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Personal characteristics, gardening engagement, and the value of local garden: a social and economic perspective

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Introduction: In South Korea, government-led garden development has shifted gardens from private spaces to public domains.

Methods: This study evaluates the economic value of gardens' social functions by analyzing the willingness-to-pay (WTP) and usage patterns of 759 visitors across seven local gardens.

Results: On average, visitors spent 77 min traveling, with women aged 50 + reporting high stability and healing. Middle- and low-income groups (incomes below 4 million KRW) had a WTP rate of 68.1%, and garden creation experience raised WTP to 70.5%. The estimated WTP was 5,932 KRW per person per day.

Discussion: These findings provide key evidence for policies addressing regional depopulation and social isolation.

KEYWORDS

local garden, social functions, willingness-to-pay, economic value, contingent valuation method

1 Introduction

The concept of gardens originated in British aristocratic society, where they were initially private spaces for cultivating plants. During Britain's modern and contemporary periods, the definition of gardens expanded to include spaces within ordinary households, which featured a mix of flowers, shrubs, and small trees. In South Korea, the concept of gardens—initially regarded as private spaces—has gradually transitioned into the public sphere. Since the enactment of legislation related to “gardens” in 2015, garden culture has spread rapidly across the country. As gardens evolve to serve not only aesthetic purposes but also environmental and social functions, the need to evaluate their social value has become increasingly evident. In Korea, garden culture has been actively spreading since 2015, when ‘gardens’ were legalized. As gardens that can fulfill environmental and social functions in addition to aesthetic functions are expanding into the public sphere, it is necessary to study the social value of gardens.

Both domestic and international research consistently highlight the social functions of gardens (Grah and Stigsdotter, 2010). Gardens contribute to the formation of social capital and facilitate community cohesion. Community gardens, in particular, have been shown to effectively strengthen social bonds among participants, ultimately contributing to the development of social capital (Firth et al., 2011). These gardens provide spaces where residents from diverse backgrounds—whether multicultural, intergenerational, or socioeconomically varied—can gather, fostering a sense of social connection and belonging (Alaimo et al., 2010; Hancock, 2001; Kingsley and Townsend, 2006). Consequently, gardens can instill a sense of place and pride in the local environment, enhancing social cohesion and

environmental stewardship (Egli et al., 2016; Gil and Park, 2022; Park, 2017). Gardens are also associated with psychological benefits, with research indicating their therapeutic effects, particularly for the elderly (Tournier and Postal, 2014). Thus, public gardens in South Korea are expected to fulfill important social functions.

Research on the perceptions of urban green space users has been ongoing for many years. Studies have demonstrated that the presence or absence of participation in the management of green spaces affects unconscious behaviors, illustrating how public green spaces can influence local residents. Behavioral patterns such as walking, social gatherings, and pedestrian movement vary depending on whether green spaces are actively managed, indirectly shaping the social atmosphere within communities (Danford et al., 2018). Furthermore, environmental education in schools has been linked to not only improved educational outcomes but also enhanced student health. Gardening activities have been found to increase vegetable consumption, reduce obesity rates, and promote biodiversity (Fisher et al., 2022).

Research on gardens, employing methodologies similar to those used in urban green space studies, has identified social capital as a distinctive feature of gardens. Social capital refers to the intangible interactions within a society, and its impact on garden users has been analyzed through various lenses. Neighbor relationships, enhanced social cohesion, garden size, and garden activities are all factors that have been examined in relation to social capital (Eigenbrod and Gruda, 2015; Guitart et al., 2012; Mok et al., 2014).

The importance of social capital became even more evident with the introduction of community gardens. These gardens serve as spaces where residents from diverse backgrounds—whether multicultural, multigenerational, or otherwise—can gather (Hancock, 2001; Kingsley and Townsend, 2006; Alaimo et al., 2010). Community gardens are also recognized as a form of DIY urbanism (Finn, 2014). Influenced by the German Kleingarten system and community gardens in the U.S. and Australia, community gardens have rapidly spread in South Korea. These spaces effectively enhance social cohesion, contributing to the development of social capital (Firth et al., 2011). Additionally, they foster spatial awareness and a sense of place (Bendt et al., 2013).

Studies on community gardens often focus on deriving conceptual frameworks to understand the benefits experienced by participants involved in garden creation. Burt (2017) identified four common satisfaction domains through interviews with individuals who participated in green space creation and management, illustrating intangible values through concept drawings. Bendt et al. (2013) collected extensive data through open-ended questions, structuring participant perceptions into mutual engagement, joint enterprise, and shared representation.

