of city building, and enhance food security for vulnerable groups (Gasperi et al. 2016). In Melbourne, Australia, providing fresh food, maintaining sustainable development, and increasing the connection between residents and nature are the main drivers of community agriculture. It also provides the function of reducing the carbon footprint of the food system (Kingsley et al. 2019). In France, UA uses municipal waste to produce food, helping to address the problem of waste disposal in cities while focusing on productivity (Grard 2015). In Berlin, Germany, UA exists through the construction of edible schools with biodiversity. It provides an educational function. Students improve their understanding of food production and ecosystems in this form, increasing the recognition that urban culture and environmental awareness are important (Fischer et al. 2019). In Spain UA is used to foster group values (Jordi-Sánchez & Díaz-Aguilar 2021).

In addition to these, changes in lifestyle habits brought about by participation in UA also positively help participants in their lives. Burke (2018) concludes that gardeners and families who grow food have higher consumption of fruits and vegetables and tend to adopt better eating habits, leading to beneficial health outcomes. Savings in health care costs and unaffected labor productivity can improve household material well-being (Rao et al. 2022). Participation in UA and improved diet quality are directly and indirectly linked. Households involved in UA tend to have better dietary habits and access to food (Nchanji & Lutomia 2021; Mead et al. 2021). Thereby can be a lower likelihood of reducing the rate of access to some food-related diseases (Khumalo and Sibanda, 2019).

2.5.3 Urban Agriculture and Environmental Sustainability

For cities, adding sustainable nature-based solutions to food production is something that needs to be considered (Zimmerer et al. 2019; Oecd & FAO. 2022). UA, which is associated with increasing the resilience of the food system and increasing ecological diversity, can play a key role when following an ecological practice approach (Kerr et al. 2021; Clinton et al. 2018; Salle & Holland 2021; Salle & Holland 2010). Urban expansion requires the annexation of surrounding rural areas. UA is a common rural form of the transition process. During the urbanization process, UA can help urban sustainability through the benign annexation of the countryside (Biasi & Brunori 2023, Oecd & FAO 2022).

UA does provide better sustainability benefits. Reducing the heat island effect, mitigating the effects of extreme weather hazards, absorbing rainwater, reducing the carbon footprint of the food system, recycling urban waste, and increasing urban diversity (Ackerman et al. 2014; Azunre et al. 2019; Hu et al. 2021; Pungas 2019). Among them, urban agroforestry is even more advantageous than UA in this regard, and the presence of trees can better help UA cope with extreme weather disturbances. Trees also provide functions that target greenhouse gas reduction and carbon sequestration (Talor & Lovell 2021). However, the relationship between UA and sustainability is not linear and unidirectional. It can also have negative impacts on the environment or be affected by environmental changes.

2.5.4 Issue Posed by Ecological Aspects of Urban Agriculture

Some measures of agriculture may run counter to protecting environmental sustainability. Agriculture in and around cities is no exception, such as soil and water pollution due to overuse of fertilizers (Abdulkadir et al. 2012; Rufí-Salís et al. 2021; Zhou et al. 2021). While focusing on the ecological benefits of UA for cities there is also a need to be aware of the potential environmental pollution risks.

Water

Modern intensive agriculture has caused environmental pollution. However modern diets and intensive agriculture are polluting water resources while consuming large amounts of water. Most of the world's freshwater is used for food production (Wiskerke & Viljoen 2012). For example, 65% of the water consumed daily in the UK is consumed as water in food and less than one percent is used for drinking water. If the water demand of agriculture doubled, the earth's water resources could also be depleted by agriculture (Wiskerke 2009). Yet it is in this context that some forms of agricultural production practices recklessly discharge pesticides and nitrates into surface and groundwater (Goodlass et al. 2003; Parris 1998; van Eerd & Fong 1998).

Soil

Soil is an essential resource for the production of food and feed. Maintaining the productive capacity of the soil requires good and rational management of the soil (van der Ploeg 2008). In urban areas, soils face additional challenges including agriculture. The heatisland effect leads to increased soil temperatures. Soil organic matter decomposes faster, carbon sequestration becomes less efficient, and ecosystems change. Vehicle traffic and particulate matter dispersed by construction structures can lead to changes in soil pH, calcification, excess heavy metals, toxic substances, etc. (Taylor & Lovell 2021). Ye and van Ranst (2009) have developed an assessment system that simulates a 9% decline in productivity by 2030 at the rate of soil degradation seen in China 2009, and if the rate of soil degradation is doubled, the productivity of the soil will drop by 9% by the year 2030. If the rate of soil degradation doubled, productivity would fall by 30% by 2050. China's example is not unique in the world, as many other countries face soil degradation due to mismanagement (Lang 2010).

Greenhouse Gases

The globalized capitalized global food system contributes significantly to greenhouse gas emissions (Carlsson-Kanyama et al. 2003; Carlsson-Kanyama and Gonzalez 2009; Lang 2010). Fossil fuels are required in large quantities at every stage of production, processing, packaging, transportation, storage, and distribution (Pimentel et al. 2008). In the Western dietary system, for example, it takes every 7 calories of fossil fuel to produce 1 calorie of food (Heller and Keoleain 2000). The food supply chain now utilizes energy inefficiently (Wiskerke & Viljoen 2012). To feed the world's entire human population and create economic value, humans are using more resources to invest in the value that food can produce.

Greenhouse gas emissions from agriculture contribute to climate change. Climate change, in turn, is having a significant impact on agricultural production capacity (Garnett, 2008). For some regions, a warmer climate can lead to a better production environment, but for some it is almost a vicious circle. Problems such as severe droughts, floods, and changing climate can affect four aspects of food security. These are food supply, food availability, food utilization, and food system stability (FAO 2018). What people can do to mitigate climate change is to reduce greenhouse gas emissions by changing agricultural practices (Ibid.).

Loss of Biodiversity

Urbanization and modernization of agriculture have led to a decrease in biodiversity in the areas that have been changed. In order to feed people rural areas have taken over natural habitats to implement modern agriculture. This has led to the destruction of a large number of habitats and historical and cultural landscapes (Wiskerke 2009). For example, the Amazon rainforest is diminishing in size every year, and the reduced area has been turned into farmland for the production of soybeans and biofuels (Wiskerke

& Viljoen 2012). Food systems are more inclined to grow high-yielding crops and raise high-yielding animals to meet food supply challenges. The decline in plant genetics brought about by modern agriculture is a cause for concern for all. Maintaining the genetic diversity of native crops and counteracting the disappearance of crop populations should be the concern of every farmer (Visser 1998).

2.5.5 Impediments to Urban Agriculture

The development of UA is hindered by different problems. Part of it is brought to UA by external factors. Partly, it is the characteristics of UA arising from itself that limit its development.

Functions

First of all, available land is a potential hindrance for UA. When the value or expected value of land in a city is high, it is likely that the governmental and tax policies of the sub-region in which it is located will limit food production (Angotti 2015; Shackleton et al. 2017). Whereas, UA needs to be demonstrated in the urban periphery including landscape functionality, productivity, economic sustainability, psychological healing, and cultural functions as well as educational functions thereby justifying the use of valuable urban land for agricultural production (Taylor & Lovell 2021).

In relation to land use, UA as part of urban green facilities may conflict with other greening practices. The main protagonist of urban forestry, tree cover, makes it difficult for UA to be implemented in the understory (Taylor et al. 2017). Planners of urban forestry also often overlook the capacity that trees harbor in food security issues. They choose more planting of trees that do not produce food ignoring the potential of trees and shrubs to provide edible products. (Clark & Nicholas 2014).

It is important to note that while UA does provide food, its safety is not always guaranteed. This is not only a dilemma for urban agroforestry to provide food, but also a dilemma for UA Pollutants in the soil and air lead to the risk of contamination of city-grown food (Wortman & Lovell 2013).

Land Using

The world's population is rising and land use is becoming increasingly intense. Various functions in cities need to be developed by occupying land that was originally peripheral to the city (Lang 2010). One of the major constraints of UA arises in the land on which agriculture depends. UA as a primary industry is often prohibited or restricted because it does not produce as much benefit as the business function of the city. This is especially true when urban land prices are high or when development is expected to be favorable. Tax policies and zoning can then limit land use authority for agriculture (Shackleton et al. 2017).

Substitution of rural land for other functions has already occurred in many European countries (van Dam et al. 2006). This includes use for housing, recreation or production. London, for example, has used 6.63 hectares of land per capita to create a better environment to retain consumers. However, this is far more than is needed to create a fair and sustainable environment (Wiskerke & Viljoen 2012). In addition to this biofuels are becoming an expensive alternative to oil, and in terms of land function, the production of biofuels is also eating into the land used for food production (Ibid.).

Declining Income and Decreasing Labour Force

Over the past decade or so, the food supply system has transformed into a demand-driven food supply chain. As the food industry and retailing continue to globalize and centralize, price struggles in the food supply chain have become intense (Wiskerke & Viljoen 2012). Primary producers have a subordinate economic position in the food supply chain. A more significant manifestation of this is the unequal distribution of value added in the supply chain. (Ibid). In the Dutch pork supply chain, for example, pig farmers get to keep 6% of the market value of pork, the basic agricultural sector keeps 30%, retailers keep 24%, 20% is harvested on pre-packaging, and the remaining 20% is earned by the rest of the companies in the food supply chain (Hoste et al. 2004). So farmers are forced to increase production levels and scale up to reduce production costs per unit of finished product and labor (Morgan & Murdoch 2000).

With lower incomes, the agricultural labor force is decreasing globally. Not only is there a lack of labor, but workers who leave may take relevant skills and competencies with them, and even the loss of youth labor can lead to the disappearance of traditional farms (Wiskerke & Viljoen 2012). The negative impacts of UA in other ways tend to affect low-income households even more (Shokry et al. 2020; Grădinaru 2018).

2.5.6 Motivations of Governmental Participants in Urban Agriculture

Participants in UA have different motivations. Different stakeholders think differently from different perspectives. Participants may be motivated by the need to provide food, provide activities, and so on. When choosing to support UA the governmental level tends to focus on a number of factors in addition to the advantages and disadvantages. In countries of the South, UA may be a mode of production that is critical to livelihoods. A key factor for governments in determining whether or not to support UA is whether or not it has a commensurate and reasonable output. However, researchers often need to focus more on how to support participants through the development of regulations. to protect the legitimacy and existence of UA. (Clerino & Fargue-Lelievre 2020; Hakansson 2021). When UA is not seen as having a productive function but as a purely social activity, it may prevent it from being considered as part of urban planning (Rao et al. 2022). In response to food security issues, in order to deal with physical deserts, urban planners have then gradually become more and more interested in UA (Thomas 2010; Ver Ploeg et al. 2005).

Rao et al. (2022) noted that there are now few papers discussing land tenure-related land use instability in the UPA. This is because there are many farmers farming on rented abandoned or temporarily donated land (Pirro & Anguelovski 2017; Petrovic et al. 2019; Grădinaru et al. 2018). However, government land use policies or changes in attitudes can affect the development of urban agriculture. For example, in the Global South, a large number of farmers choose to avoid investing in their farms or selling their land because of mistrust or lack of confidence in the information that the policies will lead to favorable agricultural outcomes due to land reforms or policy changes (Abdulkadir et al. 2012). Prové et al. (2018), in a study on the UPA in Paris, noted that when land ownership is uncertain, it is not easy to determine the right to land. noted that long-term planning and investment in UPA is very difficult for UPA farmers when land ownership is uncertain.

When government departments act as purchasers, public procurement is also a major government concern related to UA. The state often needs to be both cost-saving and concerned with environmental sustainability in order to set an example. The choice of what kind of food is the optimal solution has been widely discussed (Wiskerke & Viljoen 2012). Cafeterias, including hospitals, schools, prisons, and governments, are an important part of any country's food economy. Their untapped potential is huge (Morgan 2006). For example, in the UK public institutions need to serve 3.5 million meals per day. Of these, 50% or £1 billion is spent on school meal overheads (Wiskerke & Viljoen 2012).

3. Case Study

3.1 Questions

1. Has urban development had an impact on peri-urban agriculture?

2. What are some of the impacts?

3.2 Hypothesis

1. Urban development has contributed to the development of peri-urban agriculture.

2. As urban development, peri-urban agriculture becomes more productive and sustainable, and marketing its products becomes easier.

3.3 Method

This is a qualitative case study and the main research methodology is to analyze primary data and draw conclusions from a combination of secondary data. The primary data consisted of comparing and analysing maps, traveling to UA sites, and conducting in-depth semi-structured interviews (Easterby-Smith et al. 2021). Residential food and farmers' food outlets were researched to determine if urban development had an impact on UA and the food supply chain in marginal urban areas.

Prior to conducting the study, the target literature was identified through keyword searches and "snowballing" (Easterby-Smith et al. 2021). Relevant government documents were also searched on the website of the Beijing Municipal Government. Some previous policies and literature related to UA, Beijing's agricultural situation, Beijing's urban planning, and the food supply chain were analyzed first. to obtain the secondary information.

The first step in obtaining primary data was to analyze the satellite maps of the previous and current areas of Beijing and the target town of Sujiatuo to find out what changes have taken place.

