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Urban agriculture as a landscape approach for sustainable urban planning. An example of Songzhuang, Beijing

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Cities serve as both political and economic hubs. Sustainable development has long been acknowledged as crucial to the well-being of the environment, people, and society. In order to improve the current state of spatial affairs and attain long-term resilience, humanity is looking for reliable and sustainable urban planning approaches. Urban agriculture has received a lot of attention in recent years as an enduring and pervasive kind of landscape. Although the contribution of urban agriculture has been well documented in many studies on economic, social and ecological aspects, there has been little discussion of its practical value as a tool for spatial development. Additionally, the potential of urban agriculture as a landscape approach remains underdeveloped. In summary, current research and practice lacks a scientific framework for considering urban agriculture as a landscape approach to intervene in urban spaces. To this end, this paper explores the potential of urban agriculture as a landscape approach in sustainable urban planning and design through qualitative case study. Taking Songzhuang in Beijing as an example, we discuss and summarise the operational value and potential of urban agriculture from a design perspective. The findings suggest that landscape-based urbanism that includes urban agriculture can harmonise social, economic, environmental and ecological elements. Finally, in order to provide a generalised approach, this paper proposes a scientific framework for articulating a landscape approach to urban agriculture to guide future research and practice.

KEYWORDS

integrated urban agriculture, landscape-based urbanism, landscape planning, urban transformation, spatial base

1 Introduction

Cities are playing an increasingly dominant role (Funes-Aguilar and Monzote, 2006), with challenges such as ensuring the quality of urban life, improving urban efficiency, and reducing ecological footprint arising (Larissa and Ana, 2013). Sustainable urban development is crucial to the protection of the natural environment and the well-being of the people and society as a whole (Bai et al., 2012). Spatial planning is generally considered to play a central role on the path to sustainable development (Haughton et al., 2010). Although people have been striving for this for more than 20 years, there seems to be a growing gap between the current model and the model that is truly necessary for sustainable urban transformation in the future (Najjar, 2022). The reason for this phenomenon is that few sustainable development initiatives

fundamentally solve problems (Bannan et al., 2022), especially from spatial perspective. Urban space is the most significant carrier of urban sustainability. Because urban space plays such a key role, it is necessary to improve these environments to support more direct and long-term positive results (Bannan et al., 2022).

Urban agriculture is considered to contribute to multiple perspectives of sustainable development (Larissa and Ana, 2013; Zasada et al., 2020). It is undeniable that more and more evidence has proven the extensive benefits of urban agriculture (Langemeyer et al., 2021). In addition to contributing to food production (Evans et al., 2022) and improving food security (Edmondson et al., 2020), urban agriculture can mitigate the urban heat island effect (Chen et al., 2023), promote surface run-off management (Pueyo-Ros et al., 2024), strengthen social relations (Park et al., 2019), enhance social inclusion (Ilieva et al., 2022), and improve human well-being (Russo and Cirella, 2019). Although these extensive studies and explanations have explained the potential contribution of urban agriculture to urban sustainability, these advantages are often underestimated or overlooked in design practice (Pearson et al., 2010). For example, Detroit's urban agriculture initiative is motivated by revitalising the recession by improving the food desert status quo (Paddeu, 2017). The main reason is that in the current urban agricultural paradigm, the fundamental and transformational potential of urban food production space has not been adequately addressed (Siegner et al., 2020). Urban agriculture usually considers its own productivity and its extension methods rather than its externalities (Nicklay et al., 2020). At the same time, these ideas limit our understanding of the extensive synergy provided by urban farms and gardens (Siegner et al., 2020). Overall, discussing urban sustainability away from a spatial perspective may not adequately present the full picture of urban agriculture (Azunre et al., 2019). For this reason, exploring operational methods and values is an effective way to demonstrate the contribution of urban agriculture to urban sustainability.

As an important component of the urban landscape, urban agriculture is an all-encompassing concept (Wylie, 2009). A broad and integrated platform needs to be provided if the value of urban agriculture can be realized. The landscape approach has become popular in the last decades, having received a boost from landscape restoration, ecosystem services, sustainable development, etc. (Arts et al., 2017; Nijhuis and de Vries, 2019). The landscape approach is promoted to better understand the connection between humans and their surrounding through landscape (Soini et al., 2012). The landscape simultaneously provides structure, ecological coherence, and variation, but at the same time offers flexible and multifunctional functions (Nijhuis, 2022). Humans are attached to the tangible landscapes in which they are born, live, work, and recreate, rather than areas that they are not used to (Horlings, 2015). Landscape approaches are strongly linked to urban sustainability and land use (DeFries and Rosenzweig, 2010). These relations with landscape lead us to respond to future action and development goals by mobilising the knowledge and skills of urban landscape (Nijhuis, 2022). Currently, of particular interest is the landscape approach that pays special attention to agricultural development from an integrated perspective (Arts et al., 2017). For example, Roggema et al. (2021) introduced an adaptive landscape approach using (urban) agriculture to leapfrog stacked urban vulnerabilities. In addition, landscape-based urbanism focuses on enhancing spatial development through a regional-scale perspective that views the landscape as a socio-ecologically inclusive

system (Nijhuis, 2019). Calace and Paparusso (2022) argue that this urban-rural compact aims to explore in depth the relationship between the landscape and the city and to promote the interaction of settlements with the urban periphery. Thus, considering urban agricultural landscapes in the landscape approach is a path that responds to the contemporary demands.

It is not uncommon to consider how urban agriculture can be regarded as a landscape approach from theories and practical precedents. On the one hand, as an important type of natural landscape, agriculture contributes significantly to human survival and well-being by providing food and ecosystem services. On the other hand, agriculture shapes the landscape (Lefebvre et al., 2015). This coincides with the logic of many historical integrated landscape systems (Zanzanaini et al., 2017), such as Hani rice terrace in Yunnan, China (Yuan et al., 2014) and Mulberry-dike and fish-pond system in the Pearl River Delta, China (Wang et al., 2019). Agriculture is one of the first human behaviors to use and intervene in landscape elements. The basis for these behaviors can be interpreted that landscape is essential to human existence and a high quality of life (Brondizio et al., 2019). Urban natural environment (water, geology, flora, and fauna) is a prerequisite for creating better and more livable urban environments (Nijhuis, 2022). These natural elements can be appropriately used by urban agriculture and provide additional values. Creating physical and cultural links between urban and rural agriculture can provide positive outcomes beyond the urban context (Foeken and Owuor, 2008). On a cognitive level, urban landscapes provide the context in which intractable problems unfold, and the landscape approach provides the framework for social-ecological systems (Balint, 2011). From a spatial perspective, landscape is promoted as the logical spatial unit for addressing sustainable development challenges; it is at the landscape level that various social, economic, and environmental processes interact and compete for resources (Opdam et al., 2013). The ecological and social characteristics of agricultural landscapes are strongly influenced by the food systems in which they are embedded (Clapp, 2015), which has led to a strong correlation between urban agriculture itself and socio-ecological frameworks. Thus, the diversity and uniqueness of urban agriculture in terms of scale, function, and origin make it possible to serve as a landscape strategy employed by landscape approach.

