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Urban Agriculture and Inner Spaces in Chinese cities -sustainabilities issues and the current urbanisation process

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List of Acronym

- ASHRAE:** American Heating, Cooling and Air Association
- CAP:** Common Agriculture Policy
- CID:** Central Innovation District
- CIRAD:** The French Agricultural Research Centre for International Development
(Centre de coopération internationale en recherche agronomique pour le développement)
- CLT:** Cross-laminated Timber
- CPULs:** Continuously Productive Urban Landscapes
- DMSP:** Defense Meteorological Satellite Program
- EAFRD:** European Agricultural Fund for Rural Development
- EC:** Council Regulation
- EU:** Regulation
- FAO:** Food and Agriculture Organization of the United Nations
- HEFL:** Hybrid Electrode Fluorescent Lamp
- HQ2:** The Second headquarters
- GDP:** The Gross Domestic Product
- LEED:** Leadership in Energy and Environmental Design
- MEA:** Millennium Ecosystem Assessment
- NGDC:** The National Geophysical Data Center
- NOAA:** The National Oceanic and Atmospheric Administration
- PUA:** Peri-Urban Agriculture
- RUAF Foundation:** The International Network of Resource Centers on Urban Agriculture and Food Systems
- TNC:** The Nature Conservancy
- TEEBs:** Economic Ecosystems and Biodiversity
- UA:** Urban Agriculture

Abstract

In China, urban agriculture is a practice that is growing today, given the urbanisation process that has occurred in recent years. Local urban policies support the development of urban agriculture due to the multiple positive implications that this practice produces on local society. Indeed, urban agriculture's positive outcomes are detectable in alleviating poverty, producing food supply and food safety, and improving local sociological well-being. Consequently, urban agriculture will inevitably impact the urban form and the policies that regulate the urbanisation process. Given these premises, urban policies are not only about shaping landscapes according to the needs of modern society, but they are concerned with the needs of human beings, especially after the pandemic. Facing the challenge of thinking about cities and buildings that can guide health more broadly, not only the minimum conditions for physical survival but also mental health and the environment. This is the statement reached by this research, which examines the multiple roles that forms of urban agriculture today have in cities in China. Urban agriculture can also effectively promote people's health and mentality through architectural and urban design.

Introduction

Urban agriculture refers to introducing farming into cities through realisation, extensive land utilisation, and new planting technologies suitable for smaller plots. Urban agricultural landscape refers to a modern agricultural landscape located in the middle of the city, the location of the urban suburbs, and the urban economic circle, closely relying on and serving the development of urbanisation in urban development. This agricultural landscape emerged to improve the standard of living in modern urbanisation and to optimise the urbanisation process. In the continuous advancement of urbanisation, urban public space is further fragmented, especially under the division of urban transportation and service places such as communities; commercial spaces gradually isolate urban public spaces into a fragmented state. In the harmonious and stable development of the original society, part of the public space is driven by class and other social interests, so the open public space is restricted. Mature cities, abandoned vacant residential urban land, etc., create urban agricultural development and provide sustainable growth. For saturated urban systems, the expansion will urbanise surrounding towns and rebuild towns to provide agrarian value. These provide emotional value to the food supply and mental health of residents around the city.

PART 1 URBAN AGRICULTURE

Chapter 1: Urban Agriculture Main Overview

1. Definition and understanding of Urban Agriculture

Urban agriculture refers to an ecological agricultural system with a particular environmental spatial pattern within the urban spatial geographical scope (including functional radiation areas), with sustainable development as the core, reflecting the integration of urban and rural areas and serving the functions of the city, with multi-function, high-tech, highly industrialised and market-oriented ecological agricultural system. It is the inevitable result of the development of industrialisation and urbanisation. It can provide production and living materials for society and effectively coordinate the relationship between cities and nature and between urban people and nature so that people can enjoy all kinds of conveniences of urban life and the joy of returning to nature. Urban agriculture has a broader geographical scope and more prosperous functions than traditional agriculture. Developed countries such as Europe, the United States, and Japan began to study urban agriculture in the first half of the 20th century; Germany pioneered the development model of "citizen farms" as early as 1919; Japan began to search for practice in urban agriculture in the 30s of the 20th Century; In the 50s and 60s of the 26th century, the United States officially proposed the concept of urban agriculture. Urban agriculture has developed countries from theory to proper practices as diversified and fully functional. It has. It has offered good social, economic, and ecological benefits. In the 90s of the 20th Century, Shanghai took the lead in proposing the development of urban agriculture, and then Beijing, Shenzhen, Guangzhou, and other places also carried out the practice and exploration of urban agriculture and achieved remarkable results in facility agriculture, tourism agriculture, manor agriculture, etc., which played a positive role in the construction of the city's ecological environment.

1.1 Aspects related to UA (Urban Agriculture): food, intra- and peri-urban agriculture, type of area where UA is practised, type of production system, product destination, and scale of production.

The definition of food includes very diverse agricultural productions, although more prominent foods are suitable for any product or livestock to consume. Then, food is mainly cultivated or raised (cereals, roots, vegetables, aromatics as medicinal and fruit crops, and livestock of all shapes and sizes). A smaller one deals with other plants, such as ornamental plants and agro-industries (e.g., silkworms, tobacco, etc.). In food crops,

the definition clearly emphasises being more perishable. Animal and plant products and by-products of higher value. Several studies considered only food production, while others included food and non-food preparation. Since these systems are complementary and often gender-specific, they enhance food security, economics, and environmental benefits at all levels (from individuals to cities). Excluding non-food categories from the general UA concept will truncate our understanding of the UA system. Communication production systems and specific production units are everywhere. In many ways, UA can interact with other city functions, using and providing resources, outputs, and services to the city.

As can be seen from World Bank statistics (World Bank¹,2021), the food crisis has multiplied over the past few years, with about 193 million people facing sudden food insecurity of "crisis" level or greater in 53 countries (ICES/Harmonization Framework phases 3-5), an increase of almost 40 million more than the already record number in 2020, and millions of people in dozens of countries are on the verge of starvation as UN Secretary-General Ban Ki-moon ²(1944-,2007-2016 Secretary General of the United Nations) called for solutions to the food crisis that require short-term measures and long-term increases in food availability.

In addition, the rapid development of the industrial economy and the continuous advancement of urbanisation have also led to a series of problems, such as the reduction of agricultural land and the decline of agriculture. Cities are generally built in plain areas with good natural conditions and the best agricultural areas. Therefore, in urbanisation, the land contradiction between urban and rural areas has become more and more prominent, and large areas of fertile land in the past have gradually disappeared, so it is necessary to strengthen the development of agriculture and promote the rejuvenation of agriculture. On the one hand, it is essential to improve the efficiency of agricultural production, develop high-tech agriculture, and raise the total amount of grain production by increasing grain output per unit area. On the other hand, we should try our best to improve the area of adequate cultivated land and to achieve this; we must continue to vigorously promote the protection of agricultural land and prevent urbanisation that is still in the process of continuing to swallow up large areas of agricultural land step by step; on the other hand, we must make maximum use of idle land in cities for agricultural production, introduce agriculture into cities, and increase the area of agricultural space.

¹ The World Bank is an international financial institution that provides loans and grants to the governments of low- and middle-income countries for the purpose of pursuing capital projects.[5] The World Bank is the collective name for the International Bank for Reconstruction and Development (IBRD) and International Development Association (IDA), two of five international organizations owned by the World Bank Group. It was established along with the International Monetary Fund at the 1944 Bretton Woods Conference. After a slow start, its first loan was to France in 1947. In the 1970s, it focused on loans to developing world countries, shifting away from that mission in the 1980s. For the last 30 years, it has included NGOs and environmental groups in its loan portfolio. Its loan strategy is influenced by the United Nations' Sustainable Development Goals, as well as environmental and social safeguards.

² Ban ki-moon:1944-,2007-2017 Secretary General of the United Nations.

Intra-urban agriculture within cities takes place within city boundaries. Most cities and towns have areas of land that are vacant or available for urban agriculture, including areas that are not suitable for construction (along streams, usufruct rights, proximity to airports, earthquake or flood-prone areas, buffer zones between residential and industrial areas, etc.) and vacant public or private land (reserved for future use, land vacant due to speculation awaiting construction) that has or can be used productively in urban agriculture (temporary or permanent). Typical intra-urban agricultural systems include community gardens, backyard gardens, nurseries for the production of saplings, herbs, and medicinal plants, production of mushrooms, and small livestock in smaller quantities (poultry, rabbits, etc.). Agriculture in the city is mainly based on subsistence standards or relaxation, and the other part is market-oriented.

Peri-urban agriculture takes place in the area around the city's construction. Surrounding urban areas tend to experience rapid and dramatic changes: land prices rise, an influx of people from rural and urban areas increases density, multiple uses appear, and land improvement spreads (Ir. Henk de Zeeuw, the development of Urban Agriculture; some lessons learnt-Key note paper for the International Conference "Urban Agriculture, Agro-tourism and City Region Development", Beijing, 10-14 October 2004). These changes affect agricultural production systems. They tend to get smaller, switch from producing staple crops to more perishable ones (mainly green vegetables), and make meat, eggs, and milk. Many jobs are created by peri-urban agriculture, which is typically quite intense and commercial.

Typical criteria for these areas vary residential location (on or off-site), site development status (building and open space), site tenure/manner of use (cession, lease, sharing, unauthorised personal agreements, customary law or commercial transactions), Official land-use categories (residential, industrial, institutional, etc.) of the sector implementing the UA. Some authors focus on residential plot areas, while others have concentrated on off-sit open-space space areas. The classification of this section and the corresponding cases are described in more detail later.

Most definitions include agricultural production, including self-consumption and some trade (sale, barter, gifts, etc.). The producers or households being studied are often targeted to varying degrees. Recent economic research aims to target specific (export) market-oriented products and help us better understand UA's romance and its comparative advantage over other sources of supply at the producer and consumer levels.

2. Why is urban agriculture important?

- Urban agriculture is a system with complex functions, and its primary functions are three:

- Production features.

This is the primary function of urban agriculture as an industry, which is embodied in producing and providing agricultural and sideline products for the city to meet the needs of different consumer levels; at the same time, it also vigorously develops export-oriented agriculture, and exports agricultural products to earn foreign exchange (generally referred to as foreign exchange earning agriculture). The production function of urban agriculture is also manifested in technological innovation, radiation, and demonstration and driving role. Generally speaking, urban agriculture represents the region's most advanced level of agricultural development because of its strong agricultural science and technology strength, so it is the region's radiation source of agricultural technology. At the same time, through the construction of agricultural science and technology parks, we will realise the adjustment and optimisation of the regional farm structure and increase the income of peasants.

- Ecological function

Urban agriculture itself has the characteristics of being "clean, beautiful and green", which can reduce the harm of urban industrial "three wastes" pollution, reduce urban noise, maintain urban ecological balance, establish a harmonious environmental environment between man and nature, urban and agriculture, and provide a quiet and fresh living environment for the city.

- Life function

The city's agricultural life functions include social and cultural functions and leisure and light functions, which are manifested explicitly in the city's agriculture through the opening up of landscaped green spaces, municipal farmers' gardens, flower parks, agricultural education gardens, etc. It provides a leisure and entertainment garden for the city so that the city mates can experience agricultural production, let the young people get in touch with agricultural culture, and acquire some agrarian knowledge.

- Compared with traditional agriculture, urban agriculture is more prosperous and diverse.

Table 1: The forms of urban agriculture

| | |
|------------------------|---|
| Facilities agriculture | protective land cultivation with environmental protection and greenhouses as the main body, mainly used for the production and cultivation of vegetables, melons, fruits, flowers, edible fungi, etc; |
| Tourism agriculture | mainly forest green space, flowers, characteristic agricultural cultivation, supplemented by other natural and cultural landscapes, etc., constitute a comprehensive tourism resource; |

| | |
|------------------------|--|
| Green agriculture | mainly refers to agricultural high-tech development zones with large-scale production, which implements one-stop operation of production, processing, and sales and produces pollution-free green agrarian products; |
| Farm agriculture | has become an agricultural farm with specialised production and comprehensive operation in the mode of operation contracted by large households; |
| Municipal agriculture | A certain kind of agricultural material in which citizens participate or lease it; |
| Processing agriculture | uses local or peripheral crop products as raw materials, and implements production processing and sales. |

Resource from: Main Types of Urban Agriculture, Department of Market and Economic Information, Ministry of Agriculture, http://www.moa.gov.cn/ztlz/jlh/zlzb/201204/t20120424_2610339.htm

Urban agriculture may help address cities' environmental, social, and economic challenges. Plants can improve Earth's climate by reducing heat during the warm season and retaining water during heavy rainfall, reducing the risk of flooding. A large amount of organic waste, such as fresh food scraps, is generated in cities. Organic waste can be converted into compost and used in urban gardens. The health of city dwellers involved in urban gardening generally improves. These city dwellers typically eat more varied diets, eating more fruits and vegetables rich in vitamins and minerals. When people engage in urban gardening, their sense of belonging to their local community increases. Citizens benefit from meeting with neighbours, meeting new people, and experiencing happiness and spiritual satisfaction in the community. With the development of urban agriculture, more technologies for urban agriculture need to be developed and improved, promoting agricultural technology development.

3. Historical background of urban agriculture

Urban agricultural space, as a unique urban space, has a history of hundreds of years; before entering the industrial revolution, due to the small scale of the city, the city could rely on the surrounding rural food supply, while the natural ecology in the city has not been damaged, with the expansion of the city, population growth, the expansion of the surrounding industrial production industry, nature is destroyed, so the agricultural function of the land is introduced into the city.

3.1 Urban agriculture is developing in the world

- Howard³ -Tomorrow's idyllic city

At the beginning of the 19th century, the German government provided citizens with small fields and established "citizen farms" worldwide, making Germany the first country to propose urban agriculture.

In Howard's (Sir Ebenezer Howard, 1850-1920, English urban planner and founder of the garden city movement) pastoral city theory, agricultural production in or around the city is a core element of the pastoral city idea, in each town, five-sixths of the area should be used for agricultural production. The residential area is divided into many 20 by 130 feet of small squares, and each land can support the food requirements of a family of five (1903). Although in the 20s, cities derived from the idyllic city concept like Welwyn and Letchworth did not form food self-sufficiency as envisaged, Howard's ideas cannot be ignored.

- Corbusier⁴'s City of Tomorrow⁵

The publication of another book, Le Corbusier's (1887-1965, architect, designer, painter, urban planner, writer, and now regarded as modern architecture) *The City of Tomorrow*, and its planning in 1924 had a more dramatic international impact on twentieth-century architecture and urban design. In chapter 13 of his book, he describes in detail how agriculture can be introduced without reducing the overall density of suburbs. To illustrate the situation, he also deliberately introduced a 150-square-meter agronomic garden in a 400-square-meter living unit." Each farmer should provide food production for 100 small dwelling units ... Orchards grow between dwellings and arable fields." (Le Corbusier, 1929) It is stipulated that on the ground of 400 square meters, in addition to building huts where gardens or cultivation are built, two-story buildings are built on 50 square meters of land. The housing area is 100 square meters, 150 square meters of which are used as a sports field, and the remaining 150 square meters are a vegetable garden and a place for farming.

³ Sir Ebenezer Howard OBE (1850 – 1928) was an English urban planner and founder of the garden city movement, known for his publication *To-Morrow: A Peaceful Path to Real Reform* (1898), the description of a utopian city in which people live harmoniously together with nature. The publication resulted in the founding of the garden city movement, and the building of the first garden city, Letchworth Garden City, commenced in 1903.

⁴ Le Corbusier, original name Charles-Édouard Jeanneret 1887-1965, was a Swiss-French architect, designer, painter, urban planner, writer, and one of the pioneers of what is now regarded as modern architecture.

⁵ *City of Tomorrow* first appeared in English in 1929 Le Corbusier presents in this work two schemes for the reconstruction of a modern city. One is the "Voisin" plan for the center of Paris and the other is his more developed plans for the "City of Three Million Inhabitants." In both these schemes he adopts skyscrapers as his most important units, but they are set at immense distances from one another and are surrounded by large open spaces or parks. They are allocated to commercial, not residential purposes; the greater tenement houses and other buildings will remain relatively low in height. The plans in the book demonstrate the scope and general appearance of the reconstruction that Corbusier proposes.

- Wright⁶, "The Living City"⁷

The American architect Wright (Frank Lloyd Wright, 1867–1959 was an American architect, designer, writer, and educator) published a series of papers in the mid-nineteenth period and then compiled a book called *The Living City*. His most direct explanation of the organic city was the introduction of agricultural production into the suburban walking settlements. Wright's idea of architecture and agronomic consent as landscapes is his greatest gift to contemporary architects and builders of urbanism, an idea that breaks down the boundaries between the city and the suburbs and that productive landscapes will have the same status as traditional urban development.

-Urban agriculture space during the interwar period

The period between 1900 and 1945 was the most rapid period of urban agriculture, which shows that development did not stem from architects' ideas but from war.

Whether during World War I or World War II, large numbers of urban residents suffered from famine, which directly led to a movement to improve local food, and the most effective solution to this was urban agriculture. During World War I, the government's campaign to increase food production did not begin until 1917. In 1913, there were about 450,000 to 600,000 urban agronomic gardens of 250 square meters in the UK. By 1917, it had reached 1.3 million to 1.59 million plots, and these blocks of agronomic gardens could produce 20 million tons.

From the late twenties onwards, the mass unemployment of urban dwellers led to a brief revival of urban agronomic gardens characterised by self-sufficiency. During the Second World War, the British government prepared urban households for food production, and in October 1939, the famous "Dig for Victory" led by the Minister of Agriculture broke out. In fact, in the middle of World War II, more than half of the artisans began to engage in agricultural activities through urban agricultural gardens or even in their gardens. By the war's end, about 1,500 urban agronomic gardens were created. In 1944, when residential gardens, urban clearings, and urban parks were taken into account, the output of urban agriculture as a whole could meet more than 10% of

⁶ Wright, Frank Lloyd Wright (June 8, 1867 – April 9, 1959) was an American architect, designer, writer, and educator. Wright believed in designing in harmony with humanity and the environment, a philosophy he called organic architecture. This philosophy was exemplified in *Fallingwater* (1935), which has been called "the best all-time work of American architecture". Wright pioneered what came to be called the Prairie School movement of architecture and developed the concept of the Usonian home in Broadacre City, his vision for urban planning in the United States.

⁷ *The Living City*, First published in 1958, in New York, proceeds from an analysis of the development and gathering instincts of primitive humans, it proposes a model of an ideal city as opposed to the present city. The architectural features of the democratic city of the future proposed by Wright as a solution found inspiration in the topography of the city built according to an organic plan. Every resident is entitled to at least one acre of space to build his own home according to his needs.

the country's food needs and more than 50% of its fruit and vegetable needs (Crouch and Ward, 1988).

-Post-war Urban Reconstruction and the Decline of Urban Agricultural Space

The increasingly perfect social security system, high employment rate, and increasingly prosperous material life made urban residents think that urban agronomic gardens were no longer needed daily, but the new British government launched a survey in 1964 led by Professor Harry Thorpe, who attached great importance to the value of urban agronomic garden but was critical of the urban agronomic garden movement, he believed that in the new era, urban agriculture revival should belong to the "leisure garden", and made 44 suggestions. There were also calls for a more explicit urban agriculture code. But until now, it has not been adopted by the government. It would be short-sighted to completely dismiss Professor Thorpe's thinking, as the urban agronomic garden near Brighton Pier is now a place for city dwellers to relax.

- The recovery of urban agricultural spaces, diversification, and sustainable development.

Since the seventies of the twentieth century, the environmental crisis has begun, so local organisations and social activists have called for creating and introducing more urban open spaces. Instead of making some urban parks, it leads to a new type of open space that takes advantage of the urban space of these small and previously used industrial land plots. The development of environmental ethics brought about a new way of life, and this culture led to the revival of urban agriculture in the United Kingdom, which also gave birth to many new urban farming activities, such as the more famous urban farm and community farm movement.

By the 90s, there were more than 60 urban farms nationwide in the UK. Urban farms have complex functions, emphasising production, leisure, and education tasks in this period and, of course, beginning to have commercial value. Community farms were born in the United States in the seventies of the nineteenth century. Like urban farms, the most significant difference between community farms and traditional agronomic gardens is that there is more emphasis on the social value caused by agronomic gardens and the stimulating value of the vitality of the entire community. However, smaller than urban farms, it is more common in urban neighbourhoods. The concept of community farms has now been introduced in the UK and is represented by urban agriculture and community farm associations.

The concept of sustainability was introduced at the Rio Earth Summit in 1992 and was later used to warn of the growing environmental crisis. For developing countries, urban

agriculture as long as it is driven by economic demand, while in developed countries, it emphasises its social leisure and ecological protection functions; in Europe, urban farms and community farms are increasingly interested. In Africa, Cuba, and other third-world countries, urban agriculture is still the economic security on which many poor citizens depend.

Chapter 2: Urban Agriculture in Land Use

Theoretical thoughts

- In 1999, Columbia University professor Dickson Despommier(1940-, an emeritus professor of Microbiology and Public Health at Columbia University) first proposed "vertical farming" to explore urban agriculture combined with architectural space theory.
- Continuously Productive Urban Landscapes (CPULs) by K.Bohn (Katrin Bohn, University of Brighton) and A.Viljoen (Andre Viljoen, Professor of Architecture, School of Arch, Tech, and Eng, a leading figure researching the architectural and urban design consequences of sustainable urban food systems.), In 2005, integrating agriculture into urban spaces as continuously productive landscapes was proposed. A complete approach to integrating agriculture and urban design was proposed for the first time. In the same year, Arjan van Timmeren⁸(1969-, full professor at the Delft University of Technology, Faculty of Architecture and the Built Environment, Department Urbanism, Environmental Technology & Design, Academical Portfolio Director 'Sustainable Cities' for TU Delft Extension School for continuing education and Principal Investigator at 'AMS Institute' (Institute for 'Advanced Metropolitan Solutions') in Amsterdam)'s study "Autonomy and Heteronomy" proposed the theory of "sustainable implantation", embedding urban agriculture as a functional component into the urban infrastructure system.
- In 2009, Andres Duany⁹ (1949-, an American architect, an urban planner, and a founder of the Congress for the New Urbanism), a representative of new urbanism, put forward the idea of "agricultural urbanism", which integrates food production into all levels of urban structure. In the same year, American Wagner et al. put forward the concept of "food urbanism", combining urban transportation space for food system layout and integrating agricultural space with urban space. In 2011,

⁸ Arjan van Timmeren, with a focus on environmental technology, urban metabolism, the circular and biobased economy, urban climate, and ecological behaviour, his work focuses on sustainable development in the built environment. In addition to holding positions in quality teams, scientific boards, and (inter)national steering committees, Arjan manages multiple (international)projects.

⁹ Andres Duany, Garden Cities: Theory & Practice of Agrarian Urbanism, An introduction to community planning and management that enables the entire interaction of agriculture and modern society. Agricultural urbanisation may not be for everyone, but it is one of the more rewarding ways to develop and live on land. Due to their climate change mitigating effects, new agricultural lifestyles should be available to as many people as possible. The agricultural landscapes of most neighbouring towns are valued for other reasons and are protected by government policy to maintain their economic viability.

the Ecological Innovation Laboratory of Victoria, Australia, proposed "Food Sensitive Planning and Urban Design", re-examining urban space from the perspective of the food cycle process.

1. Integration of urban space and urban agriculture

Modern urban agriculture has been around for hundreds of years, and now there are many different models, each with unique spatial characteristics and management models.

It is generally believed that the external space, composed of buildings, roads, and other entities, is an urban municipal space, which differs from the architectural space. However, in modern cities, the surroundings of buildings are built, and even the design of some interior spaces increasingly permeates the requirements of the urban environment. It should be the object and content of modern urban design. With this, the urban space is extended to the architectural space according to its nature and the scale of integration with agriculture, which is divided into architectural space, urban idle space, urban public space, urban neighbourhood-urban scale space

- The local space of the building integrates urban agriculture

Roofs, balconies, walls, window sills, and interiors can all be selectively used for agricultural farming, depending on the building's nature and the space's characteristics. Studies have shown that rooftop vegetables are also effective pollutant filters and inherently safe. Commercial rooftop farms are usually produced in greenhouses in combination with hydroponic cultivation systems.

The most prominent feature of this agronomic garden is the freedom of form, where city dwellers can unleash their creativity, maximise limited space, create an atmosphere close to nature that they want, and simultaneously satisfy a sense of accomplishment.

In 2011, Gotham Greens¹⁰ developed the first commercial rooftop greenhouse in the United States, Green Point, Brooklyn, New York, with an annual output of about 45,000 kg of vegetables per 1 400 m², solar photovoltaic panels to power hydroponic farms, LED lighting, passive ventilation technology to reduce electricity and heating needs, to date, the company has developed 15,800 m² of rooftop greenhouses, equivalent to 40 hm² of traditional farmland. In addition, there are examples of indoor and underground agricultural cultivation in buildings.

¹⁰Gotham Greens is a worldwide pioneer in the field of urban agriculture and a leading regional producer of hyper-local, premium-quality, greenhouse-

This form of rooftop agronomic garden is gradually becoming popular in China for balcony farming; city dwellers use their balconies to grow some vegetables to experience the joy of life brought by urban agriculture. This phenomenon is widespread; on the major e-commerce websites (Taobao), many sellers sell the containers, soil, and seeds needed for balcony planting. This planting method is more flexible, and residents can choose the plants to be planted according to their preferences, and this way is not limited to the space size.

- Professional farm

In China, there are citizen farms (allotments), which refer to the municipal government or association renting to citizens; such agricultural gardens range in scale, some in apartment courtyards, and some in small-scale agronomic gardens.

Management mode is a unique organisation (or government) responsible for the management; the agronomy garden is divided into many small units, available for citizens free or low claim, on its agriculture, this way belongs to the government to urban residents. The farm became non-public land, divided by cultivated land owners column, independent distribution, but because "in the federal agronomy law, agronomy garden area planting height shall not exceed 1m", thus makes this space has the visual public. This kind of agronomy is the most common in Germany. Materne, in 1965, in the residential planning to add agronomy, pointed out that "in groups of dense cement forest insert the available private open space provides the special pattern, makes the building surrounding area, especially the high-density residential blocks, gives a lot of flow, change, multi-level space..."

- Community farm

A group of people cultivates a community farm garden. This form of urban farm garden mainly exists in the United States, Canada, Australia, New Zealand, and other countries, and there is also a small part in Europe. The community farm is generally by the government or non-profit organisations for operation and management, and volunteers give the crowd priority; the citizens can apply to join, and the ownership may be state-owned, also be private land in the United States a common form of urban some abandoned pieces of land integration and management, it can grow productive land for agricultural products, but the type of agronomy garden no specific location selected. In terms of land scale, the American Community Farm Parks Association once conducted a nationwide survey of American community farms between the 1980s and the 1990s. There is no specific standard for the legal appearance according to the location, demand, and size of the land available.

Community farm for cities and residents has many roles and other forms of urban agricultural space; they give participants the fun of farming but also stimulate communication between the community and reduce the gap between the community; at the same time, community farms also provide food to the city of low-income people, people with disabilities and lonely elderly, belong to is a solid public nature. Children will also be organised to study and visit the experience.

- The farming community

This belongs to the North American region of urban agriculture mode, the pattern of urban agriculture to agricultural garden and living community mutual form of organisation, promote the relationship between agricultural producers and consumption, here, residents can order ingredients and products, provide a stable source of income and sales channels, and agricultural garden will provide urban residents more healthy and cheaper rural products, and can directly see the agricultural production environment and process, let the citizens for food safety more assured, strengthen the confidence in the master of the farm food, increase the regional food supply, promote the local economy and agricultural development.

The large-scale production of the agronomy park is used to reduce costs, so such urban agricultural space is relatively large, and its location is generally located in the rest of the city, and some farming communities will also choose on the roofs of buildings.

- Landscape Agriculture Park

This kind of urban agricultural space belongs to part of the urban public space system, openness, and it's more than the public space, the combination of other facilities; in the agronomy park, there will be a rest seat, game venues, children's entertainment facilities, there will be a path, running belt, small tree belt, central square, there will be a large area of green space, sports venues, even there will even be some waters area.

Such urban agronomy gardens are generally located in the big cities of developed countries, and their primary function is for entertainment and leisure, and the production function can be ignored.

- Campus farm

Schools are an indispensable element in each city. The use of campus space or school-surrounded space for agricultural production can enrich the campus landscape, enrich the students' extracurricular life, and help them understand and even experience the

process of agricultural production, so attachment school construction of campus farm production is not uncommon in China.

With the continuous development of the city and scientific and technological innovation, many young people are less and less exposed to natural products. They cannot even distinguish between the primary food of life. Therefore, the educational significance of the campus farm is significant.

- Tourist farms in sub-urban areas

Development of urban agriculture in China in recent years, the primary type from the suburbs of sightseeing experience agriculture around the city, by the farmer's open orchard nursery garden visitors experience picking, pick vegetables and flowers, enjoy the fun of rural life, sightseeing experience of agriculture will exist at home. Abroad, it belongs to the agriculture and tourism cross in cross-industry size has certain specifications, and facilities are complete, even with catering accommodation and other functions.

- Technical and research agricultural park

This rustic park is mainly designed for technical facilities and research agriculture. Facility agriculture can improve agriculture through technology, eliminate the natural environment, break traditional agriculture, and realise out-of-season food. There will also be experimental plots for agricultural research institutions in cities. This agricultural park is mainly designed for technical facilities and research agriculture. Facility agriculture can improve agriculture through technology, eliminate the natural environment, break traditional agriculture, and realise out-of-season food. There will also be experimental plots for agricultural research institutions in cities.

- Vertical farm

The vertical farm concept was first proposed by Dickson Despommier (1940-Dickson D. Despommie, an emeritus professor of microbiology and Public Health at Columbia University.). He mentioned in <vertical farm>, "vertical farm is urban large-scale agricultural production or skyscrapers in the skyscraper" The vertical farm has two main functions: the first is it throughout the year producing vegetables, fruits, fungi, and food, provides a lot of transaction support for the city, the second point is to make full use of recycling technology to treat urban wastewater and use the process of the energy to support the production process of food production.

Table 2: Integrated design of foreign urban interior space and urban agriculture

| Type | | Definition | Site selection | characteristic | Significance |
|--|---|---|--|---|--|
| Building space integrates with agriculture. | Building local space integration of agriculture | Use fragmentary space in buildings to grow agriculture-related crops, | Roof, balcony, wall body, window sill, indoor | Vegetables on the roof effectively filter the dirt and provide safety for themselves. A combination of greenhouse and hydroponic growing systems often produces commercial rooftop farms. | Low-carbon, environmental protection, time-saving, and high efficiency. |
| | Professional vertical farm | Concentrcentralized production and use of high-tech means to obtain high-yield | | The power consumed by using lots of artificial growing light has also raised questions. | |
| Urban idle space to integrate agriculture | | Idle urban space refers to the urban farm formed by the abandoned, unused, or neglected space. | Traffic dry, Lower road and nearby open space, abandoned factory warehouse, port base, both sides of the river bank, Underutilised parking lot | The design also focuses on material reuse, temporary use of facilities, and low cost. | The reuse of idle space reflects the Western countries' approach to compact cities; attention to the abandoned environment in the development gives new vitality to this space through agricultural integration, which is conducive to constructing a "good" environment for the whole city. This method's replaceability, low cost, ecology, and rural artistry make it attractive. |
| Integrate agriculture in urban public space. | | Urban public space refers to the urban external space used by citizens in a city, which forms urban agriculture combined with public space. | City squares, parks, street parking lots, green spaces, etc., can be extended to the shared space of community residents. | Integrate food, landscape, and environment, and integrate the community. | Community agriculture has also significantly improved the quality and connotation of community living through kneading and recycling technology, multi-functional demand, seasonal agricultural characteristics, artistry, and other aspects. |
| Urban block- -the integrated design of urban | | The integrated design of agriculture and | | | |

| | | | | |
|-----------------------------|---|--|--|--|
| scale space and agriculture | urban interior space can be expanded to urban blocks, areas, and even urban scale | | | |
|-----------------------------|---|--|--|--|

Resource from: "Protecting ecosystem services of urban agriculture against land-use change using market-based instruments.

A Polish perspective "in Land Use Policy.

- Specific planning strategies support the various functions offered in agricultural activities

By neglecting activities related to food systems, planners miss an excellent opportunity to leverage food systems. In their efforts to develop healthy communities, something as important and enjoyable as food supports a good quality of life. As one of the necessities of life, food has almost become a necessity in people's lives. Avoid it entirely as an organisational strategy for community improvement. For example, few urban farming features, such as community gardens, are as crucial as other urban farming features, such as open green spaces, resulting in the lack of introduction into urban planning processes or zoning to protect them. Urban areas often require the most significant effort but offer the most excellent potential incentives for integrating local food systems into planning, primarily due to high population density consumers and many poor people living in cities.

Owing to their vast reach, planners can be crucial in creating community gardens and other urban agricultural elements, safeguarding them with suitable zoning, and even establishing the minimum quantity (or location) per person. Urban planners can also consider farmers' markets, farm-to-institution programs, and local food networks that connect growers with processors, restaurants, grocery stores, and direct-to-consumer purchases. Transportation systems that distribute food consider residents' availability and accessibility; waste is also an opportunity for urban planning. In many cities, planners have a unique advantage in coordinating cross-disciplinary activities, making cities.

Agriculture realises its full potential as a versatile and sustainable land use.

Table 3: Urban planning to support various functions of urban agriculture

| Function | Description and Justification | Supportive Planning Strategies |
|------------|--|---|
| Production | Urban agriculture produces fruits, vegetables, mushrooms, herbs, medicinal plants, meats, dairy products, eggs, and other goods. | Assign adequate, safe, and easily accessible land with ample solar access and a source of irrigation water. |

| | | |
|-------------------------|--|---|
| Energy Conservation | The embodied energy from inputs, transportation, and packaging is decreased when food is produced locally. | Create networks and transportation systems to deliver meals to customers effectively. |
| Waste Management | Organic waste products can be composted as a fertility resource for growing food and other products. | Identify systems to collect, divert, and transport organic wastes away from landfills to urban agriculture. |
| Biodiversity | Numerous species, including native plants, can be grown as crops or companion plants in agriculture. | Create communal gardens and farms in some low-diversity open space settings (grass, for example). |
| Urban Greening | Urban environments become more green through backyard and community gardens, enhancing visual appeal and general well-being. | Encourage the transformation of abandoned and neglected land into functional green areas that locals may utilise. |
| Community Socialization | Provide urban agricultural and gardening activities as part of current programming, especially in the summer. | Incorporate additional attractions and activities in addition to communal garden areas to promote social interaction. |
| Education | Urban agriculture teaches people all ages about food, nutrition, cooking, the environment, economics, and cultures. | Provide urban agricultural and gardening activities as part of current programming, especially in the summer. |

Resource from: "Multifunctional Urban Agriculture for Sustainable Land Use Planning in the United States" in *Sustainability* 2010, 2, 2499-2522; doi:10.3390/su2082499.