Secondly, interviews were conducted with food suppliers in the target area of the study to find out the types and quantities of several major local food sources.

Thirdly, interviews were conducted with various interest groups such as local farmers, government officials, companies involved in local agricultural activities, and urban planners to find out how local UA has changed as a result of urban development.

Then, the local agricultural production in the food supply chain is analyzed by extracting keywords and key information from the primary data obtained from the interviews. This study is a qualitative study. I used grounded analysis, so when analyzing the primary data I first had to translate all the interviews into English and then read the whole content. I synthesized the entire content, thought about what the commonalities of the Interviewee's responses were and then did open coding. the extracted codes were very complex and some of the codes were one sentence. The third step is conceptualization, i.e., reducing a complex, long code into a conceptual word or phrase. At this point, the codes become short and conceptualized but may be very large in number. The fourth step involves recoding, which reduces the number of unimportant codes that do not so often appear in the answers of interviewees and brings back some of the previously ignored codes. the fifth step is linking and categorization, which means categorizing each of the codes, linking related or contradictory codes together, and grouping them into the same groups. The last step is to re-measure the importance of these grouped codes and make some trade-offs (Easterby-Smith et al. 2021). The fourth to sixth steps need to be repeated several times, which was done two times in this study (Figure 2).

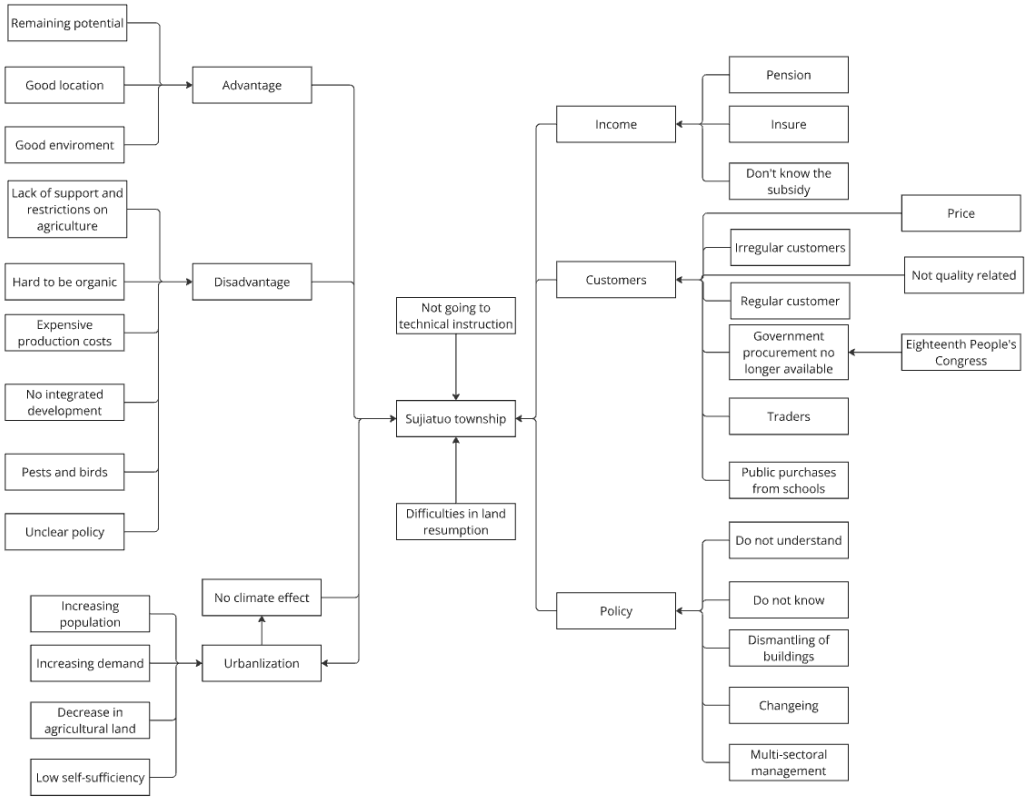

Figure 2. Results of data analysis.

Two rounds of shortened abstraction and categorization of different codes yielded the final results (Image made by me).

Finally, the primary data is compared with the secondary data to find out how urban development in Sujiatuo township affects the development of local UA and changes in the food supply chain.

3.4 Selection of Study Target Areas

Figure 3. The location of Sujiatuo township.

The study site is in Beijing, the capital of China. The town of Sujiatuo is in the northwest of Beijing. To the northwest are mountains, while to the southeast is the center of Beijing. This is a place that has been influenced by the urban development of Beijing. Data map: Imagery ©2024 TerraMetrics, Map data ©202 Google 4. Sujiatuo. [2024-06-12] (Color blocks and place names added by me).

The spatial scope of this study is Sujiatuo Township, Haidian District, Beijing. In the past two decades, this traditional agricultural area has been gradually surrounded by cities due to urban development and massive population inflow. Some of these agricultural areas became buildings. The traditional rural areas became peri-urban areas (Figure 3).

3.4.1 Selection of Interviewees

This case study hopes to look at different aspects of possible answers to the experimental question through different responses from different interest groups.

So in this study, there were a total of fourteen respondents for whom semi-structured interviews were conducted. eleven were face-to-face interviews and two were telephone interviews. Three of the interviews were conducted for approximately 40 minutes and the rest were over an hour.

One of the fourteen interviewees was interviewed through three rounds of a written question-and-answer format. The written question-and-answer format was similar to a semi-structured interview. The questions posed in the first round also used pre-determined questions from the semi-structured interviews. Secondary and tertiary questions were then asked through responses to the interviewees.

The interviewees were all people related to agriculture and urban planning in Sujiatuo Township. They included one urban planner employed by the municipal government, two staff members of the agricultural department of the town-level government, one employee of a state-owned agricultural research institution, one employee of an agricultural company affiliated with a state-owned institution, and two employees of a private agricultural company or an agricultural department affiliated with a private company. One staff member of the village government within the jurisdiction of the former Sujiatuo township. Six local private agricultural practitioners, and one former private agricultural practitioner (Figure 4). Refer to the Final Questions section for interview questions for different Interviewees.

In addition to this, a short question and answer session was conducted at seven fresh food outlets to obtain information on the sources of fresh food before the study start. These included two supermarkets, two mobile vendors, and three fixed fresh food outlets.

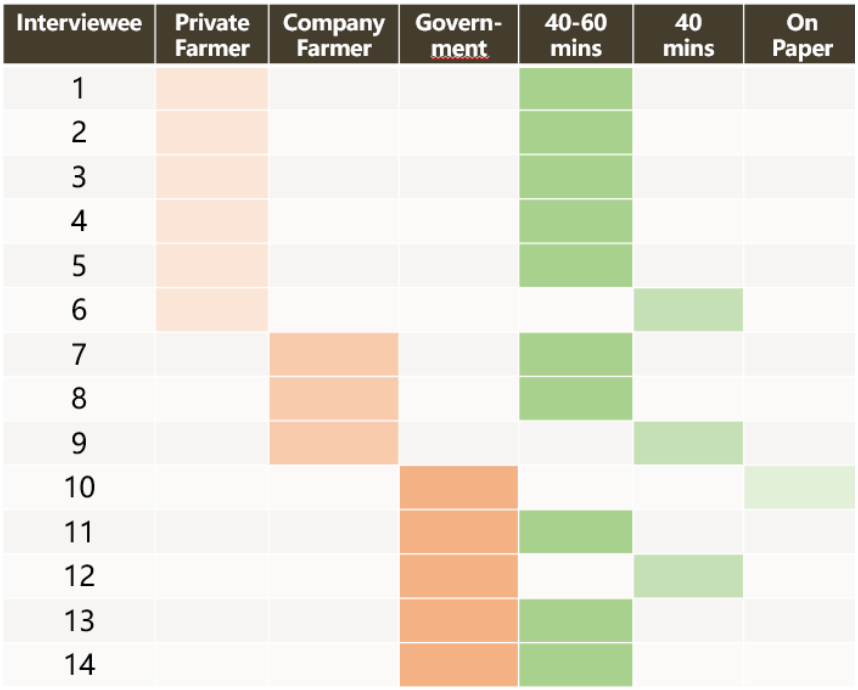

Figure 4. Categorization of the different Interviewees and how the interviews were conducted.

Six private farmers, three companies, and five employees from government departments were interviewed. All were around 40 minutes in length, with the longest going up to an hour. One Interviewee answered by text (Image made by me).

3.5 Basic Information on Interviewees

Interviewees 1-6 are private peri-urban farmers. Interviewees 7-9 are peri-urban agricultural companies belonging to some other company (Figure 4, 5). Interviewee 5's farmland is rented from Interviewee 8's company and Interviewee 6 uses an allotment

rented from Interviewee 7's company. So there were nine peri-urban agricultural farmers interviewed, but the source of farmland use rights was different. Although they are all renting for land use rights, Interviewee 6 is renting for a short period of time and is a legal second-hand sublease. Interviewees 1-5 are legal long-term leases, so they have basically been leasing since 2000. Interviewee 7's company has a partnership with the local village communities, which gives them the right to rent and use the land. Interviewee 8's company has a cooperative relationship with the local government, so they can rent and use the land. Interviewee 9's land is subleased from a "friend", and his village leases out land in the same way as Interviewee 1-5, through a long-term lease between a private party and the village collective. Therefore, Interviewee 9's case is theoretically non-compliance (Figure 5).

	Belonging	Has farm area reduced	Main Corp	Current area (Acers)	Whether buildings in the park have been demolished	Original area	Starting year	Subsidies other than those mentioned by each individual	Organic Farming Certification
Interviewee 1	Rent from Community	Yes	Peaches, plums, cherries other vegetables	2.5	Yes	50	1999	Yes, means of production	
Interviewee 2	Rent from Community	No		1			1974		
Interviewee 3	Rent from Community	Yes	Peaches, cherries, a few apricots, plums, walnuts and a few vegetables	0	Yes	10	2000		
Interviewee 4	Rent from Community	No		3.3	yes		2000	Yes, means of production	
Interviewee 5	Rent from Community	NO	Peaches, apples, cherries, and to a lesser extent pears, plums, apricots, and to a lesser extent other trees producing dried fruits.	10	Yes		1999	Yes, means of production	
Interviewee 6	Rent from Interviewee 7	No		30 (Square meter)			2021		Yes
Interviewee 7	Cooperate with Community	Yes	Vegetables and management of tenants' vegetables, a few fruit trees for educational purposes	38		360	2008	Yes	Yes
Interviewee 8	Running the land	No	Apples mainly, pears, plums, peaches, apricots, strawberries	133 for planting, 2200 for renting			1998	Yes	
Interviewee 9	Rent from private	No	Different kinds of vegetables, a few mushrooms	1.6 acres, but also operating other areas of the field			2021	Yes, Organic farming sub	Yes

Figure 5.Information of Interviewees.

To easily understand and compare the base profile of each Interviewee involved in agricultural activities for the following text. (Image made by me).

Interviewee 10 is a planner from the planning department of the Beijing government. So he represents the planner's view. Interviewees 11-13 are government employees working in Sujiatuo township. Their views represent the interest of government employees in practicing government functions. Interviewee 14 is a staff member of an agricultural science research organization in the Sujiatuo area. He represents the views of those at the forefront of agricultural science and technology and those teaching agricultural technology (Figure 4).

3.6 Secondary Data

3.6.1 Basic Facts about Beijing

Until 2022, Beijing has a population of 20 million people. Among them, urban areas had more than 19 million people. Then the population reduced by 43,000 people by the end of the 2023 year. However looking at the change in population over the last 20 years, Beijing's population has risen by 7 million people (Beijing Municipal Bureau of Statistics 2023). The per capita income of urban residents was 84,023 RMB (Chinese money), and that of rural residents was 34,754 RMB. In 2022, the total annual grain production of 454,000 tons, over seven years up grown of 20.1%. Vegetables and edible fungi production of 1,989,000 tons, than last year, an increase of 20.1%. In addition to this, there are 1,027 farms also had entertainment function and host tourists. There were 7,105 farm households receiving tourists (Beijing Municipal Bureau of Statistics 2023).

3.6.2 Population Growth

Beijing's population is growing rapidly. However, natural increase in the local population accounts for only 23% of this growth. Foreign population growth accounts for 76.1% of the total population growth. Twenty-two percent of the total population growth comes from Beijing's neighbor, Hebei Province. Industries relocating out of Beijing to Hebei, the need for land to produce more food and labor shortages are disguised as the absorption of human and land resources from Hebei Province (Zhao 2014).

According to the Seventh Census of Beijing conducted in 2020, there were 78,235 people living in Sujiatuo township (Beijing Haidian Statistics Bureau 2021). This is about 32,000 more than the 46,786 people living in the Sujiatuo area according to the sixth census in 2010 (Pang & Shen 2010). This represents a significant increase in population in Sujiatuo Township alone. However, with more people bringing more demand for food and land.

