agronomy

MDPI

Article

Chinese Residents' Perceived Ecosystem Services and Disservices Impacts Behavioral Intention for Urban Community Garden: An Extension of the Theory of Planned Behavior

Can Wu [1,2,3], Xiaoma Li [1,3], Yuqing Tian [4], Ziniu Deng [2,5], Xiaoying Yu [2,6], Shenglan Wu [7], Di Shu [1,3], Yulin Peng [2], Feipeng Sheng [8] and Dexin Gan [1,3,*]

1 College of Landscape Architecture and Art Design, Hunan Agricultural University, Changsha 410128, China; Wcan@hunau.edu.cn (C.W.); lixiaoma@hunau.edu.cn (X.L.); Shudi@hunau.edu.cn (D.S.)
2 College of Horticulture, Hunan Agricultural University, Changsha 410128, China; dengzn@hunau.net (Z.D.); yxy1578@hunau.edu.cn (X.Y.); pengyulin@stu.hunau.edu.cn (Y.P.)
3 Hunan Provincial Key Laboratory of Landscape Ecology and Planning & Design in Regular Higher Ed-ucational Institutions, Changsha 410128, China
4 School of Environment, Tsinghua University, Beijing 100084, China; tyq21@mails.tsinghua.edu.cn
5 Research Center for Horticultural Crop Germplasm Creation and New Variety Breeding, Ministry of Education, Changsha 410128, China
6 Mid-Subtropical Quality Plant Breeding and Utilization Engineering Technology Research Center, Changsha 410128, China
7 Orient Science & Technology College, Hunan Agricultural University, Changsha 410128, China; wushenglan@hunau.edu.cn
8 Department of Architecture, Hunan Urban Construction College, Xiangtan 411104, China; shenfeipeng@youfangkj.com
* Correspondence: Gandexin@hunau.edu.cn

Citation: Wu, C.; Li, X.; Tian, Y.; Deng, Z.; Yu, X.; Wu, S.; Shu, D.; Peng, Y.; Sheng, F.; Gan, D. Chinese Residents' Perceived Ecosystem Services and Disservices Impacts Behavioral Intention for Urban Community Garden: An Extension of the Theory of Planned Behavior. *Agronomy* **2022**, *12*, 193. https://doi.org/10.3390/agronomy12010193

Academic Editors: Moritz Von Cossel, Joaquín Castro-Montoya and Yasir Iqbal

Received: 13 December 2021
Accepted: 3 January 2022
Published: 13 January 2022

Abstract: Urban community gardens (UCGs), greenspace cultivated and managed for vegetables by local communities, provide substantial ecosystem services (ES) and are warmly welcomed by residents. However, they also have many ecosystem disservices (EDS) and are almost always refused by the decision-makers of the government, especially in China. Better understanding the residents' perceived ES and EDS and the impact on the behavioral intention (BI) toward UCGs is of great value to solve the conflicts between residents and the government concerning UCGs and to develop sustainable UCGs. Following the theory of planned behavior (TPB), we measured perceived ES/EDS, attitudes (ATT), perceived behavioral control (PBC), subjective norm (SN), and BI of 1142 residents in Changsha, China, and investigated their direct and indirect causal relationships using structural equation modeling (SEM). The results showed that: (1) ATT, PBC, and SN significantly and positively impact the BI of UCGs and together explained 54% of the variation of BI. (2) The extended TPB model with additional components of perceived ED/EDS improved the explanatory ability of the model, explaining 65% of the variance of BI. Perceived ES and perceived EDS showed significant direct positive and negative impacts on UCGs, respectively. They also indirectly impacted BI by influencing ATT, PBC, and SN. The findings of this study can extend our understanding of residents' attitudes, behavior, and driving mechanism toward UCGs, and can help decision makers to design better policies for UCG planning and management.

Keywords: urban community garden; ecosystem service and disservice; behavioral intention; theory of planned behavior; structural equation model

1. Introduction

According to the American Community Garden Association (ACGA), an urban community garden (UCG) is any piece of land managed and cultivated by local communities to grow vegetables or flowers [1,2]. UCGs are hybrid parts of the city belonging to both the

built environment and the green infrastructure, the public and the private, and the planned and the unplanned [3]. They are productive landscapes where people and place, mind and body, social and physical, and past and present intermingle [4]. UCGs offer many ecosystem services (ES) [5] such as the provision of food and medicinal plants [6], local climate regulation [7], biodiversity [8], habitat for species [9], the facilitation of active and healthy lifestyles [10], neighborhood relationships [11], opportunities for relaxation and recreation [12], increased social cohesion [13], and environmental education [14]. However, UCGs are also associated with various ecosystem disservices (EDS) [15] such as sheltering harmful animals and vectors of diseases, contaminating soil, destroying landscape aesthetics, and increasing interpersonal tension [3,16]. The current theoretical research mainly focuses on the direct or indirect social and environmental impacts of urban community gardens [1,5], where the understanding of ES and EDS focuses on assessing its level of delivery benefits and value [2,6]. However, to our knowledge, few studies investigate whether these services and impairments affect personal and social cognitive factors such as perception and attitudes, which affect their behavioral intentions or practices.

In the 19th century, the UCG emerged in the European and American urban areas in response to the lack of fresh food during the Industrial Revolution, and became an effective measure to prevent social unrest during war periods and the Great Depression [17]. The UCG is currently expanding worldwide and is seen as one strategy for responding to the dietary, social, and environmental problems caused by rapid urbanization in developed and developing countries. UCGs have attracted increasing attention from scholars and practitioners [18], with examples of UCGs including the Verge Garden in Australia [19], the Community in Bloom in Singapore [20], the P-Patch program in Seattle [21], and the Empty-Spaces Plan in Barcelona [22]. At the same time, many countries see UCGs as illegal and informal spaces; gardeners grow land in community public spaces without permission and consultation almost around the world [23], such as in Zimbabwe, Kenya, and South Africa [24].

Before 2010, there were no formal UCGs in Chinese cities [25]; residents spontaneously occupied open public space, usually green space, by creating self-claimed vegetable lots in many corners of cities [26]. Like many illegal UCG practices abroad, this spontaneously formed open gardening space [15] constitutes an infringement of land use rights without consultation with stakeholders such as non-gardeners and community officials. These spontaneous practices lead to disputes and conflicts, posing challenges to urban community governance in China [25,26]. In recent years, the Chinese government has increasingly supported the intensive development and ecological utilization of idle urban land. Within this context, the UCG is also seen as an effective measure for many urban regeneration policies, such as "Stock Regeneration" and "City Betterment and Ecological Restoration" [25]. Furthermore, since the UCG is regarded as a beneficial way to meet the well-being and needs of contemporary urban people, many local government agencies began to legally establish and maintain UCGs [27]. As of 2020, the number of legal UCGs has reached more than 300 in Shanghai and 30 in Changsha [28]. Most UCGs in China are initiated and created by residents or community grassroots organizations; in contrast, UCGs in developed countries are more often planned, developed, and managed by governmental or commercial agencies [25]. Therefore, to facilitate the establishment of comprehensive UCG planning, construction, and management policies in China, and to ensure that UCG projects remain vital and relevant, a deep understanding of urban residents' community gardening behavior is necessary.

To develop more effective community gardening interventions for urban residents, it is important to conduct research based on theoretical models that adequately explain and predict gardening behavioral intention. A primary framework for predicting and explaining behavioral intention is the theory of planned behavior (TPB) [29,30]. The theory emphasizes that the behavioral intention (BI) of individuals is influenced by their attitude (ATT), subjective norms (SN), and perceived behavioral control (PBC) [29]. Due to different research focuses, previous TPB-based research did not examine the interaction of

residents' perceived ecosystem services and disservices associated with the formation of UCG behavioral intention. Therefore, assessing the perceptions of ecosystem services and disservices is pivotal to developing guidelines and policies that improve UCG planning and management [31].

Given the lack of a comprehensive theoretical framework, the present study aimed to create a structural equation modeling (SEM) of the extended TPB model, including residents' perceived UCG ecosystem services and disservices, as a means of predicting the community gardening behavioral intention of Chinese urban residents. Our main objectives were to (i) investigate the perception of UCGs' ecosystem services and disservices by urban residents in inland China and (ii) examine the possible causal relationships among residents' perception of UCG ecosystem services and disservices and individual and social cognitive factors. SEM was applied to examine the hypothetical causal relationships driving the behavioral intention. The analysis in this paper focuses on the impact of perceived UCG ecosystem services/disservices on residents' individual cognitive factors (attitudes and perceived behavioral control) and social cognitive factors (subjective norms), as well as the significance and magnitude of impact on the gardening behavior intention. Therefore, the study findings contribute to the literature by revealing the mechanism for residents' perceived ecosystem services/disservices, attitude, self-efficacy, social stress, and UCG behavioral intention.

This study's first original contribution was novel evidence for the cognition of ecosystem services associated with UCG. The second original contribution was that we adopted an integrated view to jointly consider UCGs' abilities to provide ecosystem services and disservices. The third original contribution was that by adding the structure of perceived ecosystem services and disservices, we constructed an extended theoretical framework based on classical TPB theory. Our findings could help urban decision-makers and managers to better understand the ways UCGs are perceived and predict the possible impacts of changes in UCG ecosystem services and disservices on urban residents' gardening participation. Increasing residents' awareness of benefits that the UCG could provide (perception of ecosystem services) can motivate their continued behavioral intention. Reducing the various obstacles associated with UCGs and thus reducing residents' perceived ecosystem disservices will help provide useful information for future scientific regulations, planning concepts, construction models, and management policies related to UCG practice, giving community gardens sustained long-term vitality.

The rest of this article is organized as follows. In Section 2, we review the relevant literature and develop hypotheses. Then, the research design and methodologies are described in Section 3. Furthermore, in Section 4, we analyzed the results and examined the influential mechanism for residents' perceived ES/EDS, individual/social cognition factors, and behavioral intention. Finally, the discussion and conclusions are given in Section 5.

2. Research Background and Hypotheses Development

To develop more effective community gardening interventions for general urban residents, it is important to conduct research based on theoretical models that adequately explain and predict gardening behavioral intention. The theory of planned behavior (TPB) is a socio-psychological model for predicting and explaining individual motivation and behaviors, especially pro-environmental behaviors [29,30]. From the psychological perspective, TPB theory is a useful theoretical framework that can shed light on the complex psychological processes underlying individual behavior, which makes it an important tool to apply while clarifying the role of human volitional behaviors [32,33]. The theory emphasizes that the behavioral intention (BI) of individuals is influenced by their attitude (ATT), subjective norms (SN), and perceived behavioral control (PBC) [29]. Attitude is the first determinant and refers to the degree of a person's positive/negative [34,35], support/non-support [36], and/or favorable/unfavorable [37] evaluation or appraisal for performing a behavior [38]. Perceived behavioral control (PBC) is the second determinant and refers to the personal perceptions that make it difficult or easy to conduct a certain ac-

tion and the extent to which performing a particular act is under the individual's volitional control [39]. Subjective norm as a social predictor is the third determinant of behavioral intention and refers to an individual's perception of the degree to which social pressure prompts them to perform or avoid a particular behavior and whether important others support or do not support the activity [40]. Current studies indicate that an individual's intention to participate in a behavior is stronger when they have positive attitudes towards that behavior, a greater sense of self-efficacy, or strong social support [35,41]. Behavioral intention is at the core of TPB and is the key link between psychological perception and behavior. PBC, ATT, and SN all have an impact on BI, but in different ways and to various extents [41]. The stronger an individual's intention to undertake a behavior, the more likely the behavior will be performed [42,43]. If a person has a favorable appraisal and a better perceived behavior control ability of the UCG, he may also expect his important referent individuals (or groups) to endorse his behavior. The higher a person's evaluation and confidence in his participation in UCG behavior the more likely he is to perceive less pressure from important representatives. TPB has been successfully applied to many domains of pro-environmental behavior, including sustainable housing purchase intention [44], energy-saving and emission reduction [45], recycling behaviors [46], environmental protection [47], and participatory natural resource management [48].