Despite the benefits of urban agriculture and its strong relationship with landscape systems, there is still a gap in consensus approaches to embedding urban agriculture in urban environments in a landscape-based approach. Global urban agriculture practices are leading us to think about new ways of shaping and transforming urban spaces. To this end, this paper will review and reflect on the case of Songzhuang's sustainable urban planning and propose constructive conclusions in terms of the initiative and process of the design, using a qualitative case study approach. Therefore, this paper is divided into the following sections. Section 2 introduces the materials and methods used in this study and explains how urban agriculture is analysed in practice. Section 3 presents the findings of the case study and a practical phenomenological view of the relationship between urban agriculture and the landscape approach. Section 4 summarises the theoretical framework for considering urban agriculture as a landscape approach to sustainable urban planning based on the results of previous analysis. Sections 5 and 6 discuss the contribution and novelty of the findings and make recommendations for future research.

2 Materials and methodology

2.1 Case study area

Songzhuang is a town located under the jurisdiction of Tongzhou District in Beijing, between 116°35'23"~116°46'53" "E and 39°54'05"~40°01'50" "N. As of the end of 2018, Songzhuang Township had a household population of 76,714. Songzhuang is located in the northern part of Tongzhou District, to the east of the Chaobai River, south of the town of Lucheng, southwest of the town of Yongshun, west of the Wenyu River, and north of the town of Liqiao in Shunyi District. The total town area is 115.2 square kilometers. The total length of the four rivers in the town is 37.4 kilometers, and the density of the river network is 0.3 kilometers per square kilometer. Songzhuang is a grain and vegetable base in Beijing with a total of 3,867 ha of arable land and cultivates a wide variety of crops, such as wheat, corn, and vegetables. Animal husbandry, fishpond farming, forestry, and fruit cultivation also thrive in Songzhuang.

Songzhuang, as a planned future sub-center of Beijing, assumes a very important responsibility for economic and social development. Looking back at Songzhuang's geographic features and history, the development has always relied on extensive agricultural land and associated farming activities. On a more fundamental level, agriculture cannot flourish without the region's fertile soil, adequate water supply, and other landscape elements. Its peri-urban location has led to an increase in the value of land in the area. However, in the face of various goals and trends, Songzhuang's planning has remained ecologically oriented, with a focus on preserving the centrality of agricultural fields. An agriculture-based urban development framework (Rao et al., 2022) is selected based on the status of the site and the requirements of the upper-level plan. The core of the plan emphasises integrated landscape planning thinking and the portrayal of a future vision (Gaffikin and Sterrett, 2006) in a regional perspective. This long-term perspective allows Songzhuang to practice sustainable urban planning while demonstrating the reliability of urban agriculture as a landscape approach.

2.2 Profiling of the local urban planning

The spatial elements of Songzhuang's urban planning are depicted, integrated and scanned on the basis of secondary information collected through existing sources such as literature, yearbooks, policy documents, official reports and grey literature. The relevant planning documents are sourced from the open database of the Beijing Municipal Planning Bureau. This study comprehensively assesses project-related policy documents, planning reports, and other relevant textual information when analysing and discussing design and planning details. Finally, the main profiles of Songzhuang's sustainable urban planning are established through qualitative analysis and inductive method.

2.3 Qualitative case study

A qualitative case study approach is used to understand the Songzhuang urban planning process and to examine the role of urban agriculture in shaping the spatial base. The case study

methodology is the most widely used research method by researchers interested in qualitative research in academia (Baskarada, 2014). Qualitative case study research is a research method that helps to explore phenomena in a specific context through various data sources, examining multiple aspects of the phenomenon from different perspectives (Baxter and Jack, 2008; Mattke et al., 2022). We use descriptive critique (Attoe, 1978) to investigate what is in the Songzhuang plan and to monitor its future development. This approach does not explicitly state what is 'right' and 'wrong', but rather aims to guide people to observe the static and dynamic changes in the landscape by illuminating them. Because the case study serves the function of describing or evaluating the project, it can form the basis for the theory and logic behind urban agriculture practices. The Songzhuang plan has now completed its conceptual design phase, and its implementation is still in its early stages. Therefore, the descriptive criticism of the case study focuses on the following parts: first, the relationship between urban agriculture and urban space in the planning process; second, how landscape and urban agriculture are considered in the integrated planning approach; and finally, how the landscape approach is implemented in the design details (Roggema and Yan, 2019) and what role urban agriculture plays in it.

3 Results

This section will outline the process of Songzhuang's sustainable urban planning to demonstrate how urban agriculture can be integrated into the spatial foundation of urban development from a landscape approach perspective.

3.1 Legislation: incorporate urban agriculture into urban planning process

The inclusion of urban agriculture as part of planning is a guarantee that will continue to provide value in the long term. First, a statement of legitimacy for urban agriculture needs to be made at the policy level. The Songzhuang Plan clearly states in its documents that agricultural production is an essential part of the area's sustainable development. At the same time, the development of agricultural production in the area will also help to be closely connected to the center of Beijing. In addition to policy, giving urban agriculture its rightful role in land use can provide urban agriculture with spatial support. Songzhuang planners noticed the importance of this and have emphasized that ensuring the stability and adequacy of agricultural land is necessary to achieve the goal of long-term sustainability. Songzhuang strictly adheres to the principle of protecting production land, known as basic farmland. In China, the enactment of the Basic Farmland Protection Regulation has made peri-urban agriculture immune to land grabbing (Zhai and Huang, 2003). In addition, Songzhuang's innovations include that new forms of urban agriculture, such as green roofs, are integrated into the urban design catalog. This addition adds more site types and areas within the city limits. In this way, based on the affirmation of the value of urban agriculture in terms of sustainability, it becomes practical to consider the implicit complexities associated with agricultural land and food supply in urban land use planning.