3.6.3 The Land Needs of Urban Development

China's rapid industrialization and urbanization have led to a rapid decrease in the area of farmland; 80.11% of the growth in urban areas throughout China between 1995 and 2000 came from farmland. The production value of industry and real estate is much higher than that of agricultural land. Competition from investment in the real estate sector has led to the conversion of large amounts of farmland to urban land (Yu & Lu 2008). By 2022, the farmland in Beijing was 93,548 ha, accounting for 14.22% of the city's area (Beijing Municipal Commission of Planning and Natural Resources 2021). From the founding of China in 1949 to 2022, the area of farmland has decreased by 382,002 ha. The speed of farmland reduction in Beijing ranges from slow to fast to slow. In 2022, the area of retained farmland in Beijing was even less than the area reduced in the past 20 years (Zhang et al. 2006).

This can be clearly seen from the analysis of the satellite map of the Sujiatuo area. Comparing the satellite maps of the Sujiatuo area in 2002 and 2022 (Figure 6, 7), in 2002, there was a lot of agricultural land in Sujiatuo and the area behind it, and not much of it was used for residential or other non-agricultural purposes, and in 2022, a large amount of the agricultural land has been changed into land for other purposes. In 2022, a large amount of agricultural land will be converted to other functions, a large portion of which will be new residential areas, with a large influx of people into Sujiatuo and the surrounding area, and new land functions gradually replacing agricultural production functions. What was once a rural area has become an urban fringe consisting of a mosaic of urban and non-urban functions.

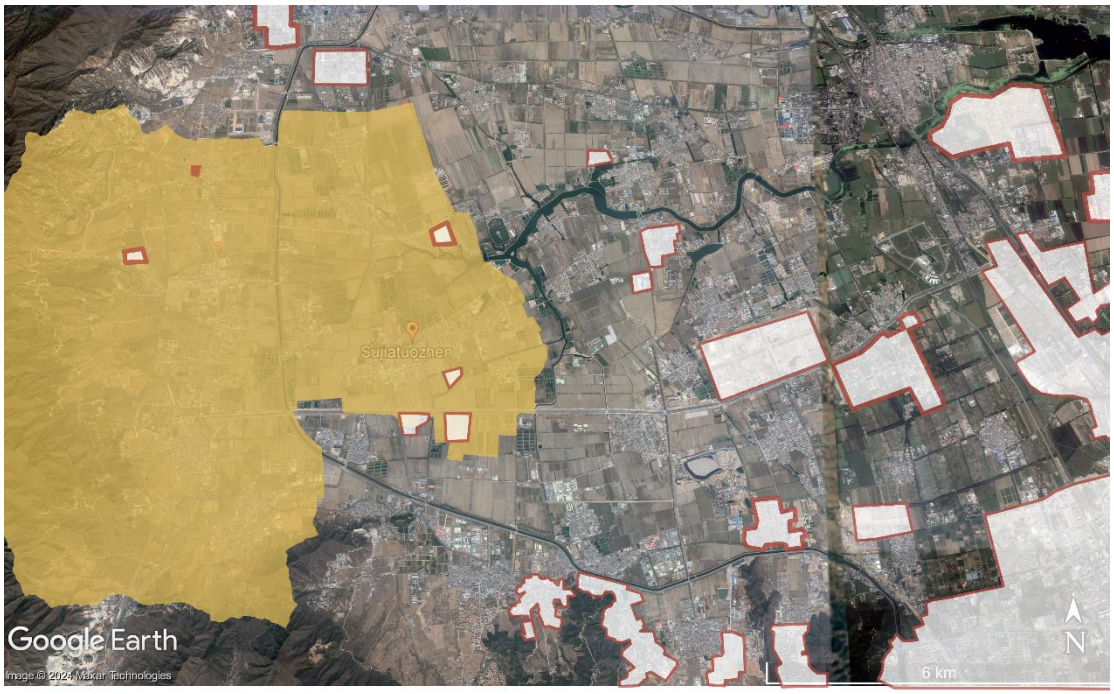

Figure 6. Sujiatuo town and surrounding area in 2002.

Sujiatuo town is around farmland. There is almost no mosaic around the town of Sujiatuo that could be made large enough to become an urban function. The white areas circled in red are non-agricultural function sites such as high-rise buildings, industrial parks, and recreational facilities, and the yellow areas are Sujiatuo Township. Data map: Image ©2024 Maxar Technologies, Map data ©2024 Google. Sujiatuo. [2024-06-12] (Color blocks added by me).

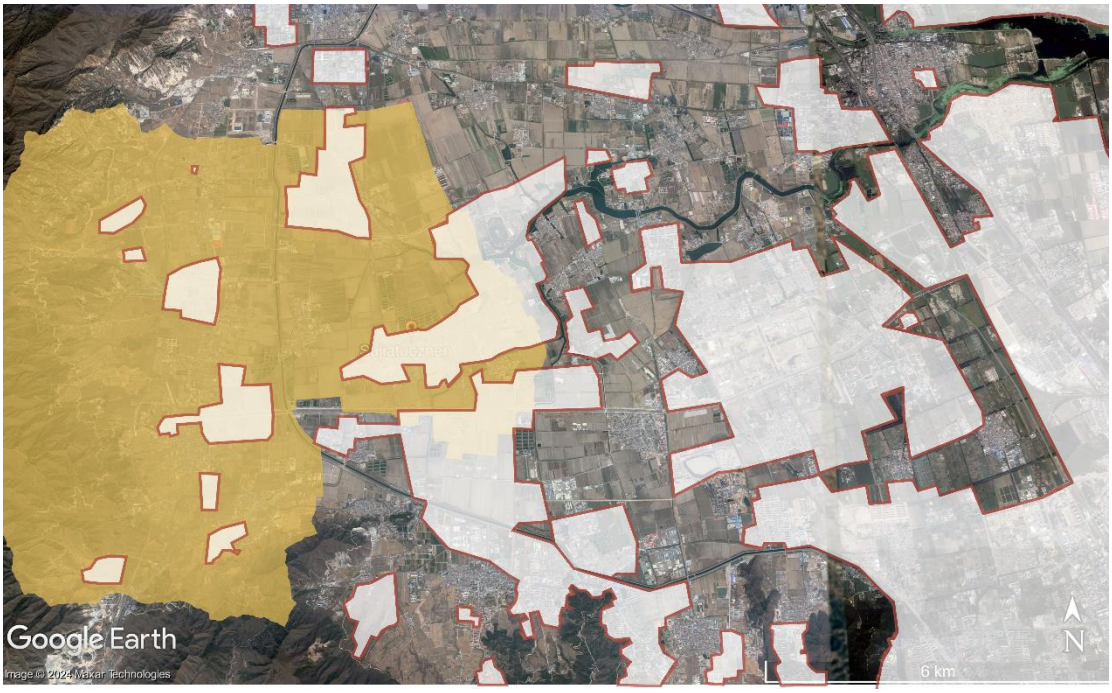

Figure 7. Sujiatuo town and surrounding area in 2022.

The mosaic of urban functions spreads to the mountainside. Much of the agricultural land has been converted to recreational residential or other functions. Compared to 2002, Sujiatuo Township can be described as having changed from a rural area to a peri-urban area. The white area circled in red is the non-agricultural functional land such as high-rise buildings, industrial parks, recreational facilities, etc. The yellow area is the town of Sujiatuo. Data map: Image ©2024 Maxar Technologies, Map data ©2024 Google. Sujiatuo. [2024-06-12] (Color blocks added by me).

The development of agriculture in Beijing is organized in the form of "five rings". The functions vary from the urban fringe to the administrative boundary of Beijing. The first circle in Beijing is the urban development circle, which consists of urban areas and some suburbs, focusing on farms with pretty landscapes and farms used to display scientific research results. These two types of farms will be able to provide a good environment for neighboring cities and residential areas as well as display and trade high-tech agricultural products; The second circle is the peri-urban agricultural development circle, which consists of peri-urban areas and rural areas, focusing on the development of ecological farm, farm with creative entrepreneurial ideas, and high-tech farm (Li & W, 2012). The first two circles are where Sujiatuo township is located. It can be seen that Beijing's agricultural development expects the functions of Sujiatuo township, which is now in a sub-urban area, to be landscape function, exhibition function, and high-tech agriculture.

The fifth circle is an agricultural development circle that cooperates with Hebei Province and Tianjin, where are the most out layer circle and located outside of Beijing. The Beijing Municipal Government is encouraging the construction of food production bases in this region, so that Beijing's all-season vegetable supply can be guaranteed by the neighboring region (Ibid.). To support Beijing, Hebei Province to build 66,000 acres

of vegetable production bases in neighboring areas every year, and by 2020, the construction area will reach 30,000 acres. About 360 million kilograms of vegetables will be supplied to Beijing every year. By then, the share of vegetables supplied to Beijing from Hebei province will increase by 5% (Beijing Municipal Commission of Development and Reform, 2017). The fifth circle is the main source of food for Beijing.

3.7 Food Production and Demand in Beijing.

In 2009, the population of Beijing was 12.458 million. It means people in Beijing need 10 million kilograms of vegetables every day. Moreover, the demand for vegetables and fruits is increasing with the changes in residents' income and food intake structure (Gao et al. 2007). In 2013, a survey by the Beijing Municipal Bureau of Industry and Commerce showed that there were 21,254,000 people in Beijing. They needed 20 million kilograms of vegetables per day. Beijing's decreasing farmland area and increasing population cannot achieve self-sufficiency in food supply. Beijing's self-sufficiency rate for fruits and vegetables is low, with 75% of vegetables and more than 90% of fruits supplied from outside the province (Hong & Wang 2015). Only pork and chicken have high self-sufficiency rates in Beijing, at 79.92% and 44.46% respectively (Hong & Wang 2015). Beijing's vegetable sources are relatively centralized, with only 15% of the vegetables on the summer market in 2021 supplied by Beijing itself, 37% by, located in the fifth circle planned by the Beijing Municipal Government, the nearest province of Hebei, followed by Shandong and Liaoning in Hebei's vicinity (Figure 8).

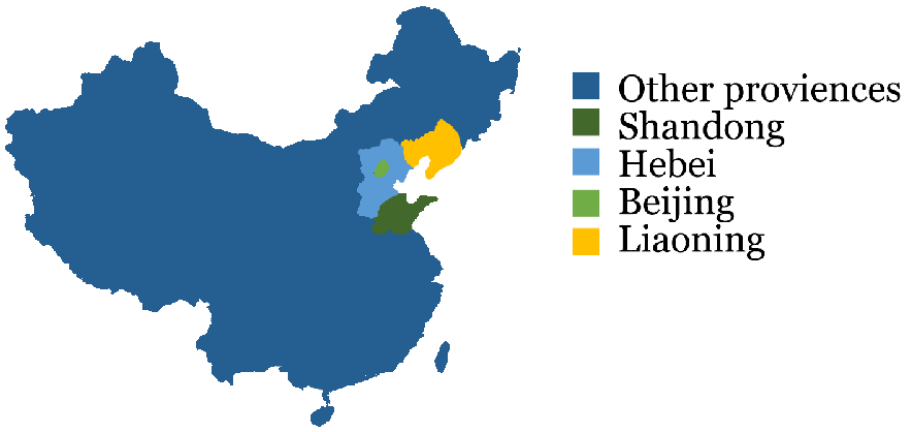

Figure 8. Schematic map of sources of vegetable supply in Beijing.

Hebei is the closest province and is the "fifth ring" in Beijing's vegetable supply, providing Beijing with the largest amount of fresh summer vegetables. Other neighboring provinces also provide Beijing with large quantities of vegetables and fruits. (Image made by me).

The remaining provinces account for only 20 percent. In winter, Beijing produces even less, only 6 percent. Shandong replaces Hebei in supplying 27% of Beijing's vegetables. Southern provinces dominate, supplying 37% of vegetables (Zhao et al. 2011; Lei et al. 2010). Data from the "Xinfadi" distribution center, which supplies 80 percent of Beijing's vegetables, also suggest that Beijing's self-supply of fresh vegetables is roughly 15 percent in summer and only 6 percent in winter (Figure 9, 10). Fruits are supplied in large quantities from southern provinces (Beijing Xinfaadi Agricultural Products Wholesale Market n.d.).

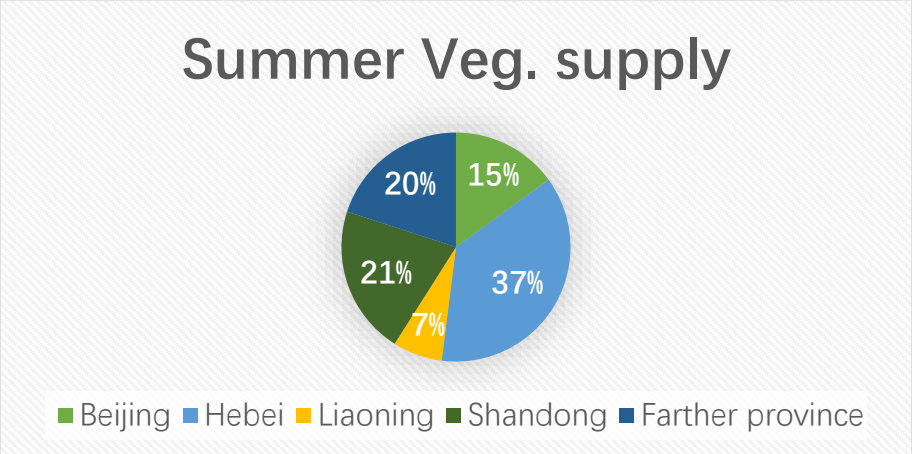

Figure 9. Sources of summer vegetable supply in Beijing.