Due to different priorities, previous researchers have investigated the determinants of a range of pro-environmental behaviors among citizens. Nevertheless, in the context of the UCG, few studies have used the TPB to investigate the relationship between residents' individual or social psychological factors, and their impact and extent on behavioral intention [39,40]. These lead to the following hypotheses:

Hypothesis 1 (H1). *Attitudes are positively associated with UCG behavioral intention.*

Hypothesis 2 (H2). *Subjective norms are positively associated with UCG behavioral intention.*

Hypothesis 3 (H3). *Perceived behavioral control is positively associated with UCG.*

These lead to the following hypotheses:

Hypothesis 4 (H4). *Attitudes are positively associated with subjective norms.*

Hypothesis 5 (H5). *Perceived behavioral control is positively associated with subjective norms.*

The TPB is a very parsimonious model that allows researchers to include additional predictors associated with a particular behavior [42]. Recent interpretations of the theory suggest that the original TPB model is extended through new factors if behavioral intention or practice achieve a significant amount of the variance by including these predictors [49]. Researchers have explained that UCG ecosystem services (or disservices) are a series of beneficial (or harmful) consequences of promoting (or hindering) social and ecological sustainability produced through gardening behavior. Therefore, the perception of ecosystem services (or disservices) is rooted in an awareness of beneficial (or harmful) consequences [50,51]. Although it is rare to intervene in perceived ecosystem services as an extension factor in the TPB theory to explain behavioral intention and actual action, some researchers have studied residents' perceptions of ecosystem services and disservices for urban green spaces as predictors of behavioral intention and suggest that the decision-making process is related to protective behavior [52]. Moreover, in a meta-analysis of psychological–social determinants of pro-environmental behavior, it was found that the awareness of consequences has important and direct effects on individuals, social elements, and intentions in the TPB and indirectly affects behavior [53]. These results suggest that perceived detrimental consequences affect behavioral intention [33,34,54,55] and that a high level of awareness of positive consequences will help foster a more favorable attitude [32]. In addition to the relationship between awareness of consequences and

attitude, the fact that individuals recognizing specific behavioral consequences will better understand the impact of the behavior on others and the environment [56] implies that people who are highly aware of consequences have a strong sense of social expectation [57]. Consequently, some studies have provided empirical evidence for the direct impact of awareness of consequences on subjective norms [53,57,58]. Moreover, research has shown that an awareness of consequences precedes attitudes, perceived behavioral control, and subjective norms [58]. These results suggest that an awareness of beneficial (or harmful) consequences may influence behavioral intention and real action through individual and social variables.

However, few studies have included residents' perception of ecosystem services and disservices in the UCG as additional factors in TPB models and explored the driving effects of perception on residents' attitudes, self-efficacy, and social stress. These lead to the following hypotheses:

Hypothesis 6 (H6). *People who perceive higher ES will have more positive attitudes toward UCGs.*

Hypothesis 7 (H7). *People who perceive higher ES will have more positive SN toward UCGs.*

Hypothesis 8 (H8). *People who perceive higher ES will have more positive PBC toward UCGs.*

Hypothesis 9 (H9). *People who perceive lower EDS will have more positive attitudes toward UCGs.*

Hypothesis 10 (H10). *People who perceive lower EDS will have more positive toward UCGs.*

Hypothesis 11 (H11). *People who perceive lower EDS will have more positive PB toward UCGs.*

Moreover, ecosystem services and disservices are often formed based on the same set of ecosystem characteristics, ecological functions, or species groups [59]. This can easily make people conscious of the connection between the perceived ecosystem services and disservices. These lead to the following hypothesis:

Hypothesis 12 (H12). *Perceived ecosystem services are negatively correlated with perceived ecosystem disservices.*

Recently, increasing attention has been given to the importance of ecosystem services and the application of ecological models to analyze the multi-level effects of pro-environmental behavior [19,39,40]. The concept of ES has been mainstreamed as an interdisciplinary guiding framework in urban sustainability and resilience agendas [60]. The psychological theory of motivational functionalism states that motivation is the process that initiates, guides, and maintains goal-oriented behaviors and involves biological, emotional, social, and cognitive forces [61]. Motivation is the need to drive people in a specific direction to a certain purpose and to conduct a certain behavior. However, as ecosystem services help shed light on the relationship between the ecosystem and human behavior [62], ES can not only motivate the development of personal and social processes that initiate, direct, and sustain human action [38,63], but also stimulate changes in attitudes and behaviors regarding some symbol or object or aspect. Thus, the psychological theory of motivational functionalism defines ecosystem services as motivation [38,62]. The ecosystem service motivations of UCGs include those related to food supply, biodiversity preservation, soil fertility maintenance, air purification, climate regulation, physical health, recreation, interpersonal communication, and cultural education [39,51,61,64–67]. While fewer existing studies have focused on the impact of residents' perceived UCG ecosystem services on their gardening behavior, many studies confirm a significant association between resident or gardener motivation and urban gardening intention or behavior, focusing on the causes of motivation and how motivation affects behavioral intention or practice. The literature

relevant to motivation-related urban gardening behavioral intention or practice studies is summarized in Table 1.

Table 1. Motivations related to urban gardening behavioral intention or behavior studies.

Reference	Garden Type	Sample Size	Data Collection	Interviewee Type	Main Finding
[39]	UCG/UAG	180	Questionnaire survey	Gardener	Used TPB theory; the gardener's behavioral intention to participate is influenced by functional motivation, emotional motivation, and conditional motivation.
[67]	UCG/UAG	300	Questionnaire survey	Resident	Discussed the associations between personal characteristics and perceptions, needs, and motivations of potential future gardeners.
[15]	UCG	300	Questionnaire survey	Resident Gardener	Discussed respondents' corresponding motivation, the existing barriers and challenges of their behavior, and the behavioral intention to participate in paid gardening.
[65]	UAG	873	Online survey	Resident	Identified the main characteristics and motivation of potential urban gardeners and determined the mechanism of the influence of these features on motivation.
[61]	UAG	141	Questionnaire survey	Resident	Explored the correspondence between the six resident motivations and the eight gardening needs.
[68]	UHG	126	Questionnaire survey	Gardener	Divided the motivation for home gardening into two categories, one involving social interests and function and the other inherent in nature.
[69]	UCG	23	Interview	Gardener	Explored six functional motivations and three conditional motivations that influence community garden behavior.
[51]	UAG/UHG	23	Interview	Gardener	Indicates gardeners with different cultural backgrounds have different motivations for participating in gardening.
[18]	UG	60	Questionnaire survey	Gardener	Gardener's gardening motivation is divided into two types: a clear preference for gardening as a means of physical and mental health and learning new skills, and another mainly a yield-based motivation.
[64]	UCG/UAG	40	Interview	Gardener	Gardener functional motivation has direct relevance to their gardening practice; the connection between gardeners and garden occurs in gardening behavior.

Note: UG stands for urban gardens, UCG stands for urban community gardens, UAG stands for urban allotment gardens, URG stands for urban roof gardens, and UHG stands for urban home gardens.

Furthermore, motivation and barriers always appear simultaneously in many research articles. There is a range of motivations to promote gardening behavior and various barriers to the behavioral development have also been studied. Barriers regarding UCGs are related to finances, external damage, space, water, soil, organizational structure, communication,

interpersonal relationships, and participation [70–72]. In many articles, ecosystem disservices have been described as harmful consequences of ecological change or as deficient ecosystem services [73,74]. Ecosystem disservices belong mainly to four fields [73]. To begin with, ecosystem structure, processes, and services provided are negatively affected by population and development systems [75]. Then, (socio-) economic structures and processes are negatively affected by ecosystem disservices [76,77]. Furthermore, human health is negatively affected by ecosystem disservices [52]. Finally, people's quality of life is reduced by ecosystem disservices, which in turn leads to negative emotions such as anxiety and depression [52]. Studies have pointed out that many of the barriers to the occurrence and sustainability of behavior are due to ecosystem disservices [74]. Recent studies have reported that UCGs' ecosystem disservices obstruct the development of UCGs and negatively impact gardening behavior. Studies have also found that residents' motivation to grow organic or healthier food, maintain personal health, and improve quality of life [39] were positively associated with their behavioral intention and actual gardening behavior, whereas environmental impacts and health threats were negatively associated with horticultural participation and behavior [68]. Notably, people of different social backgrounds have different motivations or obstructions, but all factors have positive or negative effects on gardening behavior [66]. However, few articles have talked about the perception of UCG ecosystem services and services affecting horticultural behavioral intention or practice. The more residents believe in high ecosystem services, the greater their motivation, and the more forward their behavioral intention. In contrast, the more they think that UCGs produce various ecosystem disservices and hinder the development of gardening behavior, the more cautious and even less intent they have to carry out this behavior [70]. In addition, studies that rely on survey responses while examining the perception of motivation or obstruction have focused on gardeners in Western countries and have rarely centered on urban residents in Asian environments [15]. These lead to the following hypotheses:

Hypothesis 13 (H13). *Perceived ecosystem services are positively associated with UCG behavioral intention.*

Hypothesis 14 (H14). *Perceived ecosystem disservices are negatively associated with UCG behavioral intention.*

In conclusion, all previous studies have pointed to a relationship between perceived ecosystem services or disservices and gardening behavior. However, a deeper interpretation of the interactions between individual, social, and perceived ecosystems should explore a theoretical framework. Given the absence of an integrated theoretical framework to predict the gardening behavioral intention of Chinese urban residents, the present study adopted an extended TPB model. Perceived ecosystem services and disservices variables were hypothesized as common precursors of attitude, perceived behavioral control, and subjective norms as determinants of gardening behavioral intention among urban residents (Figure 1).

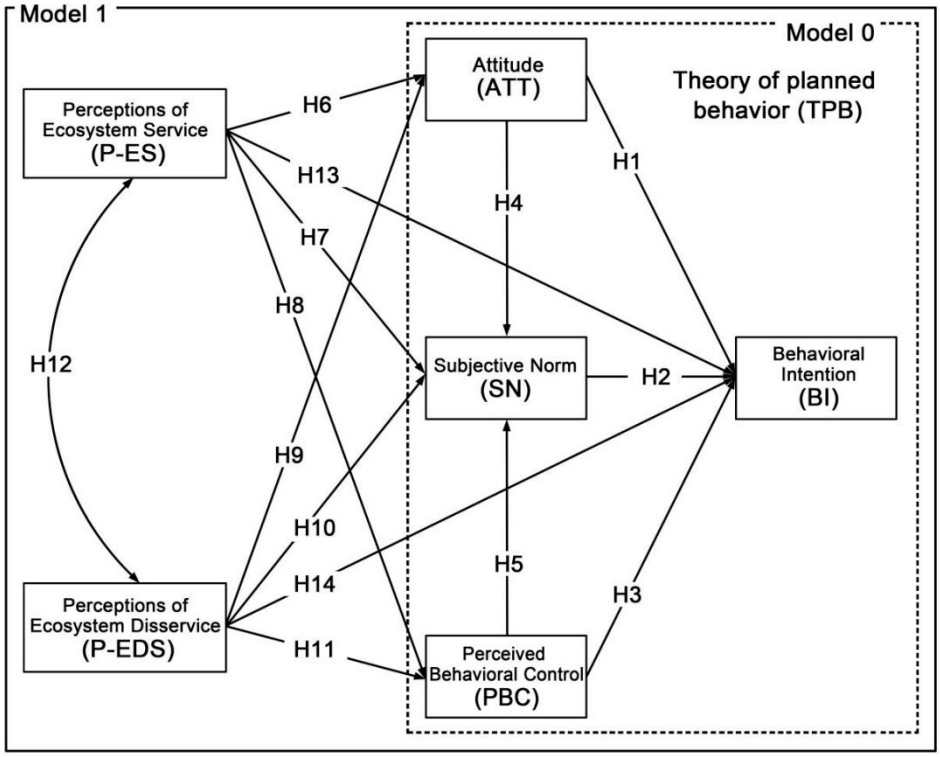

Figure 1. The initial conceptual diagram of urban residents' behavioral intention for UCGs.