Several studies evaluating the value of similar green spaces—such as parks, natural recreation forests, and arboretums—have been reviewed to quantify the social functions of gardens in economic terms. A study assessing the amount households are willing to pay per month for the management and operation of the Busan APEC Memorial Park found that the WTP amount was 2.2 times higher than the park's management budget, with age and education levels influencing responses (Kim and Park, 2014). Similarly, a study evaluating the economic value of Seonghwanglim in Wonju-si, Gangwon-do, found that higher income levels and a stronger awareness of conservation were associated with higher WTP (Lee and Lee, 2023). Studies evaluating the economic value of Suncheonman

National Garden and Suncheonman Wetland, both managed by the state, have also been conducted (Jang and Lee, 2018; Lee et al., 2017).

Internationally, many studies have connected the concept of ecosystem services with green spaces, translating these benefits into economic value. Parks and gardens accounted for 31.7% of such studies, while urban green spaces and waterfront areas represented 25.2%. Research on urban green spaces revealed that cultural functions were the most prominently recognized, accounting for 48.2%, while regulatory services followed at 17.4%. Additionally, 95% of respondents identified the well-being aspects of green spaces, emphasizing their role in enhancing quality of life and health. Social integration and connection were also significant, with 35.3% of respondents acknowledging these benefits (Pinto et al., 2022). In general, international studies tend to assign higher economic value to gardens compared to domestic studies. Urban residents, in particular, attribute high value to urban green spaces as a means of enhancing well-being, while also recognizing their role in promoting social connection, quality of life, and cultural functions.

Rather than focusing solely on the creation of small green spaces in cities, incorporating the concept of gardens and encouraging public participation can significantly contribute to the formation of social capital. This, in turn, positively affects health-related functions. Furthermore, it is necessary to evaluate whether the social functions of gardens can be linked to economic revitalization (Table 1). If gardens are perceived not only as cultural assets but also as sources of economic value, they may contribute significantly to the revitalization of declining regions.

This study aims to quantify the economic value of gardens by focusing on their social functions. International studies have shown that garden activities can improve physical health and reduce healthcare costs (Scott et al., 2020). In South Korea, the provision of public green spaces has been shown to reduce local maintenance costs (Park, 2017). Moreover, research analyzing the economic impact of public green spaces has often involved surveying visitors' WTP for the conservation and tourism value of parks and urban forests (Kang et al., 2012).

Ultimately, this study seeks to explore the connection between the social and economic functions of gardens by analyzing visitors' WTP and demographic factors. By examining the impact of garden creation and visitation experiences on WTP, this study aims to highlight the unique characteristics of gardens compared to other types of urban green spaces. Through this research, we aim to assess visitor behavior and perceptions to evaluate the social functions provided by gardens within the public sphere.

TABLE 1 Connections between garden features.

Social functions (affection factors)	Health functions (affected outcomes)	Economic functions (potentially linked outcomes)
Community Bonding	Stress Regulation	Visitor Spending
Interaction Activation	Quality of Life Improvement	Hidden Benefits
Place Awareness	Well-being Enhancement	Job Creation
Local Attachment		
Psychological Stability		
Sense of Achievement		
Social Capital Formation		

2 Methodology

2.1 Scope

The evaluation of gardens' social functions was based on a survey conducted between September and November 2023 with 753 visitors to seven local gardens across South Korea. The survey covered topics such as the 'purposes of garden use,' 'economic valuation of gardens,' and 'experience in garden creation' (Figure 1).

This study aims to analyze how garden visitors' behaviors and purposes are manifested, and whether their social-psychological responses correlate with demographic variables (e.g., gender, age, income, education). The study also investigates the average willingness-to-pay (WTP) for entrance fees, compares the results with similar green spaces, and examines the influence of garden creation experience on WTP.

2.2 Research methodology

A research methodology was applied to evaluate the social functions of gardens, using one of the green infrastructure facilities (Fields in Trust, 2018). To assess the socio-psychological functions, a survey was conducted to measure psychological agreement, evaluating the perception of gardens. Additionally, to quantify the economic functions, willingness-to-pay (WTP) was calculated (Table 2, Table A1).

The final analysis included responses from 753 participants, after removing outliers and missing values, from a total of 759 surveyed visitors at seven local gardens from September to November 2023. The survey examined the purposes of garden use, behavioral patterns, socio-psychological impacts, and the economic WTP for gardens. The survey was administered non-face-to-face using a QR code. A total of 759 surveys were returned via QR code, and 753 were analyzed after excluding outliers and missing values. The comparisons between the contingent valuation estimates and actual votes are quite favorable, and they are clearly conservative when "do not knows" are treated as "no's" (the standard practice in the contingent valuation literature). Public polls taken near an actual vote, when the information set is unlikely to change, are on average quite good predictors of two-candidate races and ballot propositions (Carson, 2012). In addition, the surveys returned were non-face-to-face and were not gender and age specific. The age group was not evenly distributed, which could lead to overinterpretation.

