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Fostering Multi-Functional Urban Agriculture: Experiences from the Champions in a Revitalized Farm Pond Community in Taoyuan, Taiwan

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Abstract: Urban agriculture (UA) with its multi-functional roles has recently become a globally important topic, as it is considered as an approach to address the emerging challenges to societies seeking greater sustainability. In Taiwan, the Hakka community of Gaoyuan in Taoyuan City, where a traditional farm pond was recently transformed into a public, multi-functional UA resource, is widely regarded as the first successful bottom-up, community-led, farm-pond-based UA in Taiwan, yet its actual performance is rarely explored in any depth. Little work has been done to provide details on the socio-ecological benefits of UA in the community redevelopment process. Through in-depth interviews, fieldwork, and participant observation, this specific qualitative study aims to explore the community champions' experiences in the transformation leading to a revitalized community. First, by linking nearby nature to people, a green network of diverse spaces, low-impact landscaping, and an agricultural-community-like pondscape, the specific landscape character that makes UA in Gaoyuan distinctive is formed. Second, through active engagement, participation, and the agency of local people, the UA implementation process features cooperative working, mutual learning, and experience-sharing. Third, UA plays a crucial role in building social cohesion that promotes people's participation in community affairs, and strengthens the community's social network, which involves agricultural life, crop production, the ecological environment, and community care. It is revealed that the farm-pond-based UA with its multi-functional roles acts as a catalyst for the Gaoyuan community's progress toward sustainability. The desired end-state of the agricultural landscape, as a synthesis of natural features and human interventions, is a more sustainable, characteristic, well-maintained and united place to fulfill people's needs and enhance people's overall health and well-being.

Keywords: agriculture landscape; green infrastructure; health; social cohesion; well-being

1. Introduction

Urban agriculture (UA) is a newly-emerging type of agriculture with the rapid growth of cities [1], faced with challenges such as changing climate, the need for a secure food supply, and increased urbanization [2]. UA is generally defined as "an industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows and raises, processes and distributes a diversity of food and non-food products" ([3]; p. 10). These agricultural activities display in diverse forms and scales in cities that reflect urban residents' various needs and preferences [4], such as

allotments, community gardens, leisure farms, educational farms, therapeutic farms, social farms, food farms, and environmental farms, to offer services and products concerning cultivation, recreation, learning, care, direct marketing, landscape management, and environmental measures [5]. It is implied that UA, a typologically diverse phenomenon spatially embedded in the urban context, plays multiple roles in urban life.

Growing evidence advocates UA's potential for the sustainability of cities that involves, for example, food supply [6], flood mitigation, employment [7], biodiversity, scenic values, cultural landscape [8], human health and well-being [9], green infrastructure [10], and a sense of community [11]. Public and private support for multi-functional UA is shown in increasing international best practices. For example, how UA can innovate the design of urban spaces and buildings is demonstrated through a range of U.S. and Canadian projects to facilitate the connections among urban environments, food supply and community engagement [12]. In some European cities, fostering UA is a vehicle for producing food, promoting biodiversity, developing attractive cultural landscapes with high recreational values, and facilitating local participation and green knowledge [13,14]. Various projects in developing countries in Africa, Latin America and Southeast Asia as well as China are documented to show their experiences in improving livelihoods, tourism, education, land use management, flood control, and social cohesion and integration [15,16]. UA offers the potential for improvements in the food supply, health conditions, local economy, social integration, and environmental sustainability in the developing world [17]. It indicates that, in both the global North and South, UA is central to the sustainable development of cities due to the broad range of services that it provides to cities and their dwellers.

A classification of UA based on policy dimensions is suggested: (1) the social dimension that contributes to the development of an "inclusive" city region, where subsistence-oriented types of UA (e.g., home gardening, community gardening, institutional gardens at schools and hospitals, and open field farming with low levels of investment) are the main features which, although showing little direct profitability, exert significant social influences on poverty alleviation, food security, social inclusion, community building, and the creation of a social safety net; (2) the economic dimension that supports the development of a "productive" city region, where market-oriented UA is key to income and employment generation from food (e.g., vegetables) and non-food (e.g., herbs, flowers and plants) production run by small-scale, family-based businesses and larger-scale, entrepreneurial enterprises, whereby UA is reliant on enterprise development and marketing and has more economic impact, profitability and externalities; and (3) the ecological dimension that fosters the development of an "environmentally healthy" city region, where UA encompasses multiple roles such as flood management [15], urban greening, the consideration of micro-climates, landscape management, biodiversity, water storage, and waste management [15,18,19]. These UA frameworks can be an approach to understanding, in whole or in part, its diverse phenomena and interests in practice including their different emphases and stakeholders that may be collaborative or conflicting.

The objectives of UA often go beyond food production and supply and are frequently related to social and environmental contributions to the urban system within the frame of sustainability [20]. As shown by Orsini et al. [21] and Specht et al. [22], social and environmental functions and benefits are frequently stressed when addressing the multi-functionality of UA. Furthermore, UA's social roles may especially involve recreation, education, health, and social care and cohesion, where there are three indicators representing its social added values, namely non-paid jobs (volunteers), social services, and educational services, to support inclusion, integration, formation, and upgrading of the community. As an example, the City Farm Schönbrunn, a bottom-up initiative in Vienna, Austria highlights social and educational activities by offering garden workshops, staffed by volunteers, for school groups, disadvantaged children, and children during holidays [23]. Being part of the urban ecological system, UA also can play a significant role in managing the urban environment [19]. The environmental added values emphasize the size of managed green areas and agrobiodiversity [23], whereby the latter includes the variety and variability of animals, plants, and micro-organisms in

support of the agro-ecosystem, and fosters the human activity of agriculture where local knowledge and culture are key [24,25]. In short, the society anticipates more from UA than ordinary agriculture, in order to improve condensed city environments in different ways, such as aiding the empowerment of local communities and the establishment of green infrastructure. UA, as a type of open landscape, is strongly connected to the built environment, and thus UA's spatial features (e.g., size, scale, and proportion) have an impact on how visible UA is in the urban context, such as its promising potential use of flowerbeds, balconies, abandoned buildings [26], open rooftops [27], vacant lots, open space, and underutilized parks [28].

UA's spatial conditions are strongly associated with the development of the built environment and green infrastructure of the city [29]. UA can create green belts enclosing the urban area, green wedges infiltrating the urban area, and individual green sites or networks patching the trans-urban area; additionally, UA varies in size and shape including large-scale farmland patterns, medium-scale collective patterns (e.g., allotments and community gardens) showing a system of combined single sites, and small-scale individual spot patterns (e.g., family gardens and rooftops) [30]. For example, extensive allotment sites, whereby grow-your-own/small-scale UA is viewed as one of the characteristics of the foodscape, are essential for the spatial identity of the neighborhoods in Newcastle upon Tyne, UK [31]. Community gardens are a crucial element of the UA landscape in the U.S. city of Sacramento, where community gardens represent a system of public and private individual plots, and the open spaces allow users to experience UA's multiple benefits [32]. Overall, it indicates that the features of production with its location, scale, and patterns have a great impact on how agriculture in urban space is perceived, apart from massive agricultural buildings (e.g., greenhouses) that have a dominant visible effect. At the planning level, it is important to integrate UA into the urban fabric and green infrastructure for enhancing the cityscape, landscape quality, and living environment. It is necessary to know how and to what extent UA could connect and unite with city components and dwellers [33].