3. Methodology

3.1. Participants and Data Collection

This paper gathered data in Changsha, China. The city is situated in the subtropical monsoon climate and has an urbanization rate of 79.6%, absorbing 2 million permanent migrants (23.8% of the permanent population). Since 2017, the government has launched the UCG project in 30 communities within the city. This survey went through three phases over a period of two years—two pre-surveys and a formal survey stage. First, between January and May 2019, we conducted the first pre-survey. This consisted of semi-structured face-to-face interviews with 84 gardeners living in six adjacent communities in the Furong District of Changsha to identify and characterize several of the most important ecosystem services in the area. Respondents could choose among eighteen ecosystem services available for urban gardens with content derived from previous research [22]. All respondents were audio recorded with their permission and each session lasted between 30 and 75 min. Twelve ecosystem service categories that were easily understood and perceived by gardeners were finalized. Subsequently, we conducted a second pre-survey. Between May and June 2019, we conducted a household survey of residents living in the same community as the previously interviewed gardeners, with 778 residents completing a structured questionnaire. We examined which of the twelve ecosystem services proposed by gardeners are more easily perceived by residents. At the same time, residents' perceptions of ten ecosystem disservices from UCGs were investigated. Variable preparation for EDS was derived from previous studies [70,73]. We placed the six ecosystem service functions that residents can easily perceive under the four major categories covered in established ES classifications: provisioning, regulating, habitat/supporting, and cultural services [78]; four EDS categories that were easily understood and perceived by residents were finalized.

Through the above two pre-surveys, the focused content of the more easily perceived ES and EDS by the urban residents of the surveyed area was identified. Furthermore, the individual/social cognitive factors and behavioral intention of UCGs were investigated. To obtain more representative data, with the help of the Changsha City Administration, the community managers of the five main urban areas became key informants. Using a

"snowball technique," interviewed community managers were asked to provide connections to new informants. An online survey was conducted in July 2020. In cooperation with Changsha Ranxing Information Technology Co., Ltd., a professional online survey service provider, we designed and collected the questionnaire. The company's users have covered more than 90% of the universities and research institutes in China; their questionnaire survey is a well-known brand trusted by leading enterprises in various industries. The company's strict privacy regulations for personal information and incentives to stimulate participation help to reduce potential bias. This survey received 1692 replies with a valid response rate of 67.5%. Statistical analysis was performed on the data of 1142 valid collected questionnaires.

The respondents' socioeconomic status is shown in Table 2. Respondents consisted of 465 men (40.72%) and 677 women (59.28%). The demographic and social attributes of the respondents were surveyed in the research, including their gender, age, education level, and family monthly income. There were 326 individuals aged between 18 and 35 (28.55%), 342 aged between 36 and 44 (29.95%), 265 aged between 45 and 64 (23.2%), and 209 people aged over 65 (18.32%). A total of 12% of the respondents had a master's degree and above, and 39.32% had a college diploma. People with senior middle school education accounted for 25.31% of the total population, and 23.38% population had completed junior middle school and below. With respect to income level, 17.08% of the respondents had a monthly income below CNY 1000, 10.25% had a monthly income over CNY 10,000, and 23.82% had a monthly income of CNY 1000–2999.

Table 2. Distribution of the socioeconomic status characteristics of the respondents.

Socioeconomic Status	Items	Frequency (*n*)	Proportion (%)
Gender	Male	465	40.72
	Female	677	59.28
Age	18–35	326	28.55
	36–44	342	29.95
	45–64	265	23.20
	>65	209	18.32
Education	Junior middle school and below	267	23.38
	Senior middle school	289	25.31
	College	449	39.32
	Master's degree and above	137	12.00
Income (CNY per month)	<1000	195	17.08
	1000–2999	272	23.82
	3000–4999	225	19.70
	5000–6999	207	18.13
	7000–9999	126	11.03
	>10,000	117	10.25

3.2. Measures

To compile a reliable set of items to measure the constructs and test the proposed model, we conducted a comprehensive literature review. Table 3 provides a summary of the items with their corresponding constructs.

Table 3. Measurement items for the personal, social, and perceived ES/EDS constructs.

Constructs	Measurement Items
Personal and Social Factors	
Behavioral Intention	Do you intend to do the following behavior in the community garden? (BI1) Gardening activities, such as planting, watering, digging, and weeding; (BI2) mental recovery activities, such as meditation and relaxation; (BI3) and recreational communicative activities, such as chatting and gathering.
Attitude	What is your attitude towards UCG as follows? (ATT1) health, education, communication, and other functions; (ATT2) community gardening space and fields; (ATT3) a variety of planting, leisure, and communicative behaviors; and (ATT4) fruit and vegetable products.
Perceived behavioral control	How do you view your behavioral control capabilities associated with UCG? (PBC1) Gardening experience, (PBC2) gardening skills, (PBC3) time available for gardening, and (PBC4) gardening information possession.
Subjective Norms	To what extent are you willing to obey the attitudes and expectations of these people? (SN1) Family members, (SN2) friends, (SN3) neighbors, and (SN4) municipal authorities.
Perceived ecosystem services and disservices	
perceived ecosystem services	To what extent do you think UCGs could bring the following benefits? (P-ES1) Vegetable food supply, (P-ES2) physical recreation/leisure, (P-ES3) social cohesion/integration, (P-ES4), maintained soil fertility/purified air/regulated climate, (P-ES5) biodiversity conservation/habitat maintenance, and (P-ES6) maintenance of agricultural or horticultural cultural heritage/education.
perceived ecosystem disservices	To what extent do you think UCGs could bring the following four damages? (P-EDS1) Volatile organic compounds and greenhouse gas emissions pollute the community environment, (P-EDS2) urban infrastructure is damaged by growing plants and microbes, (P-EDS3) vector-borne disease lurking in urban wetlands affecting residents' health, and (P-EDS4) the messy and dense growth of vegetation or crops makes people irritable.

Note: P-ES = perceptions of ecosystem service; BI = behavioral intention; P-EDS = perceptions of ecosystem disservice; ATT = attitude; PBC = perceived behavioral control; SN = subjective norm.

A validated TPB questionnaire [49] was translated into Chinese. The questionnaire was reworded so the questions and answers were more in line with our national conditions, making it more easily understood by Chinese people. The revised questionnaire, used to measure individual and social structure, was hypothesized to reflect gardening behavioral intention in UCGs. We used the questionnaire to conduct face-to-face interviews with 84 gardeners and 778 residents.

In the theory of planned behavior, behavioral intention (BI) is the most direct factor affecting behavior, which is the individual volitional intention to perform (or not to perform) a behavior [49]. This paper defines BI as the volitional intention of residents to carry out or not carry out community gardening behavior. Residents' BI toward UCG was measured

with three items: "Do you intend to do the following behavior in the community garden? Gardening activities, such as planting/watering/digging/weeding [79], mental recovery activities, such as meditation and relaxation [48]; and recreational communicative activities, such as chatting and gathering [44]." Participants were asked to rate each item described above on a 5-point scale ranging from 1 (never) to 5 (always). The BI scale internal consistency (Cronbach's alpha) was 0.913.

Attitude (ATT) is defined as a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor. This study defines attitude as the evaluative response of residents to the community gardening behavior itself and its target products. Residents' attitude toward UCG was measured with four items: "What is your attitude towards UCG as follows? Health, education, communication, and other functions [80]; community gardening space and fields [77]; a variety of planting/leisure and communicative behaviors [81]; and fruit/vegetable products [82]." Participants were asked to rate each item described above on a 6-point scale ranging from 1 (strongly dislike) to 6 (strongly like). The ATT scale internal consistency (Cronbach's alpha) was 0.963.

Perceived behavioral control (PBC) is the degree of ease or difficulty with which an individual thinks he can control and perform a behavior [49]. PBC is influenced by two factors: controlled belief and perceived power [43]. This study defines the perceived level of four important factors: information, skills, experience, and abilities related to the development of community gardening behavior [44]. PBC was measured by confidence under four conditions in response to the question: "How do you view your behavioral control capabilities associated with UCG? Gardening experience [43], gardening skills [46], time available for gardening [51], and gardening information possession [44]". Participants were asked to rate each item described above on a 6-point scale ranging from 1 (not confident at all) to 6 (very confident). The internal consistency (Cronbach's alpha) was 0.940.

Subjective norm (SN) is a person's perception of social pressures that enables them to perform or not perform the behavior [49]. SN is influenced by normative beliefs and submissive motivations. This paper defines SN as the degree to which residents follow the expectations of a "significant other" for community gardening behavior. Subjective norms were measured by asking about the following four "significant others": To what extent are you willing to obey the attitudes and expectations of these people? Family members, friends, neighbors and municipal authorities [47,54]." Participants were asked to rate each item described above on a 6-point scale ranging from 1 (strongly unwilling) to 6 (strongly willing). The internal consistency (Cronbach's alpha) was 0.903.

Before measuring the perceived UCG's ecosystem service, we first evaluated the ecosystem services and disservices for gardeners. Eighteen ES items (food supply, biodiversity, maintenance of soil fertility, local climate regulation, air purification, global climate regulation, pollination, entertainment and leisure, quality of food, nature and spiritual experiences, exercise and physical recreation, relaxation and stress reduction, aesthetic information, place-making, social cohesion and integration, biophilia, learning and education, and maintenance of cultural heritage) were extracted using items from the studies of Marta Camps-Calvet et al. [22]. Six EDS items (volatile organic compounds and greenhouse gas emissions, excessive use of pesticides and chemical fertilizers, urban infrastructure damaged by growing plants and microbes, vector-borne disease lurking in urban wetlands, disgust about animal feces or plant waste, and irritability about the messy and dense growth of vegetation or crops) were also extracted from the studies of Von Dohren [73] and Becker [70]. We visited the gardeners' UCGs and 178 gardeners were asked to score the above 18 ES items and 6 EDS items on a scale from 1 (strongly disagree) to 6 (strongly agree). The reliability and validity of each item was reported. This step shows us that in selected regions the UCG is relatively significant in the provision of nine ES and four EDS; this result is similar to the previous article [15]. However, several recent research articles have identified differences between the actual delivery of ecosystem services and human perception [83]. Therefore, before the formal survey we surveyed 778 residents,

targeting the nine perceived ES and four perceived EDS indicators described above, to examine whether their perceived ES and EDS were significant for measured items.

Finally, in the formal questionnaire, perceived ES was measured by the following six items: "To what extent do you think UCGs could bring the following benefits? Vegetable food supply [84], physical recreation/leisure [85], social cohesion/integration [86], maintained soil fertility/purified air/regulated climate [87], biodiversity conservation/habitat maintenance [88], and maintenance of agricultural or horticultural cultural heritage/education [89]". Additionally, perceived EDS was measured by the following four items: "To what extent do you think UCGs could bring the following four damages? Volatile organic compounds and greenhouse gas emissions pollute the community environment [90], urban infrastructure is damaged by growing plants and microbes [91], vector-borne disease lurking in urban wetlands affects residents' health [73], and the messy and dense growth of vegetation or crops makes people irritable [92]". The internal consistency (Cronbach's alpha) was as follows: perceived ES scale was 0.928 and perceived EDS was 0.848.

3.3. Statistical Analysis

SEM is a combination of two statistical methods: confirmatory factor analysis and path analysis. Confirmatory factor analysis (CFA), which originated in psychometrics, estimates latent psychological traits [93,94]. Path analysis, on the other hand, had its beginning in biometrics and finds the causal relationship among variables by creating a path diagram [95]. This article follows the two-step approach for the practical structural equation model (SEM) recommended by Anderson and Gerbing [96].

First, the CFA was conducted with IBM SPSS AMOS to test data reliability by calculating the Cronbach' s alpha of all observed variables [97]. This step tested whether measurement models of residents' perceptions of ecosystem service/disservice, attitude, subjective norms, perceived behavioral control, and behavioral intention towards the UCG were consistent with our hypothesis. Before data analyses were carried out, we completed data descriptive analysis for socioeconomic status (SES), which was measured as a construct of education and income.

Second, SEM was performed. SEM is a special form of multivariate analysis and was used to examine the hypothetical causality among multiple variables and how their inter-relationships may play a role in determining a particular outcome in this study. Hypothetical causal relationships were illustrated using a path diagram and analyzed for the standardized partial regression coefficients, which can be interpreted as the magnitude of direct causal influence [98]. The maximum likelihood method was used during both steps to estimate parameters. The tests involved the two models: the TPB-only model (M0) and the TPB plus perceived ES/EDS model (M1), which integrated the perceived ecosystem service and disservice constructs. Model fit was assessed using the chi-square test (X^2), likelihood ratio (X^2/df), comparative fit index (CFI), and root mean square error of approximation (RMSEA) following the best practices in SEM as suggested by Mueller and Hancock [99]. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) 22.0 for Windows and Analysis of Moment Structures (AMOS) 23.0.