This study is exempt from institutional review board review under Article 15(2) of the Korean Bioethics and Safety Act. The study does not involve invasive activities such as drug administration or blood collection, and uses only simple contact measurement devices that do not result in physical changes. The research is exempt because it does not involve non-face-to-face contact with human subjects and the research subjects are not identified.

Local gardens refer to those established and operated by local governments under Article 4 of the Act on the Creation and Promotion of Arboreturns and Gardens. As of July 2023, the designated local gardens included Semiwon in Gyeonggi Province, Dongseogang Garden in Yeongwol, Gujeolcho Garden in Jeongeup, Juknokwon in Damyang, Millennium Forest in Gyeongbuk, Changpown in Geochang, and Hwage Garden in Ganghwa County.

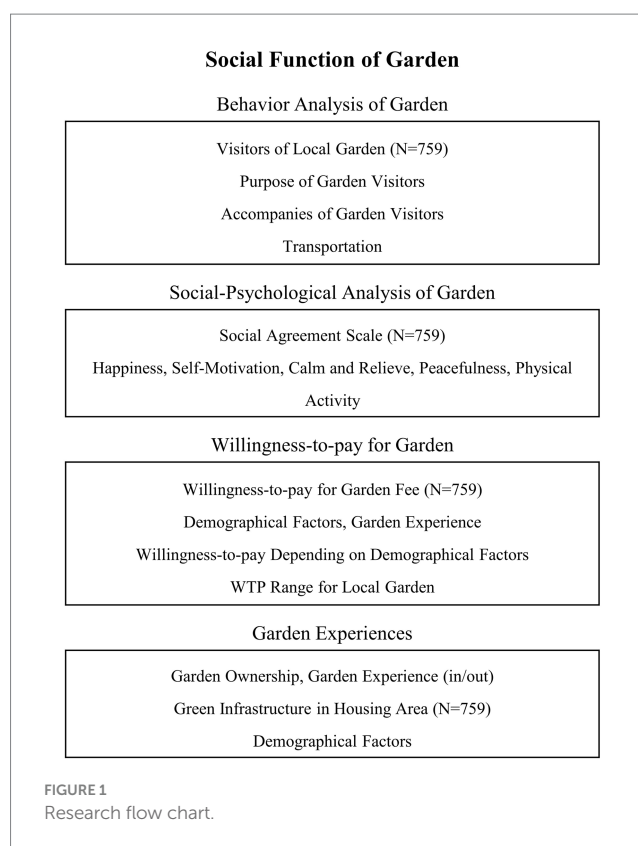


TABLE 2 Survey categories for evaluating social functions of gardens.

No.	Major Category	Subcategory
1	General characteristics	Gender, Age, Residence
2	Visit purpose and usage patterns	Companion, Transport, Travel Time, Satisfaction
3	Garden value assessment	Willingness-to-Pay (WTP), Max WTP, Garden Awareness
4	Visit experience	Garden Type, Visit Frequency
5	Gardening activities	<div>Garden Accessibility, Psychological & Physical Effects</div> <div>Stability, Peace, Healing, Nostalgia, Companionship, Happiness</div> <div>Activity Level, Physical Effects</div> <div>Sense of Purpose</div>

Participants self-reported their experiences with garden creation activities, focusing on aspects such as stability, peace, healing, and nostalgia. A non-parametric statistical method, the Mann-Whitney U test, was used to examine differences between groups, utilizing SPSS Statistics 29.0.

To identify the factors influencing willingness-to-pay (WTP), changes in WTP across categories were analyzed. The average entry fee for each local garden is 5,000 KRW. The initial proposed amount was 5,000 KRW, and WTP was set as the dependent variable with two

possible outcomes: ‘willing’ or ‘unwilling.’ Independent demographic variables such as age, education, gender, and income, as well as garden-related variables like accessibility, garden creation experience, and garden usage experience were included. A chi-square (χ^2) test was performed to analyze the changes in WTP based on these variables and determine the effect of demographic and experiential factors.

This study applied a double-bounded dichotomous choice model using the contingent valuation method (CVM). Hanemann et al. (1991) proposed the double-bounded dichotomous choice model to improve WTP estimation efficiency. Respondents were asked two sequential yes/no questions about whether they were willing to pay a specified amount for a hypothetical change in a good or service. Based on their responses, four types of data were generated:

If the respondent answered ‘yes’ to the first question and ‘no’ to the second ($t_2 > t_1$), it is inferred that $t_1 < WTP < t_2$.

If the respondent answered ‘yes’ to both questions, it is inferred that $t_2 \leq WTP < \infty$.

If the respondent answered ‘no’ to the first and ‘yes’ to the second question ($t_2 < t_1$), it is inferred that $t_2 < WTP < t_1$.