In terms of Taiwan, promoting UA is currently one of the key agricultural policies of the government for emphasizing its multi-functional values, such as food security, self-sustaining business, community revitalization, and ecological services [34]. As an example, in response to the global urban-farming fever, Taipei City Government has invested great time and effort in developing a garden city plan, whereby a community agriculture promotion center was set up in 2015 to support civic groups in their demand for implementing UA projects [35], such as land acquisition, project management, and technical training [36]. Nevertheless, Taiwan's UA development has been heavily reliant upon top-down, policy-driven programs [36,37], with readily-available city locations including vacant community lands and the rooftops of public buildings (e.g., schools and government offices) [38]. In a similar situation, Gaoyuan, a farm pond community situated in the special municipality of Taoyuan, is a recent noteworthy case of advocating UA that intends to transform an abandoned, hard-engineered, originally-agricultural-irrigation pond area into a multi-functional UA resource, by improving landscape and water quality, reintroducing farming activities, and enhancing social networks and well-being [39]. This currently on-going UA practice aims at replacing the infrastructure established for traditional agriculture with a green, publicly-accessible place that is central to the quality of life and structure of the community owing to the wide range of services that it provides to the community and its residents.

While the Gaoyuan project is widely regarded as the first successful case of bottom-up, community-led, farm-pond-based UA in Taiwan [40,41], little work has been done to provide details on the socio-ecological benefits of UA in the community redevelopment process. The research asks: What are the perspectives of leaders, who work in influential roles in the process of fostering the integration of UA with community redevelopment, on: (1) what UA could be; (2) the various purposes of UA; and (3) the socio-ecological influences of UA? Therefore, this qualitative study focuses on a specific case to explore the community champions' experiences with a traditional farm pond redeveloped into a community resource for UA that has played a much-needed role in terms of connecting people with each other, with the land, and with their traditional farming history. The significance of the

case study is to better-inform the practical aspects while conducting UA combined with community revitalization in East Asian cities. Next, the paper will review the development of UA and farm ponds in Taiwan and explain the methods of collecting and analyzing data, followed by an examination of the UA implementation process in the Gaoyuan community. The important issues about fostering multi-functional UA that integrates with the revitalization of a farm pond community will then be discussed and conclusions will be presented.

2. Urban Agriculture Development in Taiwan

Farmers' associations have played a vital role in promoting the development of UA in Taiwan [42]. Taiwan's UA originated in the 1980s and the overall development has broadly fallen into four major types [43], which are described in more detail below:

(1) Tourist farm: Sightseeing and fruit/tea/flower picking;
(2) Citizen farm: Farming experience;
(3) Leisure farm: A longer stay with diverse activities; and
(4) Educational farm: Agricultural/environmental education.

It is the tourist farm that began the evolution of UA in Taiwan [44]. With the initial purposes of reducing labor costs and increasing economic benefits, Taipei Farmers' Association (TFA) started to promote the tourist farm in the district of Muzha in 1980, then gradually expanding citywide [45], encouraged by the national policy entitled "Agritourism Development Demonstration Plan" implemented in 1982 [46]. The agricultural products of tourist farms normally comprise tea, oranges, strawberries, bell fruit, passion fruit, grapefruit, grapes, mushrooms, and Calla Lilies, attracting a large number of people to enjoy sightseeing and fruit/tea/flower picking [47].

With economic growth and improved living standards, TFA initiated a plan in 1989 to develop citizen farms whereby the first citizen farm was built in 1990 in the district of Beitou [48]. Due to a manpower shortage for farming, farmers normally lease a citizen's farmlands to cultivate agricultural products (e.g., fruits, flowers, and vegetables) by themselves. This brings the benefits of increasing farmers' incomes, allowing citizens to experience farming activities and agricultural life, ensuring food security, and facilitating the revitalization of local communities [49]. There has been a trend toward the development of citizen farms [50], currently reaching over 80 nationwide [51].

The type of leisure farms, which usually integrate cultural landscapes, fruit/tea/flower picking, sightseeing, recreation, farming, and accommodation, is considered as the typical representative of UA in Taiwan [52]. Officially recognized in 1989 by the Central Council of Agriculture (CoA) for the importance of agricultural transformation [45], the leisure farms have been flourishing since 2000, and now number over 1000 nationwide [45,53].

Recently, the educational farm has played a key role in outdoor education in kindergartens and elementary schools, as schoolchildren are encouraged to go out into the field to receive experiential learning about ecology, agriculture, and the environment [43]. The educational farm is regarded as a suitable site, because it can function as an extended, off-campus classroom, where learning and experiential programs are provided based on the environmental resources of farms (e.g., plants, animals, and facilities) [54].

In an endeavor to foster multi-functional UA, Taiwan has made good progress in social, economic, and ecological aspects [53], yet there is still much room for improvement, such as the inability of bottom-up, community-led, UA practices to sustain growth [51], and a lack of variety in the different UA developments on offer [45]. This shows that promoting multi-functional UA is still a challenge for Taiwan's UA specialists.

3. Farm Ponds in Taiwan

Taiwan has an average annual rainfall of over 2500 mm, but it is unevenly distributed throughout the year. In the rainy season (May to October), about 80% of the annual rainfall occurs but it

rapidly flows into the ocean owing to the topography with its radial network of narrow valleys. During the Ching Dynasty (1684–1895) and the early period of Japanese rule (1896–1949), farmers extensively dug farm ponds to store rainwater for agricultural uses, dealing with the uneven rainfall and inadequate irrigation systems [55]. Farm ponds aimed to retain water resources and represented a prominent, unique feature of the agricultural landscape in Taiwan, especially within the city of Taoyuan. The number of farm ponds reached its peak of around 10,000 in the year 1913, giving Taoyuan the reputation of "a thousand-pond township" [56]. However, the construction of the Taoyuan Canal, Shimen Canal, Shimen Reservoir and other irrigation facilities since the 1920s has resulted in a big change in agricultural development: from traditional farm-pond irrigation to multiple water sources [57]. Due to the development of a water infrastructure (large-scale centralized water storages and pipelines to supply farms) and urbanization, farm ponds have gradually vanished. Over 3290 farm ponds existed in Taoyuan City in the 1970s, but now fewer than 1800 remain [58].

Currently, the majority of the existing farm ponds have lost the original agricultural functions [59], and many of them have been changed for recreational (e.g., parks), ecological (e.g., bird refuges), environmental (e.g., flood prevention) and commercial (e.g., fishery) uses [56]. It shows that the multi-functionality of farm ponds in Taoyuan is an increasingly important issue, with growing attention to agricultural development combined with green infrastructure, community revitalization, and cultural landscapes [58]. This underpins the objectives of this paper that examine the community champions' experiences involved in the transformation of Gaoyuan, where an abandoned, hard-engineered, originally-agricultural-irrigation pond area has been converted into a multi-functional UA resource, and their effects on the implementation of a farm-pond-based UA integrated with community revitalization. Through this qualitative case study, the development of the UA pondscape can be better understood.

4. Methods

4.1. The Study Area

The research was conducted at Gaoyuan community with Xia-Dian-Zi farm pond (including the upper and lower ponds) in Longtan District, Taoyuan City, Taiwan (Figure 1). As one of the six special municipalities, Taoyuan City is located in the northwest of Taiwan, close to the capital city of Taipei. The topography of this area is relatively flat, dominated by the Taoyuan Plateau. Farm ponds are distributed broadly within the Plateau, owing to its special underlying geology and geomorphology. The plateau is covered by soils of reddish-brown weathered, gravelly clay layers, and deposits of well-rounded sandstone gravels from 10 to 50 m deep [57]. Supported by this, farm ponds are situated in the relatively flat lowland areas that are suitable to store rainwater and collect surface runoff.