4. Results

4.1. Descriptive Statistics

The descriptive statistics for the measured variables are shown in Table 4. Overall, participants had a positive attitude (M = 4.077, SD = 1.526), and a moderate level of confidence in perceived behavioral control associated regarding UCG (M = 3.197, SD = 1.557). Furthermore, residents' behavioral intention to participate in the UCG, which was measured by using a five-point scale, had a moderately high score (M = 2.881, SD = 1.451) In addition, means of 4.048 (SD = 1.403) for the perceived ecosystem services indicated that the participants had a high level of evaluation with the UCG ecosystem services. The mean score of 3.452 (SD = 1.232) for perceived ecosystem disservices indicated that residents favored a certain amount of the possible damages caused by UCGs. However, social support

for community gardening from "important others" around them is inadequate (M = 2.921, SD = 1.347).

Table 4. Standardized estimates and psychometric properties of the parameters of the measurement model.

Measurement Item	Mean (S.D.)	Standard Deviation	Standard Error	Factor loadings	Squared Multiple Correlations	Average Variance Extracted	Composite Reliability
BI	2.881	1.451				0.781	0.914
BI1	3.045	1.42	0.042	0.686	0.712		
BI2	2.824	1.463	0.043	0.772	0.757		
BI3	2.774	1.469	0.043	0.773	0.699		
P-ES	4.048	1.403				0.682	0.928
P-ES1	4.305	1.503	0.044	0.675	0.634		
P-ES2	4.566	1.406	0.042	0.714	0.677		
P-ES3	3.884	1.366	0.04	0.854	0.719		
P-ES4	3.665	1.357	0.04	0.849	0.703		
P-ES5	3.848	1.385	0.041	0.798	0.687		
P-ES6	4.022	1.401	0.041	0.782	0.714		
P-EDS	3.452	1.232				0.598	0.853
P-EDS1	4.147	1.119	0.033	−0.705	0.538		
P-EDS2	3.165	1.275	0.038	−0.827	0.59		
P-EDS3	3.835	1.311	0.039	−0.798	0.652		
P-EDS4	2.659	1.222	0.036	−0.735	0.53		
ATT	4.077	1.526				0.869	0.964
ATT1	4.306	1.426	0.042	0.773	0.828		
ATT2	3.887	1.614	0.048	0.818	0.844		
ATT3	3.963	1.517	0.045	0.806	0.855		
ATT4	4.153	1.545	0.046	0.803	0.847		
PBC	3.197	1.557				0.806	0.943
PBC1	3.173	1.614	0.048	0.883	0.829		
PBC2	3.131	1.598	0.047	0.901	0.861		
PBC3	3.071	1.539	0.046	0.883	0.782		
PBC4	3.411	1.478	0.044	0.786	0.643		
SN	2.921	1.347				0.701	0.903
SN1	2.984	1.362	0.04	0.842	0.683		
SN2	2.757	1.307	0.039	0.82	0.694		
SN3	2.934	1.329	0.039	0.83	0.685		
SN4	3.007	1.388	0.041	0.789	0.583		

Note: S.D.: standard deviation; P-ES = perceptions of ecosystem service; BI = behavioral intention; P-EDS = perceptions of ecosystem disservice; ATT = attitude; PBC = perceived behavioral control; SN = subjective norm.

4.1.1. Behavioral Intention for UCG

Respondents reported a high degree of behavioral intention for UCGs. Residents were asked to choose based on the five-point scale, with higher scores representing stronger behavioral intention. Residents scored the highest enthusiasm for PI1-Gardening activities, such as planting, watering, digging, and weeding (3.05). They also participated in community gardening to undergo spiritual relaxation and recovery; therefore, the score for PI2-Mental recovery activities, such as meditation and relaxation (2.82), was also high. In addition, residents were interested in the social interactions that took place in community gardening, which was reflected in the score for PI3-Recreational communicative activities (e.g., chatting and gathering) (2.77).

4.1.2. Attitude, Perceived Behavioral Control and Subjective Norm

The study investigated the respondents' attitudes towards four types of the behavioral objects for the UCG, which all received high support. ATT1-Attitude towards health, education, communication, and other functions had the highest score (4.31), followed by ATT4-Attitude towards fruit and vegetable products (4.15) and ATT3-Attitude towards a variety of planting, leisure, and communicative behaviors (3.96). The lowest score was for ATT2-Attitude towards community gardening space and fields (3.89).

Participants had a certain high level of perceived behavioral control for UCG. The highest score was PBC4-Perceived level of gardening information possession (3.41), which may stem from the fact that we live in an informational age and people have easy access to knowledge about urban gardening and agriculture. PBC1-Perceived level of gardening experience (3.17) and PBC2-Percieved level of gardening skills (3.13) had similar scores, which indicates a strong association between these two factors. Respondents with long-term agricultural experience also had higher levels of perceived skills in the areas of agriculture and gardening; however, respondents who feel weaker behavioral control over PBC3 (perceived level of time available for gardening) reported lower scores (3.07), which indicates that they were uncertain about whether they could dedicate the time necessary to maintain an urban community garden or participate in those types of activities.

To a certain extent, residents were willing to follow the expectations of "significant others" or be influenced by pressure from individuals or institutions while making a decision about whether to support or oppose community gardens. Under the current urban management system, respondents had the highest compliance with urban and community managers, hence the high score for SN4-Municipal authorities (3.00). Their level of compliance towards family and neighbors was relatively neutral, so SN1-Family members (2.98) and SN3-Neighbors (2.93) received similar scores. Finally, they showed the lowest compliance toward their friends, which is reflected in the score for SN2-Friends (2.76).

4.1.3. Perceptions of Ecosystem Service and Disservice for UCG

The survey listed six types of common ecosystem services and allowed respondents to score them based on their perceptions of UCGs. Using statistical analysis, the mean value of each term was obtained. Residents had diverse sensitivity to the different types of ES provided by the UCG, which showed high perception in general. Cultural services, such as PES2-Physical recreation and Leisure services, were the most easily perceived by the respondents and had the highest score (4.57) followed by the product offering functions of Community gardening, such as PES1-Vegetable food supply, which were also highly recognized (4.31). Factors of cultural services related to human well-being, such as PES6-Maintenance of agricultural or horticultural cultural heritage/education (4.02) and PES3-Social cohesion/integration (3.88), were also favored by the respondents. Compared to several other ecosystem services, the scores for the two regulatory services related to ecological environment declined dramatically; PES5-Biodiversity conservation/habitat maintenance received a score of 3.85, and PES4-Maintain soil fertility/purified air/regulate climate received a score of 3.67.

Generally, in these negative statements on ecological, economic, and physical health impacts, more respondents agreed or strongly agreed that urban community gardens led to these ecosystem disservices. Respondents believed that UCGs contaminated the community environment due to sewage, toxic or irritating gas, and rubbish; therefore, the P-EDS1-Volatile organic compounds and greenhouse gas emissions pollute the community environment had the most negative impact with the highest score (4.15), followed by P-EDS3-Vector-borne disease lurking in urban wetlands affecting residents health (3.84), which includes plant allergies, animal attacks, and vector-borne diseases hidden in urban wetlands. The residents expressed a neutral attitude towards the factors related to economic damage, such as P-EDS2-Urban infrastructure is damaged by growing plants and microbes (3.17), and they were not sensitive to those damages. Overall, respondents did not believe that urban community gardening would have a significant negative impact on human

psychology; thus, the opinion about P-EDS4-The messy and dense growth of vegetation or crops makes people irritable, has the lowest score (2.66).

4.2. Measurement Model

This study first conducted a confirmatory factor analysis of the measurement model. The results showed that the measurement model was significant, and all the other measurement loads on the latent variables were also significant, as shown in Table 4. The collected data and measurement models reflected a good fit because all model fits exceeded the acceptable levels proposed by previous researchers. The fit indices for the TPB model were as follows: CMIN = 813.88, df = 245, CMIN/df = 3.322, GFI = 0.942, CFI = 0.978, AGFI = 0.924, NFI = 0.969, RFI = 0.962, IFI = 0.978, TLI = 0.973 and RMSEA = 0.045. The initial model M0 is a simple TPB model, and model M1 is an extended TPB plus perceived ES/EDS model. The composite reliability values for the constructs all exceeded the 0.80 guideline. Previous studies state that the average variance extracted (AVE) should not be below the recommended 0.50 level, and the AVEs in this study were between 0.64 to 0.97, fulfilling the requirements [100]. Additionally, the CFA detected that the factor composite score was greater than 0.50, which indicates that the convergent validity is good [101]. In this study, the AVE of an individual construct was compared with the squared shared variances between constructs and was used to examine discriminant validity. Additionally, as shown in Table 5, the AVE of each structure of the factor correlation matrix is greater than the square correlation coefficients between constructs and thus has discriminant validity [100]. Overall, the model performs well in terms of reliability, convergent validity, and discriminant validity. The result showed that the Cronbach' s alpha coefficient is 0.902. The KMO value is 0.937, and the P value of Bartlett's test of sphericity is significant [102].

Table 5. Discriminant validity: average variance extracted (AVE) and shared variances.

Variance	1	2	3	4	5	6
1 BI	**0.884**					
2 P-ES	0.545	**0.827**				
3 P-EDS	−0.485	−0.411	**0.773**			
4 ATT	0.599	0.640	−0.546	**0.932**		
5 PBC	0.521	0.429	−0.413	0.435	**0.898**	
6 SN	0.565	0.466	−0.322	0.493	0.352	**0.837**

(1) Off-diagonals are shared variance, and diagonals are AVEs (bolded). (2) All were significant at 0.001 levels; P-ES = perceptions of ecosystem service; BI = behavioral intention; P-EDS = perceptions of ecosystem disservice; ATT = attitude; PBC = perceived behavioral control; SN = subjective norm.

4.3. Possible Causal Relations Influencing Behavioral Intention

4.3.1. The Impact of ATT, PBC and SN

After fitting the measurement model, this study tested the M0 structural model and assessed the fitted data. Furthermore, to explore whether the extended TPB model (M1 model) increases the interpretation strength of the variance of behavioral intention, Figure 2 presents the standardized path coefficients and explanatory variance (R^2) for the M0 structural model. The M0 model shows good goodness-of-fit measures (GOFs) to the data in Table 6. The three variables of TPB had significant positive effects on behavioral intention, indicating that residents had a more positive attitude towards the UCG ($\beta = 0.38$, $p < 0.001$) and greater subjective norms ($\beta = 0.38$, $p < 0.001$); stronger perceived behavioral control ($\beta = 0.30$, $p < 0.001$) was also associated with greater behavioral intention. Respectively, attitudes ($\beta = 0.47$, $p < 0.001$) and perceived behavioral control ($\beta = 0.17$, $p < 0.001$) showed significant correlations for subjective norms. In the M0 model, the TPB variables accounted for 54% of the variance in behavioral intention. Therefore, the results of the M0 model tested the theoretical principles of TPB and supported the study's first hypothesis.

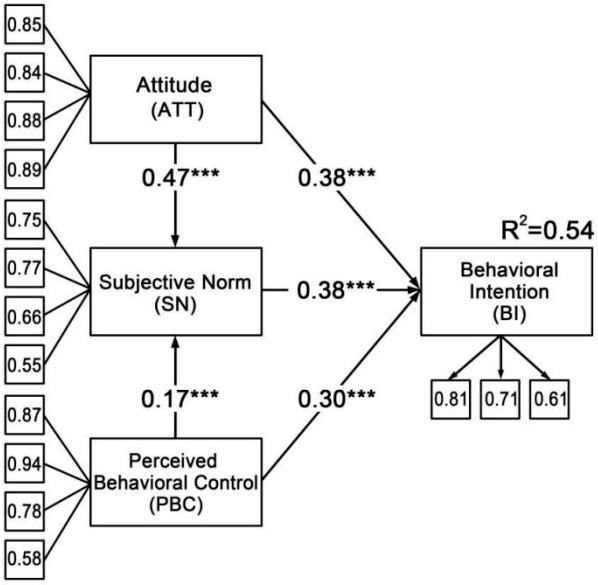

Figure 2. Possible causal relationships between the attitude, subjective norm, perceived behavioral control, and behavioral intention; *** $p < 0.001$.

Table 6. Goodness-of-fit measures (GOFs) for the structural equation models.