3.2 Conceptualization: agro-art town

Songzhuang aims to transform into an agricultural art town by focusing on cultural transformation after strengthening the relationship between people and the land. It is therefore a two-step process: firstly, building the base of urban agriculture to stabilize the relationship between people and the land; and secondly, transforming the city by relying on a close ecological relationship. Accordingly, the plan proposes a concept of functional positioning and spatial layout that locates farmland at the core and urban development around it (refer to Figure 1). During the summer monsoon rainy period, the area is conservative against storm impacts. Then, disassociation from agriculture is always avoided in the transition to the arts and creative industries (refer to Figure 2). Industries such as art and textiles have been benefited from integration with farmland. Maintaining current social networks and traditional agricultural lifestyles simultaneously provides more opportunities to create new economic opportunities for existing residents. In turn, open space and hydrologic systems are integrated with the human element in a way that encourages the development of innovative industries and provides a high-quality living environment.

3.3 Vision: integrated spatial strategy

The primary procedure in an integrated landscape approach is a comprehensive assessment of the site's natural environment and human elements. Based on the suitability analysis, urban planners

identified Songzhuang as a unique place for urban agriculture-driven urban transformation. Firstly, regarding climate, Songzhuang has long, mild, and humid summers and dry, sunny winters. Additionally, Songzhuang possesses natural resources suitable for crop growth. Moreover, the town is rich in water resources, with over 80 percent of the town's arable land being watered by main streams and tributaries of the rivers. Fertile and extensive soils along with superior germplasm resources help to ensure the quality and abundance of crops. Secondly, the residents of Songzhuang have a strong reliance and connection to the land due to the long history of farming culture and customs. The cooperative farming model over the years has provided stable labor support and maintenance for the development of peri-urban agriculture.

Based on the investigation of site conditions, the plan emphasizes a balanced spatial linkage between agricultural production, landscape, and urban subsystems with an ecologically prioritized manner. To this end, a spatial urban-rural development structure of "Two Belts and Two Districts" (refer to Figure 3) is proposed. "Two Belts" refer to the ecological and recreational international exchange belt and the rural landscape belt along the two canals. "Two Districts" describe the art district and the central district relying on agricultural production to provide industrial support and comprehensive services. The premise of intensive development is to respect the red line of farmland ecological protection. Maintaining a healthy ecosystem (refer to Figure 4) enables the more effective coordination of agricultural production and human activities (Scherr and McNeely, 2008). This blue-green interwoven ecological network becomes the foundation that nurtures prosperous areas.