If the respondent answered ‘no’ to both questions, it is inferred that $0 < WTP < t_2$.

Log-likelihood functions were used to estimate values based on the binary response data, converting the likelihood of each response into a logarithmic form. The coefficients were estimated by maximizing the log-likelihood function to calculate WTP (Kim et al., 2019; Lopez-Feldman, 2012).

3 Results

3.1 Garden usage patterns and purpose

The social functions of seven local gardens across the country were evaluated based on responses from 753 visitors. Of the respondents, 281 were male and 478 were female (Table 3). The majority of visitors resided in the Seoul and metropolitan areas, with 19.1 and 24.5%, respectively. Visitors traveled long distances to visit the gardens. The primary purposes for visiting the gardens were walking and strolling (59.4%), appreciating the natural environment (52.4%), and resting (26.0%). Regarding travel time to the gardens, 16.6% of visitors traveled for less than 30 min, 23.2% for 30 to 60 min, and 38.2% for 60 to 120 min (Table 4). On average, visitors traveled 77 min to visit the gardens, indicating that they visited for relaxation purposes rather than proximity to their residences.

3.2 Socio-psychological functions of gardens

The analysis of socio-psychological functions revealed that women scored higher in categories such as stability, peace, healing, nostalgia, companionship, and happiness. In particular, these functions were more prominent in individuals aged 50 and above (Tables 5, 6).

On the other hand, individuals with a university degree perceived gardens as more physical and active spaces, while those with experience in garden creation showed a heightened sense of purpose (Tables 7, 8). This heightened sense of purpose reflects a continued

TABLE 3 Demographic characteristics of survey participants.

Category	Subcategory	N	Proportion (%)
Visited gardens	Semiwon in Gyeonggi-do	122	16.1
	Juknokwon in Jeollanam-do	90	11.9
	Geochang Changpowon in Gyeongsangnam-do	97	12.8
	Yeongwol Dongseogang Garden in Gangwon-do	110	14.5
	Gujeolcho Garden in Jeollabuk-do	87	11.5
	Hwage Garden in Ganghwa-gun	139	18.3
	Cheonnyeon Forest Garden in Gyeongsangbuk-do	114	15.0
Gender	Male	281	37.0
	Female	478	63.0
Age	Under 18	5	0.7
	18–34 years	107	14.1
	35–49 years	164	21.6
	50–64 years	120	15.8
	65 and above	363	47.8
Residence	Seoul	145	19.1
	Incheon, Gyeonggi	186	24.5
	Daejeon, Sejong, Chungcheong	26	3.4
	Gwangju, Jeolla	141	18.6
	Daegu, Gyeongbuk	93	12.3
	Busan, Ulsan, Gyeongnam	110	14.5
	Gangwon, Jeju	58	7.6
Gardening activities	Yes	406	53.5
	No	353	46.5
Total		759	100.0

interest in garden creation and participation, confirming the “sense of place” mentioned in previous studies (Bendt et al., 2013).

3.3 Analysis of social functions based on willingness-to-pay for gardens

An analysis was conducted to examine the willingness-to-pay (WTP) among garden visitors based on their characteristics, identifying variables that influence WTP (Table A2).

The final results identified variables that influence willingness-to-pay based on garden characteristics, such as size, mode of

TABLE 4 Transportation time for gardens.

Category	Less than 30 min	30 to 60 min	60 to 120 min	120 to 240 min	More than 240 min	Average minutes
N	122	175	289	122	39	77.45 min
Proportion (%)	(16.6)	(23.2)	(38.2)	(16.6)	(5.4)	

TABLE 5 Results of the socio-psychological acceptance scale by gender.

Category	Average		<i>p</i> -value
	Male (<i>n</i> = 278)	Female (<i>n</i> = 475)	
Comfort	3.99	4.06	0.09
Peace	4.08	4.16	0.10
Healing	3.96	4.13	<0.0001
Nostalgia	3.74	3.85	0.06
Companionship	3.99	3.98	0.91
Happiness	3.96	4.06	0.09
Interests	3.79	3.92	0.13
Activity level	3.94	3.96	0.63
Physical activity	3.92	3.97	0.32
Memory	3.82	3.95	0.02
Pride	3.78	3.75	0.91
Sense of purpose	3.53	3.55	0.65

TABLE 6 Results of the socio-psychological acceptance scale by age.