Goodness-of-Fit Measures (GOFs)	Adequate Level	Recommended Level	M0	M1
Root mean sq. error of approx. (RMSEA)	<0.1	<0.05	0.062	0.045
Goodness-of-fit index (GFI)	>0.9	>0.95	0.955	0.942
Adj. goodness-of-fit index (AGFI)	>0.8	>0.9	0.932	0.924
Comparative fit index (CFI)	>0.9	>0.95	0.980	0.978
Tucker–Lewis index (TLI)	>0.9	>0.95	0.973	0.973
Normal fit index (NFI)	>0.9	>0.95	0.975	0.969
Incremental fit index (IFI)	>0.9	>0.95	0.980	0.978
Relative fit index (RFI)	>0.9	>0.95	0.967	0.962

4.3.2. The Effects of Perceived Ecosystem Services and Disservices

The M1 model is an extended TPB model that includes factors of perceived ecosystem services and disservices, and it shows a good GOF in Table 5. The M1 structure model explained 65.0% of the variance in behavioral intention. By comparing the results of the M1 model to the M0 model, the research found an 11% increase in the explained variances of behavioral intention. Of all the 14 path coefficients, 13 were statistically significant ($p < 0.01$). Most of the results are the same as the ones that we initially hypothesized, with the perception of ecosystem service having significant and direct positive effects on attitudes ($\beta = 0.56$, $p < 0.001$), perceived behavioral control ($\beta = 0.33$, $p < 0.001$), and subjective norms ($\beta = 0.26$, $p < 0.001$). Additionally, the perception of ecosystem disservice had a significant direct negative effect on attitudes ($\beta = -0.34$, $p < 0.001$) and perceived behavioral control ($\beta = -0.29$, $p < 0.001$), but the direct effect on the subjective norm was not statistically significant. Standardized parameter estimates indicated that perceived ecosystem services and disservices were associated the most strongly with attitudes. Subsequently, attitudes ($\beta = 0.13$, $p < 0.001$), subjective norms ($\beta = 0.31$, $p < 0.001$), and perceived behavioral control ($\beta = 0.20$, $p < 0.01$) significantly predicted behavioral intention. Subjective norms are the most predictive of behavioral intention, as they are influenced by attitudes and perceived behavioral control. As shown in Figure 3, the path diagram has completely standardized parameter estimates. In support of the second hypothesis, the inclusion of the perceived ES and EDS variables based on the M0 model led to an increase in the explained variances of behavioral intention.

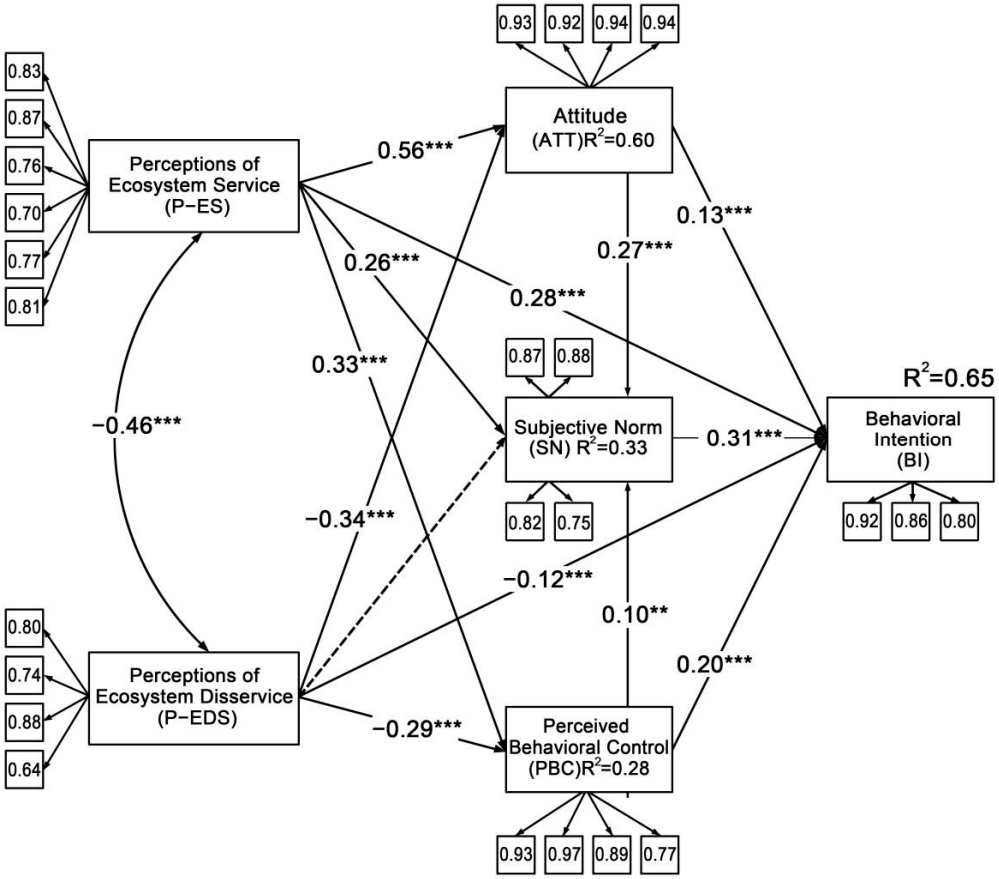

Figure 3. Possible causal relationships between perception of ecosystem service/disservice, attitude, subjective norm, perceived behavioral control, and behavioral intention; The dashed paths indicate removed hypothetical relationships leading to failed GOF measures; *** $p < 0.001$, ** $p < 0.01$.

5. Discussion

UCG development not only conforms to China's national concept of ecological construction, promoting the intensive development and ecological utilization of idle urban land, but is also an effective way to meet the needs of urban people, such as allowing close access to nature, improving lifestyle quality, and advancing well-being. This study used SEM to incorporate ecosystem services and disservices into the TPB model to explore the relationship between perceived ecosystem services by ordinary urban residents and community gardening behavioral intentions. It added novel evidence for cognition of the ecosystem services associated with UCG and adopted an integrated view to jointly incorporate UCGs' abilities to provide ecosystem services and deliver ecosystem disservices into an extended theoretical framework based on TPB theory. Overall, this study provides a better understanding of the relationships between individual, social, and perceived ecosystems by revealing that the perception of ecosystem services and disservices has important effects on predicting the behavioral intention of ordinary residents through individual and social factors. Furthermore, this study provides some support for the effectiveness and utility of the extended theory of planned behavior model in predicting the gardening behavioral intention of Chinese urban residents.

We reveal the mechanism of how residents' perceptions jointly influence their UCG behavioral intention. The first hypothesis of this study holds that behavioral intention is directly and positively influenced by attitude, perceived behavioral control, and subjective norms, which are positively influenced by attitude and perceived behavioral control. Consistent with the TPB theory, the study concluded that residents' attitudes towards UCGs have the greatest influence on their behavioral intention. Attitude or emotional motivation is an important determinant of all horticulture behavioral intention [15,19,67]. A

study of gardeners' participation in community (allocation) gardens found that the positive emotional connection they established with the garden strengthened their intention to participate [39].

Second, our study showed that residents' subjective norms of UCG had almost the same effect as attitudes on behavioral intention; however, subjective norms are largely influenced by attitudes; therefore, attitudes indirectly influence behavioral intention through subjective norms. Residents' subjective norms of UCGs affect behavioral intention to almost the same degree as attitudes. As subjective norms are largely influenced by attitudes, and attitudes are a greater influence on behavioral intent than subjective norms. This study pointed out that subjective norms are the most important cognitive structure that affects residents' gardening behavior. Compared with gardeners who have participated in a UCG, residents who were not involved in urban gardening thought that important others or institutions around them, especially municipal authorities, would not approve of the existence of community gardening in the city. Existing research has already proposed that municipal authorities could promote gardening participation by readjusting policies to change people's beliefs in subjective norms, which is a suggestion that our study confirms [19]. Additionally, this study found that the effect of perceived behavioral control or the self-efficacy of overcoming barriers on behavioral intention was the weakest of the TPB structures, which aligns with previous findings [3,71]. We thus confirmed that in order to consider the effects of attitude, perceived behavioral control, and subjective norms on behavioral intention, future interventions should adopt a multi-level research approach.

We simultaneously considered two perception constructs, i.e., perceived ecosystem services and disservices. We found that the two perceptions are negatively correlated with each other. These perceptions can explain and predict people's personal and social cognition towards UCG, thus playing a major role in influencing gardening participation. Among them, perceived ecosystem services become a non-negligible factor that can help them for residents to develop continuous gardening intentions by forming more positive attitudes, greater confidence, and less social pressure towards UCG. As we initially predicted, the inclusion of perceived ecosystem services and disservices in the TPB model led to an increase in the explanatory variance of residents' behavioral intention toward the UCG. In the initial M0 model, the explanatory variance of behavioral intention influenced by individual and social factors of TPB was 54%; however, with the extended M1 model, comparing the initial model led to an increase in the explanatory variance of behavioral intention from 54% to 65%, which is higher than the results from previous studies [39]. This finding provides support for the predictive validity of the extended TPB model. Our study did not incorporate residents' actual gardening behavior into the TPB model because many studies have shown that behavioral intention, though the closest and most direct prediction factor of behavior, does not necessarily explain real behavioral changes [42]. To narrow the gap between behavioral intention and real action and increase the explanatory variance of actual gardening behavior, future studies could delve deeper into the different roles of perceived ecosystem services and disservices.

The results of this study show that perceived ecosystem services (or disservices) not only have an indirect impact on gardening behavioral intention through the ATT, PBC, and SN factors in the TPB but also have positive (or negative) direct effects on behavioral intention. This suggests that the three variables in the TPB model do not fully mediate the relationship between perceived ecosystem and behavioral intention and that other important individual and social variables may exist. The present study examined other perceptions associated with ecosystem service functions, with individual and social factors, such as the neighborhood attachment [103], perceptions of environmental impact [68], perceived risks [104], life satisfaction [40], and identity perception [105], and found that they all have an impact on gardening behavioral intention or actions. Numerous studies have shown that a strong sense of community attachment linked to communal gardening encourages people to form connections between physical and social environments that promote interaction with others and spark changes in sustainable gardening behav-

ior [61,103,106,107]. Studies have also shown that perceptions of environmental impact from urban gardening ecosystems affect the promotion of more sustainable horticultural behaviors and practices [68,108]. The literature suggests that perception and identifying risk factors for urban gardening behavior that may have detrimental effects on human well-being are important considerations for achieving the various ecosystem service functions brought about by urban gardens [82,109,110]. In some studies on urban gardening promoting better life satisfaction and eating habits, these good perceptions have a positive effect on gardening behavior [40,68]. Some research highlights that urban gardening can reshape urban citizenship through residents' identity perception with their "environmental gardening identity" [105]. This identity perception, brought about by the social and cultural functions of ecosystem services, offers far-reaching potential for changes in gardening behavior and practice [111–114]. Based on our findings, we believe that further research should be conducted that examines the effects of various perceptual factors linked to urban gardening on behavioral intention and action.

Although aspects of urban horticultural ecosystem services and disservices have been explored in this study, gaining deeper insight into other service functions, such as community resilience [115], urban sustainability [116], landscaping [117], treatment function [118], and urban health service potential [69], would help shed light on gardening behavioral intention and practices. Community gardens have been proven to play an important role in the social–ecological resilience of urban ecosystems and offer residents a place where they can reduce stress, share experiences, and gain community support [119,120]. Previous research has shown that community gardens provide a model that can promote sustainable urban living by linking individuals and communities to the food system and promoting the development of a deep reconnection and long-term commitment to sustainable living practices [84,85,121,122]. It has been concluded that the aesthetic value of urban gardens helps enhance the attractiveness of urban areas and that a scientific garden distribution is more likely to contribute to a larger network of ecosystem services across a broader urban landscape [123–125]. Current research also indicates that site spatial and design characteristics affect people's gardening participation [126,127]. For nearly a decade, community gardens, especially at the local level, have been increasingly praised for revealing the relationship processes that connect people, ecology, and health [128] [129–132]. Notably, the latest research indicates that urban gardens have functioned as a potential health resource during the COVID-19 pandemic by giving gardeners a source of freedom and joy while facing difficult and potentially isolating situations [133,134]. On the other hand, while examining ecosystem disservices, researchers have found that vegetables grown in community gardens pose a health threat arising from their potential exposure to pollutants, such as heavy metals in the environment [104,135]. In conclusion, the metrics of six ES and four EDS are relatively common in this paper, but deepening the understanding of the function and damage of their ecosystem services is meaningful to illustrate community gardening behavioral intentions and practices in different cultural and social contexts.