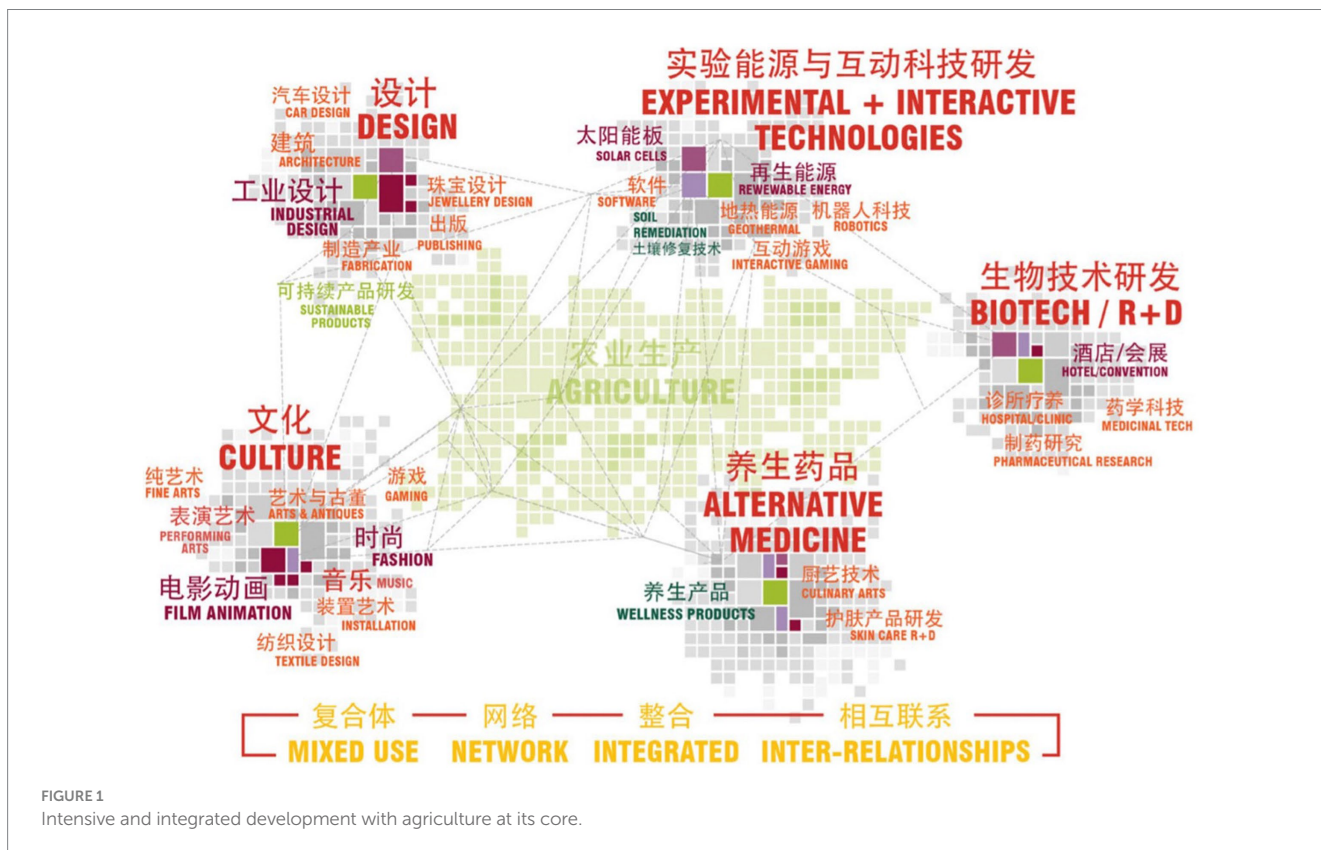
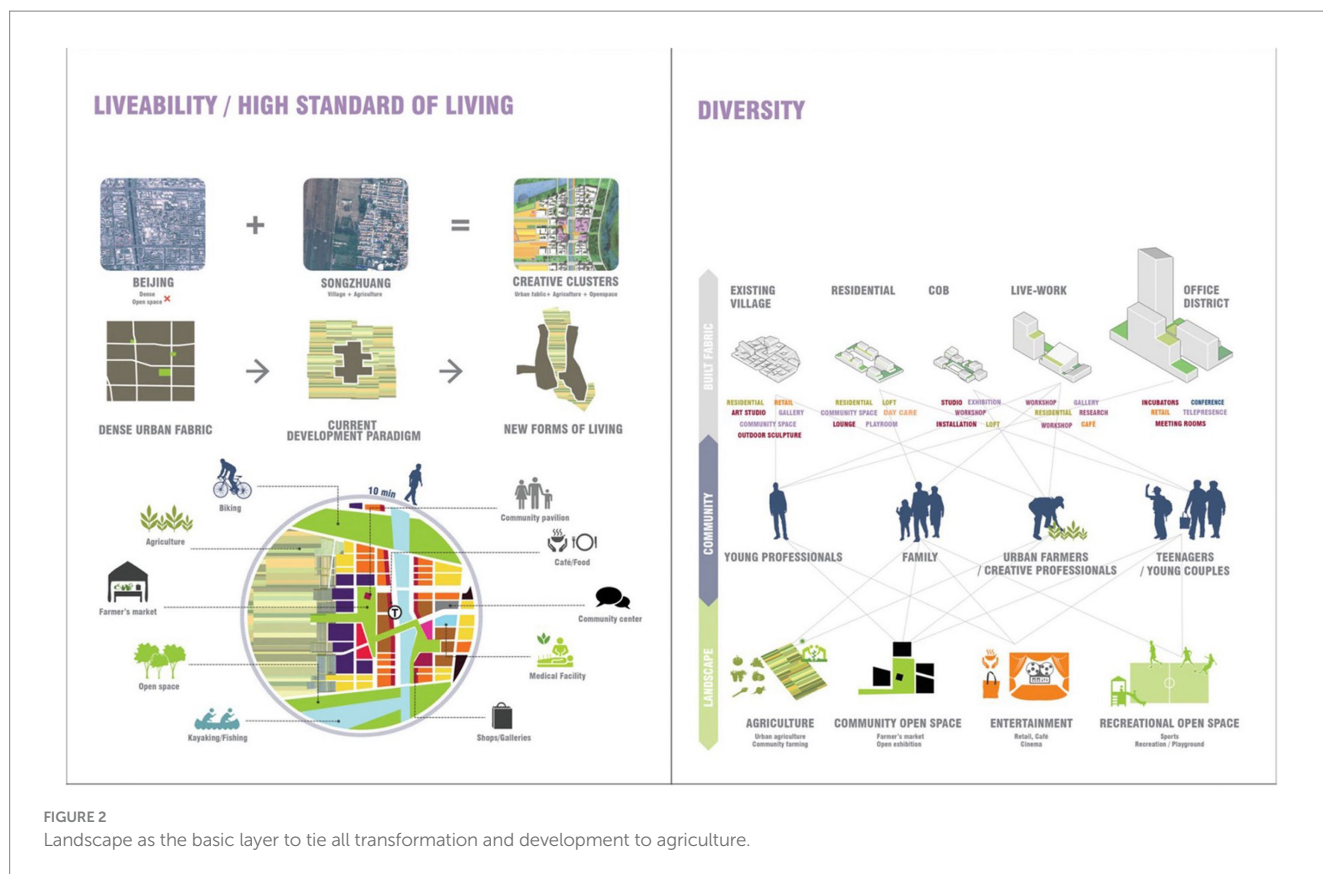


FIGURE 1 Intensive and integrated development with agriculture at its core.



3.4 Implementation: planning and design

In this plan urban agriculture is the basic layer. Then, the urban agriculture together with other landscape elements formed an ecological landscape system. Finally, the urban subsystem layer with road system, public space system and water system is attached to the basic layer.

3.4.1 Urban agriculture base

A prerequisite for ensuring that urban agriculture serves as a base is that its position receives adequate consideration in land use planning (refer to Figure 5). The support of peri-urban agriculture in land use planning is conducive to recognizing the value of agriculture. The plan states that the occupancy balance requirements between permanent basic farmland and arable land should be strictly implemented. All natural ecological spaces in the region are divided into five categories, including permanent basic farmland protection zones, ecological mixing zones, forest and grassland protection zones, watershed protection zones, and conditional construction zones, as follows: Except for the agricultural land, which is clearly indicated, the rest of the ecological land is provided for the production of agriculture and animal husbandry. China's production-living-ecological space model is crucial for regional socioeconomic development. Therefore, adopting the production space-first model is conducive to enhancing regional sustainability and resilience.

3.4.2 Ecological landscape system

By addressing the relationship between natural ecology and urban development, the plan seeks to comprehensively enhance both the

scale and quality of water and green space. Strict protection of ecological elements and arable land constitutes an important feature of the area. First, the agricultural landscape is recognized as one of the significant components of the ecological landscape system. Efforts are made to promote the quality of farmland, effectively optimize the layout of farmland, and consolidate the farmland space into one piece. Subsequently, the participatory land art landscape is formed by relying on the woodland farmland and integrating artistic characteristic elements (refer to Figure 6). Second, composite utilization of urban and rural green space is emphasized. The main approach involves comprehensively increasing the total amount of green space based on the ecological space structure of "One Ring, Five Corridors, and Multiple Points" and constructing greenways based on rivers and transportation green corridors. The plan indicates that by 2035, Songzhuang will achieve 100% coverage of the 500-meter service radius of parks and greenways and will have a total of 110 kilometers of greenways built. Third, it is necessary to make full use of the water resources in the area for the purpose of building water-friendly spaces.