2. Policy of urban agriculture in land use in the countries of the world

- Urban Agriculture from the United Nations Environment Program

Urban agriculture is agri-food production within urban administrative boundaries and peri-urban areas around urban population centres. This definition is based on literature from developed and developing nations and provided in policy recommendations from the International Resource Group. Urban agriculture can include a variety of agro-food production models, including traditional land-based cultivation, poultry, and livestock rearing; greenhouse indoor agriculture and more high-tech controlled environmental agriculture; and aquaculture, mushroom farming, and insect farming. Urban farming is based on the size/scale of the farm, The farm's location, such as individual family plots, communal allocation gardens, and more giant urban farms supplied to the market, as well as whether the food is sold in the market or for personal consumption, are essential considerations. This policy guidance promotes an understanding of urban agriculture as part of a more extensive sustainable food system.

In recent years, the emphasis on urban agriculture has come to rebalance urban-rural ties, bring nature back to cities, address the nutritional insecurity of urban and peri-

urban poverty, and provide environmental benefits such as reduced food transportation processes, resource recycling, and other opportunities for recycling, reducing food waste and wastewater treatment.

From the seven primary characteristics of urban agriculture worldwide, the second point focuses on different models of urban farming, which has a variety of models within cities, including land-based individual family plots, community-allocated gardens, and larger commercial farms, as well as other new types of agriculture that require less open land, including indoor gardening, aquaculture, mushroom cultivation, etc. These different models fit different business models and different goals and objectives. For example, high-tech vertical farming, often profitable niche crops (e.g., herbs, select vegetables), can create economic development and reduce transportation needs and associated impacts but does not necessarily serve the nutritional and income needs of the urban poor, especially as high-tech indoor farms envision greater use of robots in precision agriculture. In contrast, business models that link traditional small-scale distributive agriculture in underserved communities with community nutrition programs can provide revenue and help improve nutritional security in underserved communities. There may be many business models between traditional and high-tech urban agriculture that address unique local needs. Promote different urban farming models, making more efficient use of urban land resources and providing maximum benefits.

Urban agriculture policies on environmental sustainability and resource recycling: An emerging literature base suggests that data are too scarce to conclude urban agriculture's ecological and resource recycling benefits. Some cities have shown that urban agriculture can improve resource efficiency, but only if implemented prudently (McDougall, Christiansen, & Rader, 2019), while other data from global case studies suggest that growing food within cities is uncertain whether growing food within cities improves resource efficiency (Dorr et al., 2021a). In the United States, the impact of food miles is relatively small, accounting for about 10% of total greenhouse gas emissions (Webb and Matthews, 2008), while the effects may be more minor in other countries.

Therefore, there are policy recommendations to reduce the expansion of cities to agricultural land, thereby maintaining biodiversity and reducing carbon emissions. At the same time, combined with local land use and life cycle assessment, a systematic approach is used to absorb nutrients released from food waste residue and wastewater, and these residual energies can cooperate with circular economy policies to obtain environmental and economic benefits. It is also recommended not to promote land-based, irrigated forms of urban agriculture in areas where water resources already exist, such as Delhi, India (Boyer, Sakar, and Ramaswamy 2019), where alternative agricultural systems such as hydroponics are recommended to reduce water use. Still,

these measures can impact energy and greenhouse gas (Rufi-Salis et al., 2020). Local data also need to be collected to ensure that agriculture within cities is resource-efficient, avoid accidental hazards to the environment and authority health, pay attention to the lead content of the land, and establish optimal management models for small farms (California) to support small farms.

Table 4: European Commission Policies Relevant to Urban Agriculture

| Name and weblink | Policy Area/Domain | Policy Statement | Originator |
|-------------------------------------|---|--|------------|
| CAP Fruit and Vegetable Regime | B - Shortening Food Chains, <i>2 - Rural development</i> <i>5 - Multifunctional agriculture</i> <i>6 - sustainable land use</i> | Promotes consumption of fruit and vegetables, including some free distribution to public and charitable kitchens. Some promotion of environmentally friendly production. | EC DG Agri |
| CAP Rural Development Policy | C - multifunctional use of land in peri/urban areas <i>2 - rural development</i> | Pillar II of CAP with 3 axes: improving competitiveness of agricultural sector, improvement environment and countryside, improving quality of life in rural areas and diversification of the rural economy. Use of LEADER approach within | EC DG Agri |
| CAP Agriculture and the environment | C - multifunctional use of land in peri/urban areas <i>1 - food production and consumption</i> <i>2 - Rural development</i> <i>3 - Waste management</i> <i>4 - Water resource management</i> <i>5 - Multifunctional agriculture</i> <i>6 - sustainable land use</i> | 3 Priority areas: Biodiversity and preservation and development of 'natural' farming systems, including traditional agricultural landscapes, water management and use, dealing with climate change. Mechanisms: promoting environmentally sustainable farming practices for example agri-environmental schemes, enhancing compliance with environmental laws, sanctioning reduction in support payments. | EC DG Agri |
| CAP Agriculture and Bio-Energy | C - multifunctional use of land in peri/urban | The Directive (Renewable Energy | EC DG Agri |

| | | | |
|--|--|---|--|
| | areas <i>1 - food production and consumption</i> <i>2 - Rural development</i> <i>5 - Multifunctional agriculture</i> <i>6 - sustainable land use</i> | Directive 2009/28/EC) requires member states to plan their development of each type of renewable energy via National Renewable Energy Action Plans. Provisions for cooperation between member states help this to achieve cost effectively. | |
|--|--|---|--|

*CAP=Common Agriculture Policy

In Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005, on Article 35, (k) “diversification of farming activities into activities concerning health care, social integration, community-supported agriculture and education about the environment and food.”

- Urban agriculture policy practices in other countries

- Formal acceptance of urban agriculture as legal urban land use is essential.
- Measures to strengthen access to urban vacant land and security of land use rights.

Even in highly urbanised areas, large amounts of vacant space can be found that can be used temporarily or permanently for agriculture. For example, in Chicago, researchers identified 70,000 vacant lots (Kaufman and Belki, 2000). Many cities, such as Cienfuegos (Cuba), Piura (Peru), Dar es Salaam (Tanzania), and Cagayan de Oro (Philippines), have inventoried the open land available in the city (using methods such as community maps and GIS) and analysed its suitability for agricultural use, which creates a good starting point for promoting access to land by urban farmers.

Many cities, such as Havana (Cuba), Cagayan de Oro (Philippines), Lima (Peru), Bulawayo (Zimbabwe), and the Governor of Valladares (Brazil), have developed an urban ordinance providing for the (temporary) use of vacant urban land by organised urban peasant groups. In Amsterdam, the Netherlands, the local gardeners' association (7,200 members) leases more than 250 hectares of municipal land from the city. The association leases this land as a garden plot to members, paying a quota of about 300 euros annually. Cape Town provides land and helps improve land quality through tillage, compost manure, fencing, etc.

- Promote the use of vacant private land.

The municipality of Rosario (Argentina) created the Municipal Bank for Agricultural Land (cadastral-based land registry) and brought land where people in need of agriculture contacted vacant owners. It also leases it from private landowners to community groups interested in using it. Another effective method Rosario uses to encourage private or institutional landowners to vacate is land available to the urban poor.

- Even in highly urbanised areas, large quantities of vacant land can be used for agriculture.

For example, in Lima and Accra (hospital grounds), Harare (golf clubs), Santiago de Chile (campus), Dar es Salaam (university campuses), and Puerto Oprinces (church grounds), there are also lifetime tenure agreements between urban producers and private or semi-public property owners. Container roof gardens should be promoted through urban or NGO mediation between landlords and poor urban farmers. The Philippines can find plenty of vacant agricultural space in Manila, even in highly urbanised areas. Gordon Rain's long-term leases allow producers to invest in soil and farming infrastructure.

- The division of urban agricultural zoning.

Dar es Salaam and Doma (Tanzania), Dakar (Senegal), Maputo (Mozambique), Bissau (Guinea-Bissau), Pretoria (South Africa), Kathmandu, Nepal), Accra (Ghana), and Harare (Zimbabwe) are examples of many cities dividing urban agricultural areas into permanent land use. These areas are intended to support agriculture and protect open green spaces from being built, create buffer zones between conflicting land uses (e.g., between residential and industrial areas), or preserve downtown space for future use. In Beijing, specific urban farming activities are promoted in different peri-urban areas of the city. To a lesser extent, in Ho Chi Minh City and Hanoi (Vietnam), the city limits and surrounding areas are also reserved for aquaculture. The urban master plan of Sétif, Algeria, includes the creation of a green zone on flood-prone farmland in the Buselam Valley in the western part of the city (Boudjenouia et al., 2006).

The "green finger" model of urban expansion (that means along specific axes with green areas, already applied in several European cities, such as Copenhagen, Denmark) and the "urban network" model (interlocking green multifunctional open spaces in the interconnected centres of a metropolis that can be "random" in the Netherlands) seem to be more sustainable than the "more sustainable green belt" model.

- Promotion of multifunctional land use.
Aquaculture in lakes or ponds in or around cities may be combined with other (water and fish-related) recreational activities such as fishing, boating, fish shops, etc., which proved to be a successful model in Bangkok (Thailand). The municipality of Beijing is promoting the development of peri-urban agrotourism in the form of larger agricultural leisure parks and home-based agrotourism: farmers diversify their activities by providing services to urban tourists (food, accommodation, marketing of fresh and processed products, acting as tour guides, horseback riding, etc.). Local governments include agrotourism as part of municipal and district-level planning, establishment of agrotourism associations and information dissemination services; Assist interested farmers with business planning, tax exemption, and infrastructure development funding, and provide subsidised water and electricity (Fang et al., 2005).
- Housing projects for social integration.
Cities such as Vancouver (Canada, see article in this issue), Colombo (Sri Lanka), Kampala (Uganda), Rosario (Argentina), and Dar es Salaam (Tanzania) are experimenting with the inclusion of residential and community gardening spaces in new public housing projects and slum upgrading plans. Some cities also promote recycling grey household wastewater for home gardens and educate farmers on preventing health risks.
- Urban agriculture can be combined with other compatible land uses.
In Hyderabad, India, the Green Fodder Grass Farmers Trade Association sells about 250 tons of fodder daily using a plot of land temporarily leased from a mosque. Negotiations with the Hyderabad government are underway to access public lands for more permanent use. The association also works with dairy producers and milk consumers in the city centres to urge its members' trade to be officially recognised.

3. Urban agriculture is an expression of sustainable development

The sustainable city refers to a composite system that can operate efficiently with the coordinated development of the ecological environment, economy, and social systems, involving various levels and categories of urban economy, society, population, resources, environment, land, transportation, energy, ecology, and infrastructure. As an essential measure for sustainable urban development, urban agriculture is on the rise.

Urban agriculture has great potential to provide ecosystem services under sustainable agroecological management. Its high socio-economic and technological flexibility makes it easily adaptable to various environments and characteristics.

Chapter 3: A spatial case study of urban agriculture

1. Case studies of urban agriculture in various countries

1.1 Urban fragmentation combined with agriculture

- *Jintai Village Reconstruction, Bazhong, Sichuan Province, China by John Lin, Joshua Bolchover*

Figure 1: Aerial View of Jintai Village



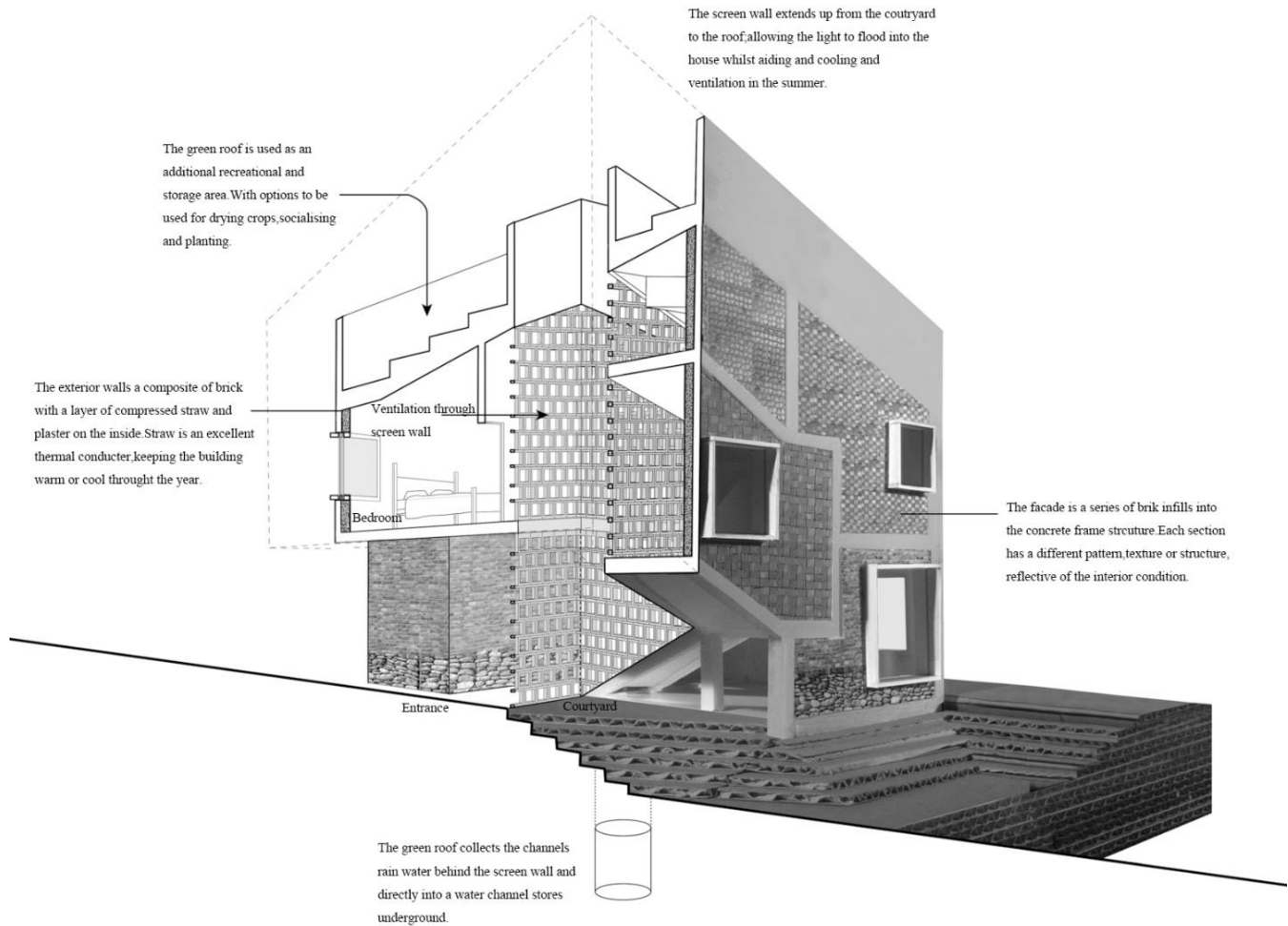
Resource from: <https://www.archdaily.com/882714/jintai-village-reconstruction-rural-urban-framework>

Situated near Guangyuan City in Sichuan Province, Jintai Village was severely damaged during the Wenchuan Earthquake that struck on May 12, 2008. Almost 5 million people were rendered homeless by the calamity, and 80% of the buildings in the impacted area are thought to have been destroyed. Significant reconstruction has started. However, Jintai Village's neighbouring areas experienced severe rainfall and landslides in July 2011, destroying some freshly constructed homes and some still under construction. Despite this tragic incident, locals have received no further donations or assistance. The project, which has the backing of the local government and non-governmental organisations, explores the various subtleties of community reconstruction while presenting a socially and environmentally viable model for earthquake rehabilitation. Twenty-two homes in all, together with a community centre, were reconstructed.

The design strategy offers four types of houses, varying in size, functionality, and roof sections. These showcase new uses for local materials, green terraced roofs, biogas technology, and accommodation for pigs and chickens. Vertical courtyards increase

light and ventilation and direct rainwater collection. The design also invests in reed bed wastewater treatment and collective animal housing. By linking the village's various projects to ecological cycles, environmental responsiveness is improved, transforming the town into a model for nearby areas.

Figure 2: Roof planting agriculture



Resource from: <https://www.archdaily.com/882714/jintai-village-reconstruction-rural-urban-framework>

Figure 3: Masterplan and Actual Venue

Resource from: Resource from: <https://www.archdaily.com/882714/jintai-village-reconstruction-rural-urban-framework>

Due to a lack of land for residential construction, the village combines dense urban living with a rural environment. Individual family-owned workshops are permitted on the ground-level open areas, while the roof supports family-owned farmland. The village's layout suggests a reconsideration of the contemporary rural landscape while upholding the idea of the common good.

Figure 4: Use rooftop and building-to-floor gardens to plant farmland

Resource from: <https://www.archdaily.com/882714/jintai-village-reconstruction-rural-urban-framework>

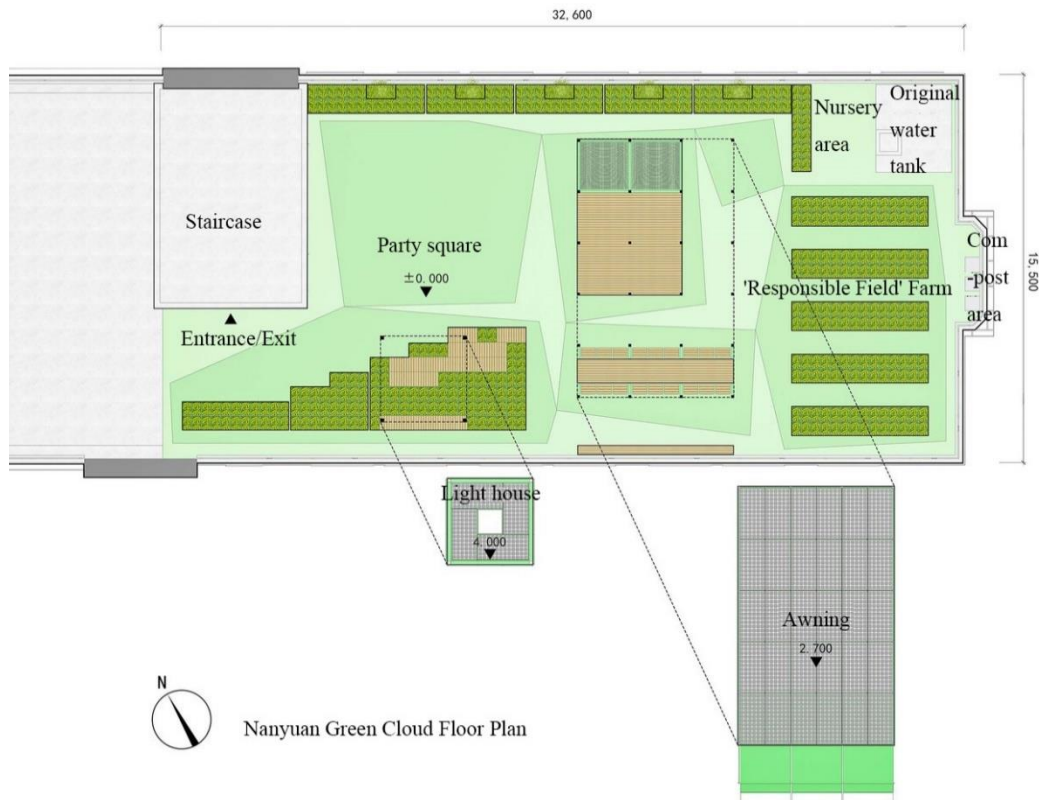
● **Green Cloud Roof of South Garden, Shenzhen, Guangdong, China by Eleven Buildings**

Figure 5: Aerial View of Green Cloud Roof



Resource from: <https://www.archdaily.com/978178/not-ready-co-build-roof-garden-green-cloud-garden-11architecture>

Figure 6: Green Cloud Roof Masterplan



Resource from: <https://www.archdaily.com/978178/not-ready-co-build-roof-garden-green-cloud-garden-11architecture>

The project is one of the "2021 Nanshan Gardens Jointly Built" led by the Nanshan District Urban Management and Comprehensive Law Enforcement Bureau and jointly initiated by the Shenzhen Green Foundation, Shekou Community Foundation, and The

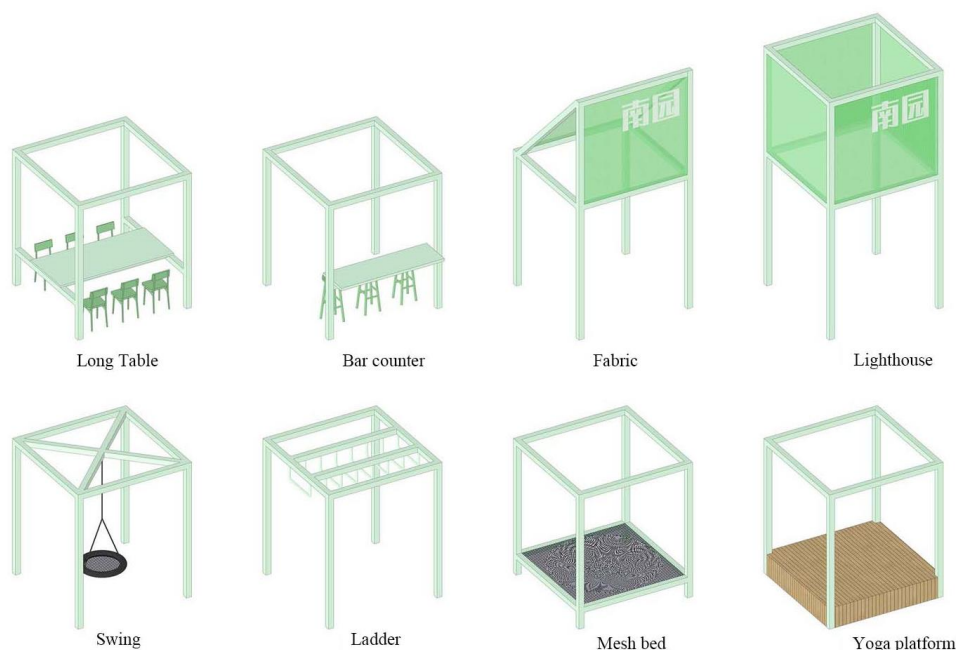
Nature Conservancy (TNC). This project is on the roof of a 6-story apartment building in an urban village. The open roof is separated from the city's transportation network, allowing for a relaxing space that flows slowly over time, like an "oasis in the city". However, isolation from the ground makes it difficult to "create community spaces where people naturally gather" on the roof.

"Green roof (low carbon)" & "Joint construction of gardens (social construction)"

The Nature Conservancy (TNC), Shekou Community Foundation, and Shenzhen Green Foundation are three cooperative organisations with a shared vision of reviving community activities, advancing nature education, building a sustainable society, and discovering a world where nature coexists.

The Bang She Youth Residences' wide roof area was chosen to concentrate mainly on environmental and community issues. It creates a 450-square-meter garden with surrounding flower beds, farms, and a partially shaded activity plaza.

Figure 7: Green Cloud roof frame structure function



Resource from: <https://www.archdaily.com/978178/not-ready-co-build-roof-garden-green-cloud-garden-11architecture>

Green cloud roof frame structure function Community building

(1) A rental farm has been created, and each community resident can rent a "responsible field" of about one m² consisting of four planting boxes. The Bangshe Apartment is responsible for essential management and maintenance. Young people interested

in agriculture, homemakers, and older adults living nearby can often come up to take care of their crops, drink tea and chat with friends at the long table under the awning, enjoy flowers and vegetables, and take their children to learn about different plants and take them for a walk.

- (2) Boli Airlines uses about 7 "responsibility fields" m² to plant vegetable seedlings in different seasons and hold hot-pot parties with harvested vegetables.
- (3) This rooftop event space can also be rented to other units for various gatherings. The 6.3m long table, yoga table, and event square can accommodate events for 20 to 30 people. If the entire venue is used together, it can accommodate more people.
- (4) The Nanshan Subdistrict Youth League Working Committee and the RE-LOOK social innovation team will cooperate with Bangshe Apartment to use this venue 1~2 times a month to hold community activities for young people.
- (5) Shenzhen Solar Energy Society and Shenzhen New Energy Association have taken this site as a practical case and plan to use it as a base to carry out a series of research activities on "the new urban lifestyle of integrating solar energy culture into the community."
- (6) In the future, the plan is to open a café on the roof.
Boxes that provide the agricultural section also serve as community exchange areas.

Figure 8: Roof planting agriculture of Green Cloud Roof



Resource from: <https://www.archdaily.com/978178/not-ready-co-build-roof-garden-green-cloud-garden-11architecture>

Figure 9: Roof farming community

Resource from: <https://www.archdaily.com/978178/not-ready-co-build-roof-garden-green-cloud-garden-11architecture>

- ***Nature Discovery Park, Hong Kong, China, by LAAB Architects***

Nature Discovery Park is a learning centre for sustainable symbiosis and ecological nature. It is located on the rooftop of Hong Kong's K11MUSEA Humanities Art Museum, providing busy city dwellers with an environment to learn about natural ecology and farm-to-table dining. LAAB's design transforms the remaining space on the roof of the original mall into a discovery park for learning and experiencing nature.

Figure 10: Aerial View of Nature Discovery Park

Resource from: <https://www.k11musea.com/visit/nature-discovery-park/>

The spatial design of the Nature Discovery Park promotes the coexistence of people, nature, and the urban environment through ecotourism and a series of educational programs on biodiversity and sustainability.

Figure 11: Bird's eye view function diagram of Nature Discovery Park



Resource from: <https://www.k11musea.com/visit/nature-discovery-park/>

The entire site leads to an aquarium with water and tropical marine creatures from Victoria Harbour, and the nature exploration trip starts with an archive featuring uncommon butterfly species. Hydroponic nurseries develop organic veggies inside the greenhouse and bring them to the table.

The farm in front of the greenhouse offers urban farming opportunities for city dwellers, promoting ecological parenting through activities such as rooftop farming and natural art jams. As Hong Kong is home to a dizzying variety of butterfly species, the nature exploration tour ends with a butterfly garden where plants are planted to attract butterflies.

- ***Planter Box House, Kuala Lumpur, Malaysia by Formzero***

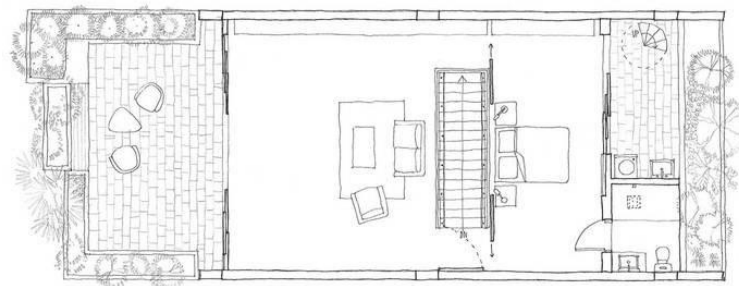
The Planter Box House, designed for a retired couple keen to grow food, doesn't look very clear as its exterior oscillates between garden, farm, and home, looking forward to a redefinition of the contemporary tropical house.

Figure 12: Planter Box House façade

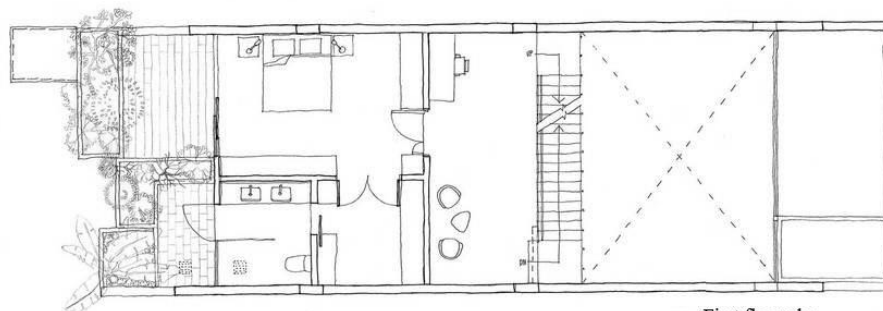


Resource from: <https://www.archdaily.com/910200/planter-box-house-formzero>

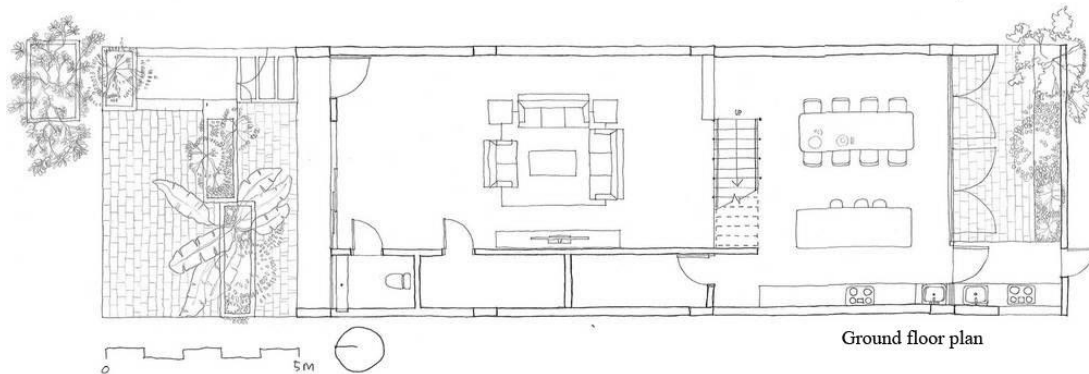
Figure 13: Planter Box House Plan



Second floor plan



First floor plan



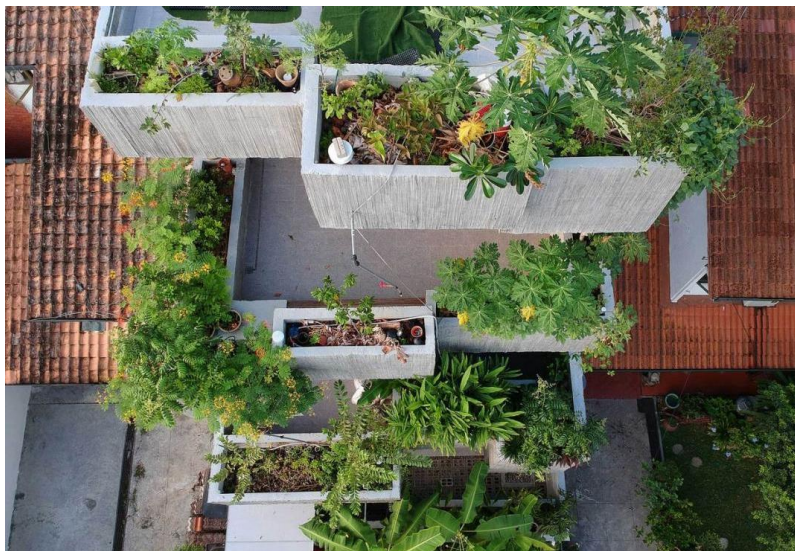
Ground floor plan

Resource from: <https://www.archdaily.com/910200/planter-box-house-formzero>

Thanks to the more than forty food plants growing in the cascading concrete pots, every house floor contrasts dramatically with the neighbouring structures. Its recessed façade adds more outdoor space for community gatherings. The first planting box was constructed around an existing jasmine tree outside the boundary. In addition to serving urban furniture, this pot connects the couple with their neighbours.

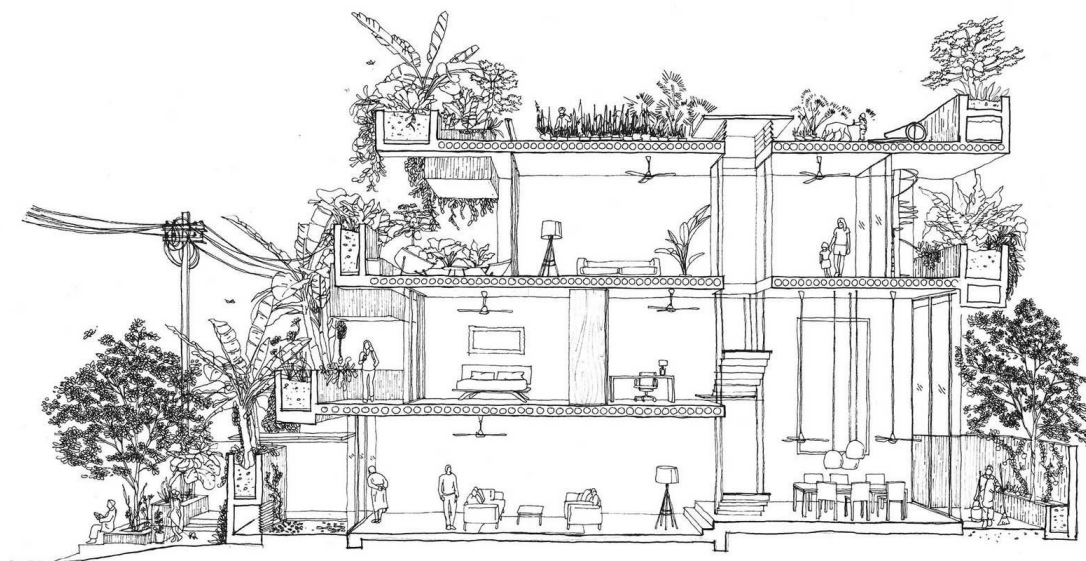
Planter Box House is a physical representation of the owner's lifestyle. It is also a knowledge platform for the couple to continuously improve their irrigation and planting systems. This customised irrigation system connects planting boxes to store and reclaim nutrient resources and rainwater within the land. It also allows for comprehensive and precise manipulation of the planting tanks, from soil composition to the water level supplied to each planting tank.

Figure 14: Planter Box House balcony planting agriculture



Resource from: <https://www.archdaily.com/910200/planter-box-house-formzero>

Figure 15: Planter Box House Section



Resource from: <https://www.archdaily.com/910200/planter-box-house-formzero>

- *Xinhua Fruit And Vegetable Market, Tainan, Taiwan, China by MVRDV*

Figure 16: Base field map of Xinhua Fruit and Vegetable Market



Resource from: <https://www.mvrdv.com/projects/391/tainan-market>

Figure 17: Aerial view of Xinhua Fruit and Vegetable Market

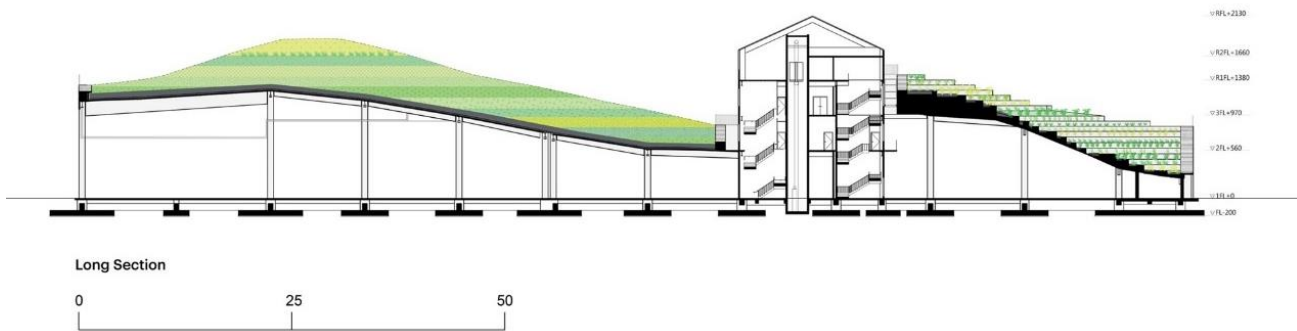


Resource from: https://www.architectmagazine.com/project-gallery/tainan-xinhua-fruit-and-vegetable-market_o

Architectural firm MVRDV designed a new wholesale fruit and vegetable market in Tainan. Tainan Xinhua Fruit and Vegetable Market occupies an essential position in the food industry and aims to elevate it into a place where the general public can enjoy food and the scenery. Located in eastern Tainan, between the city and the mountains, close to Highway 3 and public transportation connections, the market is easily accessible to both those living in the surrounding countryside and those living in the city, providing merchants, buyers, and tourists with the same level of convenience.