Our findings provide a strategy adopted on the premise of adapting to the intensive development and ecological utilization of idle urban land and meeting the well-being and needs of contemporary urban people. That is: (1) to improve the level of delivery of the UCG's ecosystem services by developing and promoting new gardening technologies; (2) to construct and publicize a series of high-quality UCG exemplary cases, to spread its various ecosystem service functions to urban residents, and to improve their perception of UCG benefits; (3) to consider and address the various gardening technical problems and social obstacles, to reduce the UCG's ecosystem disservices; (4) to publicize effective technical measures and methods to reduce the UCG's ecosystem disservices, address potential participant concerns about possible obstacles and reduce their perception of UCG damage; and (5) to find and cultivate institutions or individuals as important reference groups, such as management agencies good at organizing and operating UCGs and enthusiastic gardeners who have successfully developed UCGs; their demonstration and drive will help improve the subjective norms of residents and thus promote their gardening behavioral

intention. The proposed strategy implies that the roadmap for UCG sustainable development can be implemented by early practitioners to later participants, from megacities to middle-and-small cities.

This study had several limitations that should be considered. First, potential confounding factors, such as demographic factors and UCG location (i.e., whether it was on a roof of a public building, on a communal inland surface, or in a vacant area outside of a given community), were not strongly distinguished. Although this study is based on TPB theory as well as previous studies, variables of the SEM model containing more confounding factors would be beneficial to elucidate our understanding of the perceived ecosystem correlates of gardening behavioral intention. Second, the survey of perceived ecosystem services/disservices, ATT, PBC, and SN measures in this study were self-managed by the authors, and although the reliability and validity of the measurements of these items were derived from previous conclusions, there was not a widely tested maturity scale, and this may have led to potential errors. Using objective techniques would help to reduce biases. Third, because research on UCG perceptual ecosystem services and disservices is in its infancy, further measurement tools need to be developed. Identifying the ecosystem supply characteristics of the different types of UCGs associated with resident gardening behavior will help develop more effective policies and incentives. Finally, the structural equation model that this study proposes is based on previous research and the TPB theories of environmental psychology, but it would also be productive to explore other plausible models to help explain community gardening behavioral intention and the practices of urban residents.

6. Conclusions

The results showed that perceived ES and EDS had significant effects on gardening behavioral intention and that factors of attitude, perceived behavioral control, and subjective norms in the TPB model partly mediated this association. These results have important practical implications for both policymakers and managers. For policymakers, the benefits and positive impact of UCG can be gradually advanced by improving its capacity to deliver ecosystem services and reducing the level of disservices to their ecosystems. Therefore, the findings of this study are valuable for developing guidelines and intervention policies for the planning and management of UCGs, which can promote more scientific and sustainable gardening behavioral intention among Chinese urban residents. Furthermore, the findings of this study also have important implications for community managers or local institutions following the legalization of UCGs. Since perceived ecosystem disservices were important for new participants who focused on innocuous practice, UCG managers should pay more attention to reducing these damages by advancing gardening techniques and optimizing management policies. Future studies could distinguish between the correlation between personal characteristics of potential gardeners in residents and their perceived ecosystem services and disservices. It is necessary to further explore the impact of the perception of ecosystem services and disservices in UCG, and of different spatial and governance types, on gardening behavioral intention and behaviors. To conclude, future studies are necessary to develop evidence-based theoretical models of changes in community gardening behavior among urban residents.

Author Contributions: C.W.: conceptualization, data curation, formal analysis, investigation, methodology, writing—original draft; Y.T.: conceptualization, methodology; Z.D.: conceptualization; X.Y.: conceptualization, writing—review and editing; S.W.: investigation; D.S.: investigation; Y.P.: investigation; F.S.: conceptualization; D.G.: conceptualization, data curation, methodology, resources, writing—review and editing; X.L.: conceptualization, methodology, project administration, resources, writing—review and editing. All authors have read and agreed to the published version of the manuscript.

Funding: This study was financially supported by the State Key Laboratory of Urban and Regional Ecology (SKLURE 2018-2-2), and was supported by the project of research on urban gardening planning based on the demand of national central city construction (Changsha City Administration and Integrated Law enforcement Bureau 17020).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: We would like to acknowledge the Changsha City Administration and Integrated Law enforcement Bureau—since 2017, with their strong support and help, the urban garden research team of Hunan Agricultural University, represented by the corresponding author and the first author, has successfully carried out a series of scientific research and practical explorations on urban gardens in Changsha. In addition, the first author would like to thank Shuai Xue for his assistance in restructuring and improving this manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Guitart, D.; Pickering, C.; Byrne, J. Past results and future directions in urban community gardens research. *Urban For. Urban Green.* **2012**, *11*, 364–373. [CrossRef]
2. Filkobski, I.; Rofè, Y.; Tal, A. Community gardens in Israel: Characteristics and perceived functions. *Urban For. Urban Green.* **2016**, *17*, 148–157. [CrossRef]
3. Fox-Kämper, R.; Wesener, A.; Münderlein, D.; Sondermann, M.; McWilliam, W.; Kirk, N. Urban community gardens: An evaluation of governance approaches and related enablers and barriers at different development stages. *Landsc. Urban Plan.* **2018**, *170*, 59–68. [CrossRef]
4. Dennis, M.; Armitage, R.P.; James, P. Appraisal of social-ecological innovation as an adaptive response by stakeholders to local conditions: Mapping stakeholder involvement in horticulture orientated green space management. *Urban For. Urban Green.* **2016**, *18*, 86–94. [CrossRef]
5. Caneva, G.; Cicinelli, E.; Scolastri, A.; Bartoli, F. Guidelines for urban community gardening: Proposal of preliminary indicators for several ecosystem services (Rome, Italy). *Urban For. Urban Green.* **2020**, *56*, 126866. [CrossRef]
6. Glavan, M.; Schmutz, U.; Williams, S.; Corsi, S.; Monaco, F.; Kneafsey, M.; Rodriguez, P.A.G.; Istenič, M.Č.; Pintar, M. The economic performance of urban gardening in three European cities—Examples from Ljubljana, Milan and London. *Urban For. Urban Green.* **2018**, *36*, 100–122. [CrossRef]
7. Cabral, I.; Keim, J.; Engelmann, R.; Kraemer, R.; Siebert, J.; Bonn, A. Ecosystem services of allotment and community gardens: A Leipzig, Germany case study. *Urban For. Urban Green.* **2017**, *23*, 44–53. [CrossRef]
8. Beumer, C. Show me your garden and I will tell you how sustainable you are: Dutch citizens' perspectives on conserving biodiversity and promoting a sustainable urban living environment through domestic gardening. *Urban For. Urban Green.* **2018**, *30*, 260–279. [CrossRef]
9. Niemelä, J.; Saarela, S.-R.; Söderman, T.; Kopperoinen, L.; Yli-Pelkonen, V.; Väre, S.; Kotze, D.J. Using the ecosystem services approach for better planning and conservation of urban green spaces: A Finland case study. *Biodivers. Conserv.* **2010**, *19*, 3225–3243. [CrossRef]
10. Veldheer, S.; Winkels, R.M.; Cooper, J.; Groff, C.; Lepley, J.; Bordner, C.; Wagner, A.; George, D.R.; Sciamanna, C. Growing Healthy Hearts: Gardening Program Feasibility in a Hospital-Based Community Garden. *J. Nutr. Educ. Behav.* **2020**, *52*, 958–963. [CrossRef]
11. Torres, A.C.; Prévot, A.-C.; Nadot, S. Small but powerful: The importance of French community gardens for residents. *Landsc. Urban Plan.* **2018**, *180*, 5–14. [CrossRef]
12. Exner, A.; Schützenberger, I. Creative Natures. Community gardening, social class and city development in Vienna. *Geoforum* **2018**, *92*, 181–195. [CrossRef]
13. Schram-Bijkerk, D.; Otte, P.; Dirven, L.; Breure, A.M. Indicators to support healthy urban gardening in urban management. *Sci. Total Environ.* **2018**, *621*, 863–871. [CrossRef] [PubMed]
14. Gregory, M.M.; Leslie, T.W.; Drinkwater, L.E. Agroecological and social characteristics of New York city community gardens: Contributions to urban food security, ecosystem services, and environmental education. *Urban Ecosyst.* **2015**, *19*, 763–794. [CrossRef]
15. He, B.-J.; Zhu, J. Constructing community gardens? Residents' attitude and behaviour towards edible landscapes in emerging urban communities of China. *Urban For. Urban Green.* **2018**, *34*, 154–165. [CrossRef]
16. Egendorf, S.P.; Cheng, Z.; Deeb, M.; Flores, V.; Paltseva, A.; Walsh, D.; Groffman, P.; Mielke, H.W. Constructed soils for mitigating lead (Pb) exposure and promoting urban community gardening: The New York City Clean Soil Bank pilot study. *Landsc. Urban Plan.* **2018**, *175*, 184–194. [CrossRef]