3.4.3 Urban systems

3.4.3.1 Public space system

The public space system consists of parks, freshwater spaces, green corridors, nodes, and various other green spaces. Its overall layout begins with the construction of park clusters that are based on the green space system. Country parks, urban parks, and community parks are differentiated by scale and surroundings. This allocation ensures that there are available multi-scale parks throughout the built-up area. In addition to enriching landscape and ecological

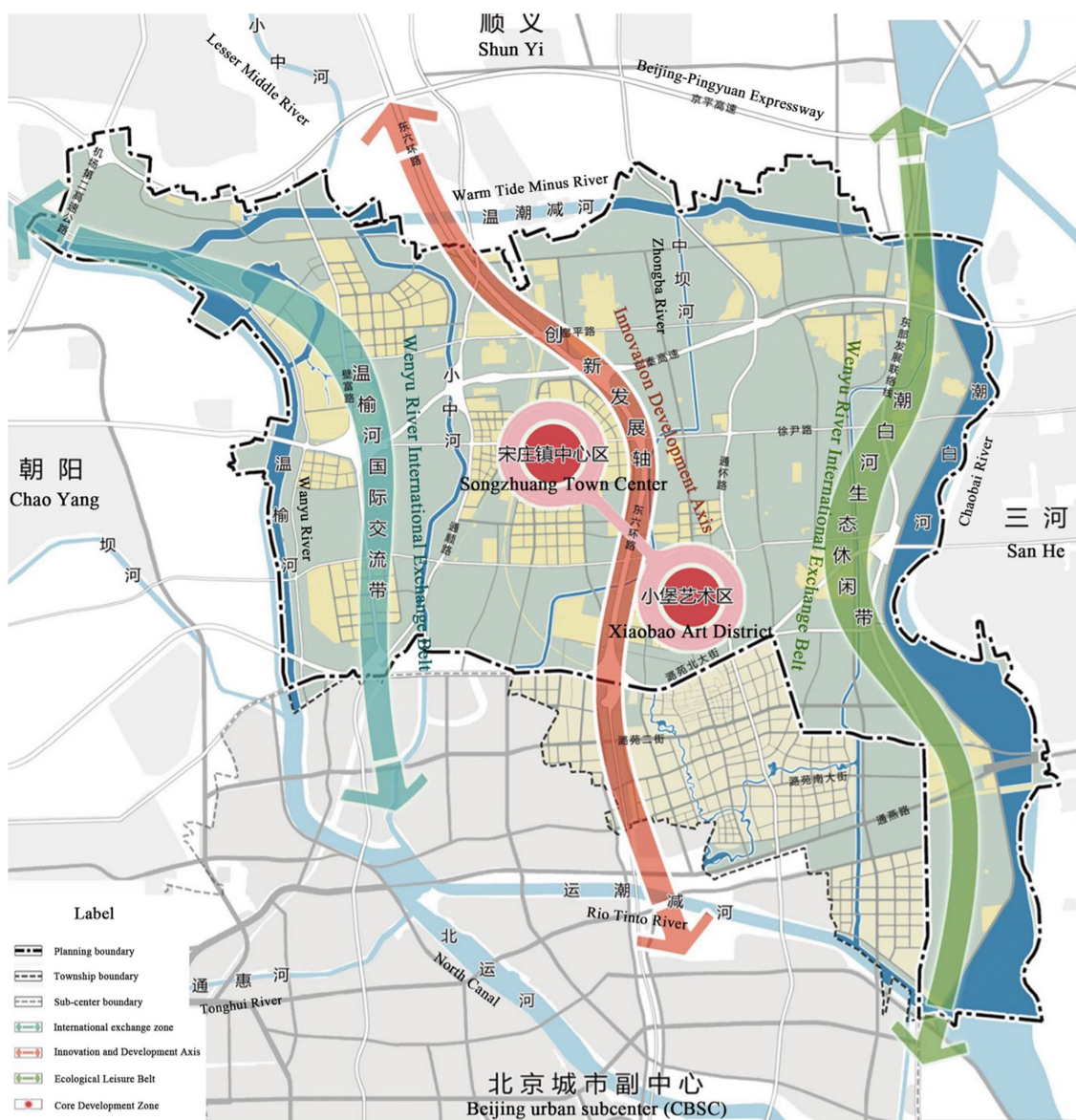


FIGURE 3 Schematic diagram of the spatial planning of the Two belts and Two districts.

diversity, having access to or exposure to freshwater blue space can provide a range of health and well-being benefits. The area is surrounded by canals and contains two longitudinal tributaries within it, which provide an adequate source of irrigation water and are used to create a freshwater ecological network. Green corridors can enrich biodiversity and offer great potential for cooling, isolation, ventilation, as well as noise reduction. Finally, thematic nodes enrich the function of the public space system and contribute to a composite green infrastructure with other elements.

3.4.3.2 Flood protection system

As part of Sponge City initiatives, utilizing multifunctional ecological wetlands to deal with stormwater is an effective way to enhance the comprehensive flood control capacity of the city. Songzhuang builds a multifunctional flood storage area by leveraging the existing low-lying areas. It serves as green infrastructure that

encompasses both ecological and landscape values. In addition, the abundant freshwater resources in the area provide the necessary water source for irrigation while contributing to a blue-green urban environment together with other green spaces.

3.4.3.3 Transportation system

The plan relies on the existing urban texture for building both a road transportation network that connects urban and rural areas and a street space environment with local characteristics. Being Beijing's urban sub-center, transportation demand is growing rapidly. A three-tier highway network comprising transit, external, and internal roads could facilitate the flow of resources and promote socio-economic connections within the region. To this end, a network of five horizontal and five vertical arterial highways has been established, spanning a total mileage of about 160 kilometers. In addition, in order to encourage green travel, a small-scale road network has been