The primary land use in Taoyuan was farm-pond-based agriculture, but rapid urban sprawl, economic development and population growth have resulted in the rapid decline of farm ponds and extensive changes in landscape. The case of Xia-Dian-Zi farm pond (Figures 2 and 3) represents a remnant of the traditional pondscape. Divided into two parts (upper and lower), the area of Xia-Dian-Zi farm pond is roughly 5000 m^2 in total, with a normal water depth of 1.2 m. While many farm ponds are buried or abandoned, this pond has been developed by the Gaoyuan Community Development Association (GCDA) as an environmental resource that fosters UA, ecological diversity, environmental education and a healthy community. The farm pond is owned by a local entrepreneur, who is also a long-term supporter of GCDA. Xia-Dian-Zi is voluntarily used by the community as a public open space available to all [39].

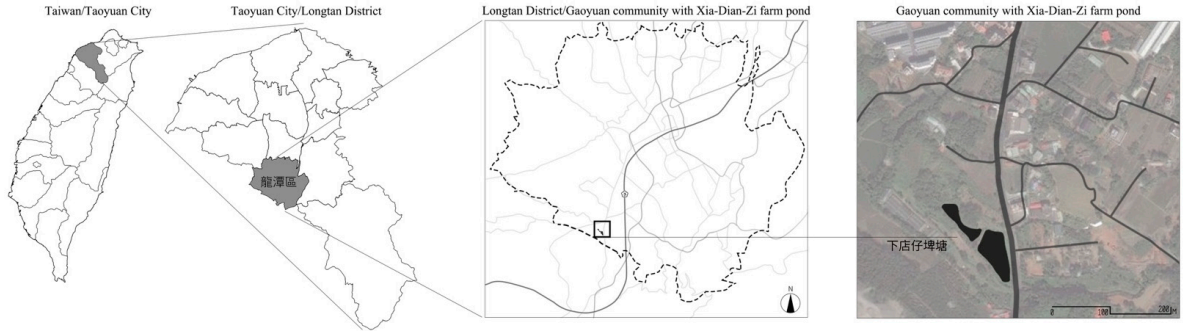

Figure 1. Location of Gaoyuan community with Xia-Dian-Zi farm pond.

Figure 2. Xia-Dian-Zi farm pond (dashed white lines) and nearby Gaoyuan community: A: wooden deck; B: stone paved path; C: artificial floating island; D: wood-chip path; E: Mugwort field; and F: agricultural field and greenhouse.

Figure 3. Xia-Dian-Zi farm pond, an oblique perspective view from northeast to southwest.

Based on Yin's rationale [60] for a single-case study as the unique case, the importance of the selected case is as follows. First, Gaoyuan community with Xia-Dian-Zi farm pond is a typical Hakka settlement in a peri-urban area. Under urbanization pressure and socio-economic development, this real-life instance demonstrates how a farm pond area could be redeveloped by a local community as an ideal state wherein UA is integrated with green infrastructure, community revitalization, and cultural landscapes. The Hakkas, an ethnic group of Han Chinese, migrated from Mainland China to Taiwan during the Ching Dynasty (1684–1895) to find a better future for their families.

Owing to migration, generation after generation faced an adverse environment, so they learned to be hardworking, persevering, and unpretentious [61]. Second, Xia-Dian-Zi has become a farm-pond-based environmental education site that attracts visits from more than 10 groups/organizations nationwide annually as a result of its reputation for establishing UA farming (e.g., Mugwort and vegetables), ecological diversity (e.g., aquatic plants and waterbirds), and a healthy community (e.g., food security and lifestyle choices). There is no charge for the visitors.

Third, GCDA is a committed local grassroots organization, whose main role is to promote local sustainability and community well-being in a proactive, localized and participatory manner. GCDA is composed of local residents, generally grouped into: (1) community workers; (2) farm pond workers; (3) farmers (Mugwort, the greenhouse (organic farming), pond-side farmlands and artificial floating islands (non-toxic farming)); (4) community kitchen workers; and (5) environmental protection workers. The area of Xia-Dian-Zi farm pond is managed according to this system. The GCDA-related works (e.g., maintenance, management, and implementation) have been long-term financially supported by local enterprises and some short-term government funding (e.g., Rural Revitalization Plan).

Fourth, the real-life context represents idyllic surroundings, showing traditional-agricultural -community-like qualities, especially attracting an increasing number of retired and middle-aged people as residents. However, the area of Xia-Dian-Zi farm pond is a public open space, and thus it is important for GCDA, who randomly patrols the area, to ensure a safe environment. There has been no crime associated with the farm pond area, but there is a concern about the farm pond water quality, which can be affected by various sources of pollution, such as industrial waste and run-off.

4.2. Data Collection

The research was conducted from August 2015 to July 2016 with data coming from in-depth interviews, fieldwork, and participant observation. This approach of data source triangulation is a strength of case studies [60], and can enhance the trustworthiness and rigor of research findings [62]. Regarding interviews, purposive sampling was employed to ensure that the sample incorporated a diversity of personal backgrounds with direct, long-term participation in local community affairs. The inclusion criteria therefore were: (1) at least five years of active participation in community affairs; (2) a leader who works in an influential role (also known as champions) in the process of fostering the integration of UA with community redevelopment. With a response rate of 100%, a total of seven in-depth interviews were conducted (Table 1): (1) IV1, the leader of Gaoyuan community who has fostered UA, farm pond redevelopment, environmental sustainability and public participation; (2) IV2 and IV3, two team leaders of farm pond workers and farmers who are retired and have been involved in the professional construction and management of Xia-Dian-Zi farm pond; (3) IV4, a farmer and the greenhouse owner who is a middle-aged returnee to Gaoyuan, and has helped the community to establish the farm pond and its surroundings as a site for UA and environmental education (e.g., programs of agricultural experience); (4) IV5, a team leader of environmental protection workers who is a retired school teacher and has been engaged in ecological conservation; (5) IV6, a team leader of community workers and community kitchen workers who is a retired school teacher and has participated in the care of elderly people and the tutoring for children in the community; and (6) IV7, a senior local government official who is a policy decision-maker and has promoted farm-pond-based community revitalization. Especially, these interviewees act as the community champions who change a traditional farm pond into a community UA resource through the phases of initiation, development, and implementation. In addition, some champions are retired and participate in community affairs without being paid for it (as an indicator representing UA's social added values mentioned in the introduction).

Table 1. Demographic data of the participants.

ID Code	Age Group	Gender	Role	Participation	Occupation
IV1	50–59	Female	The coordinator of community affairs	20 years	The leader of the community
IV2	60–69	Male	A team leader of farm pond workers and farmers	5 years	Retired
IV3	70–79	Male	A team leader of farm pond workers and farmers	5 years	Retired
IV4	40–49	Male	A farmer and leading teacher of environmental education sessions	10 years	The greenhouse owner
IV5	50–59	Female	A team leader of environmental protection workers	8 years	Retired
IV6	50–59	Female	A team leader of community workers and community kitchen workers	10 years	Retired
IV7	50–59	Male	A decision-maker for local policy	15 years	Government official

There were three central open questions asked in each interview (see below), with the intention of stimulating follow-up questions and allowing the answers to be of greater depth, thus encouraging the provision of further relevant information. All interviews were digitally recorded for later transcription, coding and analysis. The analysis approach of thematic analysis was used in the qualitative study. Thematic analysis is defined as "a method for identifying, analyzing and reporting patterns (themes) within data" ([63]: p. 79). As an independent and a reliable qualitative analysis approach [64], thematic analysis is to supply a detailed and nuanced account of a group of themes within the data [63].