Category	Average		<i>p</i> -value
	18–50 years (<i>n</i> = 271)	50 and above (<i>n</i> = 481)	
Comfort	3.97	4.07	0.04
Peace	4.12	4.14	0.69
Healing	4.03	4.09	0.30
Nostalgia	3.77	3.84	0.36
Companionship	3.99	3.98	0.82
Happiness	3.95	4.07	0.02
Interests	3.94	3.85	0.35
Activity level	3.96	3.95	0.94
Physical activity	3.98	3.95	0.80
Memory	3.93	3.89	0.59
Pride	3.81	3.75	0.70
Sense of purpose	3.53	3.55	0.60

transportation, and visitor satisfaction. The personal characteristics of the respondents included the presence of walkable green spaces near their residence, experience in garden creation, age, place of residence, educational background, marital status, and income (Table 9).

The variables regarding the presence of green spaces near the residence and experience in garden creation allowed for an examination of the relationship between garden perception and residential area. Excluding 10 respondents who declined to express any willingness-to-pay, an analysis was conducted on 749 individuals. The initial proposed amount was 5,000 KRW, representing the average

admission fee for local gardens. The results showed that 94% of respondents, excluding 38 individuals, were willing to pay the proposed amount (Table 10).

The analysis of willingness-to-pay based on age revealed that 66.4% of respondents in the 18–34 age group agreed to pay. Similarly, 66.9% of the 35–49 age group expressed willingness-to-pay. However, only 46.6% of the 50–64 age group indicated a willingness-to-pay. The younger groups, particularly those under 50, showed a relatively higher willingness-to-pay, suggesting differences in value perception of gardens across age groups.

TABLE 7 Results of the socio-psychological acceptance scale by education.

Category	Average		<i>p</i> -value
	Below college (<i>n</i> = 395)	Above college (<i>n</i> = 358)	
Comfort	4.01	4.06	0.28
Peace	4.08	4.18	0.03
Healing	4.03	4.11	0.09
Nostalgia	3.77	3.86	0.09
Companionship	3.94	4.05	0.11
Happiness	3.98	4.07	0.10
Interests	3.79	4.01	0.003
Activity level	3.89	4.05	0.03
Physical activity	3.86	4.11	<0.0001
Memory	3.82	3.99	0.004
Pride	3.69	3.88	0.03
Sense of purpose	3.49	3.60	0.13

TABLE 8 Results of the socio-psychological acceptance scale by garden creation experience.

Category	Average		<i>p</i> -value
	Yes (<i>n</i> = 403)	No (<i>n</i> = 350)	
Comfort	4.06	4.00	0.22
Peace	4.15	4.10	0.27
Healing	4.10	4.03	0.15
Nostalgia	3.9	3.71	0.005
Happiness	4.08	3.97	0.04
Memory	3.95	3.85	0.12
Sense of Purpose	3.6	3.48	0.04

TABLE 9 Selection of influencing variables for willingness-to-pay.

Category	Variables	Definitions
Garden characteristics	Size	Yes, No
	Mode of transportation	Walk, Bicycle, Car, Public Transport, Other, Tourist Bus, Train
	Garden satisfaction	Very dissatisfied, Dissatisfied, Neutral, Satisfied, Very satisfied
General characteristics	Nearby green space	Yes, No
	Indoor/Outdoor garden creation	Yes, No
	Age	Under 18, 18–34, 35–49, 50–64, 65 and above
	Residence	Seoul/Incheon, Gyeonggi/ Daejeon, Sejong, Chungcheong/ Gwangju, Jeolla/ Daegu, Gyeongbuk/ Busan, Ulsan, Gyeongnam/ Gangwon, Jeju
	Education	Below Elementary, Middle School, High School, College or Higher
	Marital status	Not married, Married, Widowed, etc.
	Income	Less than 1 M KRW, 1–2 M, 2–3 M, 3–4 M, 4–5 M, 5–6 M, 6–7 M, More than 7 M KRW

TABLE 10 Results of binary choice for garden fee ($n = 757$).

Price (KRW)	Yes-Yes		Yes-No		No-Yes		Yes-Yes			
	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)	N	Proportion (%)	No (Willingness-to-pay)	
									N	Proportion (%)
5,000	63	8.3	413	54.4	233	30.7	38	5.0	10	1.6

Among respondents with a university degree or higher, 61.9% indicated a willingness-to-pay, though the changes based on education level were not statistically significant. However, lower-income groups, particularly those below the median household income, showed a significantly higher willingness-to-pay. The highest willingness to pay rate of 72.8% was found in the group with an average household income of 1 million to 2 million won per month. Compared to the ultra-low-income group, which earns less than KRW 1 million per month, the demand for green space is high even at a certain level of low income. According to Table A2, the variables that were significantly associated with willingness to pay were income and education. (Table 11, Table A2).

Satisfaction with the garden also significantly affected willingness-to-pay; higher satisfaction correlated with higher willingness-to-pay, while 75% of those with low satisfaction refused to pay.

Additionally, there was a difference in willingness-to-pay between garden owners and non-owners, with garden owners showing a higher willingness-to-pay (Table 12).