17. Lawson, L.J. *City Bountiful: A Century of Community Gardening in America*; University of California Press: Berkeley, CA, USA, 2005; pp. 18–112.
18. Ruggeri, G.; Mazzocchi, C.; Corsi, S. Urban Gardeners' Motivations in a Metropolitan City: The Case of Milan. *Sustainability* **2016**, *8*, 1099. [CrossRef]
19. Marshall, A.J.; Grose, M.J.; Williams, N.S. Of mowers and growers: Perceived social norms strongly influence verge gardening, a distinctive civic greening practice. *Landsc. Urban Plan.* **2020**, *198*, 103795. [CrossRef]
20. Tan, L.H.; Neo, H. "Community in Bloom": Local participation of community gardens in urban Singapore. *Local Environ.* **2009**, *14*, 529–539. [CrossRef]
21. Hou, J.; Grohmann, D. Integrating community gardens into urban parks: Lessons in planning, design and partnership from Seattle. *Urban For. Urban Green.* **2018**, *33*, 46–55. [CrossRef]
22. Camps-Calvet, M.; Langemeyer, J.; Calvet-Mir, L.; Gómez-Baggethun, E. Ecosystem services provided by urban gardens in Barcelona, Spain: Insights for policy and planning. *Environ. Sci. Policy* **2016**, *62*, 14–23. [CrossRef]
23. Adams, D.; Hardman, M.; Larkham, P. Exploring guerrilla gardening: Gauging public views on the grassroots activity. *Local Environ.* **2014**, *20*, 1231–1246. [CrossRef]
24. Mwakiwa, E.; Maparara, T.; Tatsvarei, S.; Muzamhindo, N. Is community management of resources by urban households, feasible? Lessons from community gardens in Gweru, Zimbabwe. *Urban For. Urban Green.* **2018**, *34*, 97–104. [CrossRef]
25. Ding, X.; Zhang, Y.; Zheng, J.; Yue, X. Design and Social Factors Affecting the Formation of Social Capital in Chinese Community Garden. *Sustainability* **2020**, *12*, 10644. [CrossRef]
26. Zhu, J.; He, B.-J.; Tang, W.; Thompson, S. Community blemish or new dawn for the public realm? Governance challenges for self-claimed gardens in urban China. *Cities* **2020**, *102*, 102750. [CrossRef]
27. Yu, B. Ecological effects of new-type urbanization in China. *Renew. Sustain. Energy Rev.* **2021**, *135*, 110239. [CrossRef]
28. Kou, H.; Zhang, S.; Liu, Y. Community-Engaged Research for the Promotion of Healthy Urban Environments: A Case Study of Community Garden Initiative in Shanghai, China. *Int. J. Environ. Res. Public Health* **2019**, *16*, 4145. [CrossRef] [PubMed]
29. Yuriev, A.; Dahmen, M.; Paillé, P.; Boiral, O.; Guillaumie, L. Pro-environmental behaviors through the lens of the theory of planned behavior: A scoping review. *Resour. Conserv. Recycl.* **2020**, *155*, 104660. [CrossRef]
30. Ajzen, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Processes* **1991**, *50*, 179–211. [CrossRef]
31. Miller, S.M.; Montalto, F.A. Stakeholder perceptions of the ecosystem services provided by Green Infrastructure in New York City. *Ecosyst. Serv.* **2019**, *37*, 100928. [CrossRef]
32. Rezaei, R.; Safa, L.; Damalas, C.A.; Ganjkhanloo, M.M. Drivers of farmers' intention to use integrated pest management: Integrating theory of planned behavior and norm activation model. *J. Environ. Manag.* **2019**, *236*, 328–339. [CrossRef]
33. Shahangian, S.A.; Tabesh, M.; Yazdanpanah, M. How can socio-psychological factors be related to water-efficiency intention and behaviors among Iranian residential water consumers? *J. Environ. Manag.* **2021**, *288*, 112466. [CrossRef] [PubMed]
34. Zhang, X.; Bai, X.; Shang, J. Is subsidized electric vehicles adoption sustainable: Consumers' perceptions and motivation toward incentive policies, environmental benefits, and risks. *J. Clean. Prod.* **2018**, *192*, 71–79. [CrossRef]
35. Lam, T.W.L.; Tsui, Y.C.J.; Fok, L.; Cheung, L.T.O.; Tsang, E.P.K.; Lee, J.C.K. The influences of emotional factors on householders' decarbonizing cooling behaviour in a subtropical Metropolitan City: An application of the extended theory of planned behaviour. *Sci. Total Environ.* **2021**, *807*, 150826. [CrossRef] [PubMed]
36. Tsantopoulos, G.; Varras, G.; Chiotelli, E.; Fotia, K.; Batou, M. Public perceptions and attitudes toward green infrastructure on buildings: The case of the met-ropolitan area of Athens, Greece. *Urban For. Urban Green.* **2018**, *34*, 181–195. [CrossRef]
37. Ertz, M.; Huang, R.; Jo, M.-S.; Karakas, F.; Sarigöllü, E. From single-use to multi-use: Study of consumers' behavior toward consumption of reusable containers. *J. Environ. Manag.* **2017**, *193*, 334–344. [CrossRef]
38. Katz, D. The Functional Approach to the Study of Attitudes. *Public Opin. Q.* **1960**, *24*, 163–204. [CrossRef]
39. Lee, J.H.; Matarrita-Cascante, D. The influence of emotional and conditional motivations on gardeners' participation in community (allotment) gardens. *Urban For. Urban Green.* **2019**, *42*, 21–30. [CrossRef]
40. Lautenschlager, L.; Smith, C. Understanding gardening and dietary habits among youth garden program participants using the Theory of Planned Behavior. *Appetite* **2007**, *49*, 122–130. [CrossRef]
41. Armitage, C.J.; Conner, M. Efficacy of the theory of planned behaviour: A meta-analytic review. *Br. J. Soc. Psychol.* **2001**, *40*, 471–499. [CrossRef]
42. Lee, H.-S. Examining neighborhood influences on leisure-time walking in older Korean adults using an extended theory of planned behavior. *Landsc. Urban Plan.* **2016**, *148*, 51–60. [CrossRef]
43. Wang, S.; Wang, J.; Yang, S.; Li, J.; Zhou, K. From intention to behavior: Comprehending residents' waste sorting intention and behavior formation process. *Waste Manag.* **2020**, *113*, 41–50. [CrossRef] [PubMed]
44. Judge, M.; Warren-Myers, G.; Paladino, A. Using the theory of planned behaviour to predict intentions to purchase sustainable housing. *J. Clean. Prod.* **2019**, *215*, 259–267. [CrossRef]
45. Chen, M.F. Extending the theory of planned behavior model to explain people's energy savings and carbon reduction be-havioral intentions to mitigate climate change in Taiwan–moral obligation matters. *J. Clean. Prod.* **2016**, *112*, 1746–1753. [CrossRef]
46. Chen, M.-F.; Tung, P.-J. The Moderating Effect of Perceived Lack of Facilities on Consumers' Recycling Intentions. *Environ. Behav.* **2010**, *42*, 824–844. [CrossRef]

47. Gkargkavouzi, A.; Halkos, G.; Matsiori, S. Environmental behavior in a private-sphere context: Integrating theories of planned behavior and value belief norm, self-identity and habit. *Resour. Conserv. Recycl.* **2019**, *148*, 145–156. [CrossRef]
48. Grilli, G.; Notaro, S. Exploring the influence of an extended theory of planned behaviour on preferences and willingness to pay for participatory natural resources management. *J. Environ. Manag.* **2019**, *232*, 902–909. [CrossRef] [PubMed]
49. Ajzen, I. *Constructing a Theory of Planned Behavior Questionnare*; University of Massachusetts Amherst: Amherst Center, MA, USA, 2006.
50. Alaimo, K.; Beavers, A.W.; Crawford, C.; Snyder, E.H.; Litt, J.S. Amplifying Health Through Community Gardens: A Framework for Advancing Multicomponent, Behaviorally Based Neighborhood Interventions. *Curr. Environ. Health Rep.* **2016**, *3*, 302–312. [CrossRef]
51. Lewis, O.; Home, R.; Kizos, T. Digging for the roots of urban gardening behaviours. *Urban For. Urban Green.* **2018**, *34*, 105–113. [CrossRef]
52. Tian, Y.; Wu, H.; Zhang, G.; Wang, L.; Zheng, D.; Li, S. Perceptions of ecosystem services, disservices and willingness-to-pay for urban green space conservation. *J. Environ. Manag.* **2020**, *260*, 110140. [CrossRef]
53. Bamberg, S.; Möser, G. Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *J. Environ. Psychol.* **2007**, *27*, 14–25. [CrossRef]
54. Han, H. Travelers' pro-environmental behavior in a green lodging context: Converging value-belief-norm theory and the theory of planned behavior. *Tour. Manag.* **2015**, *47*, 164–177. [CrossRef]
55. Obeng, E.A.; Aguilar, F.X. Value orientation and payment for ecosystem services: Perceived detrimental consequences lead to willingness-to-pay for ecosystem services. *J. Environ. Manag.* **2018**, *206*, 458–471. [CrossRef]
56. Schwartz, S.H. Normative influences on altruism. In *Advances in Experimental Social Psychology*; Academic Press: Cambridge, MA, USA, 1977; Volume 10, pp. 221–279.
57. Park, J.; Ha, S. Understanding consumer recycling behavior: Combining the theory of planned behavior and the norm activation model. *Fam. Consum. Sci. Res. J.* **2014**, *42*, 278–291. [CrossRef]
58. Zhang, X.; Geng, G.; Sun, P. Determinants and implications of citizens' environmental complaint in China: Integrating theory of planned behavior and norm activation model. *J. Clean. Prod.* **2017**, *166*, 148–156. [CrossRef]
59. Campagne, C.S.; Roche, P.K.; Salles, J.-M. Looking into Pandora's Box: Ecosystem disservices assessment and correlations with ecosystem services. *Ecosyst. Serv.* **2018**, *30*, 126–136. [CrossRef]
60. Calderón-Argelich, A.; Benetti, S.; Anguelovski, I.; Connolly, J.J.; Langemeyer, J.; Baró, F. Tracing and building up environmental justice considerations in the urban ecosystem service literature: A systematic review. *Landsc. Urban Plan.* **2021**, *214*, 104130. [CrossRef]
61. Partalidou, M.; Anthopoulou, T. Urban Allotment Gardens During Precarious Times: From Motives to Lived Experiences. *Sociol. Rural.* **2017**, *57*, 211–228. [CrossRef]
62. Asah, S.T.; Guerry, A.D.; Blahna, D.J.; Lawler, J.J. Perception, acquisition and use of ecosystem services: Human behavior, and ecosystem management and policy implications. *Ecosyst. Serv.* **2014**, *10*, 180–186. [CrossRef]
63. Snyder, M. Basic Research and Practical Problems: The Promise of a "Functional" Personality and Social Psychology. *Pers. Soc. Psychol. Bull.* **1993**, *19*, 251–264. [CrossRef]
64. Scheromm, P. Motivations and practices of gardeners in urban collective gardens: The case of Montpellier. *Urban For. Urban Green.* **2015**, *14*, 735–742. [CrossRef]
65. Da Silva, I.M.; Fernandes, C.; Castiglione, B.; Costa, L. Characteristics and motivations of potential users of urban allotment gardens: The case of Vila Nova de Gaia municipal network of urban allotment gardens. *Urban For. Urban Green.* **2016**, *20*, 56–64. [CrossRef]
66. Trendov, N.M. Comparative study on the motivations that drive urban community gardens in Central Eastern Europe. *Ann. Agrar. Sci.* **2018**, *16*, 85–89. [CrossRef]
67. Cepic, S.; Tomicevic-Dubljevic, J.; Zivojinovic, I. Is there a demand for collective urban gardens? Needs and motivations of potential gardeners in Belgrade. *Urban For. Urban Green.* **2020**, *53*, 126716. [CrossRef]
68. Clayton, S. Domesticated nature: Motivations for gardening and perceptions of environmental impact. *J. Environ. Psychol.* **2007**, *27*, 215–224. [CrossRef]
69. Kingsley, J.; Foenander, E. "You feel like you're part of something bigger": Exploring motivations for community garden par-ticipation in Melbourne, Australia. *BMC Public Health* **2019**, *19*, 745. [CrossRef] [PubMed]
70. Becker, S.L.; Von Der Wall, G. Tracing regime influence on urban community gardening: How resource dependence causes barriers to garden longer term sustainability. *Urban For. Urban Green.* **2018**, *35*, 82–90. [CrossRef]
71. Wesener, A.; Fox-Kämper, R.; Sondermann, M.; Münderlein, D. Placemaking in action: Factors that support or obstruct the development of urban community gardens. *Sustainability* **2020**, *12*, 657. [CrossRef]
72. Shackleton, C.M.; Njwaxu, A. Does the absence of community involvement underpin the demise of urban neighbourhood parks in the Eastern Cape, South Africa? *Landsc. Urban Plan.* **2021**, *207*, 104006. [CrossRef]
73. Von Döhren, P.; Haase, D. Ecosystem disservices research: A review of the state of the art with a focus on cities. *Ecol. Indic.* **2015**, *52*, 490–497. [CrossRef]
74. Kremer, P.; Hamstead, Z.A.; McPhearson, T. A social–ecological assessment of vacant lots in New York City. *Landsc. Urban Plan.* **2013**, *120*, 218–233. [CrossRef]