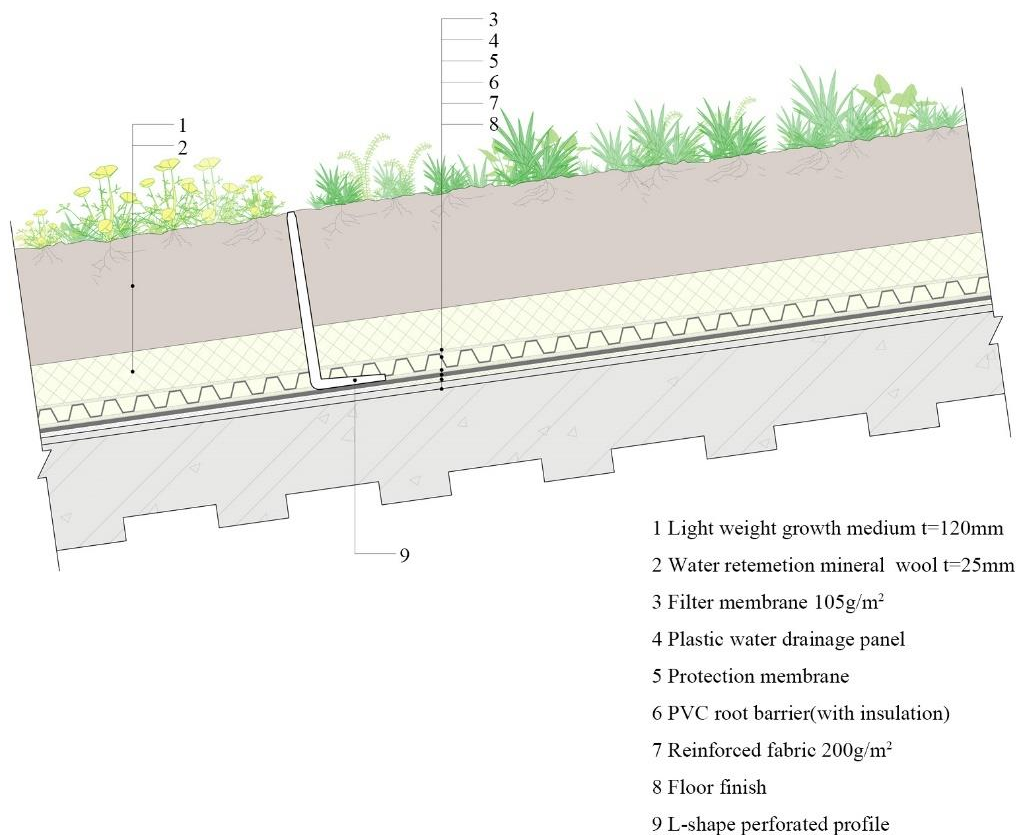
On the one hand, a simple four-story structure containing the market's administrative offices, a restaurant, and an exhibition centre showcasing agricultural products from the area makes the building ideal for school visits. The addition of the four-story building pierces the main structure, providing secondary access to the landscaped roof.

Figure 18: Long section of Xinhua Fruit and Vegetable Market



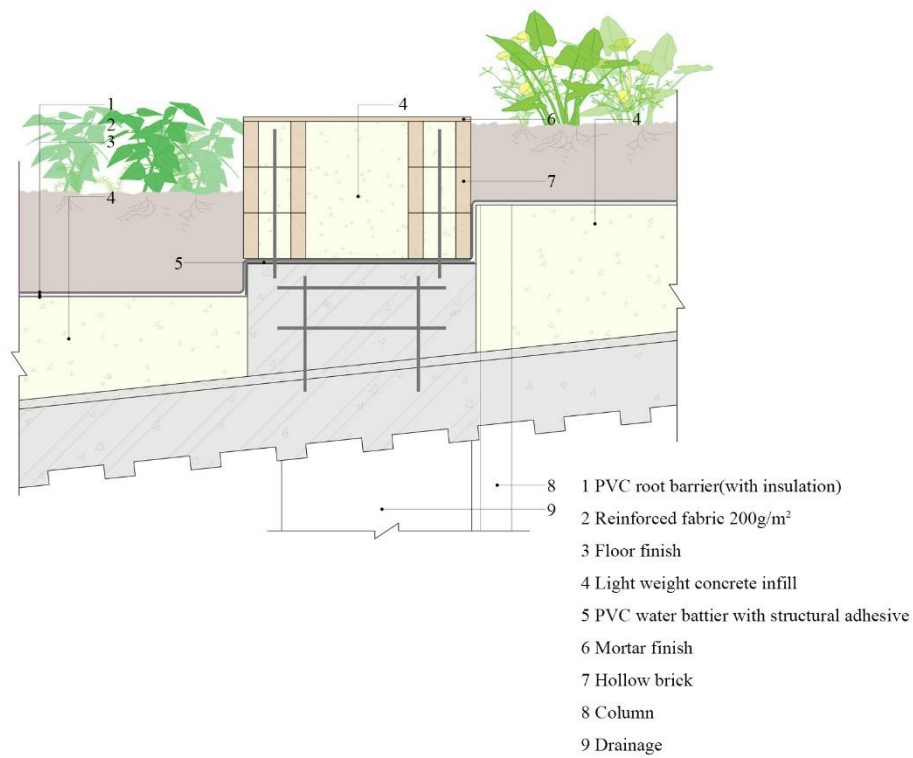
Resource from: <https://www.mvrdv.com/projects/391/tainan-market>

Figure 19: Details of the rooftop of Xinhua Fruit and Vegetable Market



Resource from: <https://www.mvrdv.com/projects/391/tainan-market>

Figure 20: Details of the rooftop of Xinhua Fruit and Vegetable Market



Resource from: <https://www.mvrdv.com/projects/391/tainan-market>

Figure 21: Xinhua Fruit and Vegetable Market’s rooftop cultivation and indoor farmers’ market



Resource from: https://www.architectmagazine.com/project-gallery/tainan-xinhua-fruit-and-vegetable-market_o

On the other hand, various crops can be planted on the retreat roof, such as pineapple, rice, rose, tea tree, etc., and they can be distributed on platforms of different heights according to the growth habits of crops and the requirements of climate. In addition, the architect also set up sheltered spaces, benches, and picnic tables on the roof, providing visitors with a place to rest and enjoy the view. The market roof presents a scene of rolling green hills, thus continuing the area's natural landscape.

Figure 22: Rooftop planting at Xinhua Fruit and Vegetable Market



Resource from: https://www.architectmagazine.com/project-gallery/tainan-xinhua-fruit-and-vegetable-market_o

MVRDV and LLJ Architects completed the Tainan Xinhua Fruit and Vegetable Market design. The project's construction is progressing orderly and is expected to be completed by the end of 2020.

1.2 Independent farms were established around the city

- *Lafayette Green, Farmington Hills, MI, The Unite State by Kenneth Weikal Landscape Architecture*

City Farm appeared in a plaza somewhere in downtown Detroit. Tangible and functional vegetable gardens productively express their charm in public spaces – urban agriculture is incorporated into urban spaces as one of the city's beautiful and exciting lifestyles.

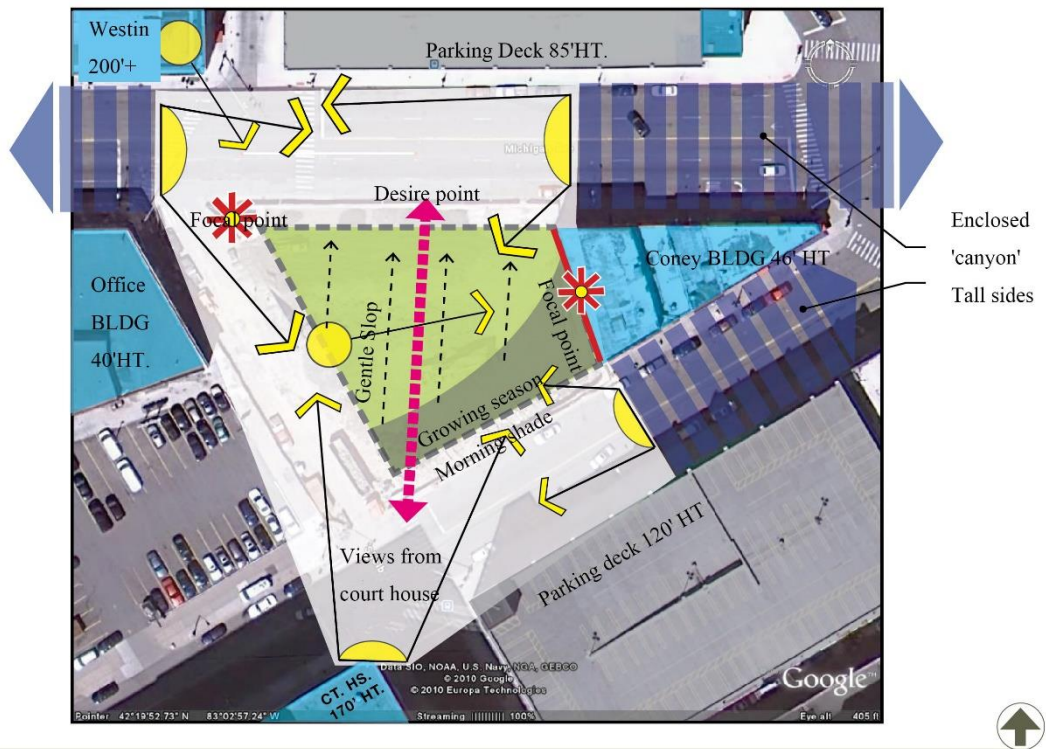
Figure 23: Site plan of Lafayette Green

Resource from: https://www.goood.cn/lafayette-greens.htm?lang=zh_CN

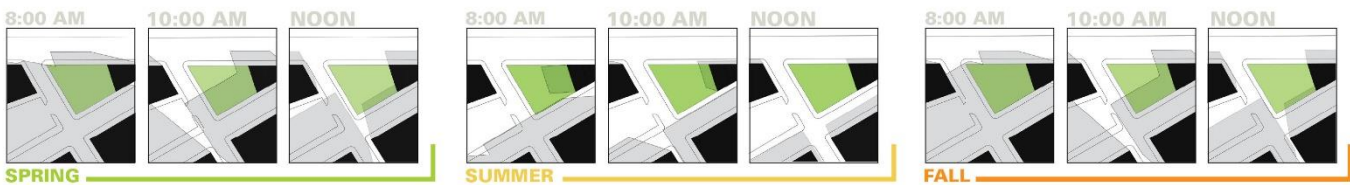
The 0.425-acre garden fills the depressing vacancy of the Lafayette Building, which was demolished in 2010. It borders the financial district and is surrounded by a bustling area. Still, the garden has managed to create a positive green space.

The city farm becomes an urban agricultural park that uses sustainable materials and has educational significance for children. Landscape architects consider aesthetics, environment, productivity, economy, etc., so this urban agricultural park is successfully integrated into the complex city, becoming a public green social space and a multi-functional community garden.

Figure 24: Sunshine Analysis of Lafayette Green



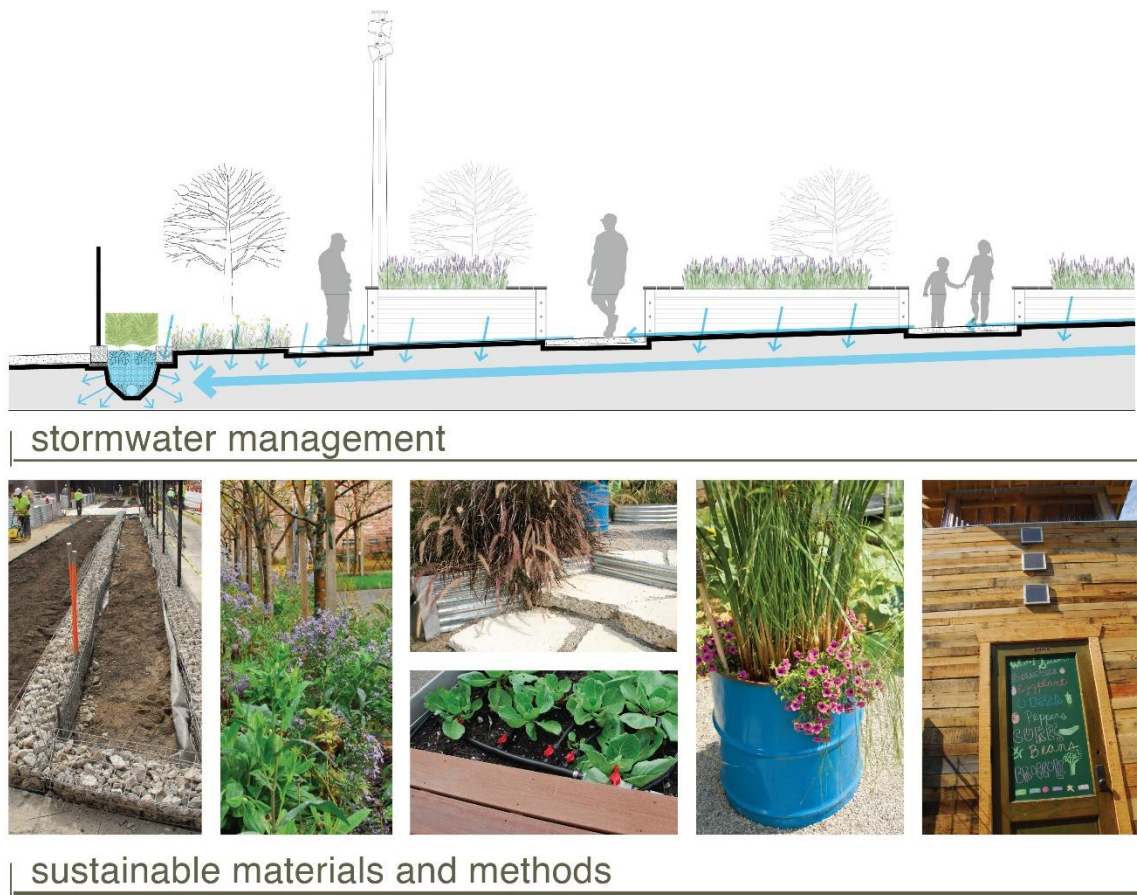
site analysis



sun/ shade studies

Resource from: https://www.goood.cn/lafayette-greens.htm?lang=zh_CN

To accommodate the 4-foot grade change throughout the site, the vegetable bed rises from ground level as it slowly descends from Lafayette Avenue to Michigan Avenue. This gentle, dynamic solution breathes life into broad, flat, expansive spaces and provides convenient planting beds for gardeners and visitors. Continuous bed heights ranging from 8 to 40 inches high along 70-foot-long pots allow toddlers to approach low-end mobility, while higher areas are barrier-free and back-friendly.

Figure 25: Using natural slop to create a sustainable plant watering system

Resource from: https://www.goood.cn/lafayette-greens.htm?lang=zh_CN

- *Sustainability*

Stormwater management and water use gardens are opportunities to demonstrate sustainability. Urban bio-depressions capture and slow stormwater runoff. It has also drawn attention through informative signage to raise awareness of bio-depression and water issues in the Great Lakes region. Between two gabion curbs, the hedge of the red-branched dogwood is cut into a clean architectural bio-depression suitable for city streets. 70% of the site's surface is porous: gravel, lawn, and planting beds. Drought-tolerant fescue lawns and efficient irrigation systems conserve water, including adjustable drip lines in raised beds.

- *Material reuse*

The site consists of a gabion curb filled with concrete rubble. Bio-depressions and broken pavement fragments are repurposed as pavers, and garden sheds are covered with recycled pallet timber and salvaged doors. The repurposed food-grade steel drums are pots for children's gardens.

- *Urban biodiversity*

More than 200 plant species, including native species, short orchard meadows, flowers, vegetables, heirloom trees, vines, berries, and bio-depressions, enhance the richness of urban environments and pollinator habitats.

- *Efficient organic farming methods*

The entire garden is organically managed. Bio-intensive raised beds with drip irrigation are highly productive, potentially generating 200-400% more heat than traditional gardens, consuming less water, and requiring low energy inputs.

- *Education & Community*

Lafayette Green is unique as an urban garden because it is a participatory public space. Anyone can participate in planting, caregiving, harvesting, learning, and teaching. It's a place to get together, engage in conversations about the local food system, share food, and experience the rhythm of the seasons. Landscape architects prioritise creating garden spaces to accommodate events, workshops, and gatherings.

Figure 26: Vegetables grown inside the square



Resource from: https://www.goood.cn/lafayette-greens.htm?lang=zh_CN

- *Sky farm, Shenzheng, Guangdong China by VRAP*

Since the end of 2015, VRAP has been applying the concept of "agricultural construction" to micro-projects, "agriculture-inclusive urbanism" – as a means of urban renewal – and we have tried to find genetic fragments of agriculture feeding back into cities through experimental design. The "Sky Farm" in Nantou Chengzhong Village in Shenzhen is one such project: a production complex public space in the urban village.

About 1368 euros can buy a foothold in the centre of Beijing and a square meter in Cangzhou, Hebei. With the same amount, they built a 400-square-meter sky farm in Nantou Village, Shenzhen. Sky Farm is an "agricultural installation" integrating rainwater harvesting, urban agriculture, and community building. It taps the potential ecological significance and production potential of "urban village agriculture" with minimal intervention in the site, providing new public gathering spaces and community-building methods.

Figure 27: Sky Farm's actual situation



Resource from: <https://www.archdaily.com/893174/sky-farm-vrap>

About 10% of Shenzhen's city is an urban village, which houses nearly 50% of the urban population. The urban village in Shenzhen is another form of urban space. Still, at the same time, it is full of a small-scale peasant economy mixed with small-scale industrial production and lifestyle and a potential way of building closely integrated with settlements. Sky Farm is an iterative product of the new urban village economy in urban villages that lack public space, and cheap sojourn space can become fertile production space and unique consumption space.

Sky Farm creates the most efficient production space at the price of civilians to achieve the most significant possible promotion effect: we use PVC, a building material that can be found everywhere in urban villages, as the primary material of the installation, and design a standardised structure that ordinary people can process by themselves,

which is easy to disassemble and transport. The side net adopts an agricultural land climbing net, the cavity is large and convenient for plants and fruits to hang, and the top net adopts a bird-proof net to protect melons and fruits while facilitating rainwater collection.

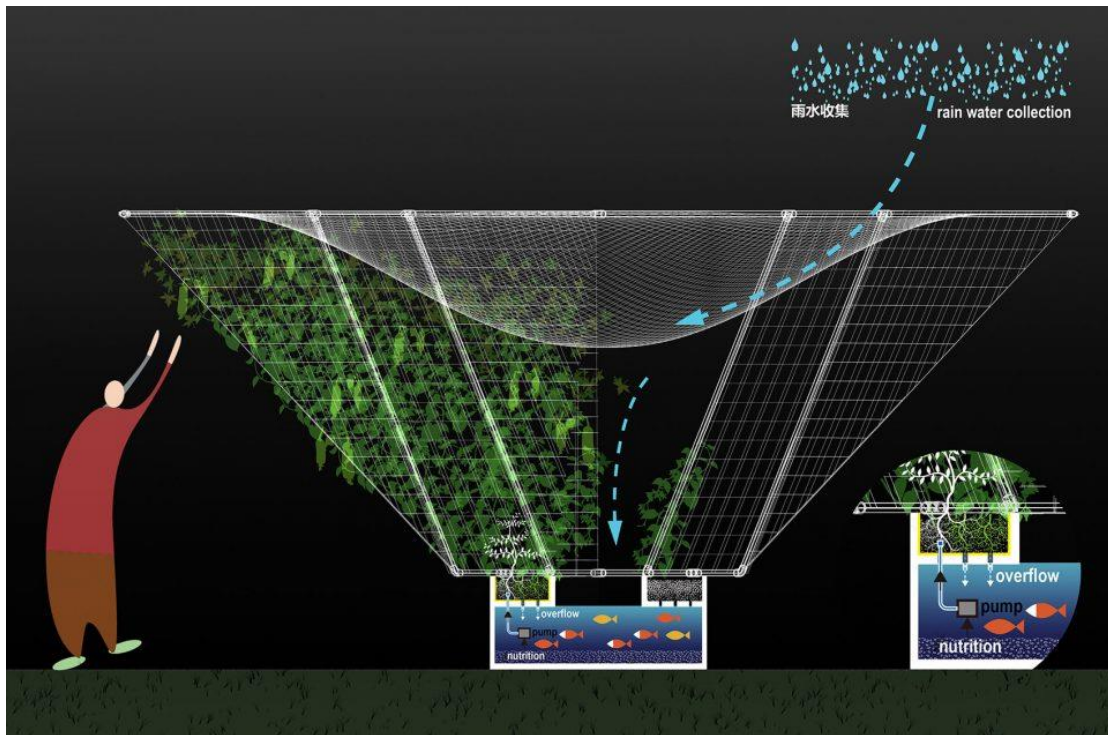
Figure 28: Sky-farm farming method details



Resource from: <https://www.archdaily.com/893174/sky-farm-vrap>

The site was originally a construction waste dump, and to facilitate the growth of plants and potential changes in the site's function in the future, we adopted the "aquaponics" method to cultivate the cultivation of Sky Farm. Initially, without a water source, nine "black boxes" were placed to feed hundreds of fish using rainwater collected, and the "fish manure nutrient water" in each black box was circulated to the plants through a low-pressure pump. The lowest cost, minimal intervention, and minimal maintenance support the 400 square meter Sky Farm. It is estimated that in one summer, Sky Agricultural can collect and use 300 tons of rainwater, raise more than 200 fish, and cultivate more than 200 kilograms of melons and fruits (taking cucumbers as an example).

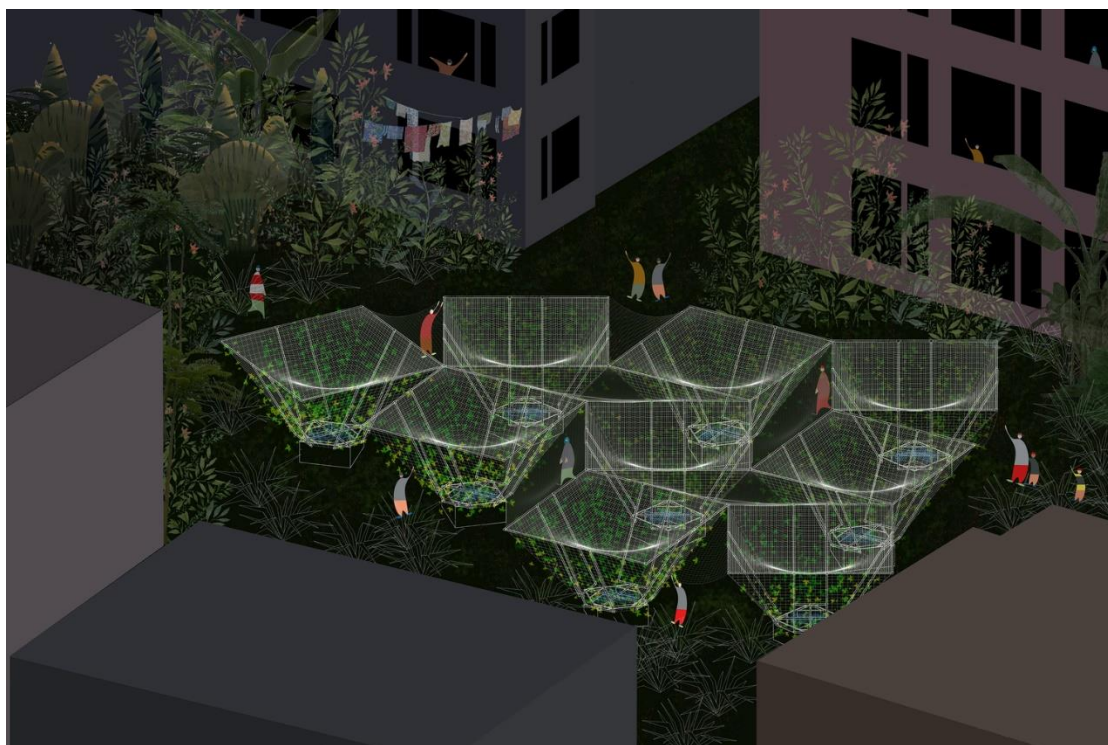
Figure 29: An aquaponics and rainwater harvesting system



Resource from: <https://www.archdaily.com/893174/sky-farm-vrap>

Sky Farm is a "mobile farm" in urban villages; it can appear on the roof platform, on the street, or in any 1.5 square meters of vacant space, and the grid frame can be adjusted according to the actual situation. The lower part is maximised for public space, and the upper part is for plants.

Figure 30: Sky-farm axonometric view



Resource from: <https://www.archdaily.com/893174/sky-farm-vrap>

- *Nature Urbaine, Agripolis, Paris, France by Acropolis*

Figure 31: View of Acropolis



Resource from: <https://agripolis.eu/>, <https://www.archdaily.com/923857/the-worlds-largest-urban-farm-opens-next-year-in-paris>

This is the largest urban farm in the world. The organic farm will have 30 different plants, tended by 20 gardeners, and should produce 1,000 kilograms of fruits and vegetables daily in the summer. Nature Urbaine occupies the roof of Pavilion 6 of the Expo Porte de Versailles in Paris, ultimately occupying 14,000 square meters (the equivalent of two football pitches). The farm has more than 4,500 square meters of operating production area, with 696 columns and 1,428 cultivation troughs. Maraîchers (Market gardeners) use cutting-edge vertical growing methods, including hydroponics and aeroponics. With a 90% reduction in water use and no urban pollution, these systems cycle water and nutrients in a fully closed loop, leaving a lasting effect. Five times more production space is made available with vertical farming.

The venue will be located on top of the newly developed Paris Porte de Versailles Expo in the 15th arrondissement and aims to showcase the global sustainability model. Prove that urban centres can be idyllic, practical, and a source of greenery.

The idea for the farm came from Agripolis. French company Agripolis specialises in production farms on flat surfaces or roofs. The founder of Agripolis, Pascal Hardy, clarified in an interview with The Guardian that "the goal is to make the farm a globally recognised sustainable production model, where (they will) use quality products, grow at the rhythm of the natural cycle, all in the heart of Paris".

Residents can rent specially designed wooden boxes on site as an allocation.

Those wishing to visit the farm can visit the on-site restaurant and bar with a capacity of 300 people, which will enjoy panoramic views of the capital and seasonal foods produced on the property or participate in special events, team-building activities, and educational excursions.

However, Agripolis hopes the farm will also help reduce "food miles" by producing vegetable boxes directly and supplying local hotels and restaurants.

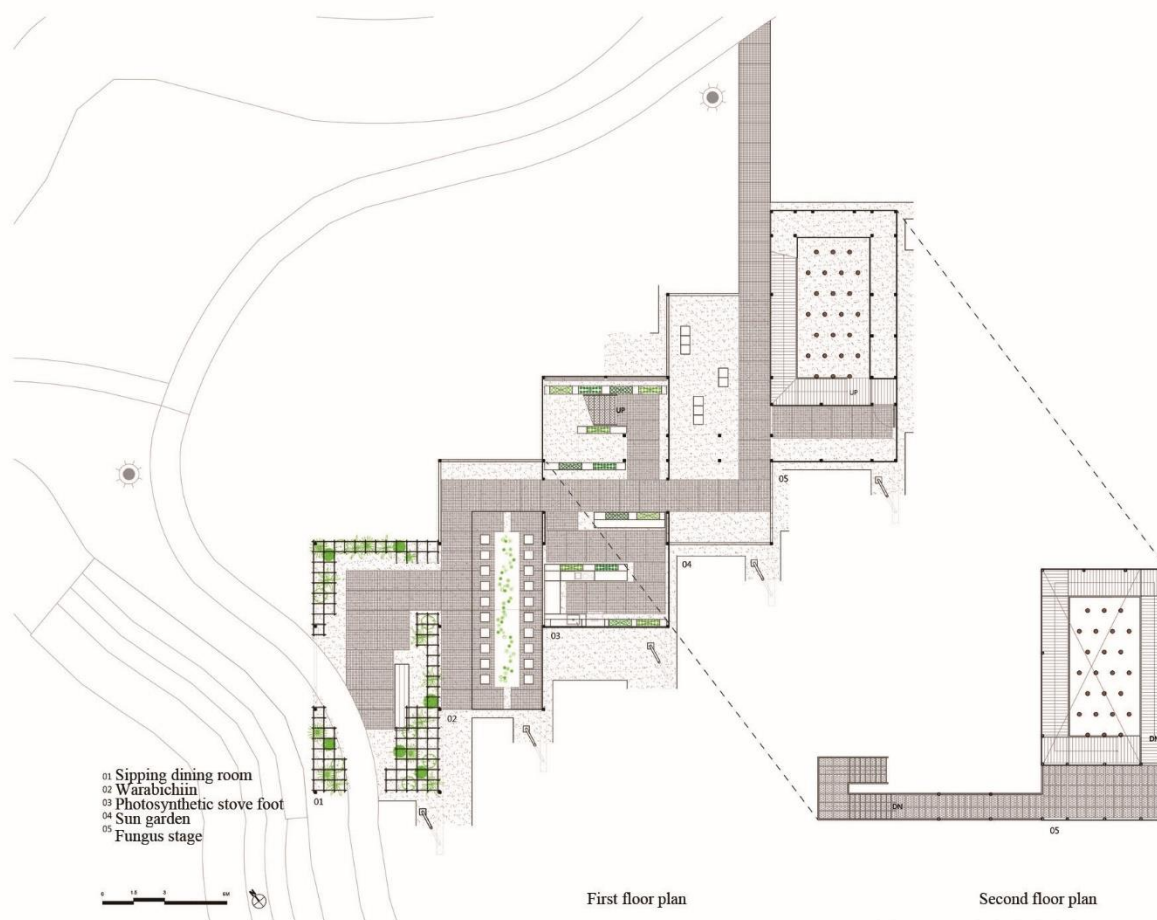
As our cities grow, urban farming will be a game-changer. It will sustainably produce large amounts of food without needing long-distance transportation.

While urban farming isn't new, Agripolis' latest project is still groundbreaking. While the project has become the world's largest rooftop farm, Agripolis emphasises that it will pioneer new technologies in aeroponic "vertical" farming.

Nature Urbaine thrives on the support of its four core services, providing customised services to individuals, businesses and communities: market gardening – cultivating high-quality, pesticide-free seasonal fruits and vegetables with short supply chains; events – providing workshops, teams Building, and conferences offer unique event spaces; Education - arranging educational visits, practical workshops and leasing garden space to residents; Partner Marketing - promoting farmland and integrating with tree footsteps. Nature Urbaine represents a paradigm shift in responsible urban production and a space for learning, community engagement and celebration of nature's gifts. Nature Urbaine intends to grow further by 2024, adding 3,540 cultivation troughs and 1,832 columns for 80,000 square meters of manufacturing space. With regard to the future, Université Nationale de Paris continues to be a global leader in urban agriculture, serving as a beacon of sustainability.

- ***Greenhouse House "Encourage Good Room", Taoyuan, China by BIAS Architect.***

In the context of the 2018 Taoyuan Green Expo, BIAS developed an experimental building called "Greenhouse as Home". Here, human living spaces are intertwined with those of plants and organised according to climatic zones rather than traditional built areas. Although the distribution of energy and water flows is scientifically controlled, greenhouse construction materials and structures are structured to divide climatic zones. Different combinations of plastic film and agricultural gauze cover the roof to regulate lighting and solar radiation. People can experience the intertwined coexistence of the plant world and human life and use their senses and imagination to re-understand the symbiotic balance between life and the agricultural environment.

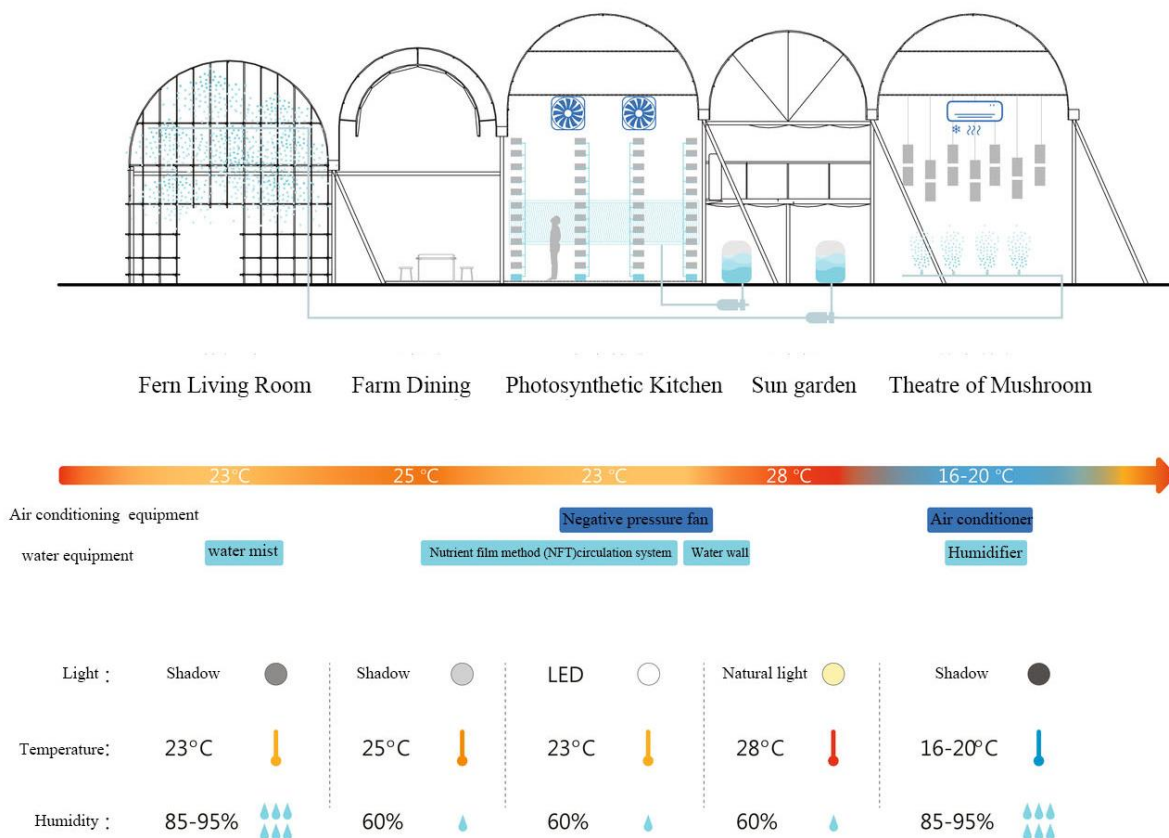
Figure 32: Masterplan of Green House

Resource from: <https://www.archdaily.com/902060/greenhouse-as-a-home-bias-architects>

The space of the "Encouraging Good Room" is differentiated by climatic conditions suitable for the growth of different plants, and at the same time, echoes the spatial function of traditional Taiwanese houses; visitors first enter the cool and humid "Fern Zhiyuan", where a large number of ferns grow on the lattice metal structure, forming a transparent and ambiguous wall like a forest. The ambiguity of the space is further emphasised by a large amount of water mist sprayed in the space to maintain the humidity of plant growth.