Willingness-to-pay (WTP) did not show a significant difference based on the presence of walkable green spaces near residences, with a significance level of 0.075, indicating no substantial difference between groups. However, 69.7% of those without nearby green spaces expressed a willingness-to-pay.

Comparing groups based on garden creation experience, those with such experience showed a significantly higher WTP rate, with 67.1% indicating willingness (Table 13).

A binary logistic regression model showed a coefficient of -0.00549 for the proposed amount, with an overall model accuracy of 73.3% (Table 14). The coefficient on the offer price is negative, similar to Chen and Jim (2010). The negative sign of Bid means that as the Bid increases, the 'yes' response could decrease. These coefficients are theoretically expected sign (Carson et al., 2001).

4 Discussion

4.1 Evaluation of the social functions of gardens

Garden visitors typically spent more than 30 min traveling to the gardens. The primary reason for visiting was for relaxation during leisure time. Due to the absence of gardens near their residences, visitors traveled long distances. Most respondents were from Seoul and the metropolitan area, indicating that gardens serve as meaningful spaces in densely populated urban areas. In South Korea, garden culture has expanded not through individual efforts but through government interventions, which have led to the establishment and spread of gardens. Therefore, a period of evaluation is needed to assess

the effectiveness of government policies and their outcomes before a mature garden industry environment can be fully established (Kingsley et al., 2020).

To examine the process by which the social functions of gardens contribute to economic revitalization, willingness-to-pay (WTP) was measured. The result of 5,932 KRW per person per day from this study can be compared to previous studies. For example, a study conducted in Seonghwanglim, Wonju, assessed WTP among visitors and residents, finding that monthly income and conservation awareness significantly influenced WTP. The estimated WTP was 56,569 KRW per household, and when extrapolated to the total number of households in Wonju, the conservation value was estimated at approximately 9.3 billion KRW (Lee and Lee, 2023). In contrast, the current study found that lower-income groups exhibited higher WTP, indicating a difference in the perceived economic value of gardens compared to natural forests. This suggests that gardens are more closely associated with residential areas and may be valued more highly by lower-income groups. This phenomenon is related to inequalities in access to green space, which have been consistently raised. According to Rigolon (2016), ethnic minorities have less access to green space in terms of quantity and quality than other major ethnic groups. Ethnic minority neighborhoods are often densely populated in urban centers, making it difficult for them to access large amounts and quality of green space. This may increase the green space needs of ethnic minorities and other vulnerable groups.

According to Bockarjova et al. (2020), small urban green spaces, such as gardens, showed an average value of 1,948 USD/ha/year, surpassing the average WTP found in this study. Their findings also revealed a tendency to assign higher value to urban parks compared to forests, with a negative correlation between green space size and value estimation—suggesting that economic value does not increase proportionally with size but rather reaches a saturation point, consistent with economic theory. Additionally, unlike this study, they observed that higher-income respondents tended to assign greater value to green spaces, with those in densely populated areas particularly valuing them highly. This may indicate a scarcity of green spaces in such regions, implying that creating green spaces there could enhance utility. Respondents also expressed a preference for entrance fees or donations over taxes as a means of compensating for green spaces' value. Bockarjova et al. (2020) also found higher WTP for higher income groups. In this study, when separating low-income and high-income groups, the highest willingness to pay (72.8%) was found in the 1 million to 2 million won per month income group, while the rest of the groups were similar to those above the median. Compared to the ultra-low income group, which earns less than KRW 1 million per month, we can observe that the demand for green space is high even at a certain level of low income. Furthermore, the high WTP of higher income groups has policy implications. This could lead to higher contributions and financial

TABLE 11 Results of the chi-square (χ^2) test for willingness-to-pay by age and average monthly earnings ($n = 749$).

Willingness-to-pay		Age (years)				Total		Average monthly earnings (10 thousand KRW)							Total
		18~34	35~49	50~64	65<			<100	100~200	200~300	300~400	400~500	500~600	600~700	
0	N	36	54	63	120	273	19	22	60	44	43	36	20	29	273
	Proportion of 'No' (%)	33.6	33.1	53.4	33.2	36.4	55.9	27.2	34.1	31.9	41.7	40.4	46.5	34.1	36.4
1	N	71	109	55	241	476	15	59	116	94	60	53	23	56	476
	Proportion of 'Yes' (%)	66.4	66.9	46.6	66.8	63.6	44.1	72.8	65.9	68.1	58.3	59.6	53.5	65.9	63.6
Total	N	107	163	118	361	749	34	81	176	138	103	89	43	85	749
χ^2		17.363***				14.167**									

Significance levels were expressed as * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

participation based on income. In the case of community gardens, it may be possible to engage higher income groups in the form of donating the budget needed to maintain the garden.