(1) What are the resources that are unique to Gaoyuan for its future development?
(2) What are your experiences in participating in local community affairs?
(3) What are the challenges and opportunities as Gaoyuan evolves toward a farm-pond-based UA community?

Fieldwork in the research included active looking, natural conversations, field notes, drawings and photographs. These were combined with participant observation, which is a primary qualitative research method to discover existing situations under study in the natural setting through observing and participating in their activities [65]. Participant observation allowed the researchers to become familiar with, and develop a deep understanding of, the setting of Gaoyuan and the people of Gaoyuan, their experiences, values, beliefs, and way of life. During the research period, the researchers joined the routine activities of the community, such as vegetable and Mugwort farming, community lunches, educational programs, environmental cleanup, and farm pond facilities' design, construction and maintenance (e.g., artificial floating islands). Importantly, for the researchers becoming good participant observers, it is necessary to preserve a critical self-reflection so as not to affect the field of research and the data collected [66].

In the following, a series of analytic drawings is presented, with participants' accounts providing qualitative data and related photographs functioning as visual evidence. All quotations are verbatim labeled with identification codes, and those marked * (e.g., IV1*) indicate paraphrased comments. Several interesting findings were revealed from the data, yet this paper focuses on those relating directly to the implementation of a farm-pond-based UA integrated with community revitalization. These findings are grouped into three main themes: (1) landscape character; (2) active engagement, participation, and the agency of local people; and (3) social cohesion and well-being.

5. Results

5.1. Landscape Character

Easy access to nature is a contributing factor affecting the UA development of Gaoyuan (Figure 4). Gaoyuan was an agricultural community during the period from the Ching Dynasty to the 1970s, located in the southern part of the Taoyuan Plateau without major rivers and natural lakes, and thus the farm pond was necessary for agricultural irrigation. Tea was the main export crop during this period, but afterwards the rapid industrialization in Taoyuan City caused the emigration of the local population and the abandonment of farmland. Gaoyuan suffered from economic decline after the 1970s. Currently, Gaoyuan community remains largely unchanged in terms of landscape. The Xia-Dian-Zi farm pond, which consists of an upper pond and a lower pond, is near a road and surrounded by farmland, vegetation, residences, and other farm ponds. The area of Xia-Dian-Zi farm pond is rich in natural landscapes and ecological resources where the people, water, soil, plants and animals live in harmony. The farm pond not only cultivates a natural ecosystem in the defined environment, but also fits into the community and the wider green infrastructure.

The farm-pond-based green network provides diverse areas of natural, semi-natural, and man-made space to create an interconnected spatial resource that supports UA practice and values the accessibility of nature within the settlement (Figure 5). It shows that the pondscape represents a collective memory of a typical farm-pond-based Hakka settlement (IV1*), where the well-maintained green network is essential and fundamental to supply an attractive and healthy setting for daily life, create distinctive landscape features for places, and establish UA with its multiple roles. Although the original purpose of farm ponds has been lost and many of them have been abandoned or buried, some people still cherish the memory of those days living around them and attach great importance to their future roles, such as UA, in the local community. Interviewee IV2, a team leader of farm pond workers, said:

> "Farm ponds and the surroundings are the precious property left by our ancestors to us. So we cannot let them disappear and must keep them well-maintained ... to promote their potential uses and values as a water and green resource ... such as the production of organic and non-toxic vegetables for our own community."

To develop UA, low-impact materials, which allow water to infiltrate and recharge aquifers and help reduce air temperatures, have been adopted to manage Xia-Dian-Zi farm pond, such as pond-side wooden decks, and a mix of wood-chip and stone-paved paths nearby a Mugwort field (IV5*) (Figure 6). It is shown that agricultural production is inextricably linked with our ecological systems, and it is vital to access on-site natural and ecological features when implementing UA, in order to advance environmental quality and landscape value. The importance of landscape character as a key part of UA is indicated by the case study to develop healthy and sustainable communities. Especially, because the farm pond area is highly accessible and close to the community center, its green spaces and farmlands with opportunities for outdoor activities and natural services given by nature provide a wide range of environmental and social benefits that positively contribute to people's overall health and well-being. Interviewee IV4, a farmer and the greenhouse owner, said:

> "We usually walk around the farm pond ... to see the changes of seasons, to see the farmlands, to see the vegetables we grow, to see them grow up day by day ... or just walk around to experience the nature ... we feel happy, content with that."

Regarding the source of irrigation water for farming, it is identified that pumped groundwater, rather than Xia-Dian-Zi farm pond, is the main supply. As described earlier, there is still concern about the water quality, because it can be affected by various sources of pollution, such as industrial waste and run-off. Unfortunately, pumping water can bring about an increase in maintenance costs, energy consumption, and greenhouse gas emissions. Therefore, how to improve and ensure the water quality

of the farm pond so that it is suitable for agricultural uses remains a challenge for the community and its target of sustainable development.

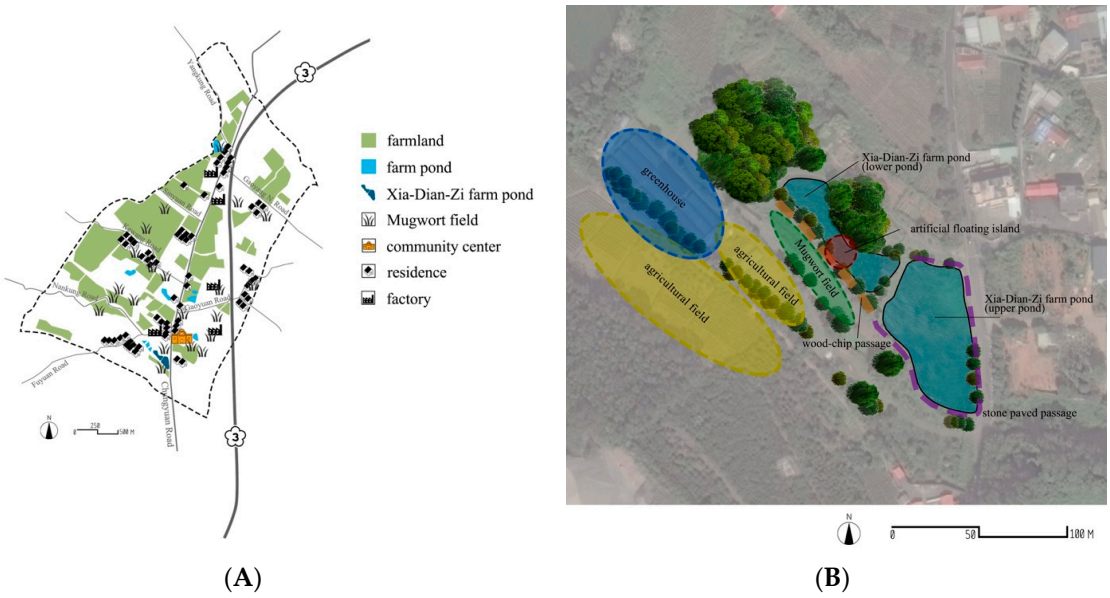

Figure 4. The plans of Gaoyuan community (**A**); and Xia-Dian-Zi farm pond (**B**).