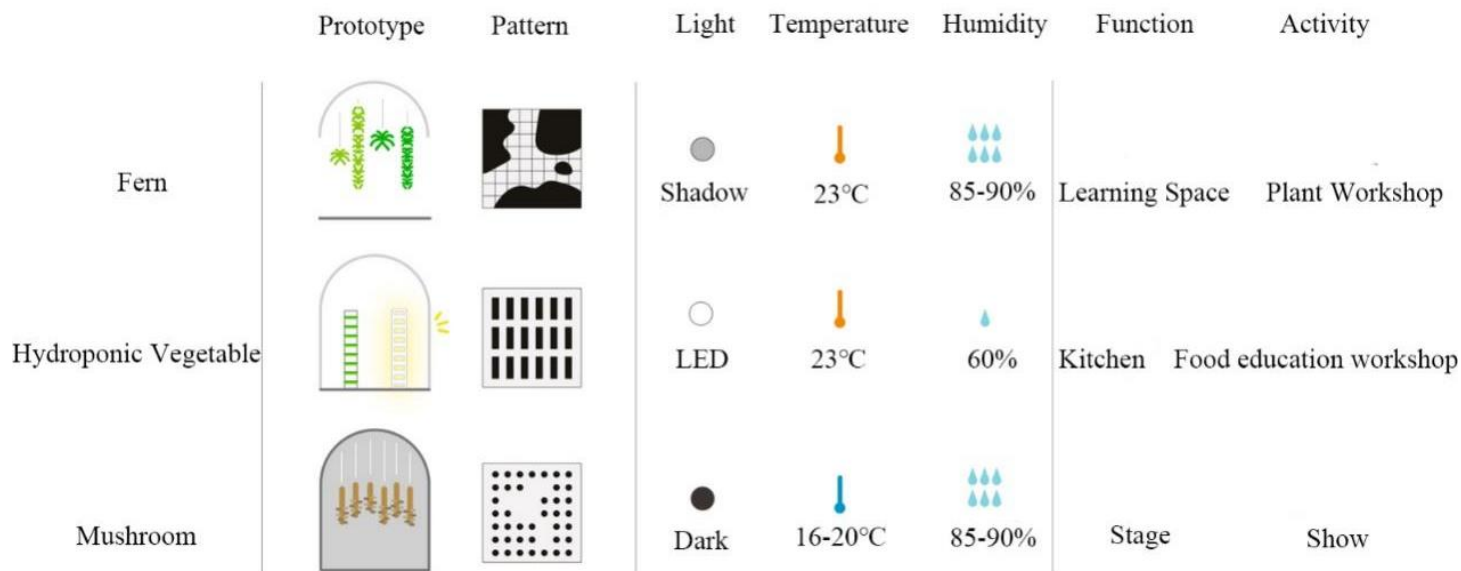
BIAS is an architectural and curatorial firm dedicated to testing and extending the boundaries of the architectural discipline. Curatorial integration is the first outcome of this goal. This corresponds to the attempt to use the program as an integral part of the architecture that closely follows climate issues, especially considering contemporary sustainable development issues.

Figure 33: Environmental control system



Resource from: <https://archello.com/project/greenhouse-as-a-home>

Figure 34: Space, Form, Function and Activity



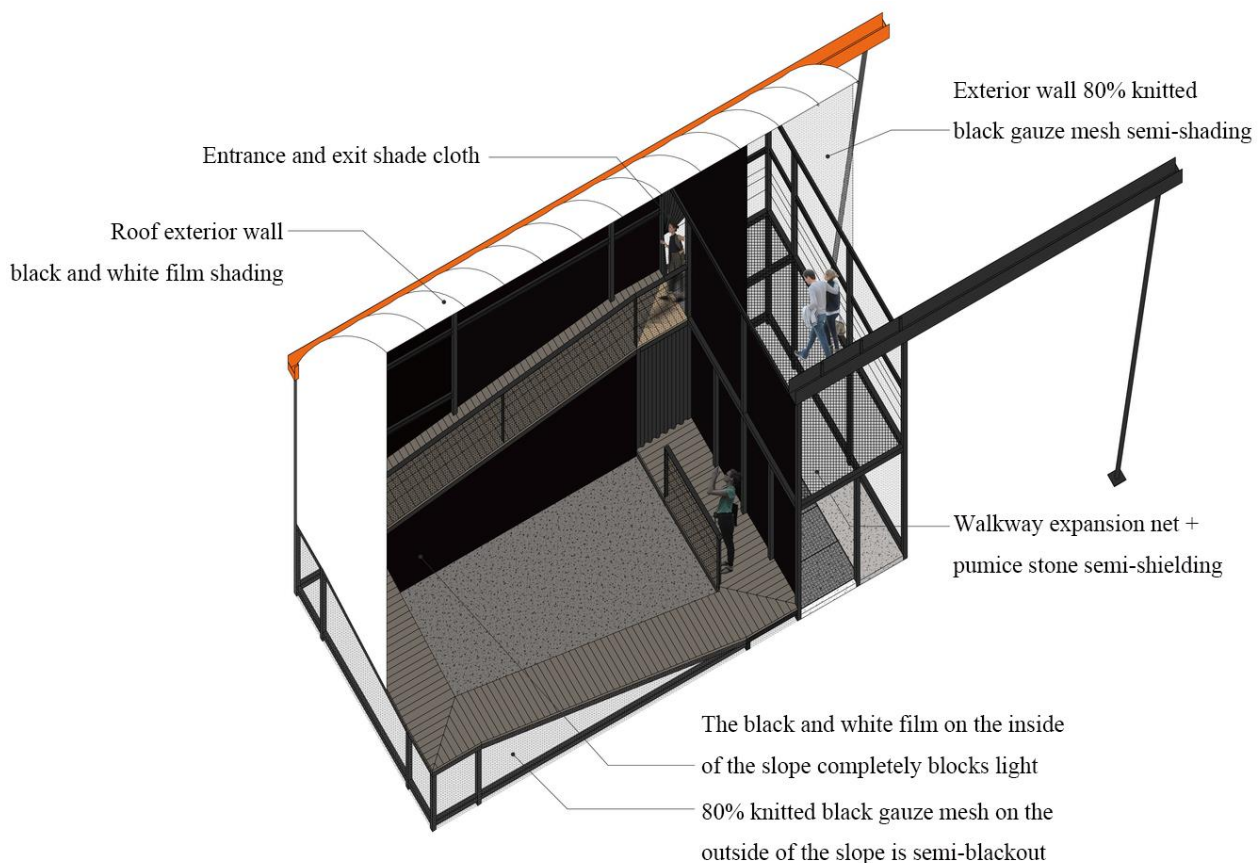
Resource from: <https://archello.com/project/greenhouse-as-a-home>

In the daily parent-child interactive cooking workshop, the chef-led the public to pick fresh vegetables on the spot for cooking and sat around the long table to eat together. The dining table and the place of origin are one, and the semi-open dining room space

blurs the boundary between home and community as if recreating the ancient life of utopian sharing and mutual assistance. Further up, through the dry and warm semi-outdoor aerial corridor of Nikko Cheng, into the calm and humid mushroom theatre stage swirling down, perception is infinitely amplified in the dark, the aroma of fresh mushrooms is grouped into the nostrils, the mushroom sparkling suspended in the air flickers and spreads, the mushroom greenhouse becomes a sensory home theatre shortly, and people who walk out of the greenhouse also seem to touch the ideal blueprint of future life briefly.

Different shade cloths are used in the shading to allow the plants inside the house to grow better.

Figure 35: Wall, rooftop and the shading system

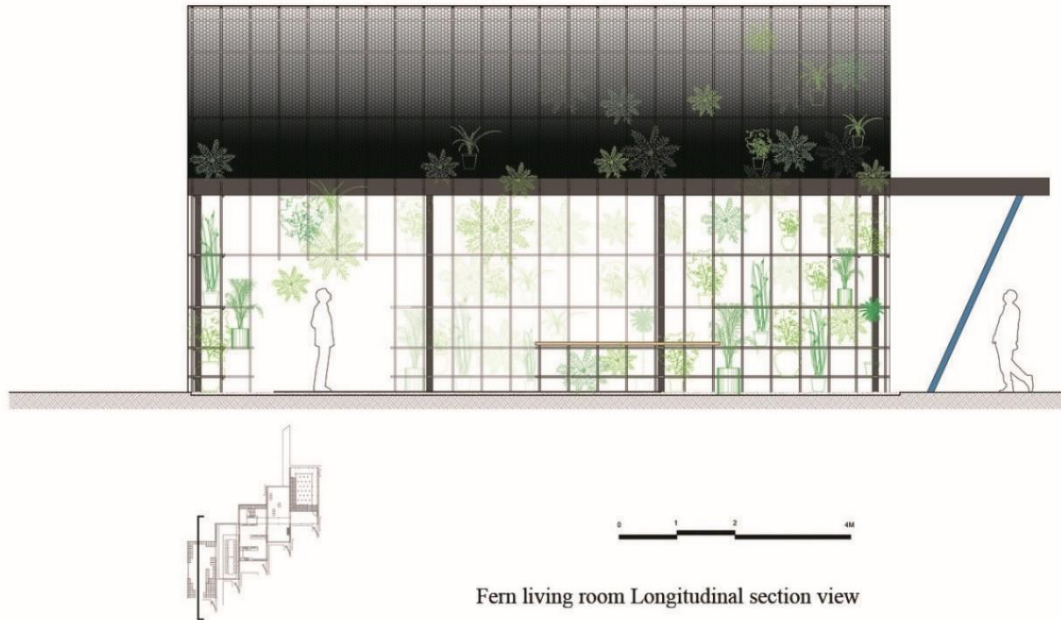


Resource from: <https://archello.com/project/greenhouse-as-a-home>

For a long time, sequential planning and design have been trying to combine architectural design with curatorial thinking, trying to transcend the professional limitations of architectural design and internalise the context of the situation into spatial design. In encouraging good rooms, the design carefully combed the context of rural agricultural development and contemporary lifestyles. It boldly blended the high-power greenhouse environment with urban life through space design and event curation

planning. It built a prototype of the future home house, hoping to stimulate the next generation's imagination of agricultural life and extend the possibility of home life situations.

Figure 36: Longitudinal section view



Resource from: <https://archello.com/project/greenhouse-as-a-home>

Figure 37: Indoor plants



Resource from: <https://archello.com/project/greenhouse-as-a-home>

Figure 38: Greenhouse farming method

Resource from: <https://archello.com/project/greenhouse-as-a-home>

- *Coro Field, Suan Phueng, Ratchaburi, Thailand by Integrated Field Co.Ltd.*

Passionate agribusinessmen, the Coro brothers hope to introduce a wide variety of produce and a peaceful, idyllic life to the city through a plot of land they own in the picturesque Thai town of Suan Phueng. The first phase of the project naturally occupies the edge of the plot bordering the city, with vegetables, melons, fruits, and a variety of crops stretching out in the neat and orderly park, creating an idyllic landscape, while in the adjacent buildings, displaying self-produced and self-sold agricultural products from the land. In line with the overall planning strategy, the project's later phases will also be implemented in the short term to enhance the park's support for diversified activities, product production, and experimentation.

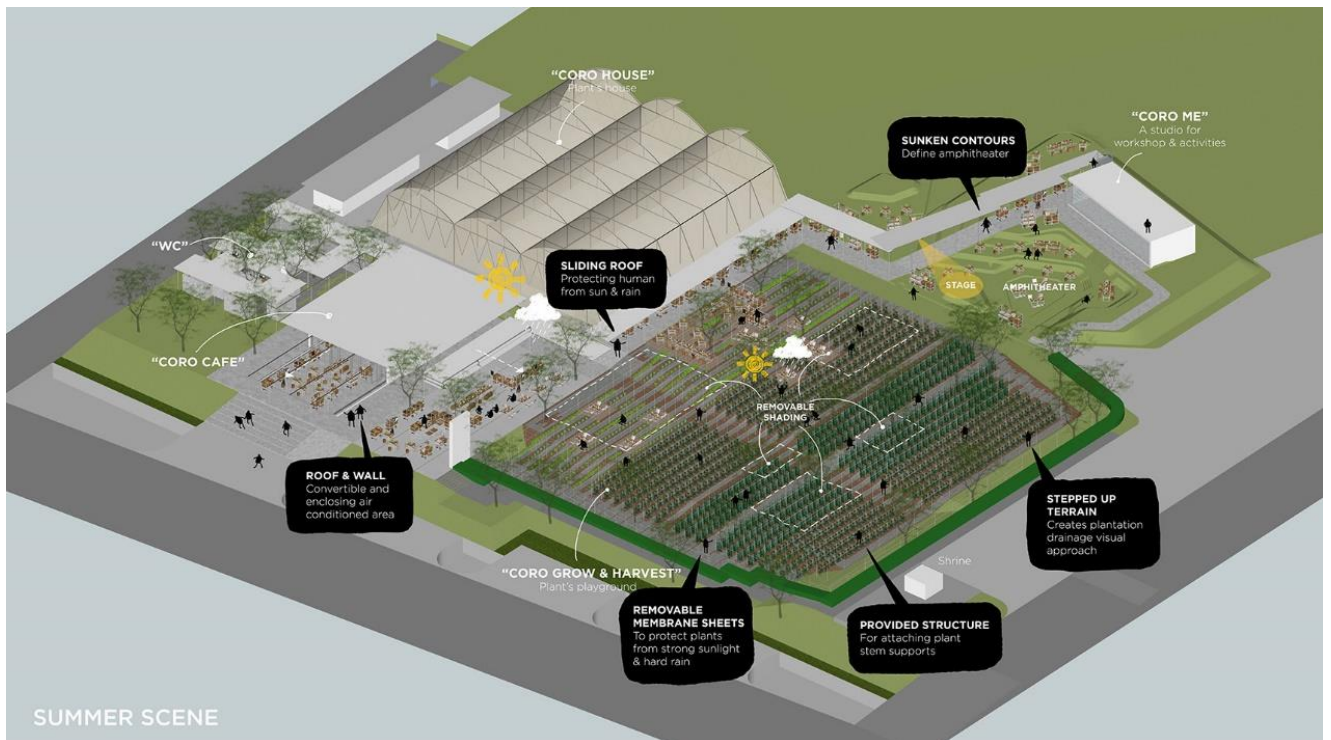
Figure 39: Moveable surfaces define different enclosures and the connecting open and enclosed spaces



Resource from. <https://www.goood.cn/coro-field-by-integrated-field-co-ltd.htm>

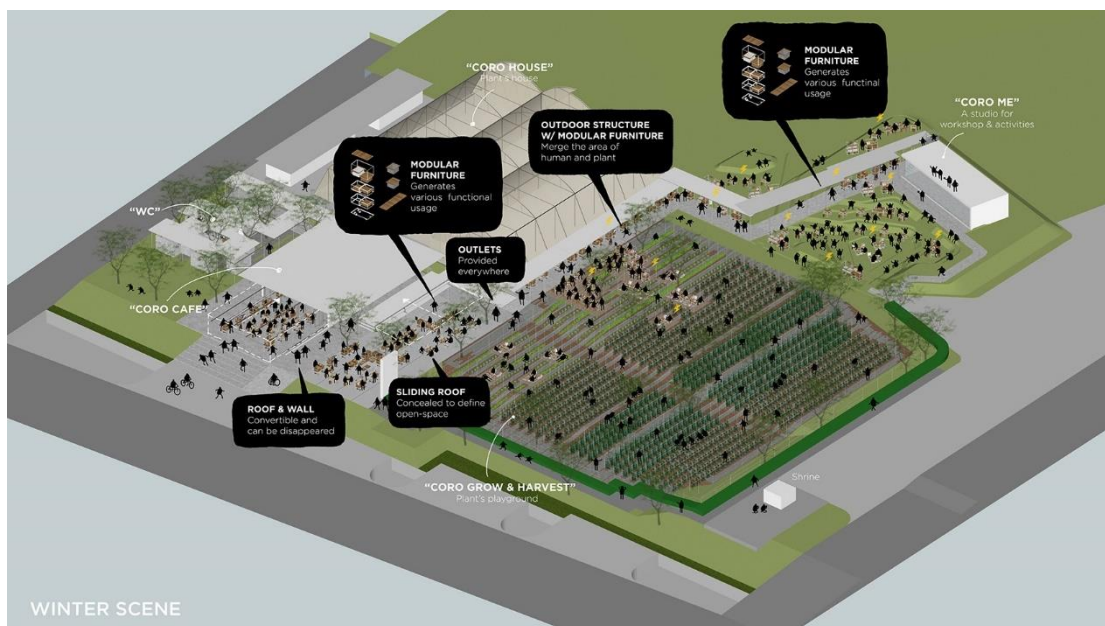
Different activities unfold in summer and winter.

Figure 40: Summer function diagram of Coro Field



Resource from. <https://www.goood.cn/coro-field-by-integrated-field-co-ltd.htm>

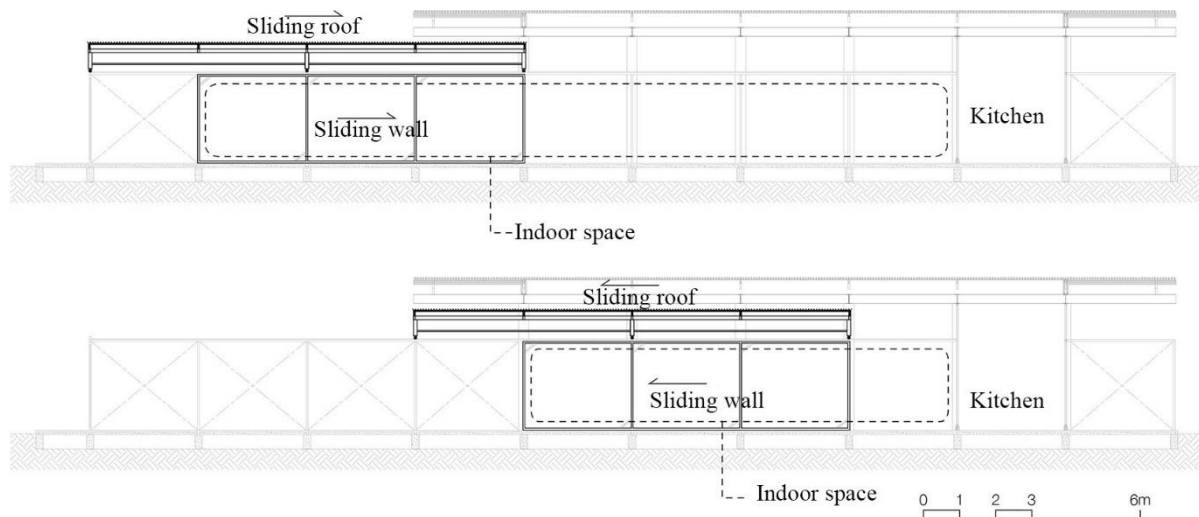
Figure 41: Winter function diagram of Coro Field



Resource from. <https://www.goood.cn/coro-field-by-integrated-field-co-ltd.htm>

A frame grid system structure with a span of 1.5 meters covers the entire site, Movable surfaces define different housings, modular furniture systems define different plans, and power outlets on the grid structure offer other activities and various adjustments. Thus, these layers of relationships create spatial resilience to encourage creativity and diversity.

Figure 42: Sliding structure section of Corn Cafe



Resource from. <https://www.goood.cn/coro-field-by-integrated-field-co-ltd.htm>

Figure 43: Sliding roof detail

Resource from. <https://www.goood.cn/coro-field-by-integrated-field-co-ltd.htm>

1.3 Urban agriculture combines eco-cities and sustainable development

- ***Pasona 02, Chiyoda, Tokyo, Japan by Konodesigns***

Pasona O2, led by Tokyo-based Japanese recruitment firm Pasona, showcases a new innovative urban farming concept in a 1,000-square-meter underground farmland space at Otemachi's headquarters. Pasona is a group that owns traditional farms in Ogata. Still, to expand their business, they created this building in Tokyo to train young people and provide employment opportunities in the agricultural field. Created in 2010 with the help of Kono Designs, this Pasona building has nine floors and allows employees to grow and harvest their food.

Figure 44: Pasona 02 planted green facade

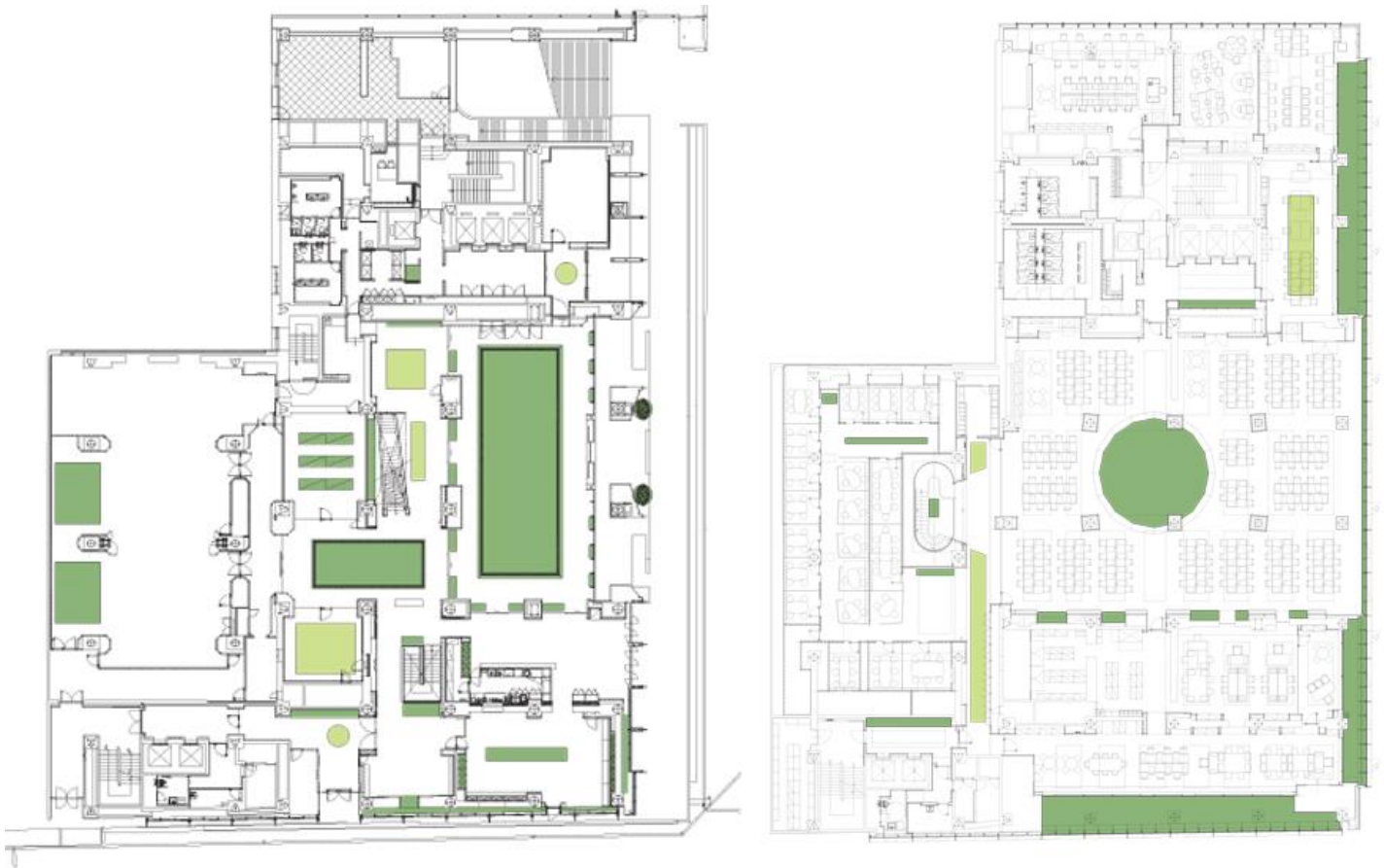
Resource from: <https://konodesigns.com/pasona-o2/>

The first thing that catches the eye of this building is the foliage outside the window. The farm building has about 4,000 square meters of green space and is home to more than 200 different types of plants, vegetables, fruits, and more.

Ripe tomatoes hang from the conference room ceiling, rice paddies grow waist-high in the lobby, and the vibrant façade of flowers and orange trees covers the building's expansive exterior. The Pasona office building in the heart of Tokyo, Japan, is surrounded by agricultural varieties. Pasona 02 features more than 200 varieties of fruits, vegetables, and rice, including lemons, broccoli, salad vegetables, berries, pumpkin, eggplant, and passion fruit.

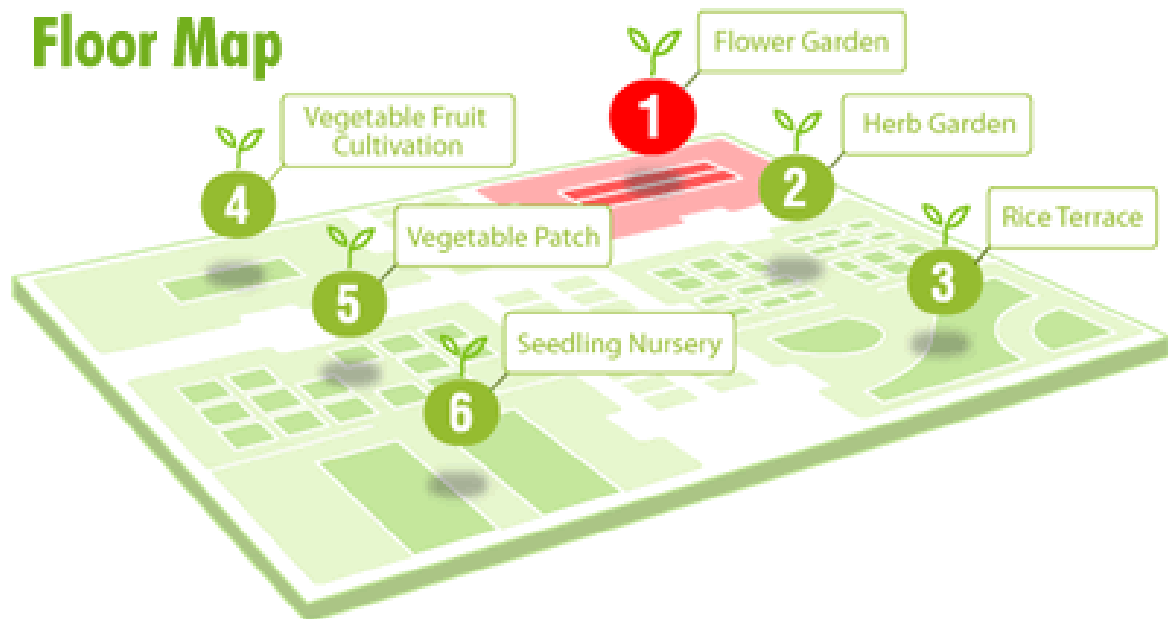
Without sunlight, plants rely on artificial light from diodes, light-emitting diodes, metal halide lamps, and sodium vapour lamps for support. The place's temperature is computer-controlled, and the vegetables are grown with pesticides. Some plants grow in water and use little soil, a method called hydroponics. It is believed that using this method can increase the growth rate of plants by 30% to 50%. This office area is a complete indoor ecosystem, featuring approximately 43,000 square feet of vegetation dedicated to flora, an automatic irrigation system, HEFL, fluorescent lights, and LED lighting.

Figure 45: Pasona 02 Floor plan



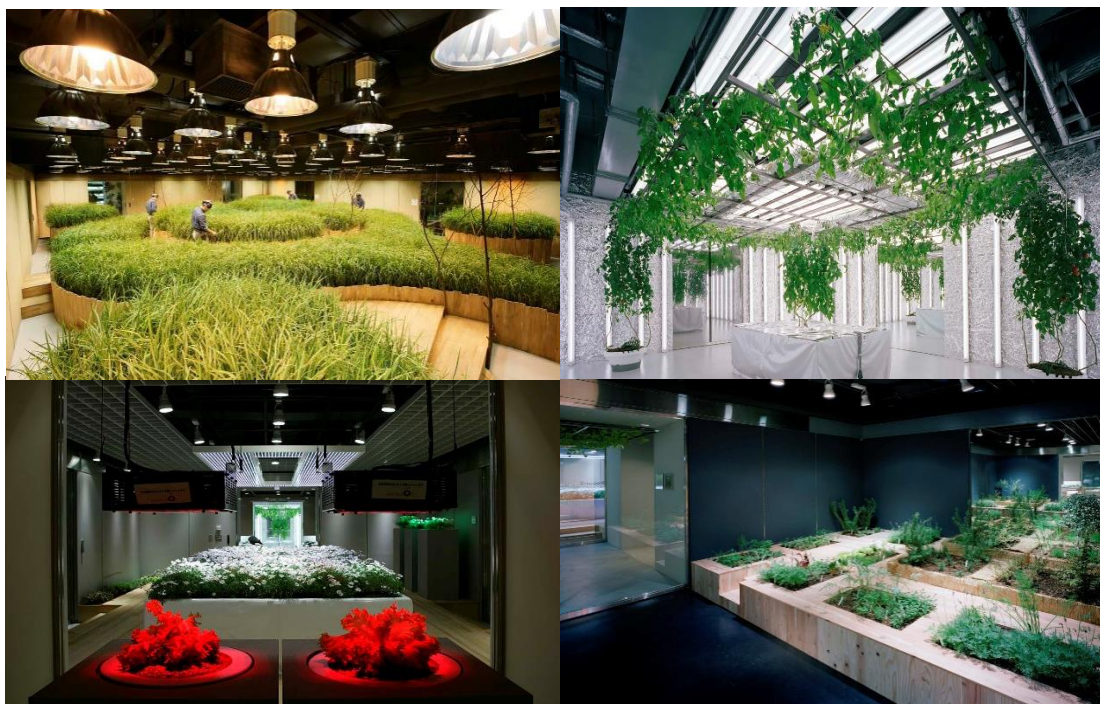
Resource from: <https://www.insideflows.org/project/pasona-urban-farming/>

Figure 46: Pasona 02 Floor Map



Resource from: <https://www.insideflows.org/project/pasona-urban-farming/>

Figure 47: Pasona 02 Internal planting agriculture for self-supply and self-operation



Resource from: <https://konodesigns.com/pasona-o2/>

There are flower fields, vanilla fields, Paddy fields, fruits and vegetables, Vegetable plots, Seed chambers, etc.

Since establishing its underground farm growing program eight years ago, the reputable temporary recruiting firm Pasona has been pushing urban agriculture by offering community seminars to train younger urban farmers. Pasona initially embarked on the project to create jobs in the agricultural sector. However, the business has emerged as a leader in Tokyo's urban agriculture scene thanks to the newest advances in soil, lighting, and hydroponics technologies. Employees directly contribute to the Farm to Office Table program, even though guests are welcome to enter the lobby and view the farm in person. They maintain, gather, and prepare produce from the on-site cafeteria in collaboration with the management team. The freshness of the final dish is enhanced by the close encounter with the seed-to-fruit cycle, which also brings attention to the necessity for a food supply in communities and workplaces.

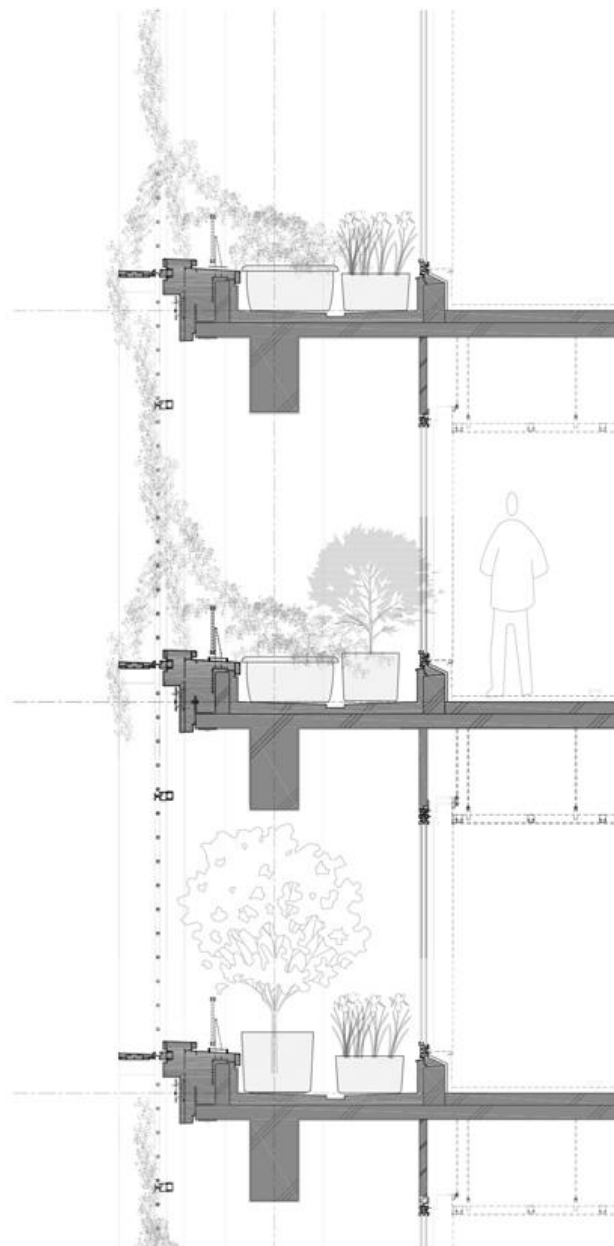
Like any creative endeavour, this indoor farm has its problems. Compared to conventional farming practices, the energy needed for lighting might not be the most efficient, and some could find the sterile atmosphere repulsive and strange. Pasona, on the other hand, views its indoor farm as an experiment rather than a flawless prototype, and the knowledge gained from it will probably guide future efforts in urban agriculture.

Factors that contributed to project success:

1. 4,000 square meters of farmland can be created in the city centre. Transporting food from the farm would be less time-consuming and effort-consuming.
2. The office building has a sound heating system and ventilation system, two main qualities of a greenhouse system. There is, therefore, no need to build additional heating or ventilation systems to support farming within the building.
3. Office workers enjoy the fun of picking and growing food, which brings physical and mental relaxation to them.
4. It creates a better green environment. Fresh air is produced from plants.

Design and practice: Rice can be harvested three times a year.