Beijing's local summer vegetable production accounts for only 15 percent of all vegetables consumed in Beijing, so local supply does not account for much and most of the supply comes from neighboring provinces. Data Source: Beijing Xinfaadi Agricultural Products Wholesale Market (n.d.). (Image made by me).

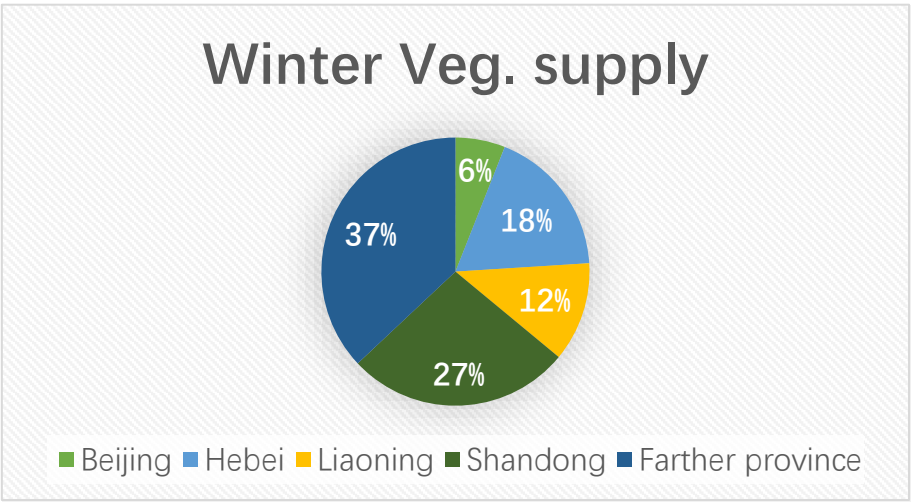

Figure 10. The source of Beijing's winter vegetable supply.

Beijing produces even fewer vegetables locally in the winter, and most of them come from neighboring provinces. Data Source: Beijing Xinfaadi Agricultural Products Wholesale Market (n.d.). (Image made by me).

3.8 Competitiveness of local production

In addition to dietary needs, local agriculture in Beijing has a presence in the landscape, emotionally and culturally. Beijing was once known for its rice, watermelons, ducks, and other products. With urbanization, the reduction of agricultural land and policy changes have made it impossible to produce many of the foods that could once be grown and raised in Beijing. Beijing residents miss the city's diminishing landscape of local products and foods (Sun, 2022).

> "I have lived in Liulangzhuang since I was a child, and my family grew the famous "Beijing West Rice". When I was a kid, I always ran wild with my buddies in the rice paddies, and year after year, I was two cuts taller than the rice. When I was a child, I used to run wild with my buddies in the rice fields, and I was two times taller than the rice".
>
> Residen(Sun 2022)

On top of that, local production has an unrivaled geographical advantage. Most of the orchards and vegetable gardens on the outskirts of Beijing are pick-your-own farms. People can go to the farms and summarize what they have picked and eaten. This method of marketing reduces transportation, maintains the freshness of the fruit, and has activity and entertainment value. As a result, this approach is particularly popular with the public. This was particularly evident during COVID-19.

> "During the epidemic, tourists couldn't travel far, so external consumption became internal to Beijing. Now that the epidemic is over people are moving more, they don't necessarily have to play in local peri-urban agriculture or rent land to grow."
>
> Interviewee 11

4. Interview Result

4.1 Changes Related to Farm

Interviewees 6 and 9 had fewer years of involvement in planting activities. So the range of years they answered was only the changes experienced in the last two years.
The other respondents basically answered with changes in the farmland experienced since the beginning of 2000. The three key changes mentioned by interviewees the most, which were all changes related to important items in the farmland, namely changes in the fruit trees, and changes in the garden buildings versus changes related to the land.

Local farmers planted fruit trees before 2002. Historically, Sujiatuo township was used as the first planting base for Fuji apples soon after the founding of China.

> We have been growing Fuji apples for so many years, especially at the Farm, and the best time for us was in 1982 when we first introduced the Fuji apple to Beijing and started growing apples.
>
> Interviewee 8

Around 2000, because of the aging of the trees and the land from the township communities began to lease to individuals, so farmers began to gradually replace with other varieties with higher economic benefits. With the aging of trees, around 2020, trees were affected by natural causes, diseases, and deaths. Farmers began to replace the trees for the second time.

> The first trees were planted by young people (around 1980) and were old apple trees. Then gradually replaced (these trees). I bought new trees every year. At first (when he rented the orchard). I didn't know how to plant them. I planted the trees where the old ones were. Then more trees were planted and I figured out how to do it myself.
>
> Interviewee 5

> “I've got some cherry trees that have died a lot. Last year's heavy rain made ..... After that, you can plant them again when you have money.”
>
> Interviewee 4

> “I just replanted this tree, look at the little tree, just planted. It's not at its best time yet. You see this one, here is the best production time, it just started to bear fruit last year.”
>
> Interviewee 1

However, there are some farmers who can't afford to replace the trees or don't know whether they should replace the trees or not.

At that time, 20 years ago, these varieties should have been better at that time, but if you look at the varieties nowadays, these two varieties (what he planted in his farm) become out-of-time varieties. Yes, of course, this series of varieties is still good, but not the best for now. People now change varieties, they wants to change, but they can not change. Because they need to invested so much money, and then they need to cut down the original tree that has now fruiting and then replant with some new…… my advice to farmers is every other year regenerate new trees a little. Because this time cycle is longer, less economic pressure. And it mixed varieties of planting.

Interviewee 14

4.1.1 Changes in Architecture

At the beginning of the 21st century, tourist agriculture, which means farmland hosting visitors and offering entertainment services, used to be encouraged in Beijing. Farmers constructed some buildings on the farmland at that time. The buildings were used as service buildings when there were tourists, and some other uses, such as storing agricultural implements, packing boxes for agricultural products, workers' rest, rentals, and restrooms. However, due to tightening and policy changes. These buildings have been demolished in recent years. This made these farmers have some dissatisfaction Beijing Municipal People's Government (2021).

“They said they'd tear down the house in the yard. I didn't agree. They said I couldn't keep the house, as long as there were beds inside (which meant the building could be rented out as a living place). But what if I'm tired and want to take a break and lie down at noon? What if I want to put something away? Anyway, it's just not allowed to have electricity or water right now. ..... There are a couple houses down the road from me that are still rented…… At the earliest time, they advocate people do tourist agriculture and so on. I build roads for people to come to sightseeing and picking and so on. Now the government is asking to tear it all down. （The houses and roads in the farmlands) have all been demolished. If you demolish your illegal structures, you'll get 300 RMB per square meter. I even built it costing more than 300 dollars. If this land has been demolished and you want to plant on the farm, you have to have a place to prepare things. No matter what baskets or boxes you have to prepare, this is also not allowed. You don't even have a place to put it, and now you're not allowed to get it. One policy at a time.”s

Interviewee 1

“This house that wasn't used before by us. They said need some documents for having a house and so on. It was demolished before I came here. It was torn down before I came here. (The site is still maintained as if it had just been torn down).”

Interviewee 9

“There used to be a place for guests to rest, but now there's no place for them. Not even a shed is allowed to remain. What if it rains while you're farming?”

Interviewee 7

However, the fact is that most of these farm buildings are non-compliance structures from the government's point of view. Only licensed farmland can legally establish these structures. The main policy is now more concerned with basic farmland security than changing the structure of the rural economy.

> “It's all about growing things and keeping the area of basic farmland, otherwise why demolish these illegal structures? The question is how much of this land has actually been planted after it has been demolished?”

Interviewee 12

> “(A certain orchard now) said that it was given an allow to keep a toilet before, but now it may be demolished if it is consider not compliant. If they now own some buildings that are remnants building, they can't say it's legal now. It can only stay there for now, but if there will be a day when the policy may be tightened then they will not able to have any building even toilets.”

Interviewee 11

4.2 Agricultural Subsidies

4.2.1 Support for Farmers

Based on the interviews with Interviewee 11 and Interviewee 13, government support for farmers has been ongoing. However it is not always given in the form of cash.
From the farmers' perspective, the level of perception of subsidies is not high. When subsidy was mentioned in the interviews, the first reaction of all five Interviewees was that they had not received it. However, after a discussion of the relevant content, Interviewees were usually able to recall some of it. For example, they mentioned the distribution of fruit tree saplings or the sale of fruit tree saplings at a low price by the village collective, subsidies from the state for the purchase of agricultural machinery, and discounts on the purchase of other means of agricultural production.

> "At the time of agricultural mechanization subsidies, when buying a tractor gave some money, I have not had a weeder, it seems to give 50%, and then gave a little farmland subsidy, but not much. You do not mention I can not remember, as if the fallow forest industry subsidized a little, is to the village collective, did not give me."

Interviewee 3

> "Giving money is basically nothing, but giving pesticides, trellis film, mulch is helpful."

Interviewee 4

"Agricultural production materials are given, but not to everyone, sometimes it has to be more than 10 acres"

Interviewee 1

"The subsidy for organic fertilizer is now available year after year, and it's very cheap, but I'm not very happy with these organic plots, they don't work well, and I have to bother others to transport them here, and I have to hire people to move them. There was a cherry sapling discount before and I took it."

Interviewee 5

However the subsidy can't completely cover every farmer, because the total number of farmers is relatively large, but the amount of subsidy is not that big, take Niegezhuang as an example, which is a village included by Sujiatuo township, in 2000 in order to give a job to the villagers who don't have a job, so the land is rented to the villagers in the form of 0.8 acres per person which resulted in the number of Niegezhuan village that have working farmers now be large. The village collective is the landowner and the actual owner of all assets. Therefore, the handling of subsidies is discussed and decided by the village collectives. In the case of Niegezhuang, for example, the village collectives want all these farmers in difficulty to receive the subsidy, so instead of taking the form of payment in cash, it should be in the form of reduced fees for the purchase of agricultural materials. All farmers who register to apply for the purchase of agricultural production materials are eligible for subsidies to buy agricultural materials at less cost.

"The state's subsidies are there, but it is unrealistic to send every family, really buy into the fertilizer sent to each family is too little. So we are letting villagers in need register. Then the subsidy can be used to reduce the price they buy."

Interviewee 13

"Policies are always being adjusted over and over again, and the number of beneficiaries and the number of subsidies are changing. But it has to be only if the requirements are met; some farmers now own land that is actually illegal, so naturally there is no way to benefit from the policy."

Interviewee 11

In addition to this farmland, which is mostly planted with fruit trees, the village of Niejianzhuang receives management from three departments, which include the Forestry Department, the Department of Agriculture and the Planning and Natural Resources Commission.

"Theoretically we support farmers to plant everything, but the forestry department and the planning department may not require that."

Interviewee 11

Five of all nine peri-urban farmer Interviewees felt that they had received funding other than discounted prices for agricultural production materials. However, the types were all not the same. Three of the four Interviewee respondents were from corporate-operated farms. Interviewee 1 and Interviewee 5 indicated that they had received additional financial assistance. Both of their farms were over 8 acres in size. So indeed as Interviewee 1 and 13 described in their interviews

> "Subsidies go mainly to large farms."
>
> Interviewee 1

4.2.2 Insurance

Insurance is also an often forgotten government-supported program. The reason it is forgotten is that farmers often do not take this insurance. Four out of five interviewed farmers on private farmland were not insured. Interviewee 9 in the company that owns the farmland also just started on it in the first year. Often the interviewed farmers were resistant to insurance because of the extra money they had to spend, lack of understanding of the mechanism, and the perceived difficulty of making a claim.

> "I don't have insurance. How much can I get in the end (from insurance)? There's not much money in getting half a day's worth of photos and assessments."
>
> Interviewee 2

> "Because of last year's insect disaster, we had to buy insurance for this year, otherwise we can't explain to our boss if we can't produce any agricultural products."
>
> Interviewee 9

However, insurance is actually reasonable from the perspective of farmers' profitability. According to the answers of Interviewee 13 and Interviewee 11, the government will insure 50% of the insured farmers and the Haidian district government will reimburse 40% of the compensation to the farmers. In fact, farmers can be insured with only 10% of the money. With the passage of time, the loss of insurance has become more rigorous.

> "Previously, the Haidian District Agricultural Committee determined the loss, but later it was handed over to the insurance company, and the loss determination was very strict."
>
> Interviewee 13

4.3 Customers

For each of these farmers, the source of getting customers is different. All of these producers have irregular clients. All of the individual and company farmers all accept sporadic customers for picking, except Interviewee 8's company, which caters to customers who need to rent allotments interviewee 6 is one of those allotment users. And Interviewee 9, who supplies vegetables directly to the company they belong to. Three of the individual peri-urban farmers felt that their purchasers mainly originated from the city.