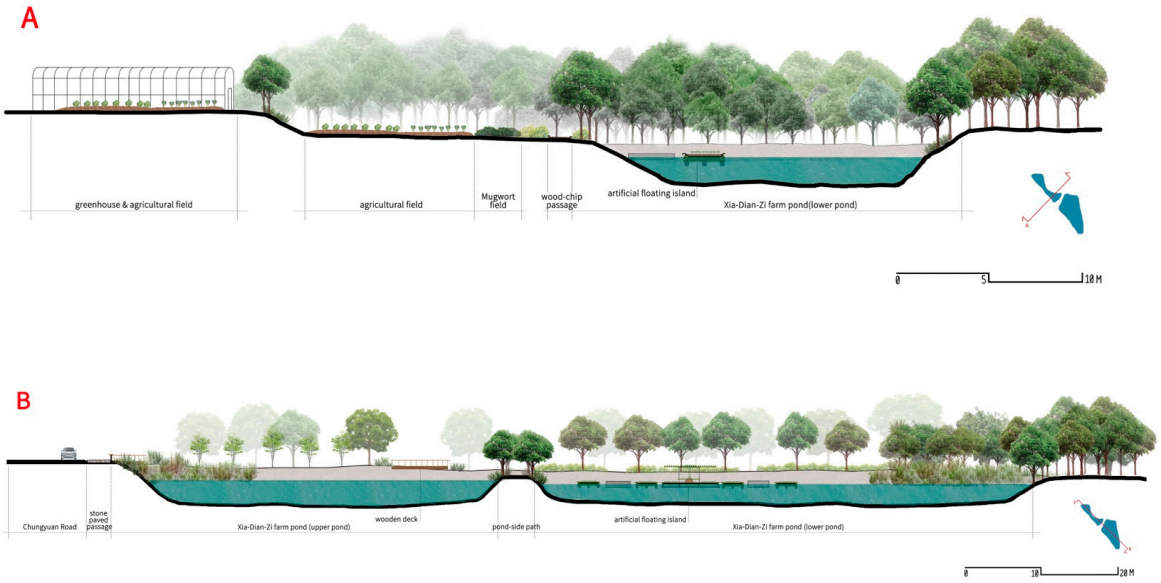

Figure 5. Two cross-sections of Xia-Dian-Zi farm pond: (**A**) cross section; and (**B**) longitudinal section.

A **B**

Figure 6. A low-impact landscaping approach: a combination of a wood-chip path and a stone-paved path nearby a Mugwort field (**A**); and a pond-side wooden deck (**B**).

Evidently, an agricultural-community-like pondscape occurring in the intra-urban fabric is a distinctive landscape character in terms of Gaoyuan's transformation (Figure 7). Under the growing pressure of rapid urbanization and social-economic development, Xia-Dian-Zi farm pond is the first in the local area to demonstrate how a farm pond, as an important cultural landscape, could be revitalized to reconnect people, nature, and agriculture. Through restoring the farm pond area, people recall the pleasant past to re-experience the agricultural-community-like lifestyle and environment. Interviewee IV1, the community leader, said:

> "I was born here … why we still live here because of its air, quietness, environment, atmosphere … but new developments, such as high-tech factories, raise local concerns about the impact on lifestyle and environment … thus we hope to maintain the original, desirable landscape of Gaoyuan … what we do is small-scale community farming and landscaping to bring back the agricultural-community-like pondscape that is full of our memories living here."

(**A**) (**B**)

Figure 7. (**A**) An agricultural-community-like pondscape as a distinctive character of Gaoyuan; (**B**) the photo shows a perspective view from the lower pond to the upper pond.

There is only a five-minute-walking-distance between the community center and Xia-Dian-Zi farm pond. Scattered trees, wide farmlands, grassy fields, bird sounds, natural breezes, fragrant plants

and visible wildlife constitute the in-between environmental experience. When arriving in the farm pond area, there is a stone-paved path around the upper pond with wooden decks to access water or look into the distance. To go further, the lower pond is in sight, with artificial floating islands on top of the water and surrounded by a wood-chip path and agricultural and Mugwort fields. Farmers and workers are talking to each other. This real-life scene shows an idyllic lifestyle and environment of traditional-agricultural-community-like qualities. Interviewee IV3, a team leader of farm pond workers, said:

> "We would say that accessing water is human nature. For an agricultural, farm-pond community, coexistence with nature is the central value. We cannot live without it . . . openness of view, clean water, fresh air, tall trees, good agricultural productivity, diverse wildlife, feelings of relaxation, stress relief . . . to live a healthy life ... I desire this kind of environment."

To sum up, the analysis shows that the landscape character, involving linking nearby nature to people, a green network of diverse spaces, low-impact landscaping, and an agricultural-community-like pondscape, contributes to the implementation process of UA in Gaoyuan. The UA practice features a revitalized farm pond as a site that possesses natural features, such as calm water, verdant plants, spatial openness, natural sounds, fresh smells, and perceptible wildlife. This further corresponds to the multi-functionality of UA, as a farm pond area can function as an important and favorable vehicle in the community for fostering opportunities for relaxing and restorative experiences in an outdoor setting, promoting the positive influences of UA on local residents' health and well-being.

5.2. Active Engagement, Participation, and the Agency of People

The UA implementation in Gaoyuan is reliant upon an understanding of the importance of people's long-term involvement in, and experience of, farming activities, interpersonal interactions and community services, and how these shape the character of the community (IV7*) (Figure 8). The area of Xia-Dian-Zi farm pond is a private property but is managed by GCDA for public use by focusing on working cooperatively, learning mutually, and sharing experience. Specifically, the team of farmers takes care of the Mugwort field, the organic farming (i.e., the greenhouse), and non-toxic farming on the pond-side farmlands and artificial floating islands. The team of farm pond workers carries out the pond-related construction and management (e.g., artificial floating islands). The team of environmental protection workers (15 people per group) is responsible for all the farm ponds and their surrounding area's regular maintenance (e.g., cleanup) (Figure 9), besides undertaking a long-term ecological survey to build a database of the ponds' natural environment and ecology. Especially, the team of farm pond workers also plays a key role in the outdoor educational program for groups of around 20 students. Because of the reputation of UA combined with ecological diversity and community revitalization, the area of Xia-Dian-Zi farm pond has been an environmental education site that can accommodate groups of around 15 people every session (e.g., agricultural experience activities) (Figure 10). Moreover, the organic agricultural products are certified periodically by organic certification organizations authorized by CoA. Non-toxic farming focuses on the avoidance of chemical fertilizers and the use of certified organic fertilizers made mainly from sawdust, bean dregs, and pulp.

It seems that UA acts as a catalyst for local people's participation that encourages civic engagement and active citizenship. Interviewee IV4, who is also a leading teacher of the environmental education sessions, talked about his experience:

> "What is the motivation for participating in the community affairs . . . I think because this is my hometown. If we can do, we of course come together to help. We are happy for doing this. Because this is true happiness, it can be naturally disseminated to other people."