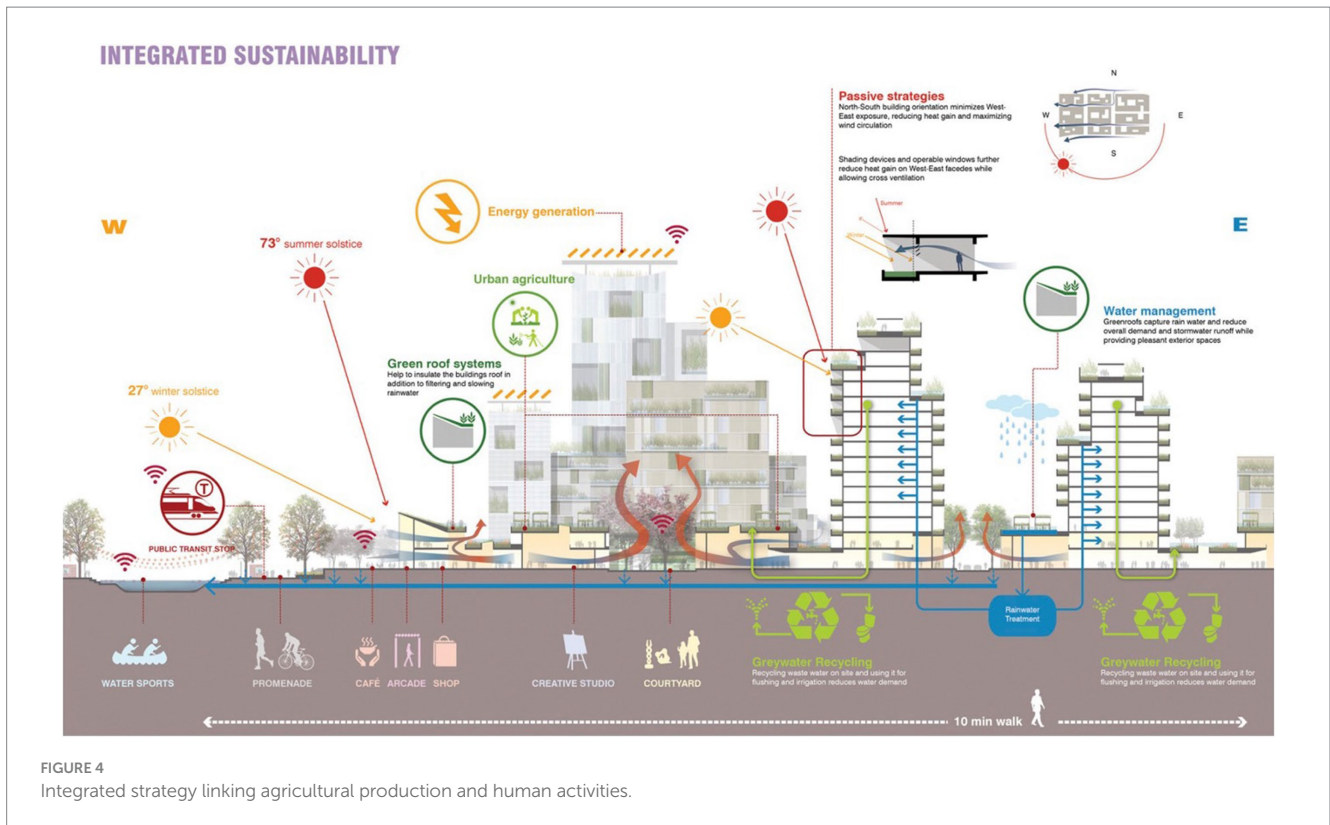


FIGURE 4 Integrated strategy linking agricultural production and human activities.

established to support walking and cycling priority. In addition to securing the right of way, the plan includes utilizing rivers, green belts, and centralized green spaces to create a pleasant environment as an initiative to fully mobilize the natural elements of the area.

3.5 Reflection: an operational framework for urban agriculture as a landscape approach

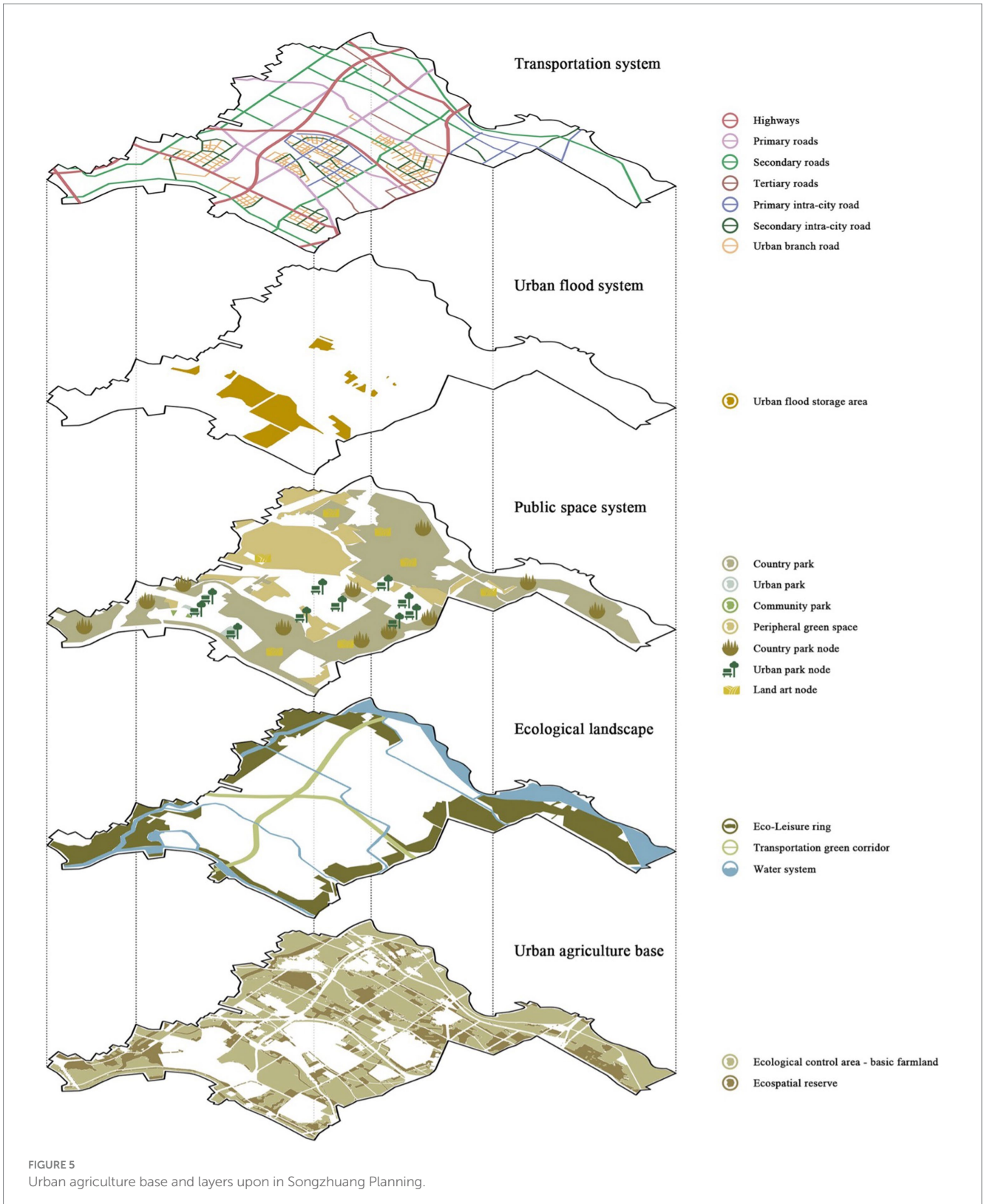
Reviewing the Songzhuang urban planning process, the plan follows an operational framework for urban agriculture as a landscape approach to sustainable urban planning (refer to Figure 7). First, the justification of urban agriculture in urban planning is identified before actions, which include policy and land use planning. The motivation to guarantee the adoption of urban agriculture is to fully recognize the multifunctional value of urban agriculture in specific projects and sites. Next, the current status of the site needs to be assessed to determine its suitability for urban agriculture. Since urban agriculture is considered a landscape approach, the evaluation of the site needs to first include natural elements such as soil, water, and climate. In addition, considering that the approach serves many aspects of urban development, aspects such as location, demographics, history, and human-land relationships also need to be considered. Then, an integrated planning and design approach with a long-term vision needs to be formulated to guide specific steps, such as the urban transformation of Songzhuang. Next, a layered approach is used, with urban agriculture as the base layer, the ecological landscape systems as the middle layer, and urban subsystems as the third layer. Ultimately, this system will lead to the achievement of urban sustainability goals.