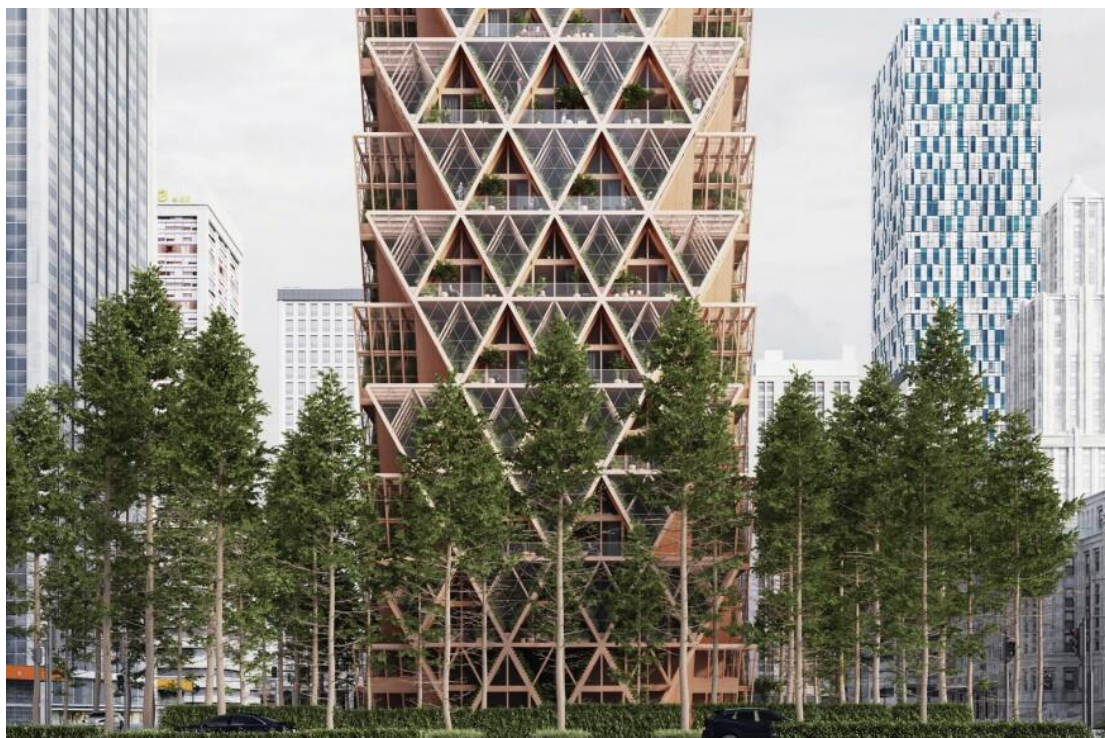
Figure 48: Pasona 02 Sectional view



Resource from: <https://konodesigns.com/pasona-o2/>

- *The Farmhouse by Studio Precht*

Figure 49: The Farmhouse's appearance by Studio Precht



Resource from: <https://www.dezeen.com/2019/02/22/precht-farmhouse-modular-vertical-farms/>

Food and shelter are human needs, and architects can rethink their relationship. There is a chance to improve architecture and agriculture by reestablishing their connection and modifying both. "I think we're missing out on this mind-body connection with nature, and this project could be a catalyst to reconnect us to the life cycle of our environment," Chris Precht said. His wife and partner, Fei Precht, added: "Our motivation for photographing 'The Farmhouse' was personal. Two years ago, we moved our office from downtown Beijing to the mountains of Austria. We live and work away from the grid and are as self-sufficient as possible. We grow most of the food and get the rest from neighbouring farmers. Our relationship with food is very different now. The tomatoes in your garden taste different than those shipped around the world. We know this lifestyle is not everyone's choice, so we try to develop projects to bring food back to the city.

A-frame housing modules composed of cross-laminated timber (CLT) will be stacked throughout the structure to create flexible living areas. Premade. Because CLT retains the carbon absorbed by the trees that produce it, it is a more sustainable building material than other inexpensive materials like concrete.

The farm

Stacked gardens reduce the need to transform forests, savannahs, and mangroves, allowing used farmland to be restored naturally. Vertical farms can increase crop yields per unit of planted area. The indoor climate of the greenhouse protects food from different weather conditions and provides different ecosystems for other plants.

The farmhouses operate in an organic life cycle as a by-product within the building, and the output of one process is the input of another: the building already generates a lot of heat that can be reused to grow plants such as potatoes, nuts or legumes. Water treatment systems filter rainwater and greywater, replenishing and recycling them into greenhouses. Food waste can be collected on-site in the basement of a building, turned into compost, and reused to grow more food.

"This food production process becomes visible," Precht said. "It re-enters the centre of our lives and the centre of our thoughts. Food has a significant role in our daily lives, and I view The Farmhouse as an educational statement that clarifies the origins of our food and how it is prepared and served.

The house

The farmhouse is based on encouraging citizens to grow food locally, but its architecture also perpetuates this ecological aspect.

"In a way, we build our farmland, we grow our buildings." Trees are the primary building material of farmhouses. Cross-laminated wood panels are used to develop modular systems for structures, finishes, and pots. There are many benefits to using CLT. It is precise in manufacturing, easy to transport, and quick to install. Living with wood is also eco-efficient: trees grow through natural energy. The process of manufacturing structurally engineered wood products consumes much less power than steel, cement, or concrete and produces fewer greenhouse gases during the manufacturing process. In addition, the wood stores carbon (about one ton per cubic meter), so it has a lighter overall environmental footprint than other building materials. The farmhouse consists of a fully modular building system that is prefabricated off-site and transported by truck. The prefabrication of modular building kits shortens construction time and impacts the surrounding environment. This building system is based on the structural clarity of a traditional A-frame house and is connected to a diagonal rib frame that runs loads throughout the building. Each wall of the frame is present on three floors. The inner layer has finishes, electricity, and pipes, the middle layer has structure and insulation, and the outer layer has horticultural elements and water supply.

Single-family users can build their homes using as many modules as they choose or form taller residential complexes by arranging A-frames into stacked duplex structures.

Figure 50: The Farmhouse by Studio Precht's in-house residence and farmer's market



Resource from: <https://www.dezeen.com/2019/02/22/precht-farmhouse-modular-vertical-farms/>

For single-family structures, the system provides homeowners with a tool to design their dwellings based on the needs and requirements of living and agriculture. Structural and horticultural elements, waste management units, water treatment, hydroponic, and solar systems can be selected from the modular catalogue, offering flexibility for various layouts.

The tower's ground level will house an indoor food market, a cellar for winter food storage, and a composting device to turn food waste into growing material.

Fei Precht says we now live, work off the grid, and try to be as self-sufficient as possible. We grow most of the food ourselves and get the rest from neighbouring farmers," she continued. Our relationship with food is very different now. We know this lifestyle is not everyone's choice, so we try to develop projects to bring food back to the city.

- ***Amazon Arlington, Virginia, USA-New headquarters by NBBJ.***

In late 2018, Amazon declared that its second headquarters (HQ2) would be in Arlington, Virginia. This development is part of the PenPlace program, creating over 25,000 employees. Since then, Amazon's dedication to being a reliable corporate and community partner has advanced significantly. In addition to our ongoing collaboration

with neighbourhood organisations, we provide in-kind support and charity donations to over 100 nonprofits, community organisations, and small enterprises.

Figure 51: Amazon Arlington ideal renderings



Resource from: <https://www.aboutamazon.com/news/job-creation-and-investment/building-on-progress-at-amazons-hq2-in-arlington-virginia>

More sustainable design

When we announced the construction of HQ2, we pushed ourselves to think outside the box and design Amazon's buildings to help steer the industry toward net-zero emissions. We electrified HQ2's operations to eliminate fossil fuel use in building systems and food services. We are committed to providing renewable energy for 100% of HQ2's operations through off-site and on-site solar projects, aligning with Amazon's commitment to achieving net-zero carbon in its operations by 2040.

Programs focused on PenPlace sustainability include:

- Dedicated to attaining LEED Platinum certification—the most prestigious sustainability designation granted by the U.S. Green Building Council—for a development project.
- By including strategically designed climate-responsive elements in our office buildings, such as high-performance glass and integrated sun visors, we can save 30% of the American Heating, Cooling, and Air Association (ASHRAE) baseline for building heating and cooling.
- More than 125 EV charging stations are available, with the ability to double capacity as needed.
- Using small flow devices and reclaimed water use, water consumption is reduced by 50% compared with national standards.

- Reduce the amount of embodied carbon in concrete structures by at least 10% compared to typical building practices while committing to 100% offsetting of remaining embodied carbon in building materials.
- Bird-proof glass was used, as appropriate, on all seven buildings in PenPlace to ensure the development was safer for the bird population in the area.

Connect the neighbourhood

PenPlace was designed as part of the local community because they wanted employees and residents to enjoy the space equally. This means considering how people travel to PenPlace and use the space daily. The community's Green Ribbon, a network of shared routes and walkways, will include a 15-foot-wide multimodal corridor. Plans prioritise walking, bicycling, and public transportation. When completed, PenPlace will offer more than 900 interior and exterior bike storage booths to encourage cycling commutes rather than single-person vehicles. Every vehicle movement at the site, including loading docks, will occur underground, allowing the community to enjoy continuous outdoor public spaces like gathering spots, plazas, and lots of green space.

Figure 52: Amazon Arlington Interior and Exterior Connectivity Plaza



Resource from: <https://www.aboutamazon.com/news/job-creation-and-investment/building-on-progress-at-amazons-hq2-in-arlington-virginia>

Being able to assist thriving neighbourhood small businesses is one of the critical opportunities to design a warm, friendly, and well-connected community. PenPlace will have three retail pavilions with dining, shopping, childcare, and other options in addition to more than 100,000 square feet of space in the main structure. More than 26,500 square feet of property were also purchased to construct Arlington County

Community High School's new residence. About 300 kids can pursue their academic objectives and future readiness at the public school.

They know that success and scale come with broad responsibilities, so they strive to be good neighbours in the communities in which we operate. When National Landing was chosen as HQ2's site, and the commitment to be a trusted business and community partner in the region, the work that would be part of that community fabric reflects that commitment every day.

- ***Socio-Technical City, Netherlands, by UNStudio***

Dutch architecture firm UNStudio has created a new urban vision for "The City of the Future", a testing ground for The Hague Central Innovation District (CID). The design, known as the "Social Science and Technology City", covers an area of 1 square kilometre and is located in the city centre. The plan would cover the current train track infrastructure and turn the property into a green, self-sufficient residential neighbourhood with offices, public transportation, and urban transportation.

UNStudio's vision for The Hague is one of the studies carried out for "The City of the Future", jointly initiated by BNA Research (Royal Netherlands Institute of Architects), Delft University of Technology, Delta Metropolis, the General Directorate of Transport, the General Directorate for Environment and Water Resources, the Ministry of Infrastructure and Water Management, the Ministry of the Interior, and the Cities of Amsterdam, Rotterdam, The Hague, Utrecht, and Eindhoven. Ten multidisciplinary design teams were assigned to investigate a novel method of urban development using five test sites in Amsterdam, Rotterdam, The Hague, Utrecht, and Eindhoven at the beginning of the project in January 2018.

Figure 53: Overall rendering of Socio-Technical City



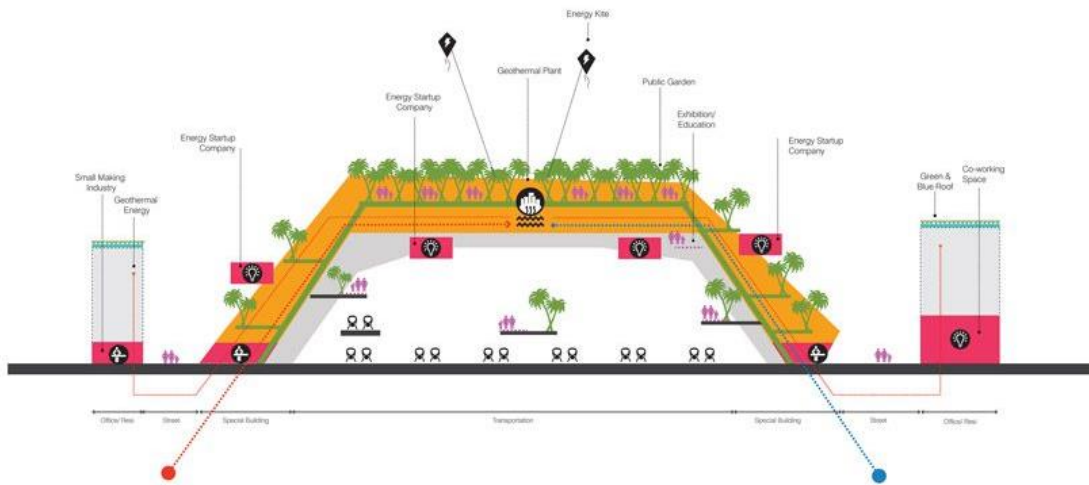
Resource from: <https://www.unstudio.com/en/page/11727/socio-technical-city-of-the-future>

Figure 54: Masterplan of Socio-Technical City



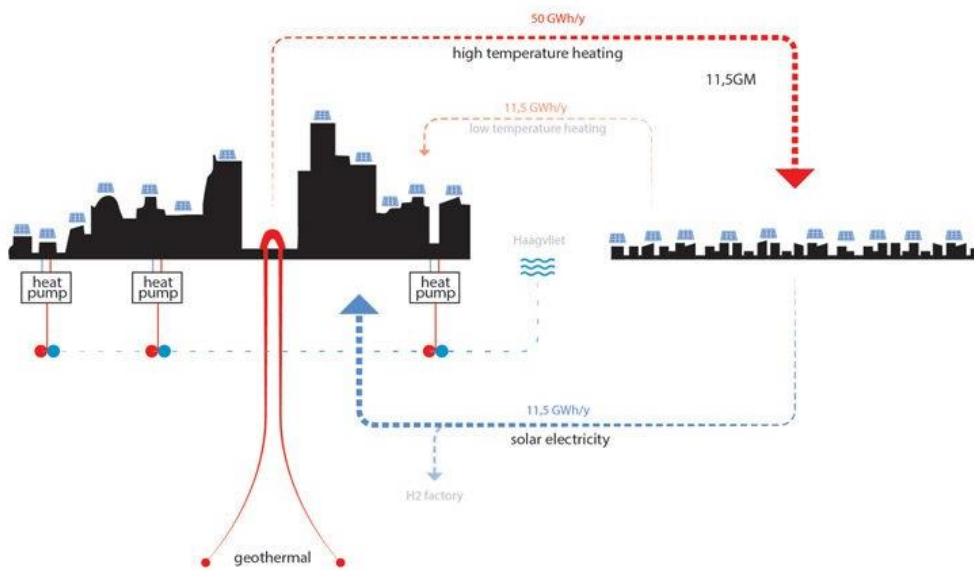
Resource from: <https://www.unstudio.com/en/page/11727/socio-technical-city-of-the-future>

Figure 55: Energy and Planting in the Socio-Technical



Resource from: <https://www.unstudio.com/en/page/11727/socio-technical-city-of-the-future>

Figure 56: Temperature heating in the Socio-Technical Central Innovation District Surroundings



Resource from: <https://www.unstudio.com/en/page/11727/socio-technical-city-of-the-future>

PART 2 URBAN AGRICULTURE IN CHINA

Chapter 1 The historical background of urban agriculture in China

1. The development history of urban agriculture in China

- Development of urban agriculture in Ancient China

China has always been a predominantly agricultural country; as early as primitive society, the etiquette system of the field (a significant ceremony in China, the emperor of the Han Dynasty personally cultivated the field and held a solemn field ceremony, which is complex and expresses the ruler's consciousness of emphasising agriculture and advising farmers) can be reflected. By the pre-Qin era, the agriculture-based idea of heavy agriculture was ingrained entirely in China.

Ancient Chinese cities had walls and moats that clearly defined them spatially, so they were also called cities. Urban agriculture in ancient China refers to agricultural production activities managed by city dwellers located within, above, or around city walls. Because agriculture occupied a very high status in ancient China, there was also heavy agriculture and light commerce in the city.

Urban agricultural space is also widespread; urban agriculture has been with the entire feudal dynasty, not only to supplement the food supply of urban residents but also for scientific research and education or political needs.

- The development of urban agriculture in the pre-Qin¹¹ period.

Urban agriculture began to emerge before the previous system was stable, and the earliest surviving agricultural almanack in China shows that in the spring and autumn periods or before, people began to use the city's gardens for agricultural cultivation. By the Warring States period, the use of city dwellers' residential courtyards for agricultural production was already widespread.

¹¹ Pre-Qin, (Paleolithic period ~ 221 BC) refers to the historical era before the establishment of the Qin Dynasty.

- The development of urban agriculture during the Qin¹² and Han¹³ dynasties.

The social stability and the evolution of production tools during the Qin and Han dynasties led to an unprecedented increase in agriculture. Urban agriculture is mainly divided into several types:

- The first is to make use of the vacant land near the palace. At that time, there was even technology for greenhouse cultivation;
- The second is the practice of agricultural production in royal gardens handed down from previous historical periods;
- The third type is also handed down from the previous dynasty, where the ordinary people use their family yards to produce food;
- In peacetime, people in the Han Dynasty even used the district field style for agricultural production on or above the city walls.

- The development of urban agriculture during the Tang¹⁴ and Song¹⁵ dynasties.

The Tang and Song dynasties were another heyday of social development in ancient China, so urban agriculture also developed considerably. The type of space used mainly inherits the tradition of the Qin and Han periods. Song Zhenzong(968-1022, the third emperor of the Northern Song Dynasty) personally supervised planting urban agriculture using the palace wall. Using urban agriculture planting carried out in the garden, Tang Xuanzong¹⁶ (685-785, one of the most famous emperors in the Tang Dynasty and even in Chinese history. He reigned for nearly 44 years (712-756 AD)), planted food in the garden and used the space of urban agriculture to educate the prince while carrying out agricultural production.

¹² The Qin Dynasty (221 BC-207 BC) was the first unified feudal dynasty in Chinese history developed by the State of Qin during the Warring States Period.

¹³ The Han Dynasty (February 28, 202 BC -January 10, 9, August 5, 25-November 25, 220) was a dynasty that emerged after the Qin Dynasty, also known as the Tianhan Dynasty. It is very representative of Chinese history and has an important position of inheriting the past and ushering in the future. The Han Dynasty is divided into two historical periods, the Western Han Dynasty (202 BC-8 years) and the Eastern Han Dynasty (25 years-220 years).

¹⁴ The Tang Dynasty (June 18, 618-October 16, 690, February 21, 705-May 12, 907) was a period in Chinese history. In an important dynasty, in the 289th year of Guozuo, there were 21 emperors (not including Wu Zetian). The country name Tang is the ancient name of Jin, and now it refers to the central ethnic group in Shanxi Province.

¹⁵ The Song Dynasty (960-1279) is a dynasty in Chinese history that inherited the Five Dynasties and Ten Kingdoms and started from the Yuan Dynasty. It was divided into two stages: the Northern Song Dynasty and the Southern Song Dynasty.

¹⁶ Tang Xuanzong(September 8, 685-May 3, 762), the ninth emperor of the Tang Dynasty in China, was the third son of Emperor Ruizong Li Dan, and his mother was Concubine Dou De of Emperor Ruizong. He was the most famous emperor in Tang Dynasty and even in Chinese history. One of the emperors, who reigned for nearly 44 years (AD 712-756), retired as the Supreme Emperor for 6 years and lived to be 77 years old. He was the longest-reigning and longest-lived emperor in the Tang Dynasty.

- The development of urban agriculture during the Ming¹⁷ and Qing¹⁸ dynasties.

By the Ming and Qing dynasties, urban agriculture had matured. The rapid expansion of the population caused a shortage of arable land in the country, so agriculture was forced to move towards higher yields on the one hand and relied on urban agricultural space to replenish it on the other.

- Urban Agriculture in the Nineties of the twentieth century

Although Chinese society experienced great upheavals in the nineteenth and first half of the twentieth century, the agricultural space in Chinese cities did not die. Family-type urban agriculture existed in various periods of ancient China. This type continued after entering the modern era, especially in the war period, when the connection between the city and the countryside was almost severed, and urban agriculture could only provide food. Another type of urban agriculture that has continued is urban agriculture, whose primary purpose is scientific experimentation, and the experimental field of the Academy of Agricultural Sciences near the Lenovo Bridge of Beijing's North Third Ring Road has existed since the early days of the establishment of New China. In addition, the Beijing Zoo was also an agricultural experimental field.

- Urban agriculture after the Nineties of the twentieth century

In the nineties of the twentieth century, China's theoretical exploration of urban agriculture began, and policies began vigorously supporting the development of large-scale intensive facility agriculture, high-tech agriculture, and ornamental agriculture to attract tourists.

Beijing held the first national seminar on urban agriculture in 1998, attended by representatives of coastal cities in Shanghai, Shenzhen, and Xiamen. Urban agriculture in Chaoyang District, a suburb of Beijing, is the most prominent urban agriculture area in Beijing. Since 1997, five urban agriculture experimental zones have been formed in the region, including Guangying and Jinsheng. Later, Haidian, Shunyi, and the other regions also began to develop urban experimental demonstration areas in their areas.

In 1994, Shanghai proposed that the government rely on one city's economic and technological advantages, strive to realise the transformation of suburban to urban agriculture, and put its 2010 long-term goal and "Ninth Five-Year Plan" to vigorously develop tourism agriculture, facility agriculture, and estate agriculture. The Happy

¹⁷ The Ming Dynasty (1368-1644) was the last unified dynasty established by the Han nationality in Chinese history. It had sixteen emperors and lasted for 276 years.

¹⁸ The Qing Dynasty (May 15, 1636-February 12, 1912). It was a unified dynasty established by the Manchus in Chinese history, and it was also the last imperial dynasty in Chinese history [see 6]. The royal family originated from Jianzhou in the Ming Dynasty Jurchen Aixinjueluo. The Qing Dynasty experienced a total of 11 emperors, and another 4 Jurchen leaders in Jianzhou and 1 Khan of the Later Jin Kingdom were posthumously awarded as Qing Emperors. The dynasty lasted for 276 years.

Farm, converted from the Shanghai World Expo parking lot, is a typical example of a place where citizens can apply for a piece of land for free and grow some crops. They regard this as bringing peace of mind to a busy life. However, the event only lasted for two months, and the sensation in society and the spiritual impact of the citizens are undeniable. Urban farming types such as balconies, rooftops, houses, and campus farms have also begun to appear in China's large and small cities.

Chapter 2: Urban Agriculture in Current China

1. Urban Agriculture in China

1.1 General Background

According to McClintock, “It maintains that agriculture in cities performs economic, social and environmental functions, which contribute to the sustainability of cities” (McClintock, 2010). Typically, households in cities in the Global South farm undeveloped, marginal, and community lands primarily for food for household consumption, while vacant land in post-industrial landscapes is used for agricultural purposes. Roofs, balconies, nearest open spaces, road dividers, and parks are used for agricultural purposes in northern cities across the globe.

In urban planning and agriculture, planners have some awareness but little literature/generalised lessons about the underlying fits/disadvantages of incorporating UA into planning. In UA’s interface with the people and environment in which it sits, managing conflict between inconsistent land use is necessary at all scales. Still, there is little systematic research into best scale-dependent practices. The impact of agricultural activities on neighbouring residential uses can generate claims of nuisance, such as interference caused by noise, smell, chemical sprays, or dust. Meanwhile, non-farm activities such as dogs can impact agricultural use. (Daniels and Bowers¹⁹,1997). Right-to-farm legislation is one response used in the USA to give farmers a defence to civil claims for impacts on nearby land from noise, smell, and other intrusions, as long as they carry out ‘good management practices’ (Daniels and Daniels,2003). This is a limited response to the symptoms of conflict and does not address problems of planning and design of urban development that is sensitive to agricultural operations and appropriate modifications to farming practices on the edge. (Sinclair and Bunker²⁰,2007). Issues of scale in UA are well recognised in the institutional environment. At the macro-scale production, the primary challenge is preserving land for agricultural use in peri-urban areas while minimising conflict between different land uses.

¹⁹ Deborah Bowers, Tom Daniels, “ Holding Our Ground: Protecting America's Farms and Farmland” .

²⁰ Sinclair, I., Docking, A., Jarecki, S., Parker, F., Saville, L., 2004, from the Outside Looking In: The Future of Sydney’s Rural Land, Funded by a University of Western Sydney Regional and Community Grant.

The increase in urban agriculture has brought new spaces where cultivation is exercised. The most common is cultivation in the backyard and around buildings. However, urban agriculturists have also invaded communities, public lands, and parks in recent decades. Among these are areas allocated to other uses, such as roadsides and airport buffers, as well as areas not suitable for building, such as stream sides, floodplains, drainage way-leaves, wetlands, and steep slopes (Freeman²¹, 1993; UNDP, 1996)(Erik Bryld²², Potentials, problems, and policy implications for urban agriculture in developing countries)Urban agriculture can be defined as Agricultural production (crops and livestock) in urban and peri-urban areas for food and other uses, the related transport, processing, and marketing of the agricultural produce and non-agricultural services provided by the urban farmers (water storage, agritourism, urban greening, and landscape management,)It is not its urban location which distinguishes urban from rural agriculture, but the fact that it is embedded in and interacting with the urban system. Such linkages include the use of urban residents as labourers, the use of typical urban resources (like organic waste as compost and urban water for irrigation), direct links with urban consumers, direct impacts on urban ecology (positive and negative), being part of the urban food system, competing for land with other urban functions, being influenced by urban policies and plans, etc. It is often thought that urban agriculture is a reliction of rural habits that have come with the migrants to the cities and will dwindle over time, but that is incorrect. It is an urban phenomenon that grows when cities grow (although its locations and characteristics change sharply).

Although public awareness of farming activities in cities is slowly increasing, agriculture is still, in many cases, “by definition” not practised in cities and is often seen as “economically unimportant” or “a temporary phenomenon”. The terms “agriculture” and “urban planning” seem incompatible. Land remains one of the controversial issues related to Urban Agriculture (Webb, N. 1998), but access to land is mostly more crucial than land availability (Mougeot, Luc²³ 1994). Urban land management (as any other land management) should aim to put urban land resources into efficient and sustainable use (FAO²⁴ 2000). First, this requires recognising the prevailing problems and acceptance of urban livelihood strategies, including urban

²¹ Donald B. Freeman is an Emeritus Geography Professor at York University, Canada. His research interests include the historical geography of trade and development in the Pacific and Southeast Asia. Freeman, D. (1993). Survival strategy or business training ground? The significance of urban agriculture for the advancement of women in African cities. *African Studies Review*, 36(3), 1–22.

²² Erik Bryld is a senior consultant, partner, and managing director at Tana Copenhagen. He has more than a decade of solid experience working with governance, aid effectiveness, and conflict mitigation and prevention in Africa and Asia.

²³ Luc Mougeot, Senior Program Specialist - Education and Science Program - International Development Research Centre (IDRC). Luc Mougeot is a Senior Program Specialist with the Education and Science Program of Canada's International Development Research Centre (IDRC) in Ottawa. He currently manages a large portfolio of projects for advanced scholars from low and middle-income countries, particularly for women in science and technology.

²⁴ FAO, Food and Agriculture Organization of the United Nations is a specialized agency of the United Nations that spearheads international efforts to combat hunger. FAO operates as a neutral forum for both developed and developing countries, where all countries work together as equals to negotiate agreements and discuss policies. FAO is also a source of knowledge and information, helping developing countries and countries in transition to modernize and develop agriculture, forestry, and fisheries and ensure good nutrition and food security for all. Its Latin motto "fiat panis" translates into Chinese as "let us have bread." As of October 2013, FAO has 194 member countries, 1 member organization (European Union), and 2 associate members (Faroe Islands, Tokelau Islands).

farming, and realising the benefits and opportunities created through the productive use of green open spaces in cities. "Urban agriculture is a practice widely used in the past and is still in common use in many urban areas around the globe. Urban agriculture is one of the most exciting concepts of sustainable development since it addresses almost all areas of sustainability. It promotes self-reliance, community, and local economy while reducing many environmentally harmful practices from modern farming practices." (Hsin, Robert²⁵ 1996)

"A fundamental step to set the right conditions for city farming is to develop an urban agriculture plan and policy, recognising the interrelated nature of food, agriculture, health, and ecology by forming a municipal working group to deal with food issues from a total system perspective. This could involve, among others, the health department, planning department, engineering, local economic development, water management, and waste management. The urban agriculture plan should be incorporated into the land use planning system. This implies that urban agricultural activities are recognised as major components of green zoning systems, for which a dedicated policy must be formulated, developed, and implemented". (Deelstra, Tjeerd and Herbert Girardet .1999)

Intra-urban/peri-urban character of location: By far, the element most common to reviewed definitions is a location "in (within) and around" cities or urban areas (e.g. Ganapathi, 1983; Sawio, 1993; Smit et al., 1996b; COAG/FAO, 1999). This element is probably the most significant source of contention, so it will be discussed more at length than other elements. Most UA field studies have been carried out in large urban centres, national capitals, or secondary cities; thus, few can be assumed to have dealt mainly with agriculture in rural areas " typical" of the respective countries. However, few differentiate between intra and periurban locations. Those which do so have been used as criteria for intra-urban agriculture, population sizes, density thresholds, official city limits (Gumbo and Ndiripo, 1996; Murray, 1997), municipal boundaries of the city (Maxwell and Armar-Klemesu, 1998b: 7), agricultural use of land zoned for other use (Mbiba, 1994). agriculture within the legal and regulatory purview of urban authorities (Aldington, 1997: 43). In a rare comparison between RA and UA, (Moustier 1998) defines UA as one carried out within or on the outskirts of a city where a non-agricultural use of local resources is a natural option; RA is one found in areas where this option is not an issue. In the CIRAD²⁶-Agricongo study of (open-space) market vegetable farming in Brazzaville, for instance, gardens within the city limit are labelled "intra-urban". In contrast, that off-limit (though within a specific travel-time band - see below) is called "peri-urban" (Moustier, 1999: 53).

²⁵ Hsin, Robert. Faculty of the School of Architecture. Work at Florida Agricultural and Mechanical University. Thesis.

²⁶ CIRAD was founded in 1984 as a public establishment (EPIC), following a merger of French tropical agricultural research organizations, and is under the joint authority of the Ministry of Higher Education, Research and Innovation and the Ministry for Europe and Foreign Affairs. As such, it supports French science diplomacy operations. CIRAD is a French agricultural research and cooperation organization working for the sustainable development of tropical and Mediterranean regions.

Types of areas where UA is practised: criteria according to which such regions are typified vary from author to author: location respective to residence (on-plot or off-plot), development status of site (built-up vs open-space), modality of tenure/usufruct of a site (cession, lease, sharing, authorised or unauthorised - through personal agreement, customary law or commercial transaction); the official land-use category of the sector where UA is practised (residential, industrial, institutional, etc.). While some authors have focused on home-plot areas (Lee-Smith et al., 1987; Regis, 1999), others have aimed their study at off-plot and open-space locations.

Urban morphologists believe that cities should properly reserve the "room" for creating green space for the development of urban agriculture and to provide citizens with places for leisure and recreation. In the second half of the 19th century, Germany formally established the "citizen farm" system to develop "citizen farms" around cities. Adequate Nutrition In recent years, the purpose of Citizen Farm has shifted to providing citizens with leisure and farm life experience. According to the difference between suburbs and cities, Clawson & Knetshch proposed three types of regional utilisation in 1966. Spatial orientation refers to constructing parks and sports grounds in the city. Intermediate regional refers to constructing recreational parks, pastoral parks, and rural areas in the countryside closer to the city. Resource-oriented recreational areas such as museums and theme parks refer to the construction of large-scale forest parks and the wild regions in areas far from the city using more beautiful natural landscapes. In 1969, Japanese scholar Isomura Eiichi put forward the "urban third space theory", which held that in addition to the land that provides the first space for living and the second space for various industrial activities, modern cities must also offer a third space for outdoor leisure places for citizens where they can free to use.

Urban agriculture is also an essential part of urban planning. British social activist Howard put forward the concept of a "garden city", which requires "to combine all the advantages of active city life with the beauty and all the welfare of the countryside". British urban planner Raymond Unwin and Finnish-American architect and planning master EIril Saarinen²⁷ also emphasised to varying degrees that urban and agricultural land should maintain a certain proportion of green space, which plays a vital role in urban construction and urban connection. Effect. Scholars such as Henk de Zeeuw²⁸ proposed in the article "Incorporating Urban Agriculture into Urban Policies" that urban

²⁷ Eliel Saarinen, architect Rantasalmi, Mikkeli, 1873 - Bloomfield Hills, Michigan, 1950). The first phase of his vast output of work is inserted in the experience of the typical Northern European countries in which the themes of Art Nouveau came together in a romantic eclecticism comforted by the study of the size and nature of national traditional materials.

²⁸ Henk de Zeeuw is co-founder and first director of the RUAF Foundation (the International Network of Resource Centres on Urban Agriculture and Food Systems). Before he developed an interest in urban agriculture, he worked for twenty years as a rural development expert in various countries for organizations like the International Agricultural Centre in Wageningen, the Dutch Ministry of Foreign Affairs, ETC Foundation, Leusden, the Netherlands. In the mid-nineties, he initiated the RUAF network to create more attention and support for urban agriculture at international, national, and local levels. He coordinated major international programs like "Cities Farming for the Future" and "From Seed to Table" that operated in 25 cities in 17 countries. He is the author of numerous publications and academic papers. His most recently co-authored work 'Cities and Agriculture: Developing Resilient Urban Food Systems' is an experience and evidence-based 'state of the art' exploration of urban agriculture, providing policymakers, urban planners, and urban agriculture practitioners an overview of crucial aspects of urban agriculture and its contributions to the development of sustainable, resilient and just urban food systems.

agriculture should be included in urban development planning, which can beautify the city and prevent the uncontrolled expansion of the city and soil degradation. In 1999, Canadian urban planning expert Quinn discussed how to incorporate urban agriculture into municipal planning in his comments on the written materials and oral reports of urban planners in 18 cities in China and made the methods and strategies for its brief narrative realisation. Some cities in developing countries have gradually incorporated urban agriculture into urban planning. For example, in Kinshasa, Dar es Salaam, Dakar, Bissau, Maputo, and other cities, urban agriculture has been included in urban expansion plans.

Depending on the form, scale, climate, and management practices deployed in urban agriculture, urban agriculture (UA) can provide various ecosystem management services. One prominent service is the ability to offer fresh local food to city dwellers. Local fruit and vegetable production can lead to healthy dietary changes that benefit public health. (Hu et al., 2011). These Studies have shown that UA on vacant lots, rooftops, and building facades can also provide 90% of the product (Aragon et al., 2019).

To better study urban ecosystem services, it is necessary to take a step back and clarify the single meaning of "urban", "ecosystem", and "ecosystem service". Starting with an "ecosystem," can be defined as "a group of interacting species and their native, abiotic environments working together to sustain life." For an "urban" environment, a city can be defined as a single ecosystem or a distinct group of individual ecosystems, such as green spaces or rivers. "Ecosystem services", defined by De Groot et al. and the Millennium Ecosystem Assessment²⁹ (MEA), are human access to ecosystem functions. In contrast, economic ecosystems and biodiversity (TEEBs)³⁰ contribute directly and indirectly from ecosystems to human well-being. Even following Daily et al., "Ecosystem services" are natural ecosystems and the species that make up such systems to support and meet the conditions and processes of human life, allowing for the conceptualisation and management of relationships and interactions between humans and the environment in a broader sustainability context. These definitions emphasise the degree of interdependence between humans and the rest of nature.