Through cooperative working, team members have a sense of achievement that is a key to pushing themselves forward and toward emotional well-being. Interviewees IV2 and IV3, team leaders of farm pond workers and farmers, respectively, talked about their feelings when seeing a wealth of UA:

"We can have such achievements, and these will encourage ourselves to go further . . . the more we work, the more inspired we feel." (IV2)

"The physical exhaustion is totally offset by the sense of achievement!" (IV3)

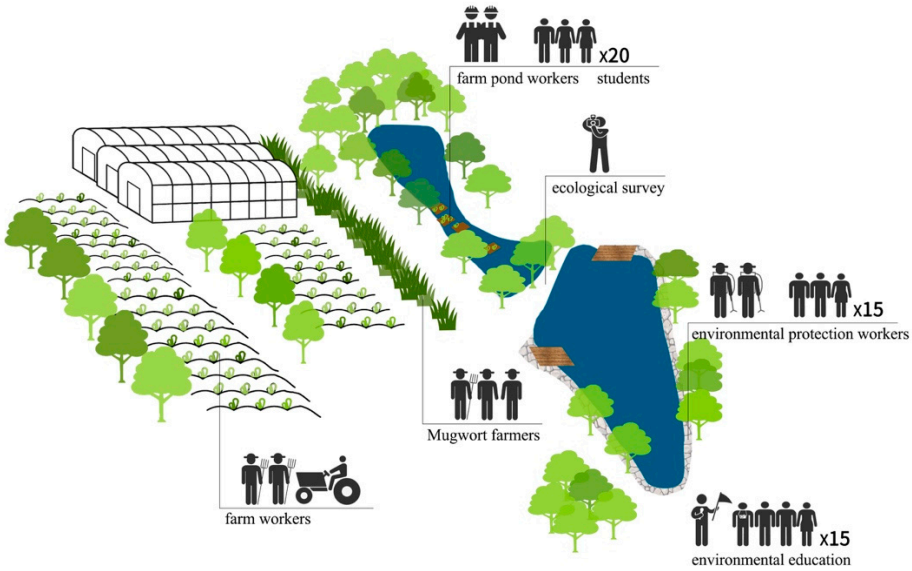

Figure 8. Cooperative working, mutual learning, and experience-sharing.

Figure 9. An environmental cleanup of the upper pond of Xia-Dian-Zi.

Figure 10. A UA environmental education workshop.

The case of Xia-Dian-Zi farm pond is also an example of a UA practice where mutual learning and experience-sharing are important contributors to realize bottom-up, community-led UA initiatives. The working locations of all individuals and groups are near each other, therefore members can see each other, conduct conversations with each other, and learn what others do. Interviewee IV4, who is also an expert in organic farming, said:

> "I am good at organic farming, but when the farm pond workers are building bamboo rafts and artificial floating islands, I have no idea about that, so I am willing to see what they are doing, to learn from them ... Sometimes we stop our work, take a rest, and maybe help the Mugwort farmers with a little work, such as passing organic fertilizers to them. We can chat to each other about what we do, the life, the community. This is very relaxing with friends."

The case of Xia-Dian-Zi farm pond shows that the presence of a pleasant environment to work, learn, interact, and relax is important for developing UA. Bringing community members together through UA is valuable to further help revitalize communities. Moreover, artificial floating islands (Figure 11) represent a collective work from the bottom up rather than autocratically from the top down. This process enhances people's awareness of how UA can be developed multi-functionally. Especially, the ways of improving the ecological environment have been an important aspect of Gaoyuan community's development [IV1*]. By an integration of growing non-toxic vegetables (e.g., lettuce and spinach) and offering wildlife habitats, artificial floating islands are beneficial to the ecological diversity of the farm pond area. Interviewee IV5, who is a team leader of environmental protection workers and has been involved in ecological conservation, emphasized the multiple functions of artificial floating islands:

> "No matter how the farm pond is redeveloped, we must preserve its ecology, even create more ecological values within the area ... the use of artificial floating islands is not just for growing non-toxic vegetables, it can also create biodiversity and wildlife habitats that attract dragonflies, turtles, fishes and others ... you can even see turtles climbing up the floating island to sunbathe ... it is an ecology, and a landscape, too. Its benefits expand gradually."

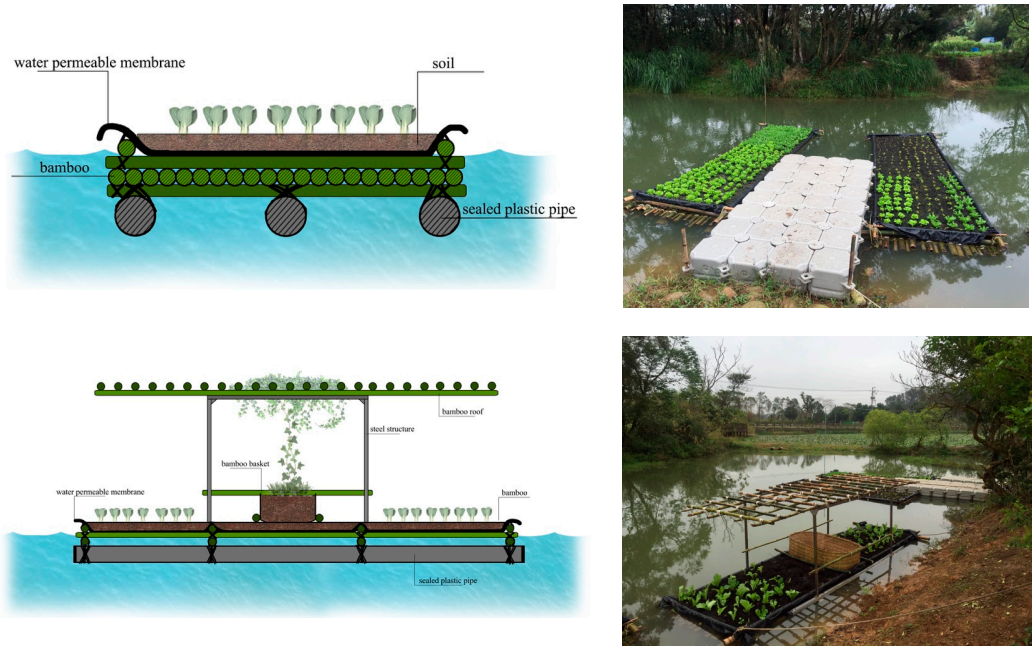

Figure 11. Two types of artificial floating islands.

The utilization of artificial floating islands has multiple purposes: growing aquatic vegetables, improving water quality, and enhancing ecological diversity. The soil used in artificial floating islands is called peat soil. Technologically guided by external experts, the construction of the two types of artificial floating islands requires collective work from the community. Particularly, it is linked with an environmental education workshop recently offered by Taoyuan City Government and the Department of Landscape Architecture, Chung Yuan Christian University. Every year, approximately 20 undergraduate students work with community members to build artificial floating islands (Figure 12). This process highlights UA's potential to build a strong and healthy community. Interviewee IV2, a teacher of the environmental education workshop, said:

> "When we work together, especially students coming, I feel I am more cheerful, more energetic. It seems that I am 10 years younger!"

In summary, the analysis indicates that UA has stimulated active, sustaining engagement, participation, and agency of local people that enables farm-pond-based cooperative working, mutual learning and experience-sharing, such as the work with artificial floating islands. The case shows favorable outcomes of UA that require bottom-up, community-led action in the long term. Additionally, it is a collaboration between the community and the university that has created productive results.

Figure 12. Students worked with the community members to build artificial floating islands.

5.3. Social Cohesion and Well-Being

The case of Gaoyuan community shows not only a farm-pond-based UA implementation, but also a cohesive social network beyond that (Figure 13). Gaoyuan has actually experienced the evolution from traditional agriculture, through economic decline to the practicing of UA, and the current status is heavily dependent on the community's awareness, support, and resources to develop a social network incorporating UA into community revitalization. A key task of this is to engage more people in the process with everyone being well-suited to a particular job [IV1*]. Gaoyuan has been successful in performing the task, as a result of the nature of a typical farm-pond-based, agricultural Hakka settlement, where close social relationships help to bind community members together. For example, the team of community kitchen workers, mainly composed of employed and retired women who know each other, has been effective in helping in a program that serves meals for the community elderly as well as providing after-school child care services. Interviewee IV6, a team leader of community workers and community kitchen workers, said:

> "I think we have done it very well! ... not just for some groups of people, but for all the community members, including the elderly, middle-aged adults, and children ... Our activities arranged that we can take care of different people, everyone can gather together at various events. This helps us get united."