4 Discussion

4.1 Operational values of urban agriculture towards urban sustainability

Currently, sustainable development is used to guide urban planning (Agudelo-Vera et al., 2011). At the same time, the goal of urban resilience has become increasingly close to the goal of global sustainable development (Elmqvist et al., 2019). Urban agriculture is a comprehensive concept that plays an economic, social, and environmental role and contributes to the sustainable development of cities (Azunre et al., 2019). In addition to basic production functions, urban agriculture provides a wide range of ecological functions (e.g., nutrient cycling and microclimate control; Lovell and Johnston, 2009) and cultural functions (e.g., recreation, cultural heritage, and visual quality; Lovell and Johnston, 2009). In the process of sustainable planning and development of Songzhuang, fully utilizing the value brought by urban agriculture is a significant way to adapt to the local conditions. Because of the long farming tradition and flexible supply of agricultural land, urban agriculture spatial interventions are aligned with the lifestyle of local residents.

Unlike many other planning practices, Songzhuang puts agriculture at the forefront and ensures that conflicts between urban construction and agricultural production are minimized. As the most basic living guarantee for human survival, the dependence on local agricultural production often results in cities being usually located in the most fertile areas in the world (Güneralp et al., 2013). For urban environments, the choice of agricultural production systems that leverage the proximity of resources and consumers is the most appropriate (Lovell, 2010). Under the dual objectives of saving the



current situation of land and improving urban sustainability, promoting local food production through urban agriculture can avoid a long series of harmful environmental impacts that are often not considered in land planning and utilization (Langemeyer et al.,

2021). Overall, urban agriculture as an integrated sustainability strategy can effectively intervene in all elements of the urban built environment, from the physical base to multidimensional sustainability goals.



FIGURE 6
The Buitenschot Land Art Park is a recreational park with noise-reducing features, which reduces noise from airplanes and also provides the area with space for events and recreational areas.

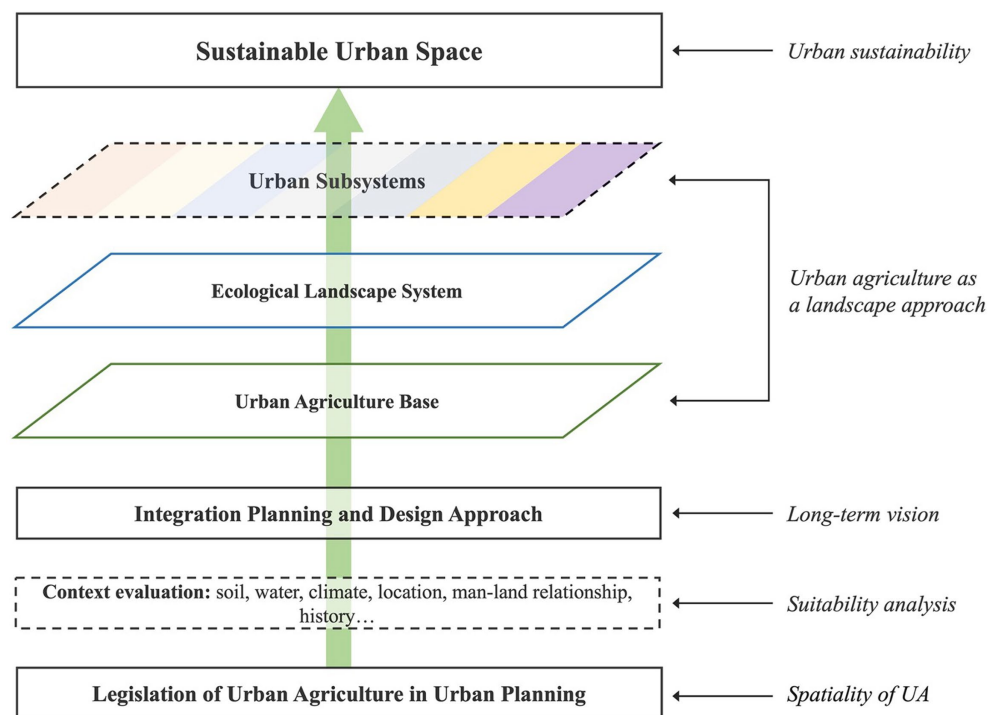


FIGURE 7
Operational framework for urban agriculture as a landscape approach.

4.2 Engage urban environment through a landscape approach

Compared to Landscape First (Roggema, 2020, 2021), urban agriculture as a landscape approach specifically affirms its nature-based characteristics. Agricultural landscapes are continuous, multi-scale landscapes with strong heritage value. Furthermore, agricultural activities have always been inextricably linked to many elements such as water, air, and biodiversity. As

cities continue to consume the suburbs, agricultural land is being lost and agricultural landscapes are being destroyed (Beckers et al., 2020). Urban agriculture acts as a bond when layering landscape elements, making the connection between multiple elements more rational and intimate. Adapting to local conditions has always been a revered Chinese approach to the relationship between people and the environment, where the primal function of land is production. This approach has strengthened the relationship between humans and the land from ancient times to

the present, while also offering insights on how mankind can balance the natural environment and the need for development.