The average willingness-to-pay (WTP) in this study was lower compared to international studies on urban agriculture gardens and community gardens. This is likely due to the relatively low initial proposed amount. However, since all respondents except 16 expressed willingness-to-pay, it may be possible to increase entrance fees in the future. Private gardens in Korea currently charge entrance fees ranging from 10,000 to 20,000 KRW, with visitor numbers continuing to rise. This suggests an increasing economic value for domestic gardens, which warrants further investigation into their ripple effects.

4.2 Potential for expanding the social functions of gardens

Research on the psychological benefits for older adults indicates that gardens are associated with a sense of accomplishment, well-being, reduced symptoms of depression, improved cognitive function, and the formation of social relationships (Tournier and Postal, 2014). Visiting gardens can serve as an effective method of physical activity for the elderly (Thompson, 2018). Horticultural therapy has also been shown to be particularly effective for older adults engaged in garden activities (Jarrot and Gigliotti, 2010). For older individuals, it is important to focus on horticultural activities that are static, as they can improve cognitive function by stimulating the senses. Several studies have shown that gardening can help alleviate symptoms of Alzheimer’s disease by enhancing physical capabilities (Stern and Munn, 2010). Garden activities are known to reduce anxiety and provide a sense of stability, making them beneficial for mental health and well-being (Whear et al., 2014; Howarth et al., 2020). This study also found that elderly women, in particular, experienced psychological stability from garden activities, which aligns with previous research suggesting that gardening can significantly impact both mental health and physical activity in the elderly. In addition, the United States has introduced garden programs to reduce childhood obesity rates and has shown effective results (Kabisch et al., 2015). A long-term study in the UK found a significant correlation between mortality rates for cardiovascular disease and green space (Richardson et al., 2013).

International studies have focused primarily on vegetable gardens. Single-family homeowners are more likely to engage in garden creation to grow fresh produce and obtain nutrients, whereas multifamily housing areas tend to have lower rates of garden creation. In regions with higher rates of multifamily housing, gardens are used more as spaces for leisure and relaxation rather than for growing crops (Draper and Freedman, 2010; Song et al., 2022). In the case of low-income groups, gardens are more frequently used to grow fresh produce for nutritional purposes (Pham et al., 2022). However, university graduates tend to have lower rates of creating vegetable gardens due to their lower demand for crop consumption.

In South Korea, the high proportion of multifamily housing makes it difficult for individuals to own private gardens. Therefore, a different approach to garden management is needed compared to international practices. This study found that 52.4% of respondents visited gardens in their residential vicinity or peripheral areas for landscape appreciation and relaxation. As a result, local governments have been actively creating gardens to revitalize the region. By utilizing

TABLE 12 Results of the chi-square (χ^2) test for willingness-to-pay by satisfaction level and garden ownership ($n = 749$, a, b, c: different group).

Willingness-to-pay		Satisfaction level					Total	Garden ownership		Total
		1	2	3	4	5		Yes	No	
0	N	3	26 ^c	90 ^b	100 ^a	54 ^a	273	67 ^a	206 ^b	273
	Proportion (%)	75.0	89.7	61.2	30.2	22.7	36.4	29.5	39.5	36.4
1	N	1	3 ^c	57 ^b	231 ^a	184 ^a	476	160 ^a	316 ^b	476
	Proportion (%)	25.0	10.3	38.8	69.8	77.3	63.6	70.5	60.5	63.6
Total	N	4	29	147	331	238	749	227	522	749
χ^2		101.976***						6.759**		

Significance levels were expressed as * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

TABLE 13 Results of the chi-square (χ^2) test for willingness-to-pay by green space near house and garden experience ($n = 749$).

Willingness-to-pay		Nearby green space		Total	Garden experience (a, b: different group)		Total
		Yes	No		Yes	No	
0	N	226	47	273	132 ^a	141 ^b	273
	Proportion (%)	38.0	30.3	36.4	32.9	40.5	36.4
1	N	368	108	476	269 ^a	207 ^b	476
	Proportion (%)	62.0	69.7	63.6	67.1	59.5	63.6
Total	N	594	155	749	401	348	749
χ^2		3.166 (p -value: 0.075)				4.645*	

Significance levels were expressed as * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

TABLE 14 Model coefficients.