Making connections and empowering people are fundamental to the robustness of the social network existing in the farm-pond-based community. Interviewee IV7, a senior local government official who has been involved in the change of Gaoyuan, said:

> "In Gaoyuan, a range of working groups has been set up and operated individually for promoting community affairs. This is the idea of empowerment ... The community is like a center that links everyone, every group, who are working cooperatively and effectively ... During the process, the role of government is to encourage community autonomy ... to establish their own characters, like Gaoyuan."

Apparently, this process allows people involved to get experience, a sense of achievement, and a sense of belonging, as Interviewee IV6 also said:

> "There is a general consensus among us that we all work for the community . . . we are given the power to do what we can do on our own positions ... we are working quite happily, with good collaboration. If the community needs us, we definitely join in and work together."

It is noteworthy that UA plays an essential role in the formation of social cohesion and well-being. The GCDA leads people to clean up farmlands, improve the soil, make up fertilizer, control pests and plant diseases, improve eco-diversity, build up a greenhouse, and rehabilitate Xia-Dian-Zi farm pond, whereby it shows the feature of UA, i.e., that clean, non-toxic and organic food and non-food crops are produced. More importantly, using these UA products (e.g., harvested vegetables), community kitchen workers prepare meals for the community elderly (lunches) and children (dinners) on a daily basis (IV3*, IV6*) (Figure 14). This has developed a system of combining UA with community care. When people understand whom the food is supplied to and where the food is from, there will be more community residents to join in the voluntary work. Interviewee IV2, a team leader of farm pond workers, said:

> "When seeing the elderly are happy to eat the food we grow . . . how to say . . . I am very happy, emotional . . . a sense of achievement . . . doesn't feel it is hard work."

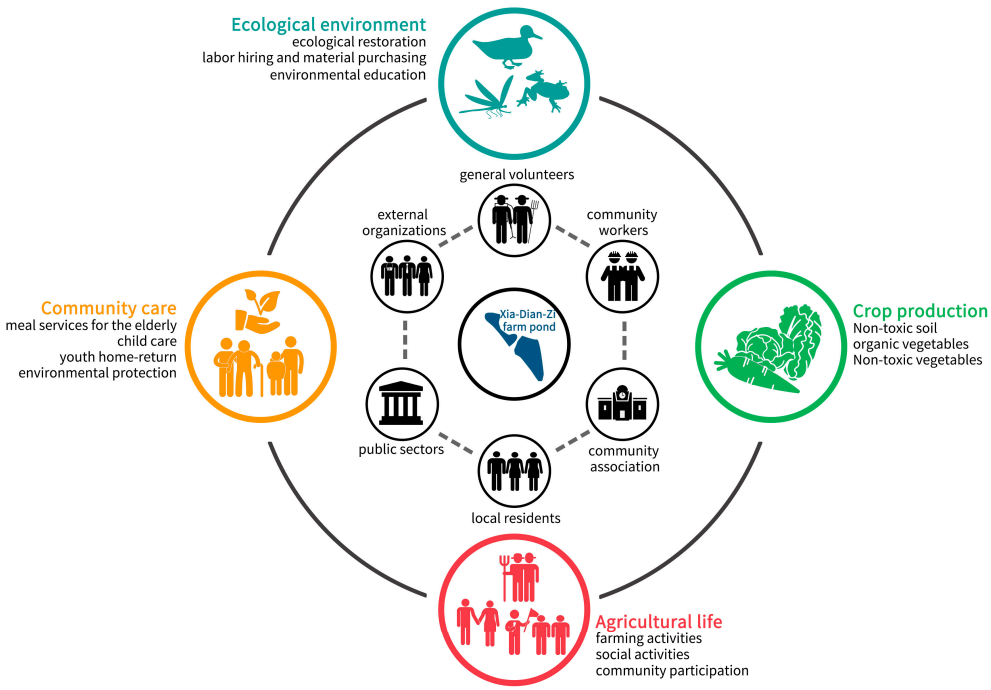

Figure 13. The cohesive social network of Gaoyuan.

Figure 14. University students having lunch with the community elderly.

Evidently, social cohesion is influential in revitalizing the farm-pond-based community, as the effects it brings about matter both for individuals and the community. At an individual level, social cohesion can strengthen active participation in community affairs such as farming activities. At a community level, social cohesion can be an integral part of a strong and effective social network. Their integrated effects on people's health and well-being and the community's sustainability obviously can be significant. Following the above, important issues associated with the research findings will be further discussed.

6. Discussions: The Function of UA in Place-Making for an Agricultural Landscape

The international literature contains many studies that have shown various roles, functions and benefits supplied by UA, yet its potential as a development option in finding alternative ways of handling social, economic, and ecological challenges in growing cities has been somewhat neglected in Taiwan, rarely receiving the same level of attention and resources as other development approaches [67]. Based on the case study of Gaoyuan, this paper aims to explore the multi-functional UA resource as a catalyst for the revitalization of Gaoyuan community. The findings indicate that UA is far more than simply food production in the city. Spatially speaking, the nature of UA as quality-enhancing and diversity-valuing on the community landscape is significant. UA can be elaborated as a valuable contributor to green infrastructure in an urban fabric. Socially speaking, the farm-pond-based UA displays the robustness of grassroots citizenship that encourages social cohesion and place-based community revitalization. Ecologically speaking, UA, as part of the urban ecological system, plays an important role in managing the farm pond that emphasizes green networks, agrobiodiversity, and water resources. Economically speaking, the food and non-food products of UA aim to achieve mostly social goals, such as community care, rather than economic profits. Overall, a cohesive social network has been developed in Gaoyuan that involves agricultural life, crop production, an ecological environment, and community care.

In Gaoyuan, the agricultural landscape today represents a synthesis of natural features (e.g., water, plants, wildlife, openness, and sounds) and human interventions (e.g., facilities, fields, farming activities, and artificial floating islands). This farm-pond-based practice has established the specific landscape character of UA (i.e., linking nearby nature to people, a green network of diverse spaces, low-impact landscaping, and an agricultural-community-like pondscape) to differentiate

its development from others. In line with Lovell [4] and Ives and Kendal [68] indicating various values of UA, this study highlights a strong link between UA and nature, because of the farm pond's capacity to enable people to extensively and deeply perceive the beauties of nature in comparison with an urban environment. Furthermore, the space of the farm-pond-based UA is distinctive, as people's perception changes over time due to seasonal changes and production cycles such as the colors, odors, and sounds as well as the growth of crops. The results imply that the physical landscape can be clearly defined by spatial units, yet the perceived size and scale of the agricultural landscape may be enlarged or downsized, because of the landscape ambiance.

Corresponding to a recent study about UA typologies [69], the case study indicates that besides the farming techniques and crops, environmental conditions (e.g., water body, landform and buildings) play a central role in making the spatial forms and qualities of the farm-pond-based UA. This circumstance further defines how people can access the space and how people are associated with the space. The way that UA is amalgamated with the surrounding areas, as illustrated in the analytic figures, has a deep influence on how UA can underpin community revitalization, such as at Xia-Dian-Zi farm pond, functioning as the central place incorporating various community activities.