A short interview with the directors of two supermarkets shows the supermarkets do not accept food from neighboring farmers. They have to comply with the Food Safety Law and get their food from the fresh food distribution channels established by the supermarkets. The company does not have an agreement with the neighboring farmers and has not been inspected for food safety, so it cannot sell their food. This was corroborated by all five producers who stated that the surrounding supermarkets were never a distribution channel. Interviewee 1 said that they used to sell to supermarkets but there was not much demand.

> "Supermarkets don't have a big volume of fruits, for example, if I go up to your garden to fetch fruit (as a stuff of supermarket), this day I only fetch 50 kg or 25 kg, I have to come every day. But hawkers can buy away one or two hundred pounds at a time."
>
> Interviewee 1

Short interviews with three private, neighboring retailers of fruits and vegetables indicated that they accept direct supplies from farmers. This was also corroborated by interviews with six food producers, five of whom indicated that they sold to retailers, although not necessarily food retail stores, possibly fruit hawkers. Fruit hawkers would buy at a low price to sell in the neighborhood. Interviewee 2 said he sells it himself and does not need vendors to sell it.

> "All that kind of morning food market, the side of the road by the village. Or go to the morning market in Houshajian (place name) to sell, or in the village, and also the kind of roadside gathering of hawkers, the mountain (tourist place) inside road I all go sell my things. If the village manager doesn’t drive me away."
>
> Interviewee 2

The reasons for choosing not to sell to hawkers at low prices were explained by Interviewee 3 and Interviewee 4.

> "Unless I can't sell it (to her own customer resources), I will let them take it away, it's really not profitable, it's too cheap. But if it really can't be sold then I have to sell it to them or it's just rotting in the ground, I can't earn any money."

Interviewee 3

"It's just too busy. I've hired a permanent employee now who works in the tunnel every day. I need to take care of the farmland and wait for customers to come. My children have work and my wife has something (maybe a job or a part-time job) to do. If I go out and sell fruit, there will be no one to take care of the farm."

Interviewee 4

4.3.1 Irregular Customers

For the farmers interviewed, the most mentioned buyers were usually irregular-picking guests (They will go farmland picking fruit by themself at a little higher price). These are usually first-time visitors who do not necessarily return after one visit. This segment of guests accounts for a portion of sales each year and is not controllable. There may be many reasons why irregular guests do not become regular guests, such as merchants do not take the initiative to operate with these potential customers, or customers may not be willing to repurchase because of price, quality, distance, experience, other choices, leaving Beijing, etc. These were not mentioned in the interviews. These were not mentioned in the interviews.

4.3.2 Regular Customers

For both private and company farm Interviewees, almost all of them, but Interviewee 2, had relatively regular buyers each year. These relatively regular buyers introduce each other to their friends or colleagues who return together to pick from the fields of the Interviewees they have visited before. However, these buyers are usually private and do not necessarily live in the neighborhood. They are more likely to live in Beijing than originally born in Beijing. Buyers come every year to buy during the fruit ripening season.

A relatively regular clientele and a profit-oriented mentality may lead to a dilemma for tree regeneration. The main reason for this mentality is that the profit from sales does not match the change in income brought in by the surrounding city.

"At first it was random irregular customers, but then it was employees of these companies around here who come as regular guests. There are a few groups gusts are (as that way become regular guests) in similarly. That is, the first time it was a person who came, and then they were introduced. And then there was one person who came and then they will come with family …… Why don't I update my tree? It's because the old customers have come to me for this peach, and they say they love it. If I change the tree then there might not get good fruit in seven or eight years of festival."

Interviewee 3

"The customers are mainly by mutual publicity."

Interviewee 7

"Every year the company I work with brings fruit-picking guests."

Interviewee 5

"There are customers who come back again, but there are not too regular or big groups of buyers, I have quite a few of those customers, but came less this year."

Interviewee 4

4.3.3 Comparison with Company Interviewees

All the farmlands of the three company Interviewees basically have relatively regular sales channels. Their main source of income is legally renting out their land Interviewee 9 mainly provides organic food to its parent company. Interviewee 8's sales channels include group purchasing and picking and private picking. It is mainly a company-to-company sales method, which accounts for about 30% of sales. Private picking can account for 50%.

"Originally there was government procurement and state-owned companies to buy, but after the 18th People's Congress there was no more, it was not allowed. Other companies (company customers of Interviewee 9) usually give welfare to employees。 They buy hundreds of boxes of fruit once. But Irregular customers also account for 50%."

Interviewee 9

4.3.4 Public Purchase by Government

Four Interviewees indicated that at one time, before there were restrictions on public purchasing, the largest purchasing came from the government and government-owned companies. However, after the 18th People's Congress of the Chinese government, such government purchasing has virtually disappeared. The report of the Congress points out that some officials have serious problems of formalism and bureaucracy, and that there are serious problems of extravagance and wastefulness, as well as corruption in some areas, which the government will seriously address (Xinhua News Agency 2012).

"In the past, there were regular customers of mine were the government, government companies or private companies, their households to buy in large quantities let us into boxes back to their own share. But now it's no longer done."

Interviewee 1

4.3.5 Public Purchase by School

Two Interviewees indicated that schools used to work with them for tours and picking. But it was on a less regular basis and for reasons that were not so clear.

> “In 2000 there were student tourist groups picking fruits that came on a regular basis, and then it was the companies that worked with them that brought clients on a regular basis.”
>
> Interviewee 5

> “I've gone out on my own before to get clients, and then I found a lot of buses! Students in the same grade (around 100 people or even more) came at that time. What a lot of sales that year!”
>
> Interviewee 3

4.3.6 Public Purchase by Company

Interviewee 9 is farmland directly owned by the company. The company has a special department that rents land here for organic farming. All the vegetables and fruits produced are directly supplied to the company for distribution to the company managers. But the vegetables and fruits produced are not enough.

> "All that is produced is sent over (to the parent company), it's not enough, we have other farming bases, but I supply directly to nearby companies here, just because it's close (to the parent compay close to Sujiatuo Township)."
>
> Interviewee 9

4.3.7 Farmers' Income Resources

The three peri-urban farms belonging to companies have slightly different sources of income. Interviewee 9 does not make any money, the staff are paid by the head office and the produce is only available to the head office. Interviewee 7's income comes from collaborations with other schools or organizations and from renting out allotments to the public. Interviewee 8's employees are also paid by their company and the main sources of income mentioned in the interviews are the long-term rental of land to neighboring farmers and the selling of agricultural products.

The remaining five peri-urban farmers have different sources of income (Figure 11). From the interviews and observations in each farmer's garden, Interviewee 1's income comes mainly from renting out his house on the farmland and from his pension. There is also potential income from technical guidance. Interviewee 2's main income consisted of money from the retail sale of produce and a pension. Although Interviewee 2 declared that her spouse is not capable of working, but still her spouse should still be able to receive a monthly pension. Interviewee 3 Prior to land resumption had part-time

jobs and was earning from the land and now has a pension. Interviewee 4 has a pension and income from selling fruit. Interviewee 5 has an income from renting out the house on the farm in addition to his pension and income from selling fruits. Interviewee 6's income comes from work that is not related to UA. She just rents land from Interviewee 7 and engages in some agricultural activities based on fun and access to fresh fruits and vegetables.

> "My husband and I come back on weekends, we don't come during the week, we get off work too late …… We just grow these things as a hobby and get some fresh fruits and vegetables on the side. But there are too many bugs that ate a lot of our plants."
>
> Interviewee 6

Individual peri-urban farmers do not have to rely on farmland for their subsistence income. Interviewees 13 and 14 answered from the policy level. However, for private reasons, it is possible that some of the interviewees actively hid some of their sources of income during the interviews.

> "All the farmers in Haidian district are already turned into urban citizens (divided by household registration policy), at least 99% of them, only a few special cases. So as long as they are retired, they must have a pension. It's not necessarily true that farmers don't have other jobs. In fact many of them do have other jobs, like going to work as gardening technicians or as security guards. They don't have to make a living out of it. So you can think about why they say they don't have money."
>
> Interviewee 14

> "All the villagers in the village have had their agricultural households converted to non-agricultural households (by household registration policy), so they can't legally rent land after that."
>
> Interviewee 13

> "People may not always be willing to answer you truthfully, after all, it is about income."
>
> Interviewee 5

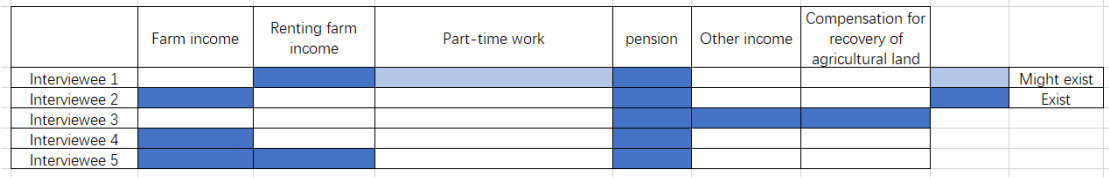

Figure 11.Private farmers' income resources.

It is intuitively clear that the main source of income for private farmers is still pensions. They don't have to necessarily rely on the farm. They usually have another job or income. (Image made by me).

4.3.8 Fruit Selection Conditions

For the customer, the price of local production may not be the only selection condition. This is because fruit producers generally believe that the customers do not necessarily choose to buy based on the price of the fruit. For example, Interviewee 4 believes that their fruit sells well because it is cheap, but the other Interviewee, producers who sell poorly do not think their fruit is expensive, but just don't sell well this year.

> "Our strawberry is really not expensive, but just no one is coming this year. Look around a few farms! Who is (selling) cheaper than me? But just no one comes (to my farm) this year."
>
> Interviewee 4

> "It's hard to say if the price is low enough to able sell well or if the price is too high to sell well. Often I sell cheaply, but I simply can't find customers Other people's houses are on the side of the road and when customers come (to Sutjiatuo township) they just buy from them (because they are convenient to reach). It doesn't really relate to whether the fruit (quality) is good or bad…… Sometimes the location is important, sometimes it's the sales channel."
>
> Interviewee 2

4.4 Teaching of Planting Techniques

Interviewees 1,2,3,4,6,9 indicated that the teaching of planting techniques provided by the government or village communities existed. Interviewee 5 indicated that it was less clear. Interviewee 6 received instruction from Interviewee 7 when he rented an allotment from them. Also, both Interviewee 7's and Interviewee 8's companies have specialized technicians to manage the farmland.

There is an interviewee said that he had heard of other villagers going to the planting instruction course a couple of times after they learned about it, but he had not heard much about others going recently. This is because all the farmers basically know the planting methods so they don't want to spend more time on the class and prefer to rest or work in the orchard without wasting time.

Interviewee 4 indicated that since the new crown outbreak, it is online teaching, which he has never seen because he does not use his cell phone to watch the course.

> "I used to ask the technician to teach and I've been there (planting technical instruction courses), but I don't go there often anymore. Now it's all taught online and I haven't watched it, I don't know how to watch it (video course) on my mobile phone. And they will come to check and inspect our farms, so just wait when they do."
>
> Interviewee 4

Planting technique courses are usually paid for, not by the farmers but by the village or township village collective who pay for technicians to come and give lectures and visit the farms.

> "This all has to be paid (by the village collective), there is no such thing as coming to give a lecture for nothing. But many times they (farmers) are not so highly motivated. If they are able to have time for a break from farm work they will go have lectures (because of weariness)….. Many times you have to give the farmers extra gifts to attract them to come."
>
> Interviewee 11

> "Every farmer thinks differently, some want to speculate, some want to get down to business or just grow fruit trees. The ones that come are the ones that want to really learn the techniques. But can feel that the motivation has been declining in recent years."
>
> Interviewee 14

4.5 Attitudes of Private Farmers to Land Policy

Private farmer Interviewees have a negative attitude towards the return of land. None were willing to give it back unconditionally.

> "I can't do it anyway, but that can't be surrendered to the state so freely. The fruit is at least a few thousand RMB a year. My energy and passion for so many years have been put into the farm. How much to give me (for get farmland back), I don't know, but that has to be paid."
>
> Interviewee 2

> "I've heard from people who went to court, and the court said that the land is collective property (owned by the village collective), but the trees are all their own. The court asks them to negotiate a solution. I have so many greenhouses, that retreating from the land have to give me money. Otherwise, I also rent it out to earn money (then give the land back)."
>
> Interviewee 4

The future of farmland reclaim is therefore difficult to carry out. With the expiration of farmland leases, the city needs to transform farmland reclaim from a new plan to farmland with entertainment, ecological, and agricultural functions that serve the surrounding innovative industrial parks, provides ecological and environmental protection, and is a large-scale fruit and vegetable grove that can be managed mechanically. The land can be reclaimed according to the lease, but the trees on the land belong to the farmers according to the new Property Law (Wang 2012). So if land is to be reclaimed it must be purchased by the government. However, due to the village's collective financial reasons, this is difficult to implement.