²⁹ The Millennium Ecosystem Assessment (MA) is a major assessment of the human impact on the environment, called for by the United Nations Secretary-General Kofi Annan in 2000, launched in 2001, and published in 2005 with more than \$14 million in grants. It popularized the term ecosystem services, the benefits gained by humans from ecosystems. During the 1990s, international conventions such as the UNEP Convention on Biological Diversity and the Convention to Combat Desertification identified the need for a global scientific ecosystem assessment. There have been advances in resource economics with little effect on environmental policy. In November 1998, UNEP, NASA, and the World Bank published a study called "Protecting our Planet, Securing our Future: Linkages Among Global Environmental Issues and Human Needs" In 2001, the Millennium Ecosystem Assessment was launched with work over four years.[1] Over 1300 contributors from 95 countries were involved as authors.

³⁰ The Economics of Ecosystems and Biodiversity (TEEB) is a comprehensive research system on biodiversity and ecosystems' value assessment, demonstration, and policy application. It is led by Pawan, a senior banker at Deutsche Bank. Proposed by Sukhdev in 2007. It has been supported by the United Nations Environment Program since 200. It is considered a feasible means to curb biodiversity loss. The TEEB office is located in Geneva, Switzerland, and is responsible for an advisory board composed of experts in the fields of policy, ecology, and economics. TEEB aims to support the formulation of biodiversity-related policies through economic means. This includes improving society's understanding of biodiversity; developing methods and tools for value assessment of biodiversity and ecosystem services; developing tools and methods for incorporating biodiversity and ecosystem services into decision-making, ecological compensation, and paid use of natural resources; and Improving the effectiveness of biodiversity conservation through economic means.

The meaning of "urban ecosystem services" is primarily based on previous interpretations. Eliminate by simply limiting the area of interest. If ecosystems – both within and outside urban areas – are often modified to provide specific ecosystem services to residents, "urban ecosystem services" directly produce services to the ecological structure of urban or peri-urban areas.

However, literature analysis shows that the perspective of urban ecosystem services classification is less clear, possibly because the boundaries between urban and non-urban and between ecosystem services and urban ecosystem services are often blurred and not easy to delineate. Therefore, there are different perspectives, and unsurprisingly, the two definitions (ecosystem services and urban ecosystem services) are increasingly convergent.

Ecosystem services of urban agriculture

1. Provisioning

- Food production (yield)
- Food production (job creation)
- Biomass production for energy generation

2. Regulating

- Soil carbon sequestration
- Nitrogen fixation
- Reduced stormwater runoff and improved water quality
- Improved air quality
- Local climate regulation/reduced

3. Supporting

- Habitat for pollinators and wildlife

4. Cultural

- Increased sense of place
- Educational opportunities
- Spaces for community gathering and recreation
- Community cohesion
- Aesthetic benefits
- Connection with nature

1.2 Policies Motivations & challenges

The Chinese government's agricultural policy emphasises yield quality and technology as key elements as it seeks to "increase the yield of high-quality products based on green and innovative production" (Ministry of Agriculture and Rural Affairs³¹, 2017).

³¹ The Ministry of Agriculture and Rural Affairs is a ministerial-level component of the State Council. The Office of the Central Leading Group for Rural Work is in the Ministry. The Ministry of Agriculture and Rural Affairs is responsible for implementing the guiding principles, policies, and decisions of the CPC Central Committee on work related to agriculture, rural areas, and farmers. It follows and endeavors to strengthen the Party's overall leadership over the above work in the course of discharging its responsibilities. Below are the Ministry's main functions: I. Take the lead in preparing and implementing strategies, mid-and long-

To ensure food security, the state is committed to achieving high levels of self-sufficiency in staple foods, meat products, fish, vegetables, and fruits in most professions (Ghose 2014).

Policies such as the Vegetable Basket Program aim to regionalise food by streamlining urban production and distribution networks, introducing more agricultural technologies, ensuring quality, managing supply issues in large and rapidly growing cities, and ensuring safety in food production practices (Gu 2009). The state also encourages the development of multifunctional spaces that provide services that go beyond agricultural products. For example, peri-urban agrotourism helps to reconnect city dwellers with significant cultural and natural landscapes and conserve arable land as cities grow (Yang et al., 2010). Building robust, localised agricultural chains through these policies and priorities is a strategic priority for the government. Furthermore, while the Chinese government encourages traditional high-tech strategies to achieve sustainable agriculture, emerging alternatives remain unexplored (Ely et al., 2016; Scott et al., 2014).

Three different forms of universal access were studied: within small cities. Capital-intensive intra- and peri-urban agrotourism. These forms are all necessary in China, although several other alternative food system arrangements (see Si et al., 2015) can also be examined through this UA lens. Residents and some entrepreneurs who develop for the market mainly carry out small-scale in-house urban farming. Capital-intensive inner-city agricultural organisations have been primarily privatised and closely tied to researchers and industry. Most Chinese cities are privatised; labour is usually hired from nearby villages. Municipal interaction with UA in all its forms at the national, provincial, and national levels, often acting as policy implementers in intra-urban areas or providing incentives for production in peri-urban areas. The researchers believe that Small-scale urban agriculture is a practice neglected by the state (Horowitz and Liu 2017). In contrast, capital-intensive inner-city food production, including vertical farming techniques such as plant factories, hydroponics, and aquaponics, and, to a limited but growing extent, 3D printed or synthetic foods are being studied in large quantities of land developed in China (Lin 2016; Roberts, 2017). Peri-urban agrotourism farms have also been primarily influenced by the development of the state, shaping the city. Suburban and urban dwellers achieve access to "natural" spaces (Yang et al., 2010).

Various interactions between the state, private sector, and civil society shaped the resulting forms of urban agriculture with Chinese characteristics.

term plans, and major policies related to agriculture, rural areas, and farmers: draft laws and regulations on agricultural and rural affairs, formulate related norms and rules, and directly related law enforcement; and participate in formulating policies on finance and taxation, pricing, purchase and storage, financial insurance, import, and export, etc.

Table 5: Players and governance structures for the three forms of urban agriculture in this study

| UA type | Carried out by | Governance |
|-------------------------|-------------------|--|
| Intra-urban small-scale | Residents | Unregulated; prohibited in some places |
| Intra-urban | capital-intensive | Private enterprises State neither incentivises nor prohibits |
| Peri-urban | agrotourism | Private enterprises State provides incentives |

Resource from: The Organic Fit of Urban Agriculture and Urban Green Space: Planning and Exploration of Urban and Rural Space Coordination, *Planning Studies*

Taking small-scale intra-urban agriculture as an example, the study of Nanjing, Jiangsu Province. For small intra-scale agriculture, much of the research that informed the study was conducted in Nanjing, China, where various forms of agriculture that occurred informally and spontaneously throughout the city were observed. Most of this form of UA takes place in the urban interior environment, implemented by city dwellers who utilise land deemed "wasteful of space". Although Nanjing's by-laws have banned food cultivation in public green spaces in residential areas since 2013 (Si and Scott 2016a), residents continue to grow in urban areas and operate outside any market-oriented structure.

Practices

The food is grown in the older community apartments inside the drum tower, Qin Huai, where the older man often lives. These locations usually lack formal organisation or ongoing maintenance, allowing more physical space to be changed to accommodate growing demand. In contrast, well-laid-out new high-rise buildings are highly regulated and produce less agriculture. Farmers often demonstrate complex knowledge of the properties of plants, utilise recycled materials, improve soil quality, and make creative adjustments to catchment and planting pots such as sinks, to name a few. Farmers in Gulou and Qinhuai usually plant vertically to build support frames for plants, reducing space constraints. However, farmers in Qixia New Town have more space and, therefore, do not need to grow vertically as often; instead, they utilise other farming techniques, such as greenhouses, highlighting their previous farming experience.

The study surveyed whether respondents agreed with the *motivation* of potential lists for UA. 91% of respondents said they were only growing food as a hobby. In addition, 84% consider the ability to grow food to be an essential part of their culture and traditions.

There are clear concerns about the impact of pollution on food production. 88% of respondents believe that urban pollution affects the food they eat. While only 21%

stressed that food safety was the primary motivator, another 96% agreed that growing their food gives them better control over food safety, and 86% believe their food is better than a wet market or supermarket. For Nanjing residents lacking trust in food safety monitoring and regulation, universal access to services on a small scale in the city seems to be a coping strategy.

Several environmental challenges affect small-scale inner-city agriculture, such as weather variability, water availability, space constraints, and soil quality. Water is more abundant and grows on land that has "stopped development", especially in the new city of Qixia, while in residential areas in the Gulou and Qinhuai districts, water is usually recycled from households. Many older respondents mentioned the physical challenge of participating in UA, soil difficulties in three districts (Qixia, Gulou, Qinhuai), and those who lived in residential areas lived on the first floor of an apartment building. However, respondents lived near their production base, with the furthest place of residence ~10 to 20 minutes away on foot or by bike. Estimates of respondents' growth space in Gulou and Qinhuai ranged from 0.5 square meters to 100 square meters (0.00075-0.15 acres). 100 m² to 1300 m² (0.00075-2 MU) in the district and the Qixia area. The most frequently cited problems asked by respondents included confrontations with construction workers, city management teams, neighbourhood committees and theft of food. Lack of consistency in enforcement by city management teams. Authorities cited temporary planting structures, such as roof structures, as their top concerns, saying they would hinder concerns about public spaces' enjoyment, use, and safety. However, it was not removed immediately in most cases, and financial penalties were not mentioned. In Qixia District, respondents mainly planted on "stopped" land, and project managers and construction workers often clashed with growers. In one place, growers receive written letters indicating that they will stop growing as planned development continues; However, it was a few years ago, and construction had not yet begun. Around the same time, construction crews arrived in the middle of the night (to avoid confrontation) and started bulldozing. Interestingly, some were compensated for the food lost – highlighting the complexity and uniqueness of land rights in Nanjing.

Research on Intra-Urban Capital-Intensive Organizations and Peri-Urban Agro-Tourism Farms.

Urban agricultural organisations in the capital were interviewed. The studies were privately owned. These businesses design, develop, and plan infrastructure and technologies for various small or large urban production. For example, a company in Shanghai planned vertical farms in the research park, while two Yang Ling and others in Beijing are designing high-tech equipment for Yang Ling and Beijing—small-scale apartment planting. Urban planners and architects are essential in conceptualising these capital-intensive agricultural spaces. Six capital-intensive companies participated in the city, in addition to an urban planner and four researchers specialising in these

technologies; Two of the enterprises are state-owned. Capital-intensive organisations within cities have strong university and industrial links. However, respondents noted negotiations with the state on zoning laws and the proposed design of food production spaces. One of the peri-urban agro-tourism enterprises specialises in cultivating and processing agricultural products. Farm size: 3 farms with an area of more than 200 hectares, most of which are around 100 hectares. Nine farms participated in the study: one from Nanjing and eight from Yangling. Three farms produce meat products, while all other companies specialise in fruits and vegetables. All agrotourism farms in this study defined themselves as "ecological" or "organic," although there were only two definitive formal certifications. This allows consumers to participate in production, from planting to picking and consumption. Three of the farms support accommodation and restaurants. One or more managers oversee the operations of the farm. At the same time, the labour comes mainly from local villages: some previously cultivated the land on which the farm is located.

Motivations

Respondents to capital-intensive intra-urban and peri-urban agrotourism said their motivations for pursuing production methods were similar to those of small-scale urban farmers. These include food safety (including traceability of food systems) and various socio-cultural benefits. However, respondents are also highly motivated by financial opportunities.

Challenges

A significant challenge within capital-intensive cities and peri-urban areas is universal access to service forms of agrotourism for their commodities (raw or processed), as they are often not considered viable ways to produce long-term food security. In general, these respondents did not believe that localised regional production chains could provide enough food supplies (staple crops or perishable items) to urban areas, given that high costs of land and start-up technology within the city (especially for indoor or vertical production companies), as well as a lack of competitive prices to conventionally produced food. Only two respondents from capital-intensive inner-city businesses noted the high freshness of the Chinese diet for UA, meeting domestic food demand for products that locally sourced products can best support. One of the researchers aims to develop urban farming techniques that allow each citizen to produce all the vegetables he needs in a small apartment. Generally, capital-intensive inner-city and peri-urban agrotourism businesses emphasise product quality and their added services (such as entertainment, social spaces, education, or landscaping) rather than their contribution to food security.

Related to this is the challenge of making these forms of UA more accessible. In general, capital-intensive inner- and peri-urban agrotourism managers and researchers point out that they offer products and services only accessible to middle- or upper-class consumers. The large, capital-intensive infrastructure projects examined in this study are community-oriented, not public. A specific group of residents will use one future site for vertical farming: middle-class commuters travelling to and from Beijing. Another future site of vertical agriculture is located in a research and business district in Shanghai. However, a vital component of this future vertical farming site is the space where the greenhouse is open to schools.

1.3 Governmental Documents

- Domestic policy

It must be noted that planning is not technical but political. China's planning system is a top-down system that is greatly influenced by China's administrative system. The planning system consists of three kinds of planning: socio-economic development plan, land use plan, and urban and rural planning. Generally, socio-economic development plans focus on development goals by setting development indicators and speeds. Land use planning focuses on arranging, balancing, and guaranteeing agricultural land (incredibly bare farmland) and construction land. In addition, urban and rural planning also pays attention to spatial layout, including setting the development direction and the use of construction land (Deng,2013)

China's urban agriculture must focus on economic function, not only because economic function is the primary function of urban agriculture but also because of China's national conditions. In addition, urban agriculture should not be widely implemented in China at present because it is essentially future agriculture, representing the highest level of agricultural productivity in China. At this stage, there is a lack of theoretical research on the city's scale on which urban agriculture development needs to be built, the mechanism of urban agriculture development, and what role the government and the market should play. Regarding structural changes, urban agriculture will develop in the direction of land-saving, capital-intensive, high-added value products. Regarding structural changes, urban agriculture will grow in the direction of land-saving, capital-intensive, and high-added value products. Projects like high-end flowers, off-season green food, and sightseeing agriculture will have excellent prospects in urban areas. In contrast, traditional rice, cotton, and rapeseed projects that occupy more land and have low unit economic value will shrink. In addition, due to the unique role of flowers, plants, and trees in maintaining the urban environment, the flower industry will receive government support, and its proportion in urban agriculture will significantly increase. Professor Wu Weihua from China Agricultural University proposed that, based on field

investigations and literature research abroad, garden horticulture is the best model for developing urban agriculture in urban areas. Everyone can participate, and it can be used everywhere. For example, the use of idle land and wasteland in the city (such as river beaches, idle land on both sides of railways and roads), residential houses, hotels, offices, courtyards, patios, roofs, balconies, windowsills, walls, stairs, etc. of various buildings are scattered and distributed in multiple places. In the fragmented space, grow vegetables, fruits, flowers, spices, and other horticultural products on the ground or in containers.

Specifically, there are four views as follows: the first view is that to match the "international" concept, the connotation of urban agriculture needs to be in line with foreign and overseas agriculture, i.e., urban agriculture is based on scattered agricultural land temporarily idles in the city, mainly for leisure and tourism. The second view holds that the scope of urban agriculture should include urban areas or zones close to cities, and its distinctive feature is the specialisation and localisation of geographical distribution. The third viewpoint expands the scope of urban agriculture to include urban areas, suburban areas, and their radiation circles centred on cities or urban clusters. The fourth view is that agriculture in urban areas can be divided into four types, namely, central zone agriculture, corridor zone agriculture, wedge zone agriculture, and outer edge zone agriculture, according to the different locations of agriculture.

- Urban Agriculture by Region Type:

1. Agriculture in the central area. This type is located in the city's central region, with a high population and building density and the highest degree of mixed and intensive land use. Official and commercial retail activities usually dominate it. The agriculture here is mainly distributed on the edge of the house (roofs, balconies, houses), idle land, courtyards, and parks. It has high value and requires more investment in agriculture. Many of these take the form of small greenhouse farming systems. This type of agriculture is most vulnerable to urban renewal

2. Agriculture in the corridor area. This type of agriculture is located in the traffic zone on both sides of the expressway or railway and belongs to the high-intensive development area. This type of agriculture is located in a favourable environment with developed transportation facilities, convenient market connection, and a high density of residents; the agricultural structure in the corridor area can operate ornamental horticulture, greenhouse vegetables and flowers, grazing, poultry, micro-animals, and collect farm products. Mainly trade and wholesale markets. The construction of cities and transportation facilities easily replaces this type of agriculture.

3. Agriculture in the isolation area. This type of agriculture is located between the transportation corridors and is distributed in a wedge shape. It is one of the concentrated areas of urban agricultural land, employment, and output. In a period of rapid

urbanisation, this area is often the main area for urban residential, industrial, greening, and other construction and development. The land use type may change from agricultural land to construction land, so attention should be paid to protecting agriculture.

4. Agriculture in peripheral areas. This type is a relatively stable agricultural area and one of the concentrated areas of urban farmland, employment, and output. The size of the outer agricultural area depends to a large extent on the efficiency of transportation and the characteristics of natural conditions. The characteristics of agriculture in the outer edge area are in the form of a large number of small and medium-sized farms, and according to the needs of the market in the urban area, the production of fresh and live agricultural products is the main.

- According to China's national conditions, there are four views on the scope of urban agriculture.

1. The first view is that to match the "international" concept, the connotation of urban agriculture should be in line with foreign and overseas agriculture, i.e. urban agriculture is mainly based on the sporadic agricultural land temporarily idle in the city and mainly on leisure and tourism.

2. The second view holds that the scope of urban agriculture should include urban areas or zones close to cities, and its distinctive feature is the specialisation and localisation of geographical distribution.

3. The third viewpoint expands the scope of urban agriculture to include metropolitan areas, suburban areas, and their radiation circles centred on cities or urban clusters. The fourth viewpoint is that agriculture in urban areas can be classified into four types, namely, central zone agriculture, corridor zone agriculture, wedge zone agriculture, and outer edge zone agriculture, according to the different locations of agriculture.

According to empirical analysis, urban agriculture may have entered the stage of urban agriculture only when urban GDP per capita reaches US\$2,000-3,000. Other scholars believe that urban agriculture is a concept of post-modern society, and only after society gradually steps into post-modernization will urban agriculture development have the conditions.

Chinese administrative rank

Chinese cities have distinct administrative hierarchical characteristics. According to the administrative level and government seat, Chinese cities can be roughly divided into seven levels: municipalities directly under the central government, sub-provincial cities, general provincial capitals, general prefecture-level cities, county-level cities, county

towns, and generally organised towns. Therefore, I chose Beijing, the capital of China, and Shanghai and Chengdu, the provincial town.

Case studies are carried out at three different administrative levels and government premises.

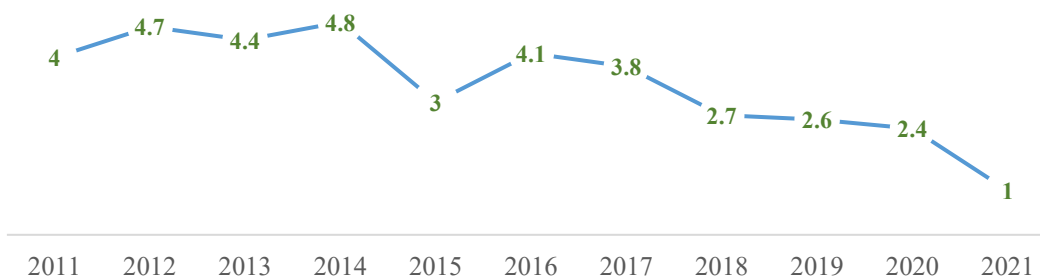
- Beijing policy

Figure 57: Map of Beijing, China



Resource from: http://datav.aliyun.com/portal/school/atlas/area_selector

TABLE 6: THE NATURAL GROWTH RATE OF BEIJING'S PERMANENT POPULATION (UNIT: ‰)



Resource from: <https://ceidata.cei.cn/jsp/Default>

Under Beijing's relevant policies, urban agriculture still starts from the countryside and strives to promote it to drive rural economic development. At the same time, urban leisure agriculture is also used to provide tourists with rest. Regarding urban spatial structure, urban agriculture has no relevant policies yet.

We can only adjust the agricultural structure and develop modern urban agriculture on the industrial structure. Actively develop urban function-oriented industries and modern urban agriculture. By the direction of integration of urban and rural development, adhere to the idea of integrating rural sightseeing and leisure tourism with the construction of beautiful countryside and urban modern agriculture, promote the transformation of rural sightseeing and leisure tourism to specialisation and standardisation, and cultivate rural tourism into the backbone of Beijing suburbs Industry and modern service industry benefiting the people of the city, and building rural areas into the preferred leisure and vacation areas to improve the happiness index of citizens.

Under the direction of integration of urban and rural development, adhere to the idea of integrating rural sightseeing and leisure tourism with the construction of beautiful countryside and urban modern agriculture, promote the transformation of rural sightseeing and leisure tourism to specialisation, special, utilisation, and standardisation, and cultivate rural tourism into the backbone of Beijing suburbs Industry and modern service industry benefiting the people of the city, and building rural areas into the preferred leisure and vacation areas to improve the happiness index of citizens.

According to the location conditions, resource endowments, industrial foundation, and development prospects of different areas in Beijing and its extension areas, the overall spatial layout of Beijing's modern urban agricultural industry is divided into five development circles.

Table 7 The layout of urban agriculture in Beijing determines five development circles.

| | Involved area | Regional Agriculture Type |
|---|---|---|
| Service and display Agricultural circle | The central area is within Fifth Ring Road. | Gradually withdraw from melons, vegetables, etc. Production of practical agricultural products, strictly prohibiting aquaculture, encourages flower and grassland development of the planting industry to beautify the urban environment, focusing on developing tourism agriculture and Exhibition Agriculture. |
| Suburban rural landscape agricultural circle | Outside the Fifth Ring Road and within the Sixth Ring Road. | Because the agricultural ecological environment is poor, it is necessary to encourage the cultivation of field crops and flowers with high ecological environmental value. Focused on developing open-field greening |

| | | |
|--|--|--|
| | | agriculture, leisure agriculture, park agriculture, and Popular science agriculture. |
| High-quality and high-efficiency agriculture in the outer suburbs circle | The outer suburban plain consists of the outer suburban plain, the Piedmont area and the Yanqing Basin area. | Focus on the development of facility agriculture, large-scale, high-quality, and safe planting and breeding, and the agricultural product processing industry. |
| Ecological Leisure Agriculture in Mountainous Areas Circle | Suburban northern, western, and southwestern mountains. | Utilise the region's natural scenery and folk cultural resources to develop characteristic, ecological, and leisure agriculture industries. |
| Radiating cooperative agriculture around Beijing circles | Areas around Beijing | Relying on the advantages of local natural and human resources, actively develop cooperative, contract, export-oriented, and service agriculture. |

Resource from: Beijing Agriculture, early November 2007 on trimonthly publication

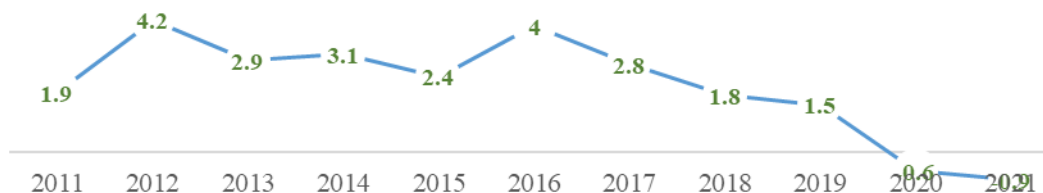
- Shanghai policy

Figure 58: Map of Shanghai, China



Resource from: http://datav.aliyun.com/portal/school/atlas/area_selector

**TABLE 8: THE NATURAL GROWTH RATE OF
SHANGHAI'S PERMANENT POPULATION
(UNIT: ‰)**



Resource from: <https://ceidata.cei.cn/jsp/Default>

Vigorously develop multi-functional urban modern agriculture and improve the diversified functions of urban modern agriculture. Focusing on the three islands of Chongming, the upper reaches of the Huangpu River, the north bank of Hangzhou Bay, and the surrounding areas of the city, taking into account both inside and outside the city, the layout of agricultural production will be optimised. Based on demarcating permanent bare farmland, building 800,000 mu of grain production functional areas, controlling important agricultural product production protection areas, and becoming high-efficiency and ecological urban modern agriculture demonstration bases and standard farmland.

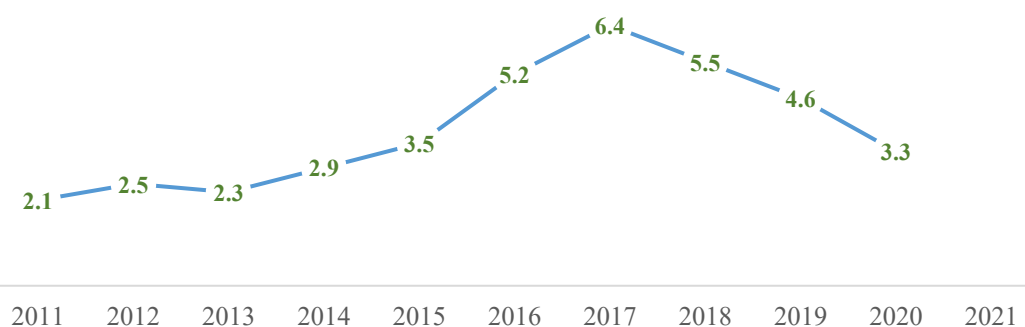
Shanghai's government has launched several programs to create a modern and sustainable system of urban and peri-urban farming:

1. Systems of quality control have been established, among others, to build "vegetable gardens" in nine suburban districts,
2. The safety of agricultural products has been strengthened through campaigns, testing, and traceability systems,
3. The average income of farmers has been increased; ecological and circulatory agriculture, mixing crop farming and livestock breeding, has been introduced,
4. Rooftop and balcony cultivation of vegetables has been promoted,
5. Projects with biodynamic farming are supported and integrated into the city's ecological policies, including preserving green areas and tree plantations. The goal is 35% coverage by 2020.

- Chengdu policy

Figure 59: Map of Sichuan Province**Figure 60: Map of Chengdu, China**Resource from: http://datav.aliyun.com/portal/school/atlas/area_selector

**TABLE 9: THE NATURAL GROWTH RATE OF
CHENGDU'S PERMANENT POPULATION
(UNIT: ‰)**

Resource from: <https://ceidata.cei.cn/jsp/Default>

Layout

1. Regional layout of modern agriculture. Taking the development of contemporary urban agriculture as the goal, we will insist on sub-regional and sub-key promotion. Develop "flower arrangement" and "mosaic" landscape agriculture in the main urban area, promote agriculture "in succession" and promote the diversified growth of farmers and develop large-scale, standardised, and high-quality high-efficiency agriculture in the second-circle districts (counties), develop agricultural logistics and transportation. Agricultural product processing and tourism agriculture; develop large-scale, regionalised, standardised, high-quality, high-efficiency agriculture and mountain, Ecological agriculture with hilly characteristics. Adhere to the concept of global Chengdu, breakthrough regional boundaries, strengthen cooperation and co-construction between circles, and form plans. A batch of agricultural product

production bases, agricultural product-intensive processing parks, and agricultural product logistics trading markets across districts (cities) and counties.

2. The functional layout of modern agriculture. By the overall plan for building a world-modern garden city and the city's industrial layout plan. Focus on the development of high-quality and high-efficiency agriculture in the plain areas of the "optimised development zone" in the western part of the city, and build an urban-rural "city in the field" form; focus on the development of ecological agriculture and rural tourism in the mountainous areas of the "Two Belt Ecological and Tourism Development Zones"; The central urban area of "Exhibition Area" focuses on the development of leisure agriculture and agricultural service industry, and builds the urban and rural form of "garden in the city"; The hilly area of the "expanded development zone" in the east focuses on the development of characteristic ecological agriculture, and builds an urban and rural form of "integration of urban and rural areas".

- Current Situation of Urban Agriculture in China

Since the 1990s, some developed areas along the eastern coast of China have begun to explore urban agriculture and achieved rapid development. In 2012, the General Office of the Ministry of Agriculture issued the Opinions on Accelerating the Development of Modern Urban Agriculture. In April of the same year, the first national urban modern agriculture on-site exchange meeting was held in Shanghai, followed by four consecutive exchange seminars. Since then, some cities have formed distinctive urban agricultural and industrial forms combined with their conditions and gradually built high-tech agricultural parks, parks, leisure parks, homestay farms, and other urban agricultural models. For example, Chengdu, with its rich rural tourism resources, Connecting agricultural tourism, sightseeing and leisure, homestay and farmhouse entertainment, Promoting the integration of the primary and tertiary industries, and Realized employment at the home of the villagers; Shanghai has proposed the concept of "residents' greening autonomy", Encourage and support social forces to operate public green Spaces, Promoted the development of the community gardens, Meanwhile, according to the residents' preferences for leaf vegetables, Put forward the development idea of vigorously developing the leaf vegetable factory; Shenzhen focuses on building an agricultural science and technology innovation park, Actively explore the development road of urban food factories; In addition to developing tourism-oriented urban agriculture, Beijing, Green agricultural products order model and citizen agricultural gardens and other forms are also favoured by residents.

Compared with developed countries, China's urban agriculture developed late. It is still in its initial stage and mainly concentrated in the "super first line" and "new first line" cities and their surrounding areas. The food production function of the city has not received enough attention, the agricultural leisure and sightseeing modes are single, and

the innovation is insufficient. As an emerging sunrise industry, urban agriculture will undoubtedly play an essential role in improving the quality of life of urban residents, promoting urban-rural integration and revitalisation. Therefore, it is particularly urgent to learn from international successful experiences and explore a set of urban agriculture development models with Chinese characteristics.

Urban agriculture is an inevitable product of the rapid development of urbanisation and an essential achievement of the perfect combination of modern agriculture and the city. It is significant for ensuring urban food safety, creating an ecological and livable environment, meeting people's diversified needs, and helping rural revitalisation. According to statistics, the arable land area of 36 large and medium-sized cities is close to 1 / 9 of the country, and the vegetable output accounts for 1 / 6 of the country. The significant difference between urban agriculture and other agricultural industries is that urban agriculture directly undertakes the responsibility of "ensuring urban supply and stabilising market vegetable prices". Especially since the outbreak of COVID-19, food production, processing logistics, and resupply have been under varying degrees of pressure around the world, and urban agriculture has played an essential role in urban food security. 2021 is the first year China's focus on agriculture, rural areas, and farmers has historically shifted to promote comprehensive rural revitalisation. Urban agriculture is essential in determining whether a good start can make a good one.

We will significantly expand arable land and increase food production capacity. An essential feature of urban agriculture is that it can use urban space to conduct agricultural production and broaden substantially the cultivated land resources. Urban farming spaces, such as family balconies, city roofs, bomb shelters, basements, and community clearings, can produce food. According to preliminary estimates, if the agricultural space available to existing cities in China is used, more than 50 million mu of arable land can be expanded. Efficient technologies such as plant factories and vertical agriculture can be used for food production. Through vertical space utilisation and continuous annual output, the production capacity per unit area can reach tens or even thousands of times that of field production. Take lettuce, for example; the annual capacity of the plant is 3000 / m², 15 times that of a greenhouse (200 / m²) and 90 times that of a field (32 / m²); produced by vertical agriculture, the capacity can reach more than 1000 times that of field. Therefore, urban agriculture will be important in expanding cultivated land resources and increasing food production capacity.

1.5 The current situation of implementing UA in Beijing

The development of Beijing's agriculture can be roughly divided into four development stages: rural agriculture oriented by the ecological economy (before 1983), suburban agriculture (1983-1995), Urban Modern Agriculture (1995-2005), and Multifunctional Urban Agriculture (2005 onwards).

It can transform from the single production function of agricultural and sideline products in the past to the integration of multiple functions such as employment and income, ecological conservation, tourism and leisure, and cultural inheritance body. Most scholars have discussed the development of urban agriculture in Beijing from the perspectives of multi-functionality, economic form, and development strategy.

Spatial differentiation and location selection are less discussed. Huang Yinghui, Shi Yajun, and Wenhua established an evaluation system for Beijing's urban agriculture. The development of urban agriculture has been comprehensively evaluated. Based on this, taking Beijing as an example, the evaluation index of the multifunctionality of urban agriculture is constructed.

Analysing the spatial differentiation law of urban agriculture's function and development model can reveal the location characteristics of urban agriculture's multiple functions. To provide theoretical guidance and practical reference for metropolitan areas' urban agricultural development strategy.

Beijing is a typical "big city small suburb"; the regional space is a circle structure. From the urban commercial centre, the near and suburban commercial and agricultural mixed type, the outer suburban plain area commodity grain and non-staple food production base (suburban agricultural land), to the outer suburbs, mountain forest, and fruit ecological agricultural production base.

By the above evaluation index and weight, the 13 counties of Beijing's urban agriculture versatility comprehensive evaluation and standardised processing through the comprehensive score of horizontal and vertical comparative analysis, according to its different dominant functions, Beijing's 13 agricultural suburbs of urban agriculture divided into three functional areas, suburban social service areas: scope including Haidian, Chaoyang, and Fengtai three areas. The region is the closest to the central urban area, with the highest urbanisation rate, the earliest time of urban radiation, the most considerable intensity, the highest degree of non-agriculture, a sizeable economic aggregate, and a high level of per capita income. The development direction of urban agriculture in this area is park agriculture, experience agriculture, sightseeing agriculture, and high-quality agriculture to realise the social service functions of urban agriculture, including science and technology demonstration, sightseeing and leisure, and agriculture education. Exurbs plain production and economic function area: the scope includes Shunyi, Tongzhou, and Daxing, three districts. The region is located in a plain area with good conditions for agricultural production; urban agriculture should focus on the development of large-scale, professional, regional, and standardised bulk agrarian products production and processing agriculture to realise the agricultural and sideline products production, employment and income increase and other production and economic functions of urban agriculture. Ecological protection function zone in

suburban mountainous areas: seven districts and counties, including Huairou, Miyun, and Mentougou. The region is located in the western, southwest, and northern mountainous areas of Beijing and plays the role of ecological barrier in the urban development strategy. Urban agriculture in this area should be guided by environmental protection and focus on developing characteristic agriculture, ecological agriculture, and leisure agriculture with the cultivation of unique characteristic agricultural products, mountain folk custom tourism, and environmental tourism as the main content. However, the Beijing suburban social service function comprehensive score is not high; it shows that suburban, urban agriculture has not given full play to its due social service function, especially in science and technology demonstration, and employment income function of implementation is low in addition, due to the cultivated land resources decreased year by year, its ecological protection function is poor. Exurbs plain production economic function of production economic function has not been fully developed; in addition to Shunyi district, the other two areas of production economic function score generally; this shows that the outer suburbs plain area urban agriculture scale and specialisation degree is not high, should gradually through the land circulation to realise the land to the scale concentration and industry to the park, extend the agricultural industry chain to improve the comprehensive economic benefit of agriculture. The comprehensive score of ecological protection function areas in suburban mountainous areas is generally high. With the promotion of environmental construction and the balanced strategy of farmland occupation and compensation in Beijing mountainous areas, the cultivated land resources in Beijing mountainous areas have been effectively protected, especially with the promotion of rural folk tourism. The social service function of urban agriculture has also been effectively played. Urban agriculture in the mountainous areas of Beijing should continue to take ecological protection, including folk tourism and vacation tourism, as opportunities to further improve its social service function.