Variable	Estimated coefficient	Standard Error	Wald Statistics Value	p -value	Exp(B)
Price	−0.00549	0.00002	349.37	0.000***	0.999
Constant term	3.24351	0.17423	346.54	0.000***	25.623
Cox and Snell R^2	0.318				
Nagelkerke R^2	0.424				
−2 Log likelihood	1499.423				
Model accuracy	73.3%				

Significance levels were expressed as * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

vacant spaces in the area, public gardens can be established to overcome the lack of private garden ownership, with local governments leading the way. However, for garden culture to spread from government-led initiatives to the private sector, paradoxically, the privatization of gardens is necessary. Allocating public spaces for private use can foster attachment and pride in the local area (Bendt et al., 2013). From an ecosystem services perspective, gardens have seven key multifunctional roles: community building, sense of place, crop production, health, nature, education, and more. Among these, community building and a sense of place are particularly important in fostering local attachment (Menconi et al., 2020). Willingness to pay may increase with the experience of gardening. This sense of place creates a sense of attachment to the place and makes them more tolerant of expenditures such as maintenance costs for the garden. Moreover, even residents without prior gardening experience can develop pride and promote social cohesion through gardens (Song et al., 2022). Sense of place, in particular, fosters attachment to the region and is closely linked to cultural services (Tandaric et al., 2022).

Studies on the spatial distribution of willingness-to-pay for gardens, particularly in areas with high populations of low-income and elderly residents, suggest that demand quantification can be utilized for urban planning policies (Albaladejo-García et al., 2021).

In addition, disasters like COVID-19 have made livable environments important. Highly accessible gardens play a positive role in these livability green spaces. According to Ugolini et al. (2021), social distancing reduced visits to large-scale green spaces such as city parks due to restricted mobility, but increased visits to neighborhood gardens and public spaces. In particular, even if people were unable to be outdoors due to distancing, simply looking out the window at green spaces near their residence reduced their sense of loss. In the future, as climate change causes special disasters, residents' movement radius may be limited. The importance of gardens for psychological recovery and physical activity will need to be emphasized.

Urban green space planning should consider proximity, area, and quality to address green space inequalities. There are significant inequalities in the amount and quality of green space. Ethnic minorities

from lower socioeconomic and racial groups enjoy less green space per capita and have access to green environments, albeit at a disadvantage in terms of quality and safety. This inequality is even more concerning because large, high-quality, well-maintained parks are more likely to promote physical activity and benefits than small areas of green space with few public health-related amenities. Urban green space planning should be targeted to address inequalities in access.

There is a need to create walkable, medium-sized gardens in the neighborhoods of socially disadvantaged people to increase access to physical activity. Long-term plans should include the creation of a green axis of gardens connected to the walking network that is based on walking accessibility. Addressing inequalities in access to green spaces must be linked to the issue of local depopulation. This is because the problem of local depopulation starts with the lack of basic amenities and poor access to them. The creation of medium-sized gardens and a garden management plan should accompany the improvement of basic residential welfare.

5 Conclusion

The analysis of the relationship between willingness-to-pay (WTP) and sociodemographic variables revealed that 66.9% of visitors aged 35–49 showed a high willingness-to-pay for local gardens. Additionally, middle- and low-income groups with a monthly household income of less than 4 million KRW exhibited a higher WTP. Visitors' perceptions of gardens were positive, and their willingness to participate was strong. Similar to international cases, individuals who owned gardens expressed higher WTP, especially those with experience in garden creation, who demonstrated an overwhelmingly high WTP. However, the actual estimated value of 5,932 KRW per person per day was relatively low.

This study provides an economic rationale for policy responses targeting low-income and elderly populations, considering the social functions of gardens. Continuous monitoring of these functions in urban public gardens will play a key role in regional revitalization. Unlike parks or forests, gardens are spaces where people actively engage, foster a sense of place, and interact. Gardens also serve as social spaces that can perform economic and conservation functions, particularly as accessible alternative spaces for low-income and elderly populations. This study confirms that individuals with garden creation experience not only develop attachment and pride in the space but also foster a sense of purpose, suggesting that garden experiences can positively influence garden maintenance and management.

However, this study has certain limitations. It did not propose alternative methodologies for deriving specific metrics of social functions. While WTP was analyzed for economic quantification, additional research is needed to explore how social capital circulates through garden activities and how business models can be applied based on this system.

This study has a high response rate from women and the elderly, which may overstate the representativeness of these groups. It was not possible to confirm the significance of willingness to pay by gender and group, and the WTP analysis was conducted with age as a covariate for the older age group. In addition, the admission fee for public gardens operated by local governments is set low, which may lead to low overall WTP estimates. The cross-sectional design may also reduce the relevance of attributing benefits from garden visits to specific causes. Finally, we acknowledge that our findings are from a domestic study, which may lead to interpretations of the results due to domestic cultural specificities.

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary material](#), further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the [patients/ participants OR patients/participants legal guardian/next of kin] was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

MJ: Writing – original draft, Conceptualization. JP: Methodology, Writing – review & editing. HL: Formal analysis, Writing – review & editing. JL: Investigation, Writing – review & editing.

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Conflict of interest

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

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/frsc.2025.1519500/full#supplementary-material>

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