In Songzhuang, planners have worked to closely integrate agriculture with the landscape, for example, by designing earth landscapes and developing aquatic ecosystems, while preserving local ecological fundamentals. The elements of mountains, water, forests, and fields are integrated to support agricultural production and enhance ecological environment construction. Although Songzhuang is transforming into an “agricultural art city” (Guinard and Margier, 2018), agriculture remains at the foundation of the transformation and urban development. Consistent with the principles of the landscape approach, the urban agriculture-based planning approach is a more ecologically sustainable approach. Designing site-specific urban landscapes with a wide range of functions is challenging (Schellhorn et al., 2008). The Songzhuang plan recognizes the strengths of urban agriculture as a multifunctional solution and considers urban agriculture and its related activities as a strategy for community integration, production value, and cultural promotion.

The spatial planning for Songzhuang in Beijing exemplifies how urban agriculture can serve as a landscape approach to shape urban space. As an important type of natural landscape, urban agriculture contributes significantly to human survival and well-being by providing food and ecosystem services (Kumar, 2012). In this case study, the plan acknowledges and respects the agricultural heritage of the area, maintaining a strong connection to agricultural activities throughout the city’s long-term development. By incorporating urban agriculture as a driver and spatial foundation for urban development, the plan enables diverse urban processes to thrive. This integrated spatial base not only preserves but also enhances the sustainability of urban agriculture, contributing to the overall sustainability of the urban environment. Thus, the methodology of urban agriculture as a landscape approach proves to be applicable and effective in sustainable urban planning.

4.3 Land use planning as a primary guarantee for achieving landscape-based urbanism

As an urban sub-center, Songzhuang’s land use and development goal have endured great challenges, particularly regarding agriculture. In the global world, along with urban sprawl, urban and peri-urban land are no longer prioritized for agricultural production and are replaced by other land uses (Langemeyer et al., 2021). Global and extended food supply chains result in significant social and ecological externalities (Paterson et al., 2015) and recreate social and ecological vulnerabilities (Langemeyer and Connolly, 2020). Remote land connectivity links urban consumption patterns to land use change and triggers a pattern of long-term unsustainable transformation (Cadillo-Benalcazar et al., 2020). So, to empower and reintroduce agriculture into cities, planners use a variety of strategies to support urban agriculture, which include creating a supportive policy environment; incentivizing urban agriculture; and providing planning, funding, and public land (Horst et al., 2017). Incorporating urban agriculture into all levels of city planning, from master plans to specific plans, can contribute to enhancing the sustainability of cities (Sarker et al., 2019). But it’s important to note that the premise of intensive development is

to circumvent the ecological protection red line of basic farmland (Xu et al., 2018). The development of urban agriculture and traditional agricultural production should eliminate conflicts in land use.

Currently, land use planning provides a long-term vision as it involves developing future land use plans (Mubvami et al., 2006). As a land use, agriculture is inherently multifunctional, providing many public benefits beyond commodity output (Oostindie et al., 2006). Currently, the removal of agricultural land from the urban land use system may undermine its efforts to be economically, socially, and ecologically sustainable (Ayambire et al., 2019). Globally, many peri-urban areas like Songzhuang are facing urbanization and loss of arable land. Considering the rationalization of agricultural land within the city in land use planning is crucial to protect urban agriculture and to lead to sustainable urban planning. Guaranteeing that urban agriculture has a legitimate identity is fundamental to ensuring landscape-based urbanism.

5 Conclusion

The main objective of this study is to address the viability of urban agriculture as a landscape approach through a qualitative case study approach. The design initiative and process in the empirical study fully reflect how urban agriculture is embedded in urban spaces and demonstrates transformative functions in practice.

By prioritising nature and integrating urban agriculture into urban context, this approach emphasises a landscape approach that promotes urban sustainability. As a foundational layer, urban agriculture involves landscape elements, enriches the socio-economic fabric of the city and promotes spatial adaptability and flexibility. While theoretically the landscape approach fits well with the goals of sustainable urbanism, it faces challenges in practical implementation, especially with regard to urban agriculture in a nature-based approach. Through a ‘research through design’ approach, this study analyses the effectiveness and implications of actions. Having accessed the components and elements involved in design, we have distilled a scientific framework that can be applied to a broader context.

This study makes innovative contributions in the design of urban agricultural spaces. Firstly, it urges us to consider the use of landscape layer method (Nijhuis, 2020). The benefits of this approach lie in dissecting the landscape system to holistically reconcile human and nature interrelationships and providing a vision across time and space. Starting with nature and weighing social development needs are added values that urban agriculture can provide. Secondly, the findings challenge the dominant approaches to urban transformation and offer new pathways. It emphasises that urban transformation is a dynamic process. Ignoring the historical roots of localisation and adaptation undermines the credibility of setting ambitious long-term goals. Effective urban development must integrate these historical elements with local spatial characteristics to ensure coherence and resilience. Severing internal relationships can undermine the effectiveness of transformative action. In addition, sustainable urban transformation must take into account changes in residents’ lifestyles and the shortening of food supply chains. Spreading from spatial interventions to changes in the lives and behavior of urban residents is the ultimate goal of urban transformation. Agriculture should not be confined to rural areas; rather, efforts to reintegrate agriculture into urban spaces are essential for sustainable development.

The operational framework is of great value in guiding the actions. This framework proposes systematic procedures from legislation, analysis, design to transformation. While the conclusions may be more broadly representative of what is inherent in the practice of urban agriculture as a landscape approach, its applicability is profoundly influenced by the site context, including factors such as soil quality, climatic conditions, existing farming practices, industrial infrastructure, and urban–rural dynamics. These factors constrain the effectiveness of the approach. In addition, the integration of urban agriculture into planning policies, particularly land use planning frameworks, poses a major challenge to the implementation of the methodology. Currently, the methodology is mainly applied in peri-urban areas and its potential contribution to the inner-city, especially high-density urban environments, remains unclear. Future research will focus on exploring strategies for establishing a multi-scale urban agriculture framework and understanding the dynamic relationship between the spatial basis of urban agriculture and the urban transformation process.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

YH: Conceptualization, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing. SN:

Methodology, Resources, Writing – review & editing. NT: Methodology, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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