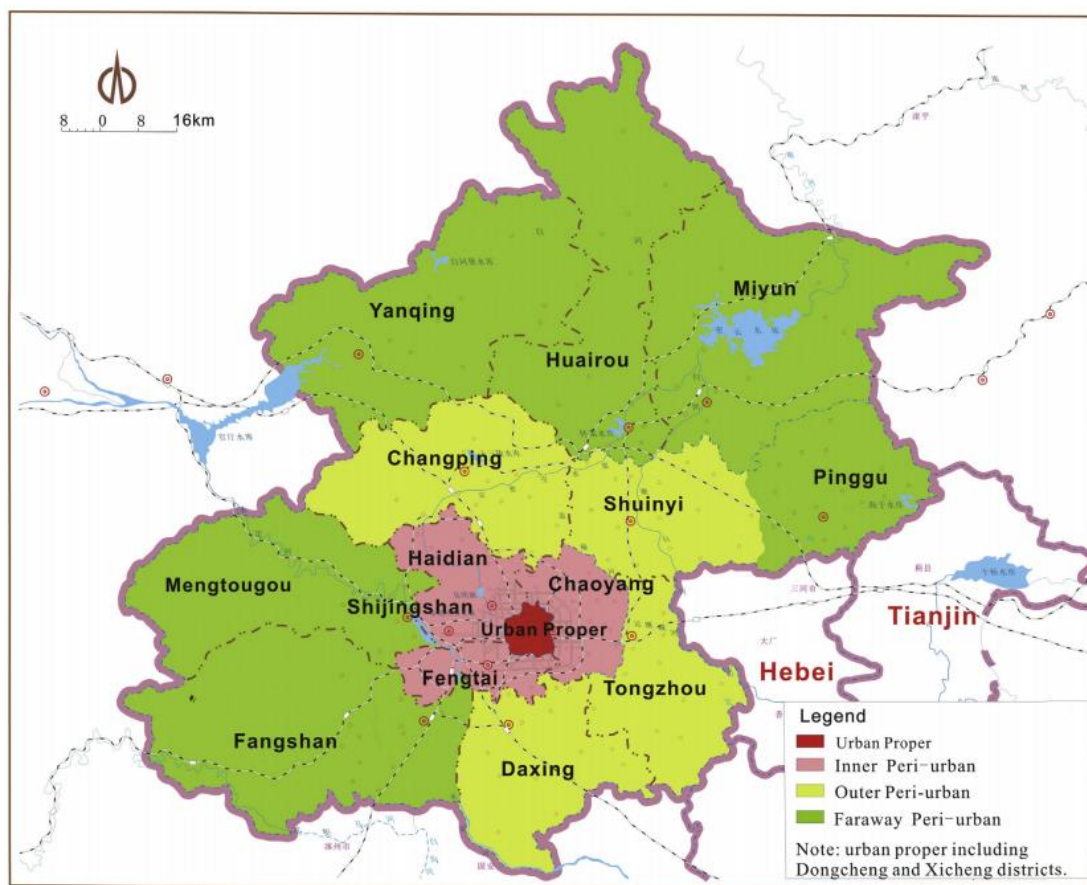
The study and contribution to the literature on agricultural growth in quickly changing peri-urban areas came from examining the practice and innovation of PUA (Peri-Urban Agriculture) development in the Beijing area of China. Beijing is China's pilot city for PUA development because of its role as the country's capital and significant degree of urbanisation. According to the 2010 census, Beijing is home to 21 million people, of which 7 million are immigrants (Beijing Bureau of Statistics, 2011).

Historically, agriculture on Beijing's periphery was marginalised (Tan, 2014), particularly between 1992 and 2004. Since 1992, the agriculture industry has experienced a dramatic downturn, losing 65,000 hectares of land and 145,000 jobs (Beijing Municipal Bureau of Statistics, 2013). Since the mid-1990s, PUA has become increasingly popular among farmers and urban areas.

PUA operates at the institutional, industrial, and territorial levels. It suggests a fundamental connection between agriculture and urban areas, two irreconcilable things. Urban growth, however, impacts surrounding rural and urban areas. Due to their proximity, peri-urban areas have been able to create new agricultural practices that protect the area's alternative food sources and maintain its rural landscapes (Clark, Jones, Porter, & Loble, 1997; Daugstad, 2008).

Beijing has witnessed the specialisation and diversification of various new forms of economic activity through traditional agriculture. This PUA, which residents mainly initiated, has had an essential impact on Beijing's rapid urbanisation. Depending on the financial activities and leading players of the PUA, the main activities can include agrotourism; however, it is challenging to integrate PUA growth into urban planning and policy due to a number of essential difficulties. First, there are the challenges posed by land use laws. In order to construct facilities, PUA resorts need land in rural locations outside of cities that aren't always considered built-up areas. Long-term investment and large-scale land allocation are further hampered by the collective rural land that PUA's fields and developed land involve, as well as the unclear property rights. To some extent, the Pearl River Delta in China's inventive farming practices might serve as a valuable model for eventually resolving these challenges. Urban-rural integration is facilitated in the Pearl River Delta by the planned and methodical deployment of greenways (Qiu, 2011). Constructing necessary facilities and infrastructure along greenways also allows the rural sector to diversify its functional structure, including agrotourism. Corporate food processing, high-tech agribusiness/agricultural parks, and farmers' collective activities are examples of successful regional agricultural strategies; it is unclear whether these strategies can be adapted to a city.

Agrotourism is perhaps Beijing's earliest and most popular form of PUA activity. There are two main types: Franker-Based Tourism Agriculture (FHSA), where participants are invited to do simple farm work, and enterprise-based recreational agricultural parks (ERAPs), which provide large-scale, more advanced recreational facilities for observation and experience of complex farm activities. While FHSA is primarily based on farmland and homestays, ERAP offers off-farm activities and higher-quality accommodation. ERAP often creates a higher level of commercialisation through more significant investment in more elaborate designs and modern functionality.

Figure 61: Map of Beijing Municipality

Resource from: Peri-urban agricultural development in Beijing: Varied forms, innovative practices, and policy implications

Given its influence and popularity, PUA often appears to be spoken by policymakers. Beijing launched the so-called "2-2-12004 Program of Action" to promote using two essential elements: agriculture-oriented resources, markets, inputs, capital, and technology, and an information platform. The program builds on the power of Beijing, where China's top 20 agriculture-related research institutes and universities are located. Spatial distribution of tissue PUA development city scale, the 2006 Beijing Urban Agriculture Policy outlines the PUA zoning plan (based on a 2006 interview with the Beijing Municipal Commission for Recreational Agriculture). PUA designates development areas to coordinate development plans with general cities. The municipality intends to use PUA to integrate urban and rural development better: (1) improve food quality for a growing urban population; (2) maintain social stability and rural income through the creation and increase of rural employment; (3) improve the urban and rural environment and reduce the dust and heat island effect by; (4) establish effective water management and recycling systems; (5) Integrate agriculture into urban planning and make more efficient use of urban and peri-urban land.

However, several key issues complicate PUA development in urban planning and policy. The first is the obstacles brought about by land use regulations. PUA resorts require land to build facilities in rural areas on the city's outskirts, which are not

necessarily designated as built-up areas. In addition, PUA's built land and fields involve collective rural land, and property rights are ambiguous, hindering large-scale land allocation and long-term investment. To some extent, some innovative agricultural practices in China's Pearl River Delta may provide a good reference for overcoming these obstacles in the long term. Greenway planning and its systematic implementation in the Pearl River Delta promotes urban-rural integration (Qiu, 2011). It also enables the rural sector to diversify its functional structure, including agrotourism, by building relevant facilities and infrastructure along greenways. However, whether the approach successfully implemented in urban metropolises at the regional level can be applied to a city remains an open question.

The results demonstrate that PUA improves the agricultural sector's profitability as economic returns rise; it also gives local governments a balanced tool to manage rural land and the need for economic growth; it slows the loss of agricultural land and guarantees enough to feed the expanding urban population; and it supplements the traditional urban and farming sectors by creating additional jobs for low-skilled rural migrants (Zhenshan Yang, Pu Hao, Weidong Liu, Jianming Cai, Peri-urban agricultural development in Beijing: Varied forms, innovative practices and policy implications). Therefore, it consolidates. As a buffer to ease pressure on Beijing's suburbs, the migration of overpopulated urban areas. Furthermore, PUA can act as an ecological buffer zone to lessen the effects of urban expansion that is environmental. Policymakers have taken notice of these beneficial functions and results and have presented the PUA policy agenda.

1.6 Implementation of Urban Agriculture Strategy in Shanghai

Shanghai, located in the Yangtze River Delta, is China's largest industrial and commercial city. The total area of Shanghai is 6340.5 square kilometres; 13 % are urban areas, and 87 %are rural. For the past decade, Shanghai has been experiencing Rapid expansion; for example, in 1994-95, it increased the built-up area by 22.4 Square kilometres.

Shanghai has entered the fast lane of urbanisation, but the city authorities also realise that the city cannot develop without agriculture. Agriculture accounts for only 2% of the gross domestic product (GDP) in Shanghai, while productivity growth is slower than in other sectors of the economy. The administrative objective is to achieve a comparable level of agricultural production within the city to ensure a stable food supply for the urban population. Strict regulations have been initiated to prevent more transfers from agricultural to non-agricultural land. 80% of arable land is subject to the Agricultural Protection Act. The government pursues capital-intensive rural development with a high degree of mechanisation and intensive land, labour, and inputs. Today, the total government investment in urban agriculture is five times that of a decade ago. The objectives of the agricultural program are to maintain social stability,

increase mechanisation, and increase production intensity. In addition, urban agriculture is seen as a way to reduce air pollution by maintaining green open spaces and providing recreational opportunities.

In the latest urban master plan 2017-2035, Shanghai proposes implementing 2.82 million mu of arable land by 2020, 1.8 million mu of arable land by 2035, and cultivating it by 2050. Land ownership remained stable. The plan stabilises the primary production area of major urban agricultural products such as grain and vegetables, reasonably guarantees facilities and agricultural land, and promotes the development of modern urban agriculture.

In terms of space, strengthen the spatial sharing and intensive utilisation of agricultural land resources, promote the complementary and coordinated development of different types of agricultural production through the development of production modes such as the combination of planting and breeding, under-forest economy, and three-dimensional breeding, and strengthen the construction of farmland and forest networks.

However, for agricultural space, Shanghai hopes to fix the scope of farmland, proposes to optimise the "three major spaces" of urban ecology, agriculture, and towns, promotes the composite utilisation of space, and establishes a "four-line" control system of ecological protection red line, permanent essential farmland protection red line, urban development boundary and cultural protection control line. Strictly abide by the red line of environmental protection in the environmental space and actively promote ecological protection and construction. Adhere to the protection of permanent bare farmland in the agricultural space, promote the concentration of permanent bare farmland into pieces, and support the development of modern agriculture.

● "Three districts and three lines"

1. **"Three districts and three lines"**: According to the three types of space of urban space, agricultural space, and ecological space, corresponding to the demarcated three control lines of urban development boundary, permanent essential farmland protection red line and environmental protection red line

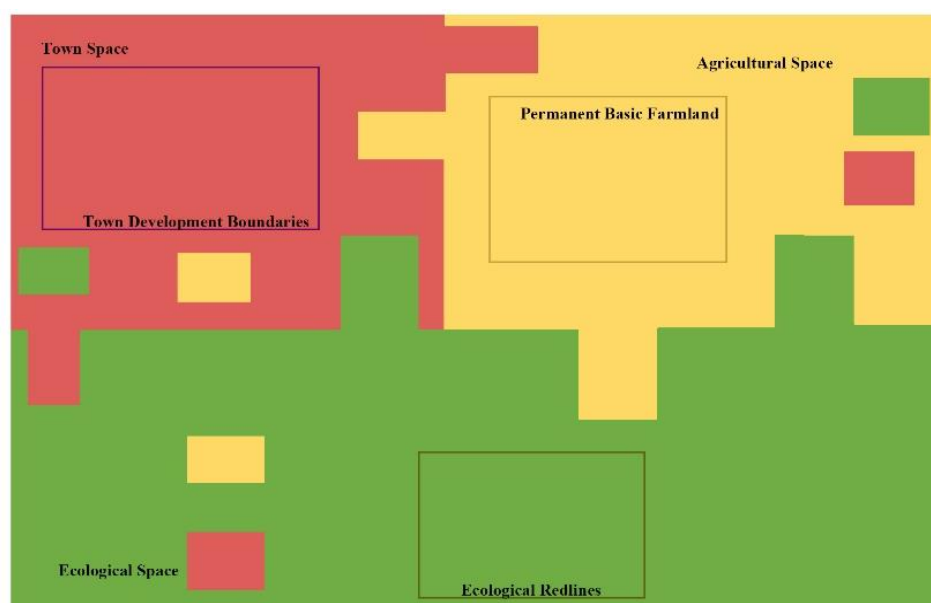
2. **The urban space** is a functional space that carries the town's economic, social, political, cultural, ecological, and other elements.

3. **Agricultural space** is a functional space with agricultural production and rural life as the main body.

4. **Ecological space** refers to the functional space with natural attributes. It mainly provides ecological services or ecological products, including forests, grasslands,

wetlands, rivers, lakes, tidal flats, shorelines, oceans, wastelands, deserts, Gobi, glaciers, alpine tundra, uninhabited islands, etc.

Figure 62: Relationship between the three districts



Resource from: The primary connotation and spatial relationship of "three districts and three lines" in territorial spatial planning,

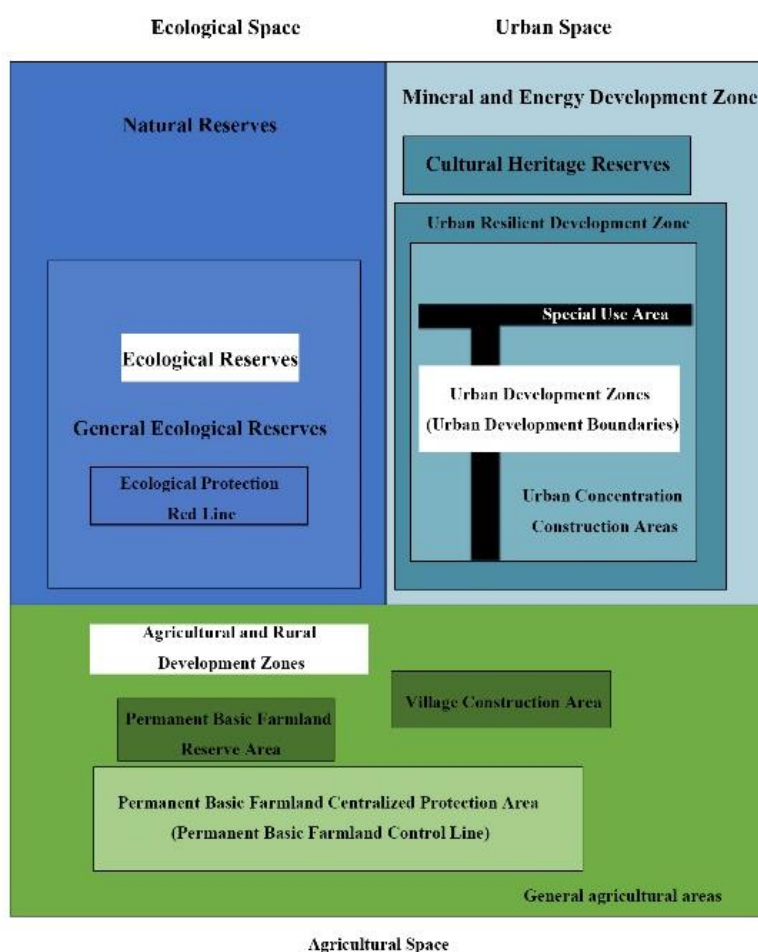
<https://new.qq.com/rain/a/20210926A03XMS00>

5. **The red line of ecological protection** is the land, water, sea area, and other areas with special essential environmental functions within the scope of ecological space that must be strictly protected, which is the bottom line and lifeline for ensuring and maintaining national ecological security.

6. **Basic farmland** is arable land that cannot be occupied or changed without authorisation by the demand for agricultural products in a specific population and economic and social development period and is determined according to territorial spatial planning.

7. **Urban development boundaries** in a certain period due to urban development needs can be concentrated on urban development and construction, improving the regional boundaries of metropolitan functions, designing cities, organising towns, and various development zones.

Figure 63: The spatial relationship of "three districts and three lines" of land space



Resource from: The primary connotation and spatial relationship of "three districts and three lines" in territorial spatial planning,

<https://new.qq.com/rain/a/20210926A03XMS00>

Shanghai's green space is limited, and there are only 40 parks. The total amount of available green space per capita is 1.15 square meters, far lower than the Chinese average of 4 square meters, not to mention the world average of 50 square meters. To address this situation, the structure of agricultural land is being restructured without affecting its nature. Integrate urban agriculture and open green space management into the urban development plan.

Urban agriculture is not yet sustainable for Shanghai, but one of the most popular activities in China is visiting parks and gardens. Every spring, thousands of citizens come to the agricultural area in Shanghai. Coupled with Shanghai's limited green space, there are only 40 parks. The total amount of available green space per capita is 1.15 square meters, far lower than the Chinese average of 4 square meters, not to mention the world average of 50 square meters. As a result, some entrepreneurs are considering

building agricultural resorts on the outskirts of Shanghai. Combined with the actual development of Shanghai, urban agriculture with Chinese characteristics has been created. At the same time, the Shanghai government adjusted the structure of agricultural land without affecting its nature. Integrate urban agriculture and open green space management into the urban development plan.

- **Plan and designed the unique structure of modern urban agriculture in Shanghai**

1. The ring area of 3 to 5 km outside the outer ring road includes a small amount of agricultural land within the ring road. This area is an ecological barrier to urban-rural integration, and the central urban area and the central city should strictly control the expansion of cannibalisation of existing farmland. Agricultural layout with the forest belt as the main body, the development of ecological services agriculture; Develop a somewhat beaded layout along the forest belt Seedlings, flowers, bonsai, small orchards and leisure and viewing gardens as the leading open horticultural farm, can be moderately preserved vegetables and vegetable gardening yards, to have both production and agricultural landscape demand.

2. many industrial belts along the riverside, including the coastal areas along the rivers in Pudong New Area, Nanhui, Fengxian, and Jinshan, as well as the western regions of Qingpu and Songjiang. This area is the leading agricultural industrialisation operation on the outskirts of Shanghai City. It concentrates on aquaculture, dairy feeding, orchards, export of vegetables, coastal biologicals, and leisure tourism agricultural products as the main body. Production Layout Mainly based on the layout of the fragmented areas of specialised production, it has been built into the most distinctive agricultural industrialisation development zone in suburban agriculture.

3. The central ring area, including the area between the green ecological agricultural zone of the outer ring road and the diversified industrial belt along the river. The scope of this region is relatively large. Still, it is pretty significantly divided into new cities, central towns, industrial and development areas, urban external transportation, and other major infrastructure, and sections or blocks will dominate the agricultural production area. The layout of agricultural production in this region should be dominated by vegetables, flowers, and seedlings, seeds and seedlings, ecological leisure forests, and unique colour breeding, and it should actively display the diversified service agriculture of generating facilities and the new development. Organise in the space structure Relying on modern agricultural parks and large and medium-sized horticultural farms and breeding farms, it is necessary to enable each clump area to form a diversified agricultural functional group with its characteristics with one industry as the mainstay and to divide it from the new city, the central town, the

industrial zone, and other non-agricultural industrial areas, to form a new multi-functional industrial zone within the metropolitan area.

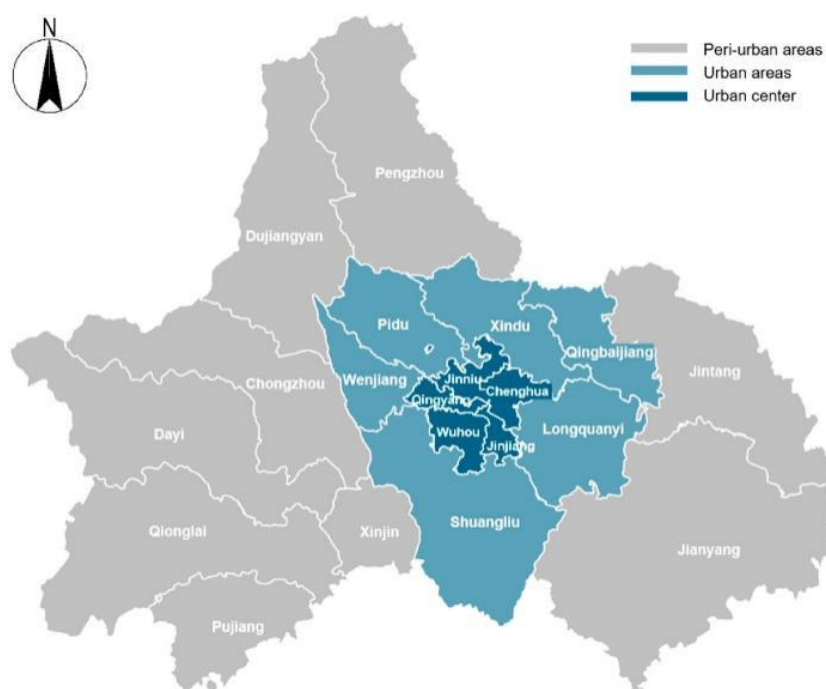
1.7 The actual situation of Urban Agriculture's application in Chengdu

Chengdu is the capital of Sichuan Province and an important central city in southwest China. In 2019, the total population of Chengdu was 16.33 million, of which the urbanisation rate was 73.12%. Chengdu's gross domestic product (GDP) 2019 was RMB1,701.3 billion (US\$263.7 billion), ranking 7th in China. Situated west of the Sichuan Basin (30°05'0"–1°26'0" N, 102°54'0"–104°53'0" N), east of Tibet Plateau, Chengdu covers an area of 14,335 square kilometres (square kilometres) totals and 3639.81 km² at Urban. The landscape of Chengdu is diverse and includes highlands, hills, and plains.

Huge elevation differences within the city lead to climate, soil, and biological resources providing a good foundation for local agriculture. Chengdu grows rice, wheat, rapeseed, vegetables, and other crops. Poultry and animal husbandry is common. Chengdu's pig industry is vast in scale and famous all over the country. Forest species, such as gardens, tea, and medicinal plants, " Sanmu ", are also common in Chengdu.

1. The total area is 14,335 square kilometres (km²), including 12 districts, five city-level counties, and four counties in the urban area in the suburbs.

Figure 64: Map of Chengdu displaying the spatial distribution of the urban centre, urban areas, and peri-urban areas



2.

Table 10: Duration and characteristics of the four phases of urban agriculture development in Chengdu

| Phase | Duration | Characteristic |
|--|----------------|---|
| Development of peri-urban agriculture | 1983 - 1998 | Increase in production capacities; The appearance of leisure agriculture; Initiation of scaling-up and commercialisation of the agriculture industry. |
| Emergence of Urban modern agriculture | 1999-2008 | Urban-rural integrated development; The appearance of new urban agriculture typologies, such as facility agriculture and ecological agriculture; Increase in the degree of agricultural industrialisation. |
| Development of urban modern agriculture | 2009 - 2016 | Taking leisure agriculture and agritourism as entry points; Integrated development of the primary, secondary, and tertiary industries; Exploration of the multifunctionality of urban agriculture. |
| High-quality development of modern urban agriculture | 2017 - present | Integration of the urban modern agriculture development and rural revitalisation; Continuous adjustments of the strategies for the urban modern agriculture development; Aiming for transformation and upgrading of the urban agriculture industry. |

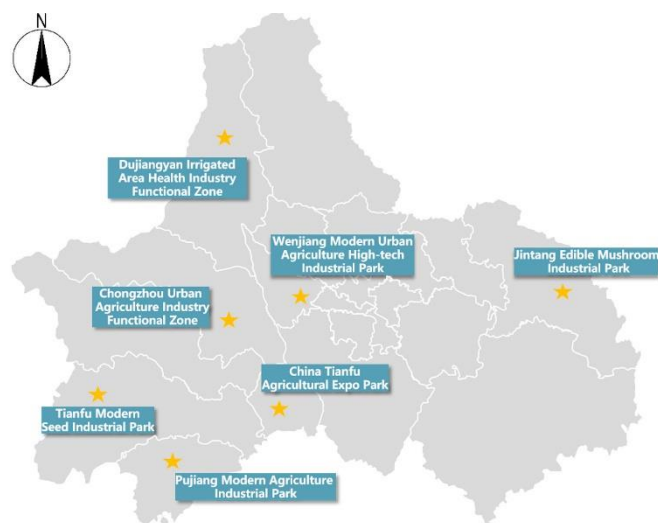
Resource from: "Assessment of Urban Agriculture for Evidence-Based Food Planning: A Case Study in Chengdu, China",

Sustainability, An Open Access Journal from MDPI, <https://www.mdpi.com/2071-1050/13/6/3234>

In Chengdu, urban agriculture expanded quickly and became a common practice in the third stage. New sectors have emerged, including tourism, creative agriculture, and leisure. The overall strategy of urban modernisation was released in 2009 with the Chengdu Modern Agricultural Plan (2008-2017), which defined agriculture by defining three concentric circles with distinct development priorities.

Urban agriculture in Chengdu has entered a phase of superior development since 2017. Six major industries, including deep processing of agricultural products, urban leisure agriculture, rural e-commerce, health, agricultural product logistics, and green planting, were identified in 2017 by the National Central Urban Industrial Development Conference as potential outcomes of modern urban agriculture in Chengdu. These industries demonstrate the high-quality outcomes and added value of urban agriculture. Currently, Chengdu's urban agriculture plan has undergone constant improvement to better align with the national rural revitalisation strategy and the urban high-quality development strategy and effectively change and upgrade the farming sector.

3. The long-term development of modern urban agriculture embedded in Chengdu with a good foundation in natural and socio-economic resources can promote urban-rural linkage and urban sustainability, so to promote the development of industries that guarantee supply and prosperity, the Chengdu Municipal Government has established seven urban modern agricultural functional zones.

Figure 65: The spatial distribution of urban modern agricultural functional areas in Chengdu

This resource is from "Assessment of Urban Agriculture for Evidence-Based Food Planning: A Case Study in Chengdu, China" in Sustainability, an Open-Access Journal, <https://www.mdpi.com/2071-1050/13/6/3234>.

Table 11: Information about Chengdu's seven urban modern agricultural functional zones

| Functional Zones | Location | Main Functions | Main Practices and Outputs |
|---|-------------------|--|--|
| China Tianfu Agricultural Expo Park | Xinjin District | Agricultural expo; Agritourism; | The “administrative committee + investment corporation + cooperative” management system; Organisation of dozens of conferences and festivals; Launch of 25 agritourism projects. |
| Dujiangyan Irrigated Area Health Industry Functional Zone | Dujiangyan city | Ecological agriculture; Health tourism industries; Agricultural heritage; Ecosystem preservation; | Preservation and demonstration of the Linpan, a traditional agricultural system in Sichuan province; The gross output value of agriculture is 1.92 billion yuan; Visitors to agritourism reached 3,600,000 person-time, and income reached 720 million yuan. |
| Wenjiang Modern Urban Agriculture High-tech Industrial Park | Wenjiang District | R and D of advanced agricultural technology; Cultural and creative industries. | Two National Key Laboratories; 21 Provincial Key Laboratories; Launch of a series of health projects; Construction of 65 km of greenbelt and 13 high-level scenic spots and gardens. |
| Tianfu Modern Seed Industrial Park | Qionglai city | Seed industry; Cereal and oil production; | Seed Testing Center; Seed Science and Innovation Center; Key Platform covering research, production, promotion, and services. |

| | | | |
|--|----------------|--|--|
| Chongzhou Urban Agriculture Industry Functional Zone | Chongzhou city | Cereal and oil production High-tech farming system and industrial chain development; Agritourism; | 100,000 mu of “rice+” industrial base; 1000 mu of food processing plant; Tianfu Elite Rice operation platform; Construction of the Rice Davos Town; Four Bases for Innovation and Entrepreneurship; 9.2 billion yuan of investment in agritourism projects. |
| Jintang Edible Mushroom Industrial Park | Jintang County | Edible mushroom production; Agricultural product deep-processing. | More than 7500 mu of mushroom field; Two leading municipal enterprises Whole industrial chain development covering R&D, production, deep processing, logistics, and marketing. |
| Jintang Edible Mushroom Industrial Park | Pujiang County | Fruit industries; Agricultural R and D, Cold chain storage and logistics; E-commerce; Agritourism; | 240,000 mu of citrus and kiwi fruits; The gross output value of 2019 reached 9.74 billion yuan; Two fruit brands ranking in the top 50 in Chinese regional brand value; 100,000 tons of fruit air-conditioning storage room 4791 e-commerce entities. |

This resource is from "Assessment of Urban Agriculture for Evidence-Based Food Planning: A Case Study in Chengdu, China" in Sustainability, an Open-Access Journal, <https://www.mdpi.com/2071-1050/13/6/3234>.

Motivation

As can be seen from the chart above, the Chengdu municipal government has developed urban agriculture according to the size of the area by formulating corresponding policies to support the Chengdu area. Some have established an agritourism Expo Park in Tianfu District, near the central region; through this project, corresponding conferences and activities can be held to promote urban agriculture, and it also has an educational and leisure role in Wenjiang and Tianfu areas; the government will support the establishment of urban agriculture high-tech experimental bases to research urban agriculture output later. At the same time, Chengdu makes full use of limited arable land resources through intensive and efficient, green and ecological technical means to ensure the quantity and quality of urban agricultural product supply so that the proportion of pollution-free farm products continues to increase and the supply capacity of green and high-quality agricultural products continues to grow.

Challenges

The reason is that urban agriculture in Chengdu has just begun to develop, and there are still deficiencies in many aspects.

Due to the increase in urban population, the expansion of urban built-up areas, the number and scale of agricultural projects, etc., the land use structure needs to be constantly adjusted. Under the strict control of "non-agriculture" and "non-grain", urban agriculture projects' expansion and extension space is limited to a certain extent.

There is a lack of unified and standardised urban agriculture management norms and standards. The standards for high-quality and high-quality agricultural products in the market are not uniform, the industry's specific high-standard assessment indicators are not clear, the regulatory standards are not clear, and some projects have the phenomenon of "playing on the edges" and not strictly supervising. A particular gap exists between actual agricultural products and high-end, high-quality agricultural products. Consistency of the exact quality of farm products and brand marketing and publicity content needs to be strengthened, and the standardisation of agricultural management in the suburbs of Chengdu needs to be further improved.

The quality traceability technology of agricultural products is not perfect, the traceability of agricultural products of existing agricultural projects in Chengdu is uneven, the quality assurance of agricultural products produced by most agricultural projects is still insufficient, and the fertilisers, pesticides, and feed and veterinary drugs used in animal husbandry still lack a perfect safety management mechanism. In addition to agricultural production technology, there is also urban agriculture building construction technology; urban agriculture also needs urban green building design and construction technology to improve gradually.

1.8 The Impact of Urbanization on Urban Agriculture in China

Based on population, agriculture, economy, and transportation from 2001 to 2012. Specifically, the total population, agricultural output value, arable land area, total freight transport, total power of agricultural machinery, fertiliser use, per capita road area, and railway-air cargo volume at the end of the year are all from the China Urban Statistical Yearbook. Residents' per capita food consumption comes from the China Regional Economic Statistical Yearbook. Global nighttime illumination data comes from weather satellites owned by the Defense Meteorological Satellite Program (DMSP). The National Oceanic and Atmospheric Administration (NOAA) and the National Geophysical Data Center (NGDC) processed the raw data obtained and built a database (<https://ngdc.noaa.gov>) for free public release. Stable lighting data from

2001 to 2012 were selected. The study reduced all economic variables based on the CPI index, with a base period of 2000. In addition, the sample in this study was all provincial capitals in China, and Lhasa was excluded due to a significant lack of data.

Core explanatory variable

This core explanatory variable is urbanisation. Commonly used indicators of urbanisation include primary and composite indicators. Urbanisation is a relatively complex process. This includes many aspects of social, demographic, spatial, and economic transformation. In this study, we look at the urbanisation of cities from the perspective that geospatial models complement traditional quantitative and qualitative research methods in terms of data timeliness, spatial analysis, and data processing. Because the data eliminates clouds, forest fires, noise, and auroras, it objectively reflects the city's economic activity before it is released. However, the measured light data differs due to the different satellite data observed. Therefore, the light data that is directly extracted cannot be used directly. According to the study of Liu et al. (2011), the lighting data was corrected during the original year.

Control variable

The high-quality development of UA is inseparable from the improvement and development of urban infrastructure. However, infrastructure includes transportation, postal and telecommunications, water and electricity, business services, etc. Most of these factors only affect the public lives of urban dwellers and are challenging to measure. In general, the investment in agricultural fixed assets in cities reflects infrastructure construction to a certain extent. The impact of investments on UA was also confirmed by the province of Srivastava (1986). Investment in fixed assets increases agricultural production efficiency while increasing infrastructure and agrarian production conditions (Antle et al., 1983; podŃ et al., 2001), affecting farmers' incomes. This study selected the per capita fixed asset investment index as the control variable.

The advancement of science and technology inevitably accompanies the industrialisation of cities, and many industrial jobs effectively attract and transfer rural surplus labour. Industrialisation not only creates technical conditions for urban agricultural construction but also improves the level of urban agricultural modernisation, makes the division of labour in urban agriculture more professional, optimises the structure of agricultural production, and selects per capita industrial added value as the control variable of industrialisation.

Arable land area per capita (land). For now, though, the output of UA is diversified. As cities grow, most cities gradually abandon some of their arable lands in favour of—the development of non-agricultural projects. However, cultivating high-value and local

speciality crops has improved with the spread of high-yield and efficient agricultural techniques. For example, many cities have changed their tradition of transforming food crops into high-value crops such as fruits or flowers. Therefore, the area of arable land still increases the added value of agriculture to some extent. This study was conducted on the per capita arable land area in cities.

Transportation will constrain rural development. Due to the absence of vehicles during harvest, crops remain unharvested or spoiled after harvest (Ahmed and Rustagi, 1987). The mode of transport used, the length and duration of the journey, and the cost of transport all affect the efficiency of the marketing system and thus agricultural output (Patrick, 2007), and Rabirou et al. (2012) also emphasise the importance of transport capacity in determining the development of urban agriculture. Low transport capacity in developing countries may distort resource allocation among geographically dispersed production units within and between agricultural and non-agricultural sectors (Adamopolos, 2011; Mcphee, 1996). Therefore, transportation capacity can be considered another factor in agriculture.

Leisure and entertainment (leisure). Uric acid pays attention to agricultural production capacity and plays the tourism functions of agricultural leisure, experience agriculture, vacation, and so on. Agriculture is considered a fragile industry with low economic efficiency and vulnerability to traditional aspects of natural and market risks. The development of agriculture has changed its weak position. UA is based on agro-ecological landscape, characteristic industry, agricultural culture, agricultural civilisation, economic potential, and industries with substantial employment effects, aiming to meet the needs of urban residents in sightseeing, tasting, leisure, adventure, entertainment, participation, experience, shopping, vacation, etc. (Orsini, F et al., 2013).