“Every year there are some subsidies (from the government for agriculture), but they have all been used by the village collectives to exchange bank loans. The conversion of villagers to non-agricultural household registration requires the village collectives to pay for their retroactive pension insurance (because non-agricultural household registration has to pay more than the agricultural population) in order for them to be able to have a citizen's pension when they retire. So (the village collectives) need to borrow from the bank. Now if you take back these leased lands a tree even if it is 2400 yuan an acre of land may have 45 trees, a family 1.6 acres of land. The village collectives simply can't afford to pay (because the money has been used to repay bank loans).”

Interviewee 11

"The farmers are very smart, if he wants to receive more compensation, today you tell them that you are going to reclaim the land, tonight they will start planting more trees."

Interviewee 12

"You can't get it (farmland) back even if you take your time, the problems before (the pension insurance price difference) were solved by mortgaging the village collective assets to the bank. Now the problems, that need to be solved with money, can't be solved, the village collective have liabilities. The key is to raise income."

Interviewee 14

4.6 Impact of Urbanization

Based on Interviewee 10's answers. In terms of urban planning, Sujiatuo Township is part of the "North Zone of Zhongguancun Science City", which is an area of science and technology and business innovation. At the same time, Sujiatuo Township is located in the northwest of Haidian District next to the mountainous area, Sujiatuo township also serves as an ecological barrier. So in the process of urbanization of these villages and towns urbanization in addition to the village to become, and write the need to solve the problem of employment, housing, infrastructure support. Therefore, the Sujiatuo area needs to become part of the new city to solve the problem of housing and employment infrastructure, but it also needs to build a new science and technology innovation base, and it needs to take on the function of ecological protection.

None of the nine farmers interviewed thought that urbanization had affected the climate of the Sujiatuo area. Four farmers noticed that farmland is becoming less and less and land for non-agricultural use is approaching. Interviewees 3, 4, 5, 6, and 7 mentioned the gradual increase of consumers. Interviewees who thought that urbanization has caused impacts did not notice many similarities in the impacts of urbanization. Two of the private farmer interviewees did not understand urbanization and did not think it caused any impact.

"High buildings are getting closer and closer, and there is just so little land that you can grow less and less. But imports from abroad or foreign countries are more and cheaper, so our market is hit."

Interviewee 4

"Now there are more and more consumers who are willing to spend, people's living standards have improved. Fruit can't be sold before 1999 (the year trying to lease farmland to the farmer by the collective), it all rot, no one comes to buy."

Interviewee 3

Interviewee 7's answer was more comprehensive and more like an analysis of the impact caused by urbanization from a company perspective.

"The city has become more competitive in terms of tourism, originally this was a good resource (for Sujiatuo township), but now it is more common, so there are more competitors and prices are lower. Revenue has definitely increased.... In this area house rent grew which made the problem of illegal construction also more, just to rent to earn money…… So local farmers in general are not short of money as a result, but still have a little less money than those who got a lot of compensation for demolishing and leaving away (because their land was purchased for building innovation parks). This is also the reason why they are not willing to hand back their land or regulate the building of their houses."

Interviewee 7

4.7 Advantages of Agriculture in Sujiatuo Township

4.7.1 Farmers' Perceptions.

Interviewees 1, 3, and 7 considered that Sujiatuo, as a peri-urban area, has a good geographical location and surrounding natural environment. A good location can lead to a better market environment. This means more sales opportunities, higher unit prices for products, and proximity to consumers also facilitates the sale of fruits that do not keep well.

"The location is good, it's easy to come here…… The fruit and all that (fruit and vegetable) has to be sold as soon as possible. Otherwise, it's useless to have something that nobody buys (rotted fruit)."

Interviewee 3

Other farmer Interviewees said there were no advantages. Some farmers who declined the interview expressed deeper pessimism and disappointment.

"There are no advantages, the advantages are all created by myself. The marketing is also my own business, the farm work is also my own business, and there is not much planting technical training. Any problems are solved by myself."

Interviewee 5

"Nothing to say, it's so difficult to do agriculture now. Can't see what's good about it. We have been abandoned."

Interviewee who refused to be interviewed

4.7.2 Government Sector's Perceptions

From an ecological and production point of view, Sujiatuo Township actually has some advantages in terms of fruit production, as the temperature difference is greater near the mountainside compared to the plains, so it is conducive to sugar accumulation.

"The mountainous and mid-hill environments are conducive to fruit growth."

Interviewee 14

UPA in Sujiatuo Township is considered by government employees to have no advantages at all from a policy perspective. Because the Haidian District is not an agricultural, urbanized district, there is basically no additional support for agriculture from a policy perspective, compared to other peri-urban areas. Because of the increased employment costs associated with urbanization.

"Haidian District has little advantage in doing agriculture. There are advantages to doing business. But agriculture not so much."

Interviewee 11

From the perspective of the planners in Interviewee 10, Sujiatuo Township itself has certain development advantages, on the one hand, there is the ecological landscape of the "Western Hills", on the other hand, there are flexible development policy and mature innovative industrial parks to support the development of the township.

"Zhongguancun, Free Trade Zone ... of these policies, specifically things you can check the relevant policy documents yourself."

Interviewee 10

The agricultural brand and the innovation capacity brought by the Haidian District can bring advantages for agriculture in the Haidian District in forming the UA industry chain. In addition to this as well as being close to densely populated areas to Sujiatuo town can bring more opportunities, but also compared to other areas more directly revealed a direct and objective needs. This is more favorable to future development.

"Haidian District has its own famous agricultural brand - Beijing West Rice, Haidian District urban agriculture can be based on its own agricultural characteristics and external science and technology innovation environment. Form their own characteristic urban agriculture technology chain and industry chain. The specific forms of practice can be varied. The proximity to densely populated areas makes the form of agricultural production in Sujiatuo Township more directly and closely related to the consumption and leisure needs of the urban population, objectively making the development of Sujiatuo Township's agriculture in the direction of higher value-added, more intensive land, and more diversified."

Interviewee 10

4.8 Disadvantages of Agriculture in Sujiatuo Township

However, the proximity to the city has resulted in higher operating costs for farmers. Employment cost due to increased urbanization in peri-urban areas is perceived by farmers as a challenge when practicing agriculture.

"Most of the means of production have high prices. Also, labour, because of living prices is expensive. Although it is possible to buy produce at a higher price because of high living prices. But again it is difficult to compete with high-grade fruits because of low quality."

Interviewee 8

"It's getting more and more expensive to hire someone. He costs 7,000 RMB a month. I won't make any money if I hire two more temporary workers."

Interviewee 4

Because the "West Mountain" is a nature reserve, and Sujiatuo Township has to fulfill the function of an ecological barrier zone from an urban planning view, access to water is relatively difficult and more expensive than usual in some of the farms. Therefore, access to water is relatively difficult and more expensive than usual on some of the farms. This point was mentioned by almost all interviewed farmers.

"We don't have wells on our land and we are not allowed to use groundwater now. It's to protect nature. My husband used to go and queue up in the middle of the night to fetch water. The village collective supplies water."

Interviewee 3

The problem of not having a brand and no one or organization trying to unite all producers to create a brand was mentioned by Interviewees 3,4,5,7,8,9,11,12,13.
The cherries produced in Sujiatuo Township used to be famous, and there were famous "Yu Bada" apricots. However, with urbanization and globalization of trade, competitors of the same fruit have entered the Beijing market. The brand advantage of these two

products no longer exists. The tourism and leisure functions that UPA in Sujiatuo can provide can easily be replaced by the same tourist destinations.

> "No one is leading the effort. Agriculture accounts for less than even 1% of the total GDP of Haidian District. They don't have to do this stuff."
>
> Interviewee 8

> "In the past, winter cherries might be 200 RMB a pound, but now they might be imported from Chile for 40 RMB for a kilo, and locally produced ones in the summer are still 30 RMB a kilo, so where is the price advantage?"
>
> Interviewee 11

> "Avoid homogenized development and reduce duplication of similar projects."
>
> Interviewee 10

The Beijing municipal government is supporting other districts and counties to launch "one village, one product" (People's Republic of China Ministry of Agriculture and Rural Affairs 2021). One agricultural product brand will be created for each village. These agricultural brands would be coordinated and marketed by village communities. However in Sujiatuo township, this didn't start.

> "The difficulty is that marketing is not good. Do you see anyone leading it? There are cooperatives in other villages, and there are people who organize to sell together in other districts. We have nothing. Even no one cares what you grow."
>
> Interviewee 4

> "It's a question of who will do it. The villages over here are all administrative, but pay little attention to business development, and cherries and apricots are relatively perishable fruits, so it's not easy to sell them. There are easy-to-store ones, such as the successful promotion of peaches in Pinggu District. They use varieties of peaches that are resistant to storage, but which are not the original Pinggu peaches…… Haidian District is no longer rural from the planning level, so naturally there are no cooperatives."
>
> Interviewee 11

> "No one does it, there is no benefit. Doing it well changed the village and town government’s stuff every few years later. There's also the risk of doing it badly."
>
> Interviewee 13

4.8.1 Plant and Nature Aspects

In terms of planting, first of all, organic farming is difficult to make huge amounts of fruits. All nine farmers interviewed said that for fruit trees it is hard to ensure that the fruits are not eaten by not using pesticides. Interviewee 9 who has organic certification is also greatly troubled by pests.

> "You can only catch them (pests) slowly, last year the pests were very bad. Spraying chili water didn't help."
>
> Interviewee 9

> "Can't do organic, these fruit trees have to be sprayed at least three times a year all these"
>
> Interviewee 3

Another Interviewee 7 who has organic farming certification stated that pests can be controlled through crop rotation and careful management. However, Interviewee 6, in which the land is rented, had the opposite opinion.

> "There are a lot of pests every year. Not many can be eaten in the end. They don't allow pesticides. Anything like crop rotation or multi-species planting doesn't work. As soon as one area has bugs they run into the others. We didn't eat any of the tomatoes we planted last year."
>
> Interviewee 6

Secondly, local birds also have a huge impact on the fruit. However, the cost of setting up bird-proof nets is high, and with the deadline for renting land approaching, farmers are now reluctant to invest more. Thirdly, private farmers are not knowledgeable about agriculture theory. This does not mean that the farmers do not have strong farming skills. They have strong local knowledge, but perhaps not enough knowledge about new agriculture knowledge.

> "The soil fertility situation over here is not very good. The fertilizers they buy themselves are not commercial fertilizers, which damage the land and are usually unfermented chicken manure. But the fact is that the organic fertilizers purchased by the government are fertilizers that have had a good time fermenting, act quickly, and improve the soil as well..... They are using many of the original old local techniques. But now the mainstream varieties and growing techniques have changed a lot. The change of mindset takes time for these old people. And with the small size of each family, it takes a lot of time to change mind."
>
> Interviewee 14

> "Basically, the time limit for renting land is almost up. But no one can say what to do with it, so they are not willing to invest more in it."
>
> Interviewee 8

"I planting techniques all by my own slowly figure out, when the tree died I planted a new one from new."

Interviewee 5

4.8.2 Unclear Policies

There are cases of not willing to speak out or some concealment. The vast majority of respondents were careful in answering the questions. Because they are not clear about what is legal and what is not. There are some behaviors such as renting land. They know well that it is non-compliance, but because of the lack of regulation, they are still carrying out such behavior. They're afraid of being censored just because they talk about what they did is non-compliance so they don't want to talk about it. There are some behaviors that I was asked by interviewees not to mention during the interview because they are obvious and can point to a particular farmer.

"Is he telling you the truth? Everyone has their own agenda for participating in your interview. He is not necessarily telling you the truth."

Interviewee 11

"Don't include this one."

Interviewee 1

In the process of implementing the policy, there are several departments managing the same land at the same time. For example, land is managed by the Planning and Nature Commission. Agriculture is managed by the Agriculture and Rural Affairs Bureau, and fruit trees are managed by the Forestry Department, building construction issue is managed by the Planning and Natural Resources Committee. So different issues on the same piece of land will be managed by the policies of the four departments. The four village departments are only responsible for implementing the policies but not clearly designating from them.

"Policies are issued to us we are only responsible for implementing them, formulating them is the job of those above us"

Interviewee from the government who declined to be interviewed

"There are policies that may not be locally appropriate and we have to find out what is appropriate for local implementation."

Interviewee from the government who declined to be interviewed

In the process of seeking telephone interviews with government personnel who receive calls from the village level to the district level to the municipal level from the time of

making inquiries often hear staff, who answer the phone call, answers that are not clear or do not know the government's policies.

> "This is not convenient for me to answer you, if we have this policy we will post it on the website, you specifically look at the policy we published."
>
> Interviewee from the government who declined to be interviewed

> "Is this policy now posted on the website? If it's not you can apply for it, if it's published after you apply for it then it is."
>
> Government Documents Management Hotline

5. Discussion

There is no doubt that Beijing's urbanization has affected in Sujiatuo township. Whether in terms of population development, the replacement of agricultural land or farmers' houses by high-rise buildings, or the positioning of Sujiatuo in the urban plan, it is clear that Sujiatuo is transforming from a village to a city. As stated by Zasada et al. (2013), urbanization will change the functional zoning of the original non-urban area. The work of farmers is changing, as seen in the shift in the government's registration of farm households and their sources of income. Also, the way the land is utilized is changing from purely productive to commercial, recreational, and environmental. For example, Interviewees 3, 4, 13 clearly described how the farmers used to only plant, but later on, they had to take care of marketing, planting, and even providing some other recreational services. The residents who are engaged in agriculture are gradually changing from farmers to urban agriculture practitioners.

