School Gardens Education Plan through the Awareness of Elementary and Middle School Parents

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ABSTRACT

Background and objective: This study was conducted on the value and operation of school garden education. It will be presented as basic data in considering the necessity of a policy for revitalizing school gardens and financial support, and can be used to find ways to facilitate education through school gardens.

Methods: The collected data were analyzed using the \( \chi^2 \) test to obtain the frequency and weight of each measurement item, and the importance of each value was calculated by giving it a relative weight and directly evaluated so that the sum of importance was 100%.

Results: In terms of the effectiveness of each value indicator of school gardens, parents of children who had experienced school gardens perceived them as having educational value (4.35 points) and parents of children who had not experienced school gardens perceived them as having health value (4.38 points). The average amount parents were willingness to pay voluntarily as a fee for school garden programs was 5,889 won and the highest amount was 30,000 won, and the average amount of government budget support parents saw as appropriate was 6,705 won and the highest was 100,000 won. Regarding the appropriate rate of education tax increase from the current rate of 30% the maximum percentage acceptable was 0.531-0.545%. Both parents of elementary and middle school students answered that educational value is the most important of the specific values of school garden service. Regarding the necessity of expanding school garden education, 89.8% of parents answered that the trend of increasing school garden education is appropriate, 93.2% answered that they were willing to have their children participate in school garden education in the future, and 81.2% answered that they would like to participate in school garden education in the future.

Conclusion: The creation and utilization of school gardens is expected to continue to increase due to the diverse values and social atmospheres of school gardens, and this study provides policy data to vitalize school garden education in the future.

Keywords: effectiveness, policy data, urban agriculture, value evaluation, willingness to pay

Introduction

As Korean society seems to find it difficult to enjoy nature due to rapid urbanization, learning related to nature is decreasing in schools, leading to the loss of experiences that are important to fostering the capacity to build a sustainable society (Kim, 2013). As the need to further strengthen environmental education was raised in accordance with the new paradigm of "environmentally sound and sustainable development (ESSD)" proposed by the UN, the direction of school education is also actively being changed from passive education centered on knowledge transfer to active education.
School gardens are a space for students to have diverse experiences and enjoy urban farming activities by creating a vegetable garden for the purpose of education. They have various names at different schools, such as Learning Garden, Educational Farm, Eco-garden, School Garden, School Learning Center, School Farm, Forest Garden (Jang, 2016). According to the Act on Development and Support of Urban Agriculture (Article 8), urban agriculture that utilizes school land or buildings for the purpose of learning and experience by students is defined as "urban agriculture for school education."

Recently, the Ministry of Education (MOE) revised the curriculum to reflect the theme of ecological transition for a sustainable society in all subjects to strengthen the ability to respond to future changes and cultivate a common knowledge base (MOE, 2021). In other words, given the rapid development of IT and the spread of urbanization, the need to provide students with opportunities to easily experience nature in schools in order to raise their awareness of the preciousness of nature and the environment and to cultivate a balanced personality has emerged, and agricultural experience education using "school gardens" has been receiving attention as a solution (Jang et al., 2017). However, due to a number of problems including difficulties in securing space for a school garden, insufficient experience and knowledge related to its operation, low educational utilization, parents’ negative views on gardening activities, additional costs incurred, and lack of management personnel, there is an urgent need to change the awareness of school garden education so that students can lead a healthy and happy school life (Hong et al., 2021b). In this regard, Hong et al. (2020, 2021a) developed indicators for the quantitative evaluation of school garden education services over the past three years, ultimately proposing 5 value indicators and 16 sub-indicators (evaluation items). An evaluation indicator is an index that quantitatively and qualitatively presents the degree of achievement of the performance goal to be achieved when the research is conducted, and has been defined as a tool for measuring whether a goal or task has achieved the goal pursued (Office for Government Policy Coordination, 2017). In this study, using the derived evaluation indicators, a parental awareness survey was conducted on the value and operation of school garden education. Based on the results, the necessity of policies for revitalizing school gardens and basic data for financial support will be presented, which can be used to find ways for school garden education. However, economic value, including ripple effect on industry, was excluded from this study because the stakeholder was not a student, and will be evaluated by converting it to market value in a subsequent study on the socioeconomic and monetary value of school garden education service.