UA can provide some food security for urban dwellers. It is more pronounced in cases of force majeure. Emergencies, such as wars, earthquakes, floods, and plagues, can cause temporary traffic jams, interruptions or even traffic blockades in a particular area, resulting in the isolation of external substances. In this case, in a closed system, people's primary food supply may depend only on local agriculture (Zezza, A., & Tasciotti, L. 2010).

Agricultural machinery power per capita (Mach) and fertiliser per capita. The right amount of machinery can optimise land yield and increase agricultural efficiency.

Electricity and fertilisers are often chosen. Contemporary economic theory suggests that agricultural machinery and fertilisers are essential inputs in the production process, which impacts agricultural production (Jorgensen 2008, Kekendall Carvalho, 2006). Therefore, consider controlling the total mechanical power and fertiliser usage per capita.

As cities expand, they will continue attracting capital investment in technological advancements, impacting UA's development. Urbanisation has promoted industrialisation and improved the production and living conditions of farmers. The development of industrialisation and mechanisation saves a lot of labour while improving urban agricultural production technology. In addition, with the improvement of infrastructure, such as high-speed rail and highways, trade and tourism between cities have become more frequent. For example, tourism will drive the development of various UA industries in the town, including leisure agriculture, folk culture, handicrafts, and trade characteristics with local products closely related to local UA. It can improve the level of Pusa in the city and bring culture and products with UA characteristics to different towns for further exchange and development.

The higher the level of urbanisation, the higher the development of UA, demonstrating the correlation between universal access to services in space and urbanisation. Based on urbanisation can be measured by night light; the highest level of urbanisation is concentrated in the southeast coastal cities, indicating more than in high-income cities. The degree of urbanisation is higher than that of low-income towns. One of the critical signs of urbanisation is the transfer of agricultural to non-agricultural populations. The increase in urban agriculture GDP may be directly attributable to the city's solid demand. In summary, the geographic agglomeration of UA is essential to our map, and urban agriculture growth appears to be associated with economic-related developments and impacts of urbanisation.

While UA provides more leisure services and ecological protection for cities, it will also attract urban migrants and promote urbanisation. In addition, urbanisation has attracted many rural labourers, and the number of workers per person has dramatically increased the cultivated land area of the remaining agricultural population, providing the possibility for the intensive development of agricultural production. However, inclusive benefits in surrounding cities have significantly negatively impacted inclusive benefits in local towns.

There is a significant spatial correlation between UA in China, indicating that the development of UA is not random and independent but is influenced by adjacent regions. Industrialisation, convenient transportation, and arable land have contributed to the development of local UA. When many peasants become new urban residents, the residents who continue to engage in agricultural production in the cities will gradually transform traditional agriculture into high-value-added urban access. Modern agricultural operations have been realised through intensive and large-scale operations. Peripheral cities will also bring spatial spillovers to the local area UA, which, in a particular town, is not isolated; it has a specific relationship with neighbouring cities, showing geographical correlation and spillover characteristics. When UA increases in the surrounding area, the local production factors or talents will be absorbed, resulting

in a decline in local UA. But yes, the proximity of surrounding cities positively impacts local UA. Reducing transportation costs between towns and cities and breaking down economic divisions will help achieve coordinated UA impacts through radiation. To fully use the complementary advantages of space coordination, it is necessary to rationally guide the layout of the urban agriculture industry and then cultivate and establish brands of urban agricultural products with local and regional characteristics. There is a need to break down the isolation of local governments and develop more comprehensive global UA policies, such as strengthening infrastructure and removing barriers between different market regions. In addition, we must promote the interaction between regional economy and urbanisation, enhance the circulation of economic factors, and establish an integrated market for urban agricultural products and services.

1.9 Comparison of the policies and measures for implementing urban agriculture in three cities

| | Beijing | Shanghai | Chengdu |
|--------------|---|---|--|
| Local Policy | Urban agriculture still starts in the countryside and strives to promote it to drive rural economic development. At the same time, urban leisure agriculture is also used to provide tourists with rest. Regarding urban spatial structure, urban agriculture has no relevant policies yet. | In the latest "Urban Master Plan (2017-2035)," Shanghai proposes achieving 2.82 million acres of cultivated land by 2020, 1.8 million acres by 2035, and 1.8 million acres by 2050. Land ownership remains stable. Stabilise the primary production areas of significant urban agricultural products such as grains and vegetables, reasonably ensure facilities and agricultural land, and promote the development of modern urban agriculture. In terms of space, strengthen the spatial sharing and intensive use of agricultural land resources, promote the complementary and coordinated development of different types of agricultural | Urban agriculture is developing rapidly and is widely used in Chengdu. New industries such as leisure, tourism, and creative agriculture have emerged in large numbers. The "Chengdu Modern Agriculture Plan (2008-2017)" announced the overall urban modernisation strategy and clarified the concentric circles of three different development focuses of agriculture. In 2017, the National Central Urban Industrial Development Conference determined that Chengdu's modern agriculture can be cultivated the six major industries, namely deep processing of agricultural products, urban leisure |

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| | | production through the development of combined planting and breeding, understory economy, three-dimensional breeding and other production methods, and strengthen the construction of farmland and forest networks. | agriculture, rural e-commerce, comprehensive health, agricultural product logistics, and green planting, mark the high-quality results and added value of urban agriculture. |
| Government Measures | A comprehensive evaluation and standardised treatment of the multifunctionality of urban agriculture in 13 counties in Beijing were conducted. Through the comprehensive scores of horizontal and vertical comparative analysis, the urban agriculture in 13 agricultural suburbs in Beijing was divided into three functional areas according to their different advantageous functions. Suburban Social Service Area: It covers three areas: Haidian, Chaoyang, and Fengtai. Due to its capital status and high level of urbanisation, Beijing is a pilot city for PUA development in China. | For agricultural space, Shanghai hopes to determine the scope of farmland, proposes to optimise the "three major spaces" of urban ecology, agriculture, and cities, promotes the composite utilisation of space, and establishes "four ecological protection red lines, permanent basic farmland protection red lines, urban development boundaries, and cultural protection control lines". "line" management and control system. Strictly abide by environmental space's ecological protection red lines and actively promote environmental protection and ecological construction. Persist in protecting permanent bare farmland within agricultural space, promote the concentration of permanent bare farmland into blocks, and support the development of modern agriculture. | The Chengdu Municipal Government has established seven modern urban agricultural functional zones based on sound natural and socio-economic resources to promote urban-rural linkage, sustainable urban development, and industrial development that ensures supply and prosperity. |

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| Difficulties | Obstacles posed by land use regulations. PUA resorts require land to build facilities in rural areas on the city's outskirts, which are not necessarily designated as built-up areas. | In Shanghai, thousands of citizens prefer to participate in park activities. In addition, Shanghai's green space is limited, with only 40 parks. The total amount of green space available per capita is 1.15 square meters, far lower than China's average of 4 square meters, let alone the world average of 50 square meters. | <ol style="list-style-type: none"> 1. Under the strict control of "non-agricultural" and "non-grain", urban agriculture projects' expansion and extension space is restricted to a certain extent. 2. There is a lack of unified and standardised urban agriculture management regulations and standards. 3. The quality traceability technology of agricultural products is imperfect. |
|--------------|---|--|--|

Regarding policy, Beijing, the capital, should start from rural development and combine urban agricultural purchasing with agricultural development in surrounding suburbs. Shanghai must begin as a whole to increase food supply; Chengdu can set up three circles to develop the economy from all aspects of agriculture. However, all urban limits are subject to urban land ownership and economic measures in power.

Chapter 3: Urban Agriculture that Extends from Cities to Suburbs

1. Current situation of urban agriculture in China

Until now, urban development and the use of urban areas are very saturated, and the current situation is very scarce for areas that can be used by urban agriculture and can only be reused in abandoned areas or small and medium-sized plots in cities, such as experimental land for schools—roof garden. The supply of urban agriculture will not be enough for the future, so China's cities continue to expand rapidly. Large tracts of agricultural land and its associated villages have been absorbed into urban areas. China's urbanisation rate has reportedly increased from 26% in 1990 to 37% in 2000 and is expected to reach 60% by 2020 (National Population Development Strategy Research Group, 2007). Thus, between 1990 and 2000, about 960 square kilometres of land were converted into built-up areas each year (Ministry of Integrated Finance and Ministry of Construction of China, 2004). While urbanisation is almost inevitable from an economic point of view, the development will lead to access to developable land at

a higher price than agriculture; urban and rural planners should be concerned about such development's social and environmental costs. Of course, there is also a critical need to maintain adequate and sustainable food supplies. In addition, access to open space, including various forms of extensive agriculture, is recognised as a high-value characteristic of quality urban areas (Bengston, Fletcher & Nelson, 2004; Stoms, Jantz, Davis and DeAngelo, 2009). The development of urban agriculture in China is relatively late, still in its infancy, mainly concentrated in "super first-tier" and "new first-tier" cities and their surrounding areas. The food production function of cities has not received enough attention (Yang Qichang, *Using Urban Agriculture as a Carrier to Promote the Integrated Development of Urban and Rural Areas*, 2022).

PwC's Strategy redefines the concept of urban agriculture; that is, it refers to the multi-functional agricultural form developed in urban areas or urban-rural border areas, providing urban residents with daily agricultural and sideline products and an excellent ecological environment, involving the production of agricultural production materials, agrarian product production, processing, circulation, and value-added services (such as tourism, shopping, entertainment, culture, and other leisure activities), embedded in the entire agricultural industry chain in all aspects of urban life. For cities, using limited farm resources to develop modern urban agriculture optimises production and improves economic efficiency and ecological and life services. Urban agriculture upgrades the traditional agricultural model with modern business models and science and technology, making production organisations more diversified and functioning beyond agrarian production. At the same time, urban agriculture emphasises "from city to city", making full use of modern science and technology and modern industrial achievements and exploring more agricultural technologies and products suitable for urban life.

- The interview with Leonardo Ramondetti: Learn about the development of urban agriculture in cities and towns after urban expansion in the Central Plains.

Chinese cities are spreading to surrounding towns, and urban agriculture is reflected in urban agricultural tourism, such as Chengdu. There are also towns like Professor Leonardo Ramondetti's «The Enriched Field: Urbanising the Central Plains», which rebuilt towns for agricultural production, replanned towns, and designed international agrarian parks. So, I had an interview with Professor Leonardo Ramondetti about several cities in the Central Plains that he had reconstructed on his field trips in China and how urban agriculture radiated to the city's outskirts.

Professor Ramondetti conducted a field trip to the province and city of Henan, central China. In the past 25 years, real estate investment in Henan has grown from 500 million RMB to 709 billion RMB because of the expansion of the city and the growth of the population, and in 2010, this change was mainly in the urban fringes and new towns. Four forms of settlement were identified in towns around the city: traditional

agricultural villages, modern agricultural villages, new agricultural towns, and real estate compounds.

Regarding the development of urban agriculture, the Zhongmu County Government has adopted agricultural modernisation and urban agricultural tourism and established the Zhongmu National Agricultural Park. The government of Yanminghu Town, under Zhongmu County, invested 2.5 billion yuan in rural infrastructure projects and built an urban agricultural tourism park. In May 2015, the government held the Yanminghu Town Agricultural Planning Competition in the People's Republic of China, which cleared the land and moved the local population into the new agricultural town so that the combination of agricultural park, environmental zone, and urban agricultural tourism area of Yanminghu Town increased agricultural production.

PART 3 CONCLUSION

1. The outcomes of this study

Urban agriculture refers to an ecological agricultural system with a multi-functional, high-tech, highly industrialised and market-oriented ecological agricultural system with a particular ecological spatial pattern within the geographical scope of urban space (including functional radiation area), with sustainable development as the core, reflecting the integration of urban and rural areas, serving urban functions, and having a specific ecological spatial pattern. It is the inevitable result of industrialisation and urbanisation; It can provide society with a means of production and living and effectively coordinate the relationship between city and nature, urban man and nature, so that people can enjoy the convenience of urban life and the fun of returning to nature. Urban agriculture has different definitions of existence in other countries and regions worldwide. Still, they are all aimed at sustainable development, driving the supply and demand economy within the city, enriching the spiritual life of the people living in the surrounding areas of the city and developing a harmonious community. With the world's increasing population, the industrial regions' economic development, and the urbanisation process have led to a shortage of agricultural land, growing efforts to expand farmland and maximise urban idle land for urban agriculture are necessary.

In the urban interior of urban agriculture, land use is mainly community gardens, roof gardens, corner farms, and other forms of urban agriculture. The primary purpose is also to make a living. Urban agriculture, because of its solid agricultural scientific and technological strength, represents the region's highest level of agricultural development, so it is the radiation source of agricultural technology in the area. At the same time, through the construction of agricultural science and technology parks, the adjustment and optimisation of regional agricultural structures will be realised, and farmers' income

will be increased. It improves the ecological environment of urban agriculture areas and enables young people in the community to learn about agriculture.

Urban agriculture has changed from theory to practice over the centuries, from the 19th century, Howard's pastoral city, Corbusier's city of tomorrow, Wright's life city in the theoretical study of urban agriculture, to the First World War and the Second World War, urban agriculture during this period developed according to war. Both during the First and Second World Wars, many city dwellers suffered from famine, which led directly to a movement to improve local food, and the most effective solution was urban farming. Since the late twenties, the mass unemployment of urban dwellers led to a brief revival of urban agronomic gardens characterised by self-sufficiency. Since the seventies of the twentieth century, the environmental crisis has begun with local organisations and social activists calling for creating and introducing more urban open spaces, hence the development of urban agriculture. The concept of sustainability was proposed at the Rio Earth Summit in 1992 and was later used as a warning of the growing environmental crisis for developing countries; urban agriculture is only driven by economic demand, while in developed countries, it emphasises its social, leisure and ecological protection functions.

China itself is a predominantly agricultural country; in the Han Dynasty, the emperor personally cultivated the fields and held solemn field ceremonies; by the pre-Qin era, agriculture-based heavy agriculture ideas were ingrained entirely in China. Ancient Chinese urban agriculture refers to the agricultural production activities managed by urban residents located in, above or around the city walls; urban agriculture has accompanied the entire feudal dynasty, not only to supplement the food supply of urban residents but also for scientific research and education or political needs. Family-based urban agriculture has been prevalent since the nineties of the twentieth century, and urban agriculture for experimental purposes is still used. Urban farming types such as balcony farming, rooftop farming, home-grown farming, and school farming have also begun to appear in China's large and small cities.





On the theoretical side, the integration of agriculture into urban spaces as a landscape of continuous production was introduced in 2005, a complete approach to integrating agriculture and urban design for the first time. From the perspective of urban space, roofs, balconies, walls, window sills, and interior decoration can be selectively used for agriculture according to the nature of the building and the characteristics of the space. In China, "balcony agriculture" has also emerged. In addition to the use of these small architectural spaces, there are vertical farms, leasable farms, agricultural communities, as well as agricultural parks, tourist farms,






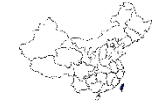
All these urban constructions related to urban agriculture need to be supported by national laws and policies. According to the International Resource Group policy





guidance, urban agriculture is defined as agri-food production within urban administrative boundaries and in peri-urban areas around urban population centres, according to literature from both developed and developing countries. In Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on the support of rural development by the European Agricultural Fund for Rural Development (EAFRD), and Council Regulation (EC) No 1698/2005 on Article 35, (k) "Diversification of agricultural activities, activities relating to health care, social integration, community-supported agriculture, and environmental and food education. In addition, some practical cases and theoretical planning of roof agriculture, balcony agriculture, vertical farm, community farm, urban farm and China have been studied, which can also prove that China has a specific role in urban agriculture practice according to its own development and national conditions.





2. The application of urban agriculture in inner space



Table 12: Summarize case studies in inner space in urban agriculture in different cities and countries

| URBAN FRAGMENTATION COMBINED WITH AGRICULTURE | | | | |
|---|--|---|--|---|
| Project | Region | Project Brief Introduction | Urban Agriculture | Sustainable measures |
| <p>Jintai Village Reconstruction</p>  <p>John Lin, Joshua Bolchove</p> |  <p>Bazhong, Sichuan Province, China</p> | <ol style="list-style-type: none"> 1. The area hardest hit by the Wenchuan Earthquake on May 12, 2008; 2. Offer four types of houses, varying in size, function, biogas technology and accommodation for pigs and chickens. | <p>Individual family-owned workshops are allowed in open areas above ground, while rooftops support family-owned farmland.</p> | <ul style="list-style-type: none"> -New uses for local materials. -Wastewater treatment -Ecological cycles |
| <p>Green Cloud Roof of South Garden</p>  <p>Eleven Buildings</p> |  <p>Shenzhen, Guangdong Province, China</p> | <ol style="list-style-type: none"> 1. The project is "2021 Nanshan Gardens Jointly Built", led by the Nanshan District Government. 2. Create an open space on the roof of a 6-storey apartment to create an urban oasis. | <p>It creates a 450-square-meter garden with surrounding flower beds, farms, and a partially shaded activity plaza.</p> | <ul style="list-style-type: none"> -Low carbon -Hold community activities for young people |



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| <p>Nature Discovery Park</p>  <p>LAAB Architects</p> |  <p>Hongkong, China</p> | <ol style="list-style-type: none"> 1. It is located on the rooftop of Hong Kong's K11MUSEA Humanities Art Museum. 2. The spatial design promotes the coexistence of people, nature and the urban environment through ecotourism and educational projects on biodiversity and sustainability. | <p>Establishing hydroponic nursery greenhouses on the rooftop and farms in front of the greenhouses provide urban farming opportunities for city dwellers.</p> | <ul style="list-style-type: none"> -Biodiversity -Urban environment through -Ecotourism -Coexistence of people, nature |
| <p>Planter Box House</p>  <p>Formzero</p> |  <p>Kuala Lumpur, Malaysia</p> | <ol style="list-style-type: none"> 1. This project is in Kuala Lumpur, Malaysia, built by architect FORMZERO in 2017—total room size 340 m². | <p>The house's cascading concrete planters hold over 40 edible plants on each level.</p> | <ul style="list-style-type: none"> - A customised irrigation system -Store and recycle nutrient resources and rainwater within the land. -Recessed façade provides additional public space for neighbourhood interaction. |
| <p>Xinhua Fruit And Vegetable Market</p>  <p>MVRDV</p> |  <p>Tainan, Taiwan Province, China</p> | <ol style="list-style-type: none"> 1. It is located in eastern Tainan, between the city and the mountains, close to Highway 3 and public transportation connections. 2. MVRDV and LLJ Architects completed the design of the Tainan Xinhua Fruit and Vegetable Market. Construction is progressing orderly and is expected to be finished by the end of 2020. | <p>A simple four-story structure contains the market's administrative offices, restaurants, and an exhibition centre showcasing the region's produce.</p> <p>Grow a variety of crops on the retreat roof. Sheltered spaces, benches and picnic tables are set up on the roof.</p> | <p>The roof structure adopts a lightweight growth medium, water retention mineral, filter membrane, plastic water drainage panel, protection membrane, PVC root barrier with insulation, and reinforced fabric. The floor finish is an L-shape perforated profile.</p> |
| INDEPENDENT ESTABLISHED FARMS AROUND THE CITY | | | | |
| Project | Region | Project Brief Introduction | Urban Agriculture | Sustainable measures |


| | | | | |
|---|--|---|--|--|
| <p>Lafayette Green</p>  <p>Kenneth Weikal Landscape Architecture</p> |  <p>Farmington Hills, MI, The United State</p> | <ol style="list-style-type: none"> 1. City Farm appeared in a plaza somewhere in downtown Detroit. The 0.425-acre garden fills the depressing vacancy of the Lafayette Building, which was demolished in 2010. 2. To accommodate the 4-foot grade change across the site, vegetable beds rise from the ground along 70-foot-long planters, with bed heights ranging from 8 to 40 inches. | <p>Tangible and functional vegetable gardens effectively express their charm in public spaces. The demolished places of the city were re-established as urban agriculture.</p> | <ul style="list-style-type: none"> -Stormwater Management -Water use -Material Reuse organic -Efficient farming methods -Urban Biodiversity -Education & Community |
| <p>Skyfarm</p>  <p>VRAP</p> |  <p>Shenzhen, Guangdong Province, China</p> | <ol style="list-style-type: none"> 1. A 400-square-meter sky farm with the same amount was built in Nantou Village, Shenzhen. About 10% of Shenzhen is an urban village, home to nearly 50% of the urban population. Shenzhen's urban villages are another form of urban space. 2. Since the end of 2015, VRAP has been applying the concept of "Agricultural Construction" to micro-projects, namely "Agricultural Inclusive | <p>It is built on a 400-square-meter sky farm in Nantou Village, Shenzhen. Sky Farm is an "agricultural installation" integrating rainwater harvesting, urban agriculture, and community building.</p> | <ul style="list-style-type: none"> -Aquaponics -Mobile farm -Common building materials PVC |




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| | | Urbanization", as a means of urban renewal. The sky farm is an iterative product of the new urban village economy. | | |
| <p>Nature Urbain</p>  <p>Agripolis</p> |  <p>Paris, France</p> | <ol style="list-style-type: none"> 1. The organic farm will have 30 different species of plants, tended by 20 gardeners, and should produce 1,000 kilograms of fruits and vegetables per day during the summer. 2. Nature Urbaine occupies the roof of Pavilion 6 of the Expo Porte de Versailles in Paris, ultimately occupying 14,000 square meters (the equivalent of two football pitches). | <p>The farm has more than 4,500 square meters of operating production area, with 696 columns and 1,428 cultivation troughs.</p> | <ul style="list-style-type: none"> -Use cutting-edge vertical growing methods, including hydroponics and aeroponics -Circulates water and nutrients in a completely closed loop -Reduced water consumption and no urban pollution - At the same time, a restaurant will be established to realise the direct cash flow of agricultural products. |
| <p>Greenhouse House</p>  <p>BIAS Architect</p> |  <p>Taoyuan, Taiwan Province, China</p> | <ol style="list-style-type: none"> 1. People and spaces are organised according to climate zones, and greenhouse building materials and structures are arranged to separate climate zones. At the same time, the distribution of water and energy flows is technically managed. The roof is covered with various | <p>The experimental urban farm of "Greenhouse as Home" builds ferns, fungi, agricultural planting areas, sun gardens, and farm restaurants according to climate zones, achieving zero distance from farm products to the table.</p> | <ul style="list-style-type: none"> - Distribute plants and plant species according to climate zone. - Different combinations of plastic films and agricultural gauze are draped on the roof to regulate lighting and solar radiation. -The context of rural agricultural development and contemporary lifestyles. It boldly integrates a high-power greenhouse environment with urban life through space design and event planning. |

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| | | combinations of agricultural gauze and plastic film to control lighting and solar radiation. | | |
| <p>Coro Field</p>  <p>Integrated Field Co.Ltd.</p> |  <p>Suan Phueng, Ratchaburi, Thailand,</p> | <p>1. The project's first phase naturally occupies the edge of the land bordering the city. Vegetables, fruits, and various crops are scattered in the neat and orderly park, creating an idyllic scenery. In the adjoining building, home-grown produce from the land is displayed.</p> | <p>Vegetables, melons, fruits, and various crops are planted on the edges of the land adjacent to the city. The adjoining buildings display agricultural products produced and sold on the land.</p> | <ul style="list-style-type: none"> -Using wood modular and modular furniture. -Removable membrane sheets. -Creates plantation drainage visual approach. |

URBAN AGRICULTURE COMBINES ECO-CITIES AND SUSTAINABLE DEVELOPMENT

| Project | Region | Project Brief Introduction | Urban Agriculture | Sustainable measures |
|---|--|--|--|---|
| <p>Pasona 02</p>  <p>Konodesigns</p> |  <p>Chiyoda, Tokyo, Japan</p> | <p>1. Pasona O2, led by Tokyo-based Japanese recruitment firm Pasona, showcases a new innovative urban farming concept in a 1,000-square-meter underground farmland space at Otemachi's headquarters.</p> <p>2. The farm building has approximately 4,000 square meters of green space with more than 200 different types of plants, vegetables, and fruits, including</p> | <p>Tomatoes hang from the conference room ceilings, rice fields are planted in the lobby, and flowers and orange trees cover the building's vast exterior. Employees contribute to the Farm to Office Table program. They work with the management team to maintain, collect and prepare produce for the</p> | <ul style="list-style-type: none"> - Artificial light from computer-controlled diodes, light-emitting diodes, metal halide lamps, and sodium vapour lamps. - Hydroponics -The office area is a complete indoor ecosystem. -Automatic irrigation system, HEFL, fluorescent and LED lighting. |

| | | | | |
|--|------------|--|---|---|
| | | lemons, broccoli, salad greens, berries, squash, eggplant and passion fruit. | on-site cafeteria. | |
| <p>The Farmhouse</p>  <p>Studio Precht</p> | Conceptual | <ol style="list-style-type: none"> 1. A-frame housing modules composed of cross-laminated timber (CLT) and prefabricated will be stacked throughout the structure to create flexible living areas. Prefabricated. 2. By re-establishing the connection between architecture and agriculture and transforming it. | <p>Vertical farms can increase crop yields per unit of planting area. The indoor climate of the greenhouse protects the food from different weather conditions, and a large amount of heat already generated by the building can be reused to grow plants such as potatoes, nuts or beans. A water treatment system filters rainwater and greywater and replenishes and recycles them in the greenhouse. Food waste can be collected on-site in the building's basement, turned into compost, and reused to grow more food.</p> | <ul style="list-style-type: none"> - The farmhouse operates on an organic life cycle. The heat generated during the growing process provides the heat needed for the next crop. -A water treatment system filters rainwater and greywater, replenishes and recycles them into the greenhouse. -Food waste can be collected on-site in the building's basement, turned into compost, and reused to grow more food. -Using CLT materials, the greenhouse gases produced during the manufacturing process are low, and its overall environmental footprint is lighter. - Consisting of a fully modular building system. |
| | | 1. This development is part of PenPlace's plan to think and | Set within indoor gardens and greenery in nearby | - Committed to providing 100% renewable energy for HQ2 operations |

| | | | | |
|--|--|--|---|---|
| <p>Amazon Arlington</p>  <p>NBBJ</p> |  <p>Arlington, Virginia, USA-New Headquarters</p> | <p>innovate sustainable technologies when building HQ2 to help guide the industry towards net zero emissions Aligned with Amazon's commitment to achieve net zero carbon across its operations by 2040.</p> | <p>areas, the spiral “climb” will allow employees and visitors to ascend the building’s exterior.</p> | <p>through off-site and on-site solar projects.</p> <ul style="list-style-type: none"> - Work towards achieving LEED Platinum certification. - Designed climate-responsive elements. - More than 125 electric vehicle charging stations available. - Using small flow devices and using recycled water. - Opportunity to design a warm, friendly and well-connected community. |
| <p>Socio- Technical City</p>  <p>UNStudio</p> | <p>Research programme</p> | <p>1. Sociotechnical cities bridge the gap between infrastructure and technology on the one hand, and quality of life and social well-being on the other. The gateway model is based on the idea that interaction is a necessary condition for innovation. Portals form catalysts for meetings; they connect communities and people, thereby forming a hotbed of innovation.</p> | | <ul style="list-style-type: none"> -Biopolus water treatment. -Recycling-climate adaptation |

(The author organized it based on the first point of chapter 3)

Conduct research based on the location of urban agricultural farms in China and worldwide.

Responsible farmland is adopted in Shenzhen in places like rooftops, combined with urban agriculture. Residents can rent a piece of farmland and adopt more sustainable methods such as ecological cycle and wastewater treatment. At the same time, they use the house's roof to build a harmonious environment. Sustainable communities.

Establish small urban natural environments and small biodiversity parks on the rooftops of Hong Kong's Nature Discovery Park.

In urban areas, abandoned urban areas will be used to re-establish urban agriculture according to the terrain. For example, in the Farmington Hills of Michigan, local recyclable materials, natural water resources and agricultural methods will be used to establish urban biodiversity. In Shenzhen, a mobile farm of "coexistence of fish and vegetables" is established within the community. The crops are placed on a grid established by PVC, and the rainwater flowing down can provide a life for fish, as an iterative product of the new urban village economy. Established in Taoyuan, the temperature zone provides nutrients for ferns and fungi, while also achieving zero distance from agricultural products to the table.

In terms of an entire building or an entire city, Japan is now building a self-sufficient building in Tokyo for employees to farm, including more than 200 kinds of plants and vegetables, using an Automatic irrigation system, HEFL, and fluorescent and LED lighting technology. To carry out urban agriculture, in the future, Studio Precht imagines that residential housing will be directly integrated with agriculture while extending out of the eco-city.

3. Urban Agriculture in China, which is the reference point

In China, a developing country, there are still some problems and challenges in generalising urban agriculture. China's environmental issues, weather change, water supply, space constraints, and soil quality will also challenge urban agriculture. At the same time, some government urban construction measures will also cause problems for residents in developing urban agriculture.

Legally, China's Ministry of Agriculture and Rural Affairs pointed out that urban agriculture must pay attention to economic functions, not only because economic functions are the main functions of urban agriculture but also because of the needs of China's national conditions. In addition, urban agriculture should not be widely practised in China at the moment because urban agriculture is essentially the agriculture of the future, representing the highest level of agricultural productivity in China. At this stage, there is still a lack of theoretical research on the scale of the city on which urban agriculture development needs to be based, the urban agricultural development mechanism, and what role the government and the market should play.

At the same time, due to China's large population and limited areas, the law emphasises that land use red lines and the future development of local land use types will restrict urban agriculture.

Urban agriculture meets the city's needs in many aspects, especially in productive, life, and ecological functions; it is a multi-functional agriculture. The development level is high. It is located in a large urban area, can be around the suburbs around the metropolitan area, or may also be embedded in the urban area.

In the current situation of urban agriculture in China, it is divided into two parts.

-The first part is for the existing areas within the city.

On December 19, 2019, the Ministry of Natural Resources, together with the Ministry of Agriculture and Rural Affairs, issued the "Notice on Issues Concerning the Management of Facility Agricultural Land" (from now on referred to as the "Notice") The "Notice" also elaborated on the relationship between facility agricultural land and bare farmland. Further improvements and breakthroughs have been made in land use, and the following new changes have emerged:

1. The internal agricultural structural adjustment scope shall include the facility's agricultural land.
2. Provision shall be made to use permanent bare farmland for some facilities.
3. Implement differentiated policies on the scale of land use.
4. Allow the construction of multi-storey buildings in breeding facilities.
5. Simplify the way of land acquisition.

On the premise of protecting cultivated land and making rational use of land, we should actively guide the development of facility agriculture and large-scale grain production. In constructing facilities, unused lands such as barren hills, barren slopes, tidal flats, and inefficient idle land should be used as much as possible, and no or less cultivated land should be occupied. Suppose it is essential to occupy cultivated land. In that case, we should try to occupy inferior cultivated land to avoid indiscriminate occupation of high-quality cultivated land and, at the same time, minimise the damage to the cultivated layer through engineering and technical measures such as soil stripping and utilisation of the grown layer.

-The second part is to urbanise the surrounding area and turn it into an agricultural town with Chinese characteristics.

Agricultural characteristic town refers to a comprehensive development project that relies on agricultural characteristic industries and characteristic environmental factors (such as regional, ecological, cultural, etc.) to create a precise agricultural industry positioning, agricultural cultural connotation, agricultural tourism characteristics and certain community functions. It is an agricultural and tourism complex that integrates industry and city, a dual chain of agriculture and tourism, and regional integration and development through modern agriculture + town. It is a new urbanisation model that

integrates tourist attractions, consumer industry clusters, and new urbanisation development areas and combines production and urban and rural areas.

The purpose of building an agricultural town with Chinese characteristics:

1. Actively promote the efficient ecological recycling agriculture model and strengthen the protection and restoration of agricultural ecology.
2. With the agricultural industry as the feature, supplemented by leisure agriculture and rural tourism, we will create a vibrant and livable urban and rural agricultural tourism community.
3. In the planning and construction, we should build a modern agricultural industrial system and form a new urban-rural integrated development model from the perspective of the integrated development of "production, ecology, culture and life".
4. From the spatial point of view, the original way of life is a system circle structure:
 - The first layer is the farmer business, including the catering, agricultural products and homestay methods provided by each farmer;
 - The second layer is a village-centred village living settlement;
 - The third layer is a broader mixed-use structure for rural resorts within a half-hour drive.

4. The outcomes of studies in different cities in China

According to the administrative division of districts and counties in China, the capital, Beijing, the municipality directly under the central government, Shanghai, and the provincial capital city, Chengdu (in the Table *Comparison of the policies and measures for implementing urban agriculture in three cities*, page.106), studying relevant political policies and practical results. Beijing, guided by the integrated development of urban and rural areas, adheres to the idea of combining rural sightseeing and leisure tourism with beautiful countryside and modern urban agricultural construction, promoting the transformation of rural tourism to specialisation, specialisation and standardisation, and cultivating rural tourism to become the backbone of Beijing's suburban industry and modern service industry that benefits urban people. Build rural areas into preferred leisure resorts and improve the happiness index of citizens. Shanghai has launched several projects to establish a modern and sustainable urban and peri-urban agricultural system, establish urban farmland in the suburbs, develop related agricultural technologies, provide job opportunities, ensure the ecological environment, and promote the cultivation of vegetables on roofs and balconies. Chengdu developed "flower arrangement" and "mosaic" landscape agriculture in the main urban area, promoting agricultural "successive", diversified growth of farmers, and ecological agriculture with mountainous and hilly characteristics. Focus on the development of high-quality and efficient agriculture in the plain areas of the "optimised development

zone" in the western part of the city, and build the form of urban and rural "field city"; focus on the development of ecological agriculture and rural tourism in the mountainous areas of the "two-belt eco-tourism development zone;" The central urban area of the exhibition area focuses on the development of leisure agriculture and agricultural service industries, creating an urban and rural form of "urban garden"; the hilly area of the eastern "expansion and development zone" focuses on the development of characteristic ecological agriculture and builds an urban and rural form of "urban-rural integration".

5. Final research and perspective for further research

Urban agriculture is also part of the progress of urban development, providing not only part of the food supply but also spiritual support and community interaction among those around the community. For China, this is a feasible policy for the future. For the time being, the focus of the policy can only be implemented on urban agricultural tourism and urban expansion in the Central Plains, as well as re-planning agricultural towns. For urban agriculture, in southern cities such as Beijing, Shanghai, and Chengdu, relatively saturated towns, they cannot refer to relevant successful cases at home and abroad. Around the city centre, the urban agricultural science and technology research area has been created, the urban-rural tourism area has been developed, and the local tourism resources are developed in combination with local agricultural products. In the Central Plains, urban sprawl blurred the boundaries of surrounding rural areas and re-engineered rustic towns and farming parks to provide food to the city. Urban agriculture is essential to urban development and belongs to China's sustainable development. It can improve the entire urban space system, add green vitality, provide healthier food, promote social relations, and improve people's emotional value.

Of course, urban agriculture will also use urban public space fragments in urban planning and urbanisation promotion, affecting the city's public part. The constraints of urban public landscape space will also limit the vitality of urban public space construction design. Therefore, we need to master this balance and create a suitable scale of urban agriculture public space so that people can better experience the interaction brought about.

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