5.1 Income and Clientele

Urban development creates more uncertainty for PA practitioners from an income perspective.

PA is usually not their only source of income. According to all private farmer interviewees and Interviewee 13, the government tried to change all the residents of Sujiatuo Township into urban household registration and insured them with pension insurance. So income from peri-urban agriculture is not a necessity of life for them. However private farmers who own land still prefer to get more income to cope with the high consumption brought by urbanization. For example, often private farmers have some income from, for example, temporary jobs, or they are actively involved in agricultural production and marketing activities. However, marketing channels have to be found by each individual. This puts their income from farms at risk of instability

It is interesting to note that Interviewee 7,11,13 mentioned that in other towns in Beijing with peri-urban agriculture there are organizations that help farmers with marketing and branding. However, in areas such as Sujiatuo, the absence of these types of organizations can lead to unstable incomes for farmers who do not have regular or stable customers. Also, in the context of increasing competition in the food supply chain (Wiskerke & Viljoen 2012), low-priced and high-quality fruits competing with products from Sujiatuo Township make it more risky to safeguard farmers' incomes.

In addition to this, public procurement can serve as a large and stable distribution channel (Morgan 2006). In Beijing public procurement is now not supported by policy. Various government departments are working to reduce the potential for corrupt practices in public procurement. However, this also reflects the fact that public procurement, while being an important part of the agricultural supply chain, may also present high opportunities for corruption because of its high purchasing potential (Ibid.).

5.2 Agricultural Production Function

From the perspective of food demand, urban development has changed the products of PA from food to, well, fresh food and related services. The agricultural production function of PA has become less important than before.

Beijing does not need to rely on locally produced food to feed its population. The fact that Beijing's main food supply comes from rural areas in other provinces suggests to some extent that food production in China is still primarily a rural issue. This is the same as what Wiskerke & Viljoen (2012) found. Urban planning seeks to preserve farmland in the peri-urban areas. The main function of farmland has also changed to preserving the surrounding environment and providing services, as well as providing limited food production. Although this view of the function of peri-urban agriculture cannot be considered wrong, ignoring the motivation of producers and the new challenges and support needed in the production process will have a negative impact on the development of urban agriculture.

5.3 Function of Environmental Sustainability and Resilience

In rural areas that are gradually transforming into PA areas, such as the town of Sujiatuo, it is perhaps easy to overlook the environmental functions provided by the UPA because they have always existed.

UPA and urban agroforestry have been recognized as increasing the ecological sustainability and resilience of cities (1.23, Oecd & FAO. 2022). It has been particularly mentioned in addressing the urban heat island effect and increasing the well-being of urban settlements (Kulak et al. 2013, Oberndorfer et al. 2007; Brown & Jameton, 2000). In terms of policy, the municipal government protects nature reserves on the urban fringe by retaining these peri-urban agriculture as transition zones, with the intention of preserving green spaces to mitigate Beijing's urban environmental problems. But the Interviewees all expressed little or no feeling about climate change. Possibly because agriculture and fruit trees have always existed in the Sujiatuo area, Interviewees did not believe that agriculture and fruit trees in Sujiatuo town had brought about a better environment. In fact, because in the case of Beijing, in general terms it can be seen as

urban agriculture is gradually decreasing. Existing green spaces are the last safeguard to protect the ecological resilience of the city and the resilience of the food system in Beijing. Therefore, in terms of ecological protection preserving peri-urban agriculture in the Sujiatuo area has always been guaranteed by urban planning (Beijing Municipal Commission of Planning and Natural Resources 2018; Beijing Municipal Commission of Planning and Natural Resources 2005).

5.4 Recreational and Other Functions

Entertainment and other features that PA can offer do exist. However, they may be limited by construction factors and therefore not always satisfactory. Adequate policy support and policy advocacy may become very useful when building from scratch. Beyond that, policy makers should utilize these features wisely rather than forgetting them.

PA can bring recreational functions or some services to urban residents (Evans et al. 2020; Kingsley et al. 2019; Fischer et al. 2019). From previous studies and as described by Interviewee 6,7 PA is something that can provide communication opportunities relaxing activity space, improve physical health, and visualize educational functions. Policymakers are tentative and cautious when it comes to the provision of other recreational services. This attitude was reflected in the leasing of land from village collectives to individuals at the beginning of the second millennium, and later allowing and supporting Interviewees to add recreational activities and buildings to the park (Beijing Municipal People's Government 2022). This policy has been tightened in recent years (Beijing Municipal People's Government 2021). The policy aims to remove non-compliant, dangerous, and environmentally negative structures. This helps to improve the peri-urban environment and in doing so, reduces the well-being of residents due to poor living conditions (Rao et al. 2022; Fanetal 2019).

This policy change might suggests that policymakers initially recognized the recreational value that peri-urban agriculture could provide, but the recreational value was replaced by a comparison of environmental protection, food production, and the commercial value of the land. In Beijing, land prices have risen, the amount of unutilized land has become smaller, and there is a need to retain a minimum area of cultivated land as well as to reclaim agricultural land leased to individuals. Combining these reasons the policy attitude towards peri-urban agriculture providing other functions has gradually turned negative, with the expectation that land in agricultural production will mainly provide agricultural production functions and attempts to recover land whose leases have expired. However, supporting products and providing services also support peri-urban space, its potential capacity, and the functions and well-being it provides residents (Magoni & Colucci 2017). Purely supporting agricultural production is an indifference to the other capacities PA can provide.

The wavering attitude from the government in the long run discourages farmers from investing more in farmland, which is the same as the findings of Prové et al. (2018). More troubling is the fact that some farmers are resistant to returning their land and have tried various ways to obtain more exit subsidies, as Interviewee 3, 12.

In the interviews with agricultural companies, all three farm companies had local people among their employees. In addition to increasing the resilience of the urban system, shortening the food supply chain, and ensuring food security (Taylor & Lovell 2021; Nasr & Komisar 2012; Hodgson et a1. 2011), the case study of Sujiatuo Township does not have a significant presence. However, the food produced in Sujiatuo town is also still sold locally to supply local residents. This reflects that in the process of urban development, although PA is transforming its business entities, its mode of operation, and its functions, it remains unchanged in its basic PA functions of providing employment and producing food.

5.5 Learning Knowledge and information Issue

In this study, PA participants, especially older private farmers, generally received limited access to information and knowledge. Even the government worker was not always aware of the information and new policies announced by the government as well as new agricultural knowledge, even if he was in charge of agriculture. Even for me, as a researcher, trying to understand all the information is a daunting challenge. So the government needs to do a better job of publicizing information and disseminating knowledge, especially for older PA participants who need extra help.

For example, Urban agroforestry is a very efficient form of practicing urban green infrastructure in the study (Colding 2007). In the case of Sujiato township, it became a way to prohibit the conversion of woodland to farmland. Instead of trying to use trees as a tool to enhance the resilience of the woodland-farmland system, the farmers using the land saw trees as obstructionists in their eyes. This reflects the fact that the results of agricultural research are not well-known to local private farmers. The same perception was also present in other Interviewee responses. Interviewee 11 believes that the lack of fruit sales in Sujiatuo Township is due to the fact that it is difficult to compare the quality of fruits produced by farmers with those in other areas. At the same time, Interviewee 14 thinks that the local land is suitable for growing fruits. Compared to the past, there have been some changes in cultivation methods, such as water use, planting techniques, pesticide and fertilizer use, and mechanization. However, more advanced planting techniques have not yet been accepted by peri-urban farmers, and their desire to learn techniques and new knowledge is limited. From the perspective of private farmers, they may feel that they don't need to learn more knowledge since they have so rich local knowledge. However, the fact is that sustainable agricultural production methods are increasingly important for agriculture and the planet, as well as

for increasing their own incomes (Biasi & Brunori 2023; C40 Cities Climate Leadership Group 2021). On the other side, those who really need to learn don't know that there are opportunities to learn. Thus, for the government, it is not only important to make policy but also important to make people know what policy are related to them.

For PA farmers who are facing urbanization, they should improve their production skills and learn more about agriculture to face the challenges posed by the globalized food supply. While governments are tightening land policies, they should actively provide knowledge and information, improve of information publication channels when farmers still need it for income generation.

5.6 Policies

5.6.1 Land Policy Disincentives to Peri-urban Agriculture

Land use policies, governmental intent to change farmland operators to village collectives, and municipal urban planning are all land-related policies that have very clear impacts on PAs and their operators (i.e., the actual users of the land). These policies may be beneficial in the long term, but they may be a hindrance to PAs in the short term when improvements are made to peri-urban space.

Peri-urban agriculture, while providing a variety of extra-functional services (Taylor & Lovell 2021; Shackleton et al. 2017), may be seen by policy makers as unsuitable for the future development of large cities in terms of a wider trade-off of benefits. This fully explains why agriculture in China, viewed in isolation, is valued and protected in policy. However, peri-urban agriculture, despite its many advantages, is not emphasized in the Sujiatuo area, according to Interviewees.

In addition to this, one of the more important reasons is the unavoidable land conflict in urban development. As land continues to diminish, there are fewer and fewer places for peri-urban agriculture to exist (Lang 2010). Beijing's policy also suggests that all land leased to private farmers should be returned to village collectives for cultivation as much as possible, except for agricultural land that needs to be preserved (Ministry of Agriculture and Rural Affairs of the People's Republic of China 2024). The rest of the land can be used for urban development, which does not only mean building technology parks, factories, and residential areas, but also other urban facilities such as parks and subway stations. It can be seen that in urban areas where land is expensive, PA will be replaced by commercial development if it is not necessary. This is still largely related to local development policies. But policy makers should also take into account the other services that PA can provide when changing policies. Ignoring the other functions that PA can provide is reducing the diversity of urban tenure and land use patterns (Cabannes 2012). Simply substituting parks for the ecological functions and recreational functions that PA provide, or for the jobs they provide, is something

that needs to be seriously considered. It is likely that PA can provide the same functions (Taylor & Lovell 2021; Yadav et al. 2012).

Interviewee 1-5,7,11,13's policy related questions responses and Beijing's policies indicate that Beijing's urban planners and policy makers do not consider food production as a major function of urban planning in the Sujiatuo area. On the one hand, there are food production sites in other provinces and cities that are supplying food to Beijing, and on the other hand, the peri-urban land of Beijing in the Sujiatuo area is viewed as land that should be used for commercial purposes, residential purposes, recreational purposes, or ecological isolation purposes, in addition to the land that must be used to provide food. Because urban agriculture is viewed not as a production function but as a social activity, urban planners have neglected to consider urban agriculture as part of urban planning (Rao et al., 2022). As a result, there is a lack of government policy support for urban agriculture. However, in reality, government policies play an important role in influencing UA (Daniela et al. 2016).

5.6.2 Policies Indirectly Affecting Agriculture

Some policies, while they may not directly affect PA, can have some impact on PA from the side, and in the Town of Sujiato this impact is relatively negative.

In exploring the benefits of peri-urban agriculture for Beijing and the level of policy support it receives, a very obvious point emerges, namely that food systems must not be discussed in isolation. This is because the food system is concerned with the impact of the social environment on it (FAO 2018).

First, in response to corrupt practices, government departments have virtually eliminated public purchases. This policy does not target peri-urban agriculture, but it clearly has an impact on it.

Secondly, it can be seen from the source of food in Beijing, that the city government is maintaining the land within Beijing for food cultivation according to the national policy (Ministry of Agriculture and Rural Affairs of the People's Republic of China 2024). However, it would be totally impossible to supply the entire population of Beijing with food grown in Beijing alone. The FAO defines PA as a food production behavior, but as cities grow, the function and amount of land use change drastically (FAO 2022). In Beijing's urban area, because of competition for land. and planners are constantly refining their plans for the city. The PA as in (Rao et al. 2022) has the same findings. agriculture is not more commercially valuable than the commercial function in the city, so the importance of food production as a function is also trivialized, so PA is gradually decreasing in the city. Especially in the Sujiato area, the recreational function was also weakened along with the policy change. In turn, agriculture that is not supported by policies makes PA farmers not confident to continue their inputs (Abdulkadir et al. 2012).

5.6.3 Dilemma

The impacts of urban development PAs and the need for new customer demand for PAs may not be a short-term solution. And it may require the combined support of governments and participants.

Urbanization and the municipality government's requests to village lever governments have led to a deadly cycle of seeming difficulties. For the village collectives to continue the policy of urbanization to create a better environment, they need to create a recognizable brand for the fruits in order to increase sales and earn money. Branding fruits requires more advanced technology and better fruit varieties. Therefore, village collectives need to recover land for centralized cultivation and transformation. However, land resumption requires financial support. The funds have already been used up in the previous retroactive pension insurance for villagers in the implementation of the urbanization policy, and there are no funds available in the short term.