### Table 1. Group of samples by region on this research

| Area                        | Elementary school | Middle school | Total |
|-----------------------------|-------------------|---------------|-------|
|                             | A | B | T | A | B | T | n  | %    |
| Capital area (Seoul/Gyeonggi/Gangwon/Incheon) | 83 | 83 | 166 | 83 | 83 | 166 | 332 | 55.3 |
| Chungcheong (Daejeon/Sejong/Chungbuk/Chungnam) | 15 | 15 | 30 | 16 | 16 | 32 | 62 | 10.3 |
| Honam (Gwangju/Jeonbuk/Jeonnam/Jeju) | 15 | 15 | 30 | 15 | 15 | 30 | 60 | 10.0 |
| Gyeongsang (Daegu/Gyeongbuk/Ulsan/Busan/Gyeongnam) | 37 | 37 | 74 | 36 | 36 | 72 | 146 | 24.3 |
| Total                       | 150 | 150 | 300 | 150 | 150 | 300 | 600 | 99.9 |

*A = Experienced people; B = Inexperienced people; T = Total.*
proportion of the population in each region by M, a domestic specialized research company located in Seoul. First, a questionnaire was distributed to parents who were identified as having children under the age of 18 attending elementary or middle school. For parents with multiple children, the number of samples was adjusted based on the gender and grade of the first child to avoid redundancy of survey respondents. The number of samples who experienced gardening and the number of those who did not were also adjusted to be the same. The responses were collected through an online survey in consideration of the COVID-19 pandemic.

Survey content

In a previous study by Hong et al. (2021b), 5 value indicators and 16 sub-indicators were ultimately proposed through verification based on performance types and evaluation principles to categorize the systematic management of school garden education (Office for Government Policy Coordination and The Korean Association for Policy Studies, 2015). The 5 value indicators were x1 (educational value), x2 (health value), x3 (welfare value), x4 (economic value), and x5 (environmental value), and the sub-indicators for each value were as follows. For educational value, 5 sub-indicators were established, including y1 (learning ability improvement), y2 (humanity cultivation), y3 (social skills improvement), y4 (agricultural literacy cultivation), and y5 (ecological sensitivity enhancement); for the health value, 2 sub-indicators were selected, including y6 (physical health promotion) and y7 (mental health promotion); for the welfare value, 3 sub-indicators, including y8 (landscape value), y9 (promoting cultural benefits), and y10 (social integration); for the economic value, 3 sub-indicators, including y11 (increase in farm household income), y12 (industrial ripple effect), and y13 (job creation); and for the environmental value, 3 sub-indicators, including y14 (environmental quality improvement), y15 (climate change mitigation), and y16 (biodiversity promotion) (Table 2).

A self-administered survey was conducted in which respondents directly filled out a questionnaire, after survey items were sufficiently described in the questionnaire, including demographic characteristics (8 items in total: gender, age, occupation, highest level of education, monthly average income, family type, number of household members, and number of children); the effect of and willingness to pay for school garden education; the importance of and satisfaction of each value; the operation method and program of school garden education; and the necessity of expanding school garden education (Table 3).

The respondents consisted of 281 males (46.8%) and 319 females (53.2%), with slightly more females than males. Respondents in their 40s represented the majority, at 449 (74.8%). Salaried employees were another majority, at 359 (59.8%). For highest level of education, university graduates were the majority, at 446 (74.3%). In terms of average monthly household income, the largest group was in the range of 4-4.99 million KRW, at 133 (22.2%). These results are similar to those of the previous study by Hong et al. (2021b), which seems to be because the same sample size was applied to ensure the sample's representativeness.

As for family type, the majority of respondents were