The implementation of UA in Gaoyuan shows a process of place-making for an agricultural landscape. As such, not only the form and features of physical spaces are created, but also a great possibility for different non-productive activities and amenities related to people's quality of life is provided. Underpinned by Tornaghi [70], who indicates the place-making role of UA, the findings show that the implementation of the farm-pond-based UA features a creative, collaborative process that contains design, development, and construction or rehabilitation of various places for farming, leisure, recreation, social interaction, environmental education, and ecological services. The desired end-state of these places is sustainable, distinguishing, well-maintained, and unified environments that satisfy people's needs and enhance their overall health and well-being.

It is revealed that the case study involves a group of individual sites, but developed as a united area with public, open access that enables residents to interact and enhances social networking. As identified by Zasada [71] who considers the social functions of UA, the study of Gaoyuan shows that the process of UA implementation features cooperative working, mutual learning, and experience-sharing, such as the production of artificial floating islands. This is a symbol of a cohesive social network mainly resulting from solid relationships with family and friends from the tradition of Hakka, and the empowerment of people who participate in community affairs. UA plays an essential role in the formation of social cohesion, because a sense of belonging, a sense of identity, and a sense of community are established through its implementation process, supporting Sowman [72] who points out that place identity, place attachment, and rootedness constitute a crucial aspect of the relationship of place to human well-being. Moreover, in accord with Souter-Brown [9] and Paradis et al. [30], the study findings indicate that bottom-up, community-led, participatory projects should be encouraged for the success of multi-functional UA. Indeed, the case study of Gaoyuan demonstrates the importance of social cohesion formed by such an approach to UA practice, where the combined effects of an individual level and a community level on fostering multi-functional UA and community revitalization can be significant.

The strong links between UA, nature, health, and community are recognized in the study, implying the potential of living environments for promoting healthy human lifestyles and well-being. This relates to a range of research that has examined the health benefits of exposure to, and interaction with, certain landscapes, typically featuring high levels of natural elements such as water, plants, trees, and vegetation. As an example, Ulrich [73] suggests that people have an innate bond with nature to respond positively to natural characteristics (e.g., scattered trees, moving water, grassy fields, and wildlife) that should have stress-reducing benefits. Hartig and Staats [74] show that people tend to prefer natural landscapes partly owing to their attention-restoration effects. Overall, the experience from the farm-pond-based UA community provides us with a sense of how local people live through the interaction with their environments, and a multifaceted understanding

that comprises physical landscape, place-human experiences and social relationships. Promoting a landscape of UA with well-being is obviously an important topic, for both health and environmental reasons. Such a landscape is context-dependent and varies from place to place. A local community is therefore a suitable research context for better understanding the resources and locality that enable UA, nature, people, and well-being to be connected, and how it could be developed to create a more sustainable environment.

7. Conclusions

Evolving from the conventional role of farming activity mainly as food production, UA with its multi-functional roles has recently become a globally important topic as it is regarded as a vehicle to tackle critical issues of societal changes toward a sustainable future. The Hakka community of Gaoyuan in Taoyuan City is a recent significant case of advocating UA combined with community revitalization, through changing a traditional water infrastructure area (i.e., Xia-Dian-Zi farm pond) into a public, multi-functional UA resource provided for the community and its residents. While Gaoyuan is widely considered as the first successful case of bottom-up, community-led, farm-pond-based UA in Taiwan, its actual performance is rarely explored in any depth. Few details are available on the socio-ecological benefits of UA in the community redevelopment process. This qualitative study thus focuses on the specific case to explore the community champions' experiences in the transformation of Gaoyuan toward a revitalized community.

Regarding methodological reflections, the qualitative research was based on a particular context (Gaoyuan community) and a particular data-collection period (August 2015 to July 2016). In order to better respond to the research aim and questions, this study depended mainly upon interview evidence for a better understanding of the experiences that have taken place, rather than statistical data for generalizable conclusions to better predict some phenomenon. Therefore, the recruitment of interviewees was aimed at achieving diverse personal backgrounds with active, long-term participation in local community affairs and with influential roles (i.e., champions) in the process of promoting UA combined with community revitalization. As Bryman [62] and Trochim [75] indicate, a thorough description of the research details is attempted in order to enhance the transferability of the qualitative findings. Although the study has reached its objectives, there was an important limitation. The study was only conducted on a small population who are the champions in the transformation process. To generalize the results for larger groups, the research should have included more participants at different levels or settings. Therefore, future research would benefit from a larger sample of UA participants and from a comparison of Gaoyuan with other types of UA in Taiwan that also include activities of civic engagement.

The key findings are:

1. The specific landscape character, which links nearby nature to people, a green network of diverse spaces, low-impact landscaping, and an agricultural-community-like pondscape, makes UA in Gaoyuan distinctive.
2. Through the contribution of active engagement, participation, and agency by the local people, the process of implementing farm-pond-based UA features cooperative working, mutual learning, and experience-sharing.
3. UA plays a vital role in shaping social cohesion, which encourages motivated, committed participation in community affairs at an individual level, and contributes to a robust and effective social network at a community level. Their combined effects on people's health and well-being and community revitalization can be considerable.
4. A cohesive social network has been developed in Gaoyuan that involves agricultural life, crop production, ecological environment, and community care.

The findings indicate that the farm-pond-based UA with its multi-functional resources acts as a catalyst for the sustainability of Gaoyuan community. In the spatial dimension, quality-enhancing

and diversity-valuing are identified as the main benefits of UA for the community landscape and can contribute to green infrastructure in the wider scale of an urban fabric. The social dimension highlights the importance of grassroots citizenship aided by the process of developing UA, actively promoting social cohesion, and place-based community revitalization. In the ecological dimension, UA features green networks, agrobiodiversity and water resources that are important for managing the farm pond and the urban ecological system. The economic dimension shows that the food and non-food production of UA intends to achieve mostly social objectives, such as community care, rather than economic profits. Correspondingly, a UA study from Hanoi, Vietnam, also shows the potential of ponds for a community UA resource such as food supply, agricultural biodiversity, environmental protection, flood prevention, and recreating a cultural landscape [8].

Through exploring the community champions' experiences, the paper intends to identify a different form of UA existing in an East Asian city and to communicate the potential of UA from a Taiwanese perspective. It is clear that the farm pond water quality is an important issue to be tackled, especially when ways of developing the multi-functionality of farm ponds is attracting growing attention nationwide. Moreover, the change of local political power may lead to a shift of emphasis away from the current status, implying that a steady progress of implementing UA based on a local consensus is a key response to local political conflict [IV7*]. In Taiwan, the case of Gaoyuan is a pioneer in the practice of farm-pond-based UA integrated with fostering community revitalization and preserving cultural landscapes, in comparison with similar farm-pond communities undergoing similar social, economic, and environmental changes, wherein commonly recreation-oriented developments (e.g., parks [76–78]) are favored, shaping a uniform pondscape and, simultaneously, contributing to the loss of place attachment and place identity.

In terms of fostering multi-functional UA, the case study underpins the European Landscape Convention, which stresses that the landscape contributes to the formation of local cultures, the consolidation of local identity, and individual and social well-being, with the aim of promoting landscape protection, quality, management, and planning [79]. Indeed, as the farm pond system is a prominent feature of the landscape in Taoyuan, the farm-pond-based UA practice in Gaoyuan shows an ongoing example that operates against the standardization and homogenization of landscape, acknowledging that the agricultural landscape contributes to the formation of local cultures and acts as an active component of the cultural and natural heritage of Taiwan.

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