75. Yadav, P.; Duckworth, K.; Grewal, P.S. Habitat structure influences below ground biocontrol services: A comparison between urban gardens and vacant lots. *Landsc. Urban Plan.* **2012**, *104*, 238–244. [CrossRef]
76. Blanco, J.; Sourdril, A.; Deconchat, M.; Barnaud, C.; Cristobal, M.S.; Andrieu, E. How farmers feel about trees: Perceptions of ecosystem services and disservices associated with rural forests in southwestern France. *Ecosyst. Serv.* **2020**, *42*, 101066. [CrossRef]
77. Drake, L.; Lawson, L.J. Validating verdancy or vacancy? The relationship of community gardens and vacant lands in the U.S. *Cities* **2014**, *40*, 133–142. [CrossRef]
78. Millennium Ecosystem Assessment. Ecosystems and human well-being. In *Millennium Ecosystem Assessment*; Island Press: Washington, DC, USA, 2003.
79. Schniederjans, D.G.; Starkey, C.M. Intention and willingness to pay for green freight transportation: An empirical examination. *Transp. Res. Part D Transp. Environ.* **2014**, *31*, 116–125. [CrossRef]
80. Bauske, E.; Cruickshank, J.; Hutcheson, B. Healthy life community garden: Food and neighborhood transformation. *Acta Hortic.* **2017**, 395–398. [CrossRef]
81. Villalobos, A.; Alaimo, K.; Erickson, C.; Harrall, K.; Glueck, D.; Buchenau, H.; Coringrato, E.; Decker, E.; Fahnestock, L.; Hamman, R.; et al. CAPS on the move: Crafting an approach to recruitment for a randomized controlled trial of community gardening. *Contemp. Clin. Trials Commun.* **2019**, *16*, 100482. [CrossRef]
82. Alaimo, K.; Packnett, E.; Miles, R.A.; Kruger, D.J. Fruit and Vegetable Intake among Urban Community Gardeners. *J. Nutr. Educ. Behav.* **2008**, *40*, 94–101. [CrossRef]
83. Chen, S.; Wang, Y.; Ni, Z.; Zhang, X.; Xia, B. Benefits of the ecosystem services provided by urban green infrastructures: Differences between perception and measurements. *Urban For. Urban Green.* **2020**, *54*, 126774. [CrossRef]
84. Turner, B. Embodied connections: Sustainability, food systems and community gardens. *Local Environ.* **2011**, *16*, 509–522. [CrossRef]
85. Middle, I.; Dzidic, P.; Buckley, A.; Bennett, D.; Tye, M.; Jones, R. Integrating community gardens into public parks: An innovative approach for providing ecosystem services in urban areas. *Urban For. Urban Green.* **2014**, *13*, 638–645. [CrossRef]
86. Opitz, I.; Berges, R.; Piorr, A.; Krikser, T. Contributing to food security in urban areas: Differences between urban agriculture and peri-urban agriculture in the Global North. *Agric. Hum. Values* **2016**, *33*, 341–358. [CrossRef]
87. Bowler, D.E.; Buyung-Ali, L.; Knight, T.M.; Pullin, A.S. Urban greening to cool towns and cities: A systematic review of the empirical evidence. *Landsc. Urban Plan.* **2010**, *97*, 147–155. [CrossRef]
88. Vogl-Lukasser, B.; Vogl, C.R.; Gütler, M.; Heckler, S. Plant Species with Spontaneous Reproduction in Homegardens in Eastern Tyrol (Austria): Perception and management by women farmers. *Ethnobot. Res. Appl.* **2010**, *8*, 001–015. [CrossRef]
89. Speak, A.; Mizgajski, A.; Borysiak, J. Allotment gardens and parks: Provision of ecosystem services with an emphasis on biodiversity. *Urban For. Urban Green.* **2015**, *14*, 772–781. [CrossRef]
90. Celata, F.; Coletti, R. The policing of community gardening in Rome. *Environ. Innov. Soc. Transit.* **2018**, *29*, 17–24. [CrossRef]
91. Lyytimäki, J.; Petersen, L.K.; Normander, B.; Bezák, P. Nature as a nuisance ecosystem services and disservices to urban lifestyle. *Environ. Sci.* **2008**, *5*, 161–172. [CrossRef]
92. Perera, L.N.; Mafiz, A.I. Antimicrobial-resistant *E. coli* and *Enterococcus* spp. Recovered from urban community gardens. *Food Control* **2020**, *108*, 106857. [CrossRef]
93. Galton, F. Personal identification and description. *Nature* **1888**, *38*, 173–177. [CrossRef]
94. Spearman, C. "General Intelligence," objectively determined and measured. *Am. J. Psychol.* **1904**, *15*, 201–292. [CrossRef]
95. Wright, S. Correlation and causation. *J. Agric. Res.* **1921**, *20*, 557–585.
96. Ketchen, D.J. A Primer on Partial Least Squares Structural Equation Modeling. *Long Range Planning.* **2013**, *46*, 184–185. [CrossRef]
97. Tenenhaus, M.; Vinzi, V.E.; Chatelin, Y.M.; Lauro, C. PLS path modeling. *Comput. Stat. Data Anal.* **2005**, *48*, 159–205. [CrossRef]
98. Arbuckle, J. *Amos 17.0 User's Guide*; SPSS Inc.: Chicago, IL, USA, 2008.
99. Mueller, R.O.; Hancock, G.R. Best practices in structural equation modeling. In *Best Practices in Quantitative Methods*; Osborne, J.W., Ed.; SAGE Publications, Inc.: Louisville, KY, USA, 2008; pp. 488–508.
100. Fornell, C.; Larcker, D.F. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *J. Mark. Res.* **1981**, *18*, 39–50. [CrossRef]
101. Anderson, J.C.; Gerbing, D.W. Structural equation modeling in practice: A review and recommended two-step approach. *Psychol. Bull.* **1988**, *103*, 411–423. [CrossRef]
102. Yunus, F. Statistics Using SPSS: An Integrative Approach, second edition. *JAPS* **2010**, *37*, 2119–2120. [CrossRef]
103. Comstock, N.; Dickinson, L.M.; Marshall, J.A.; Soobader, M.-J.; Turbin, M.S.; Buchenau, M.; Litt, J.S. Neighborhood attachment and its correlates: Exploring neighborhood conditions, collective efficacy, and gardening. *J. Environ. Psychol.* **2010**, *30*, 435–442. [CrossRef]
104. Rouillon, M.; Harvey, P.; Kristensen, L.J.; George, S.G.; Taylor, M.P. VegeSafe: A community science program measuring soil-metal contamination, evaluating risk and providing advice for safe gardening. *Environ. Pollut.* **2017**, *222*, 557–566. [CrossRef]
105. Kiesling, F.M.; Manning, C.M. How green is your thumb? Environmental gardening identity and ecological gardening practices. *J. Environ. Psychol.* **2010**, *30*, 315–327. [CrossRef]
106. Farrier, A.; Dooris, M.; Morley, A. Catalysing change? A critical exploration of the impacts of a community food initiative on people, place and prosperity. *Landsc. Urban Plan.* **2019**, *192*, 103663. [CrossRef]

107. Petrovic, N.; Simpson, T.; Orlove, B.; Dowd-Uribe, B. Environmental and social dimensions of community gardens in East Harlem. *Landsc. Urban Plan.* **2019**, *183*, 36–49. [CrossRef]
108. Caputo, S.; Rumble, H. "I like to get my hands stuck in the soil": A pilot study in the acceptance of soil-less methods of culti-vation in community gardens. *J. Clean. Prod.* **2020**, *258*, 120585. [CrossRef]
109. Amato-Lourenco, L.F.; Lobo, D.J.; Guimarães, E.T.; Moreira, T.C.; Carvalho-Oliveira, R.; Saiki, M.; Saldiva, P.H.; Mauad, T. Biomonitoring of genotoxic effects and elemental accumulation derived from air pollution in community urban gardens. *Sci. Total. Environ.* **2017**, *575*, 1438–1444. [CrossRef] [PubMed]
110. Laidlaw, M.A.; Alankarage, D.H.; Reichman, S.; Taylor, M.P.; Ball, A. Assessment of soil metal concentrations in residential and community vegetable gardens in Melbourne, Australia. *Chemosphere* **2018**, *199*, 303–311. [CrossRef]
111. Pudup, M.B. It takes a garden: Cultivating citizen-subjects in organized garden projects. *Geoforum* **2008**, *39*, 1228–1240. [CrossRef]
112. Ghose, R.; Pettygrove, M. Actors and networks in urban community garden development. *Geoforum* **2014**, *53*, 93–103. [CrossRef]
113. Litt, J.S.; Schmiege, S.J.; Hale, J.W.; Buchenau, M.; Sancar, F. Exploring ecological, emotional and social levers of self-rated health for urban gardeners and non-gardeners: A path analysis. *Soc. Sci. Med.* **2015**, *144*, 1–8. [CrossRef]
114. Passidomo, C. Community gardening and governance over urban nature in New Orleans's Lower Ninth Ward. *Urban For. Urban Green.* **2016**, *19*, 271–277. [CrossRef]
115. Shimpo, N.; Wesener, A.; McWilliam, W. How community gardens may contribute to community resilience following an earthquake. *Urban For. Urban Green.* **2019**, *38*, 124–132. [CrossRef]
116. Nova, P.; Pinto, E.; Chaves, B.; Silva, M. Urban organic community gardening to promote environmental sustainability practices and increase fruit, vegetables and organic food consumption. *Gac. Sanit.* **2020**, *34*, 4–9. [CrossRef]
117. Hale, J.; Knapp, C.; Bardwell, L.; Buchenau, M.; Marshall, J.; Sancar, F.; Litt, J.S. Connecting food environments and health through the relational nature of aesthetics: Gaining insight through the community gardening experience. *Soc. Sci. Med.* **2011**, *72*, 1853–1863. [CrossRef] [PubMed]
118. Marsh, P. D09-C Walking Each Other Home: Weaving Informal Palliative Supports into a Community Garden. *J. Pain Symptom Manag.* **2016**, *52*, e35–e36. [CrossRef]
119. Chan, J.; DuBois, B.; Tidball, K.G. Refuges of local resilience: Community gardens in post-Sandy New York City. *Urban For. Urban Green.* **2015**, *14*, 625–635. [CrossRef]
120. Spilková, J. Producing space, cultivating community: The story of Prague's new community gardens. *Agric. Hum. Values* **2017**, *34*, 887–897. [CrossRef]
121. Tappert, S.; Klöti, T.; Drilling, M. Contested urban green spaces in the compact city: The (re-)negotiation of urban gardening in Swiss cities. *Landsc. Urban Plan.* **2018**, *170*, 69–78. [CrossRef]
122. Tharrey, M.; Sachs, A.; Perignon, M.; Simon, C.; Mejean, C.; Litt, J.; Darmon, N. Improving lifestyles sustainability through community gardening: Results and lessons learnt from the JArDinS quasi-experimental study. *BMC Public Health* **2020**, *20*, 1798. [CrossRef]
123. Niinemets, Ü.; Peñuelas, J. Gardening and urban landscaping: Significant players in global change. *Trends Plant Sci.* **2008**, *13*, 60–65. [CrossRef]
124. Dennis, M.; James, P. User participation in urban green commons: Exploring the links between access, voluntarism, biodiversity and well being. *Urban For. Urban Green.* **2016**, *15*, 22–31. [CrossRef]
125. Lindemann-Matthies, P.; Brieger, H. Does urban gardening increase aesthetic quality of urban areas? A case study from Ger-many. *Urban For. Urban Green.* **2016**, *17*, 33–41. [CrossRef]
126. Danford, R.S.; Strohbach, M.; Warren, P.S.; Ryan, R.L. Active Greening or Rewilding the city: How does the intention behind small pockets of urban green affect use? *Urban For. Urban Green.* **2018**, *29*, 377–383. [CrossRef]
127. Anderson, E.C.; Egerer, M.H.; Fouch, N.; Clarke, M.; Davidson, M.J. Comparing community garden typologies of Baltimore, Chicago, and New York City (USA) to understand potential implications for socio-ecological services. *Urban Ecosyst.* **2019**, *22*, 671–681. [CrossRef]
128. Milliron, B.-J.; Tooze, J.; Vitolins, M. Process Evaluation of a Community Garden at an Urban Medical Center. *J. Nutr. Educ. Behav.* **2014**, *46*, S167. [CrossRef]
129. Marsh, P.; Gartrell, G.; Egg, G.; Nolan, A.; Cross, M. End-of-Life care in a community garden: Findings from a Participatory Action Research project in regional Australia. *Health Place* **2017**, *45*, 110–116. [CrossRef] [PubMed]
130. Litt, J.S.; Lambert, J.R.; Glueck, D.H. Gardening and age-related weight gain: Results from a cross-sectional survey of Denver residents. *Prev. Med. Rep.* **2017**, *8*, 221–225. [CrossRef]
131. Morris, A.; Campbell, K.; Britton, R.; Shabel, A.; Pacumbaba, R.; Taylor, D.; Wood, S. Urban Supplemental Nutrition Assistance Program -Education (USNAP-Ed) Community Garden Project. *J. Nutr. Educ. Behav.* **2017**, *49*, S130. [CrossRef]
132. Chalmin-Pui, L.S.; Roe, J.; Griffiths, A.; Smyth, N.; Heaton, T.; Clayden, A.; Cameron, R. "It made me feel brighter in myself"-The health and well-being impacts of a residential front garden horticultural intervention. *Landsc. Urban Plan.* **2021**, *205*, 103958. [CrossRef] [PubMed]
133. Corley, J.; Okely, J.A.; Taylor, A.M.; Page, D.; Welstead, M.; Skarabela, B.; Redmond, P.; Cox, S.R.; Russ, T.C. Home garden use during COVID-19: Associations with physical and mental wellbeing in older adults. *J. Environ. Psychol.* **2021**, *73*, 101545. [CrossRef]

134. Lehberger, M.; Kleih, A.-K.; Sparke, K. Self-reported well-being and the importance of green spaces—A comparison of garden owners and non-garden owners in times of COVID-19. *Landsc. Urban Plan.* **2021**, *212*, 104108. [CrossRef]
135. Corrigan, M.P. Growing what you eat: Developing community gardens in Baltimore, Maryland. *Appl. Geogr.* **2011**, *31*, 1232–1241. [CrossRef]