Therefore, the village collectives need to obtain more funds. The way to get more funds is to make local fruits buy better or to generate more income. In the summer when the village collectives do not reclaim land, the way to get more money from selling produce is through farmers investing in improving their farms and learning skills. However, farmers are reluctant to invest more money, firstly because of policy uncertainty about land ownership. Secondly, because they are getting older and it is difficult for them to continue learning new skills. As a result, they are unable to build a brand with good quality fruits thereby increasing sales. In terms of improving their service capacity, they are unable to provide quality services beyond agricultural production because they are not allowed to build structures on the land that are not related to production. If they cannot provide services, they will lose out to others in homogenized competition. Although it is not a UPA, it can provide agricultural activities and harvesting activities.

Therefore, Village collectives in Sujiatuo township are not able to earn money and it is difficult to recover land and implement urbanization. (Figure 12).

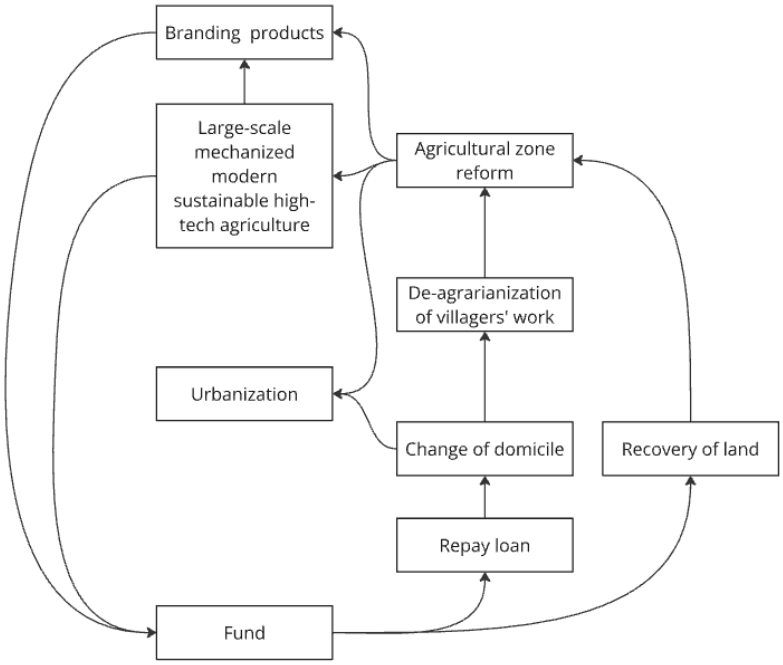

Figure 12. The dilemma cycle of urban development and peri-urban agricultural relations in Sujiatuo township.

All things considered, there is a constant need for the village collectives of the town of Sujiato to provide funds for tasks such as promoting urbanization and reclaiming farmland. But without these tasks it is difficult to obtain funds quickly. The town of Sujiatuo is thus caught in a dilemma. (Image made by me).

6. Conclusion

6.1 Has Urban Development Had an Impact on Peri-urban Agriculture? What are some of the Impacts?

It is evident from the previous analysis that urban development has an impact on PA. The impacts mainly come from policy changes that have brought about a variety of shifts in PA. These include internal farm factors such as plant species, land size, operator, operating expenses, and the functions provided by the farm. Factors external to the farm, operator's income, source of guests, changes in policy subsidies, and more ecological farming practices.

For PA farmers or companies, as operators, they may be dissatisfied with the constant changes in policy due to changes that include land use and the functions that the PA is supposed to perform. This may be because PA farmers feel unknown and confused. If the peri-urban farmers are older and less educated that may aggravate their lack of understanding and difficulty in learning about the policy changes.

6.2 Hypothesis 1. Urban Development has Contributed to the Development of Peri-urban Agriculture

Urban development can indeed promote PA. However, for some reasons, it can also inhibit the development of PA in the short term. In this study case, Sujiatuo township, Beijing, China, whether PA is promoted by the city depends on the policy direction.

In terms of land use, urban development, and PA are in competition. Urban development inevitably acquires land in peri-urban areas, thus reducing the area available for PA.

From the functional aspects, urban development can promote the diversification of PA. As cities grow and consumers demand more, PA is no longer limited to production and recreation but also requires additional functions such as education and ecological protection.

Ecologically, the proximity of PA to cities has made them more fragile and sensitive. Therefore, the government has imposed serious controls on animal husbandry, water and fertilizer use. This may have caused inconvenience and higher operating costs for peri-urban farmers. This results in both negative operational impacts and positive environmental impacts.

In terms of the food system, urban development will create both opportunities and challenges for PA sales. More customers will have more sales opportunities. However, at the same time, food from other areas will challenge the quality and price of local food.

Beijing's recent policy is to inhibit and standardize the existence of PA because the policy wants to change urban development in the PA operator's changes from private to village collective. That puts PA development in a stalemate. However, with the development of time, a better management system may bring about a form of PA that is more suitable for Beijing. For other city situation could be same.

Therefore, urban development will bring more regulations and restrictions to PA. In this way, it is helping PA to become more regulated and sustainable in development. However, in terms of land and costs, it will bring more challenges to PA. While in the short term, the changes that accompany urban development may create resistance for the PA, in the long term it will create a future for the PA that is better suited to the region.

6.3 Hypothesis 2. As Urban Development, Peri-urban Agriculture becomes more Productive and Sustainable, and Marketing its Products becomes easier

Productive capacity is improved with technological advances and with urban development marketing is easier than before. But this does not mean that PA are facing an easier situation. while PA are easier to market and have larger quantities of better products they are also facing more competition from similar producers.

With urban development, a large number of residents are closer to or live in peri-urban areas than they would otherwise be to PA. Therefore, marketing will become easier and the demand for products from customers will become more diverse. Fruit products have the characteristic of being easily perishable. This makes it necessary to sell the fruit as soon as possible. So sales are not only related to the number of guests and urban development, but also related to the quality of fruit, price, brand, and sales channels. This makes the situation of PA farmers, who produce fruit or other similar easy-perishable products, more complicated and more challenging.

Growing techniques have really improved with the advancement of agricultural technology. There is a difference in production capacity and sustainability than the previous cultivation. However, agricultural technology that can contribute to higher yields and more sustainability may not always be available to farmers because it is partly constrained by their level of knowledge, willingness to change agricultural practices, land use restrictions, and financial resources. On the good side, there are still some farmers who are willing to try more organic and sustainable farming methods.

So it can be seen that urban development does not affect PA yields. It is also difficult to see the relationship between

PA becoming sustainable and urban development. However, it is true that the products of PA are easier to sell than before. Although there may still be some challenges in marketing.

7. Reflection

Peri-urban agriculture may face many challenges in big cities like Beijing. However, if the peri-urban agriculture can be utilized a little bit, then it can definitely help the city to develop better. In using peri-urban agriculture as a tool to improve the city, it may not be permanent and there are many obstacles. From this study, it can be seen that urban policy dictates that a balance between peri-urban agriculture and urban development should be found at the policy and planning level. Properly identified policy support for urban agriculture, adequate support and teaching of new agricultural technologies, adequate publicity, well-developed marketing channels, and willing practitioners can help make urban agriculture better and contribute to a sound environment, a safe and sustainable food system, and the socio-economic and social well-being of the population.

7.1 Study Gap

This study is a qualitative case study and the results can only mean that such a situation exists however the results are not generalized and do not give a mathematical causal relationship. The results are mainly on the impact of policies and access to information on UPA practitioners. However, if we want to get a more comprehensive picture of the impacts, we can conduct a questionnaire survey of all farmers in Sujiatuo Township to get better results. In terms of knowledge of other governments or stakeholders, a more comprehensive answer could be obtained by selecting more Interviewees. I have not been personally involved in the practice of UPA. If researchers with relevant knowledge were to participate in the practice and conduct the study, some of the misconceptions that may be caused by existing PA participants' lack of knowledge or access to information could be avoided. It is possible that by continuing this research in these ways a more in-depth understanding of how urban development affects the existence of PA could be gained. And it is possible to obtain information about the impact of other factors besides policy on PA.

7.2 Limitation

Target selection is random. However, it may not always be representative enough. The richest farmers as well as the most disadvantaged farmers were not the interviewees.

The analysis and questions were one-sided and did not include all influences. The main focus was on the impact of policy, and income on peri-urban farmers.

Interviewees included company-owned, village collectively-owned, and private peri-urban farmers. Non-farmer Interviewees included urban planners, grassroots policy implementers, and technology developers. However, these Interviewees do not give a comprehensive picture. At the very least, residents of the village collective, policy implementation regulators, policymakers, and community-scale regional planners are missing.

8. Questions

8.1 Questions for the Urban Planner

What is the town of Sujiatuo expected to become in the northwesternmost part of Haidian District?

What should be its main functions in this location? What is the positioning?

Changes in the planning 06-20 years and 17-35 years in the Haidian District Planning (Land Use Planning and Territorial Spatial Planning).

In the early days, there was still mention of basic farmland protection in Sujiatuo Township. Later, in the 35-year plan, Sujiatuo Township is not considered an agricultural township.

What kind of changes have occurred in the positioning of Sujiatuo Township? Why did it change?

Shangzhuang town is not in the same situation?

Accelerating village vacations in the Haidian District Plan. Then a town like Sujiatuo, for example. Shouldn't it be within the scope of village vacations? What is the conceptualization of village vacations in the plan?

In other words, what kind of architectural form should the town of Sujiatuo have in the future?

What is the purpose of the vacate?

If it is to clear out the low end of the population, what about the future workers employed in agriculture in agricultural towns like Sujiatuo Town?

In what form will villages on the edge of the city like Sujiatuo Town remain in the future in the Haidian District? (If it will be preserved)

Or will Haidian District become a fully urbanized area in the future?

Will Daxi Mountain become a park directly bordering the city in the future?

Will it be a combination of building parks and farmland?

Sujiatuo town is in the One Town One Park program, so presumably, it will be housed in the Innovation and Technology Park. However, Sujiatuo is at the same time an eco-agricultural technology showcase. At the same time, right now Sujiatuo has a little bit of basic secured farmland, a lot of garden land, and forest land.

In the vision of urbanization, how should an agricultural village like Sujiatuo be integrated into the city?

What will be the location of the boundary of the future building (city) expansion in Sujiatuo town?

What is the vision of urban agriculture? Should urban agriculture be integrated into Beijing (Haidian)? How?

For the urban fringe like Sujiatuo Township, what are the biggest changes that have occurred in the past two decades?

How has the proximity of the urban fringe to Sujiatuo Township affected their agriculture?

What are the strengths and weaknesses of Sujiatuo Township?

8.2 Questions for Government Stuffs

What are the changes in the country's land leasing policy? How will land be leased to farmers in the future?

Is the land lease policy the same in every village? What is it like?

What subsidies does the government give to farmers in general?

Does the township government help farmers with sales? How?

What are the government's policies to help farmers? (from 2004-2024)

What are the government's measures to help when there is a disaster?

What kind of impact do you think the government's policies have had on this village?

When the city expands to the edge of this town. What will happen to agriculture in this town in the future? Why?

What do you think are the strengths, weaknesses, and dilemmas of agriculture in this town?

8.2.1 Extra Questions for Agriculture Researcher

If farmers can acquire academic knowledge plus local practical knowledge, the two together will surely produce better fruits.

Is there much technical exchange or otherwise with the town of Sujiato?

Has there been any technical teaching done? If so, what did you teach?

I heard that it's not easy to teach, is there any difficulty?

Are there any well-known fruit brands in Sujiate Township? What are the reasons?

Is organic farming a major research direction at the Institute of Agricultural Research?

Is organic farming possible in the fruit tree plantations in Sujiatuo?

Strawberries at Xishan Farm have fully automated water and fertilizer cultivation. However, it seems to be less recognized by farmers. Why is this?

The edge of the city is getting closer to the Sujiatuo area. Is there any impact on local agricultural production?-

Do you think there are any advantages and disadvantages of the current agricultural situation in Sujiatuo Township?

What should be improved in the Sujiatuo area if it wants to increase its income with agriculture or agriculture-related aspects?

8.3 Questions for Farmers

What was probably planted?

What year was the planting started?

Approximately how much is produced each year?

Is there a regular buyer each year?

How are they sold?

Are the buyers mostly local or do they sell out of town?

What are the main sources of income?

For example 80% from the sale of agricultural products, 10% from state funds, and 10% from other agriculture-related economic activities.

Since-2000.-

Have there been any changes in the orchard?

(area of land, type of cultivation, composition of staff)

Have there been any changes in policy?

(e.g. financial resources," price requirements, for agricultural products, types of plants and animals allowed to be grown or raised, use of agricultural tools; problems with watering, pesticides, fertilizers; technical support from the state)

Has the urbanization of the surrounding area (more people, conversion of farmland into woodland or residential buildings) had any effect on the orchard? For example, is it easier to sel1? Or more restrictive?

Are there any sales to the surrounding, food markets, shopping malls, supermarkets, etc.? What is the sales situation?

Are there any sales channels or plans in the neighborhood? Are there any difficulties encountered in the orchard?

What will happen to the orchard in the future? Who will inherit it?

The urban area (tall buildings, land used for non-agricultural purposes) is getting closer and closer. Will the orchard receive any(positive or negative)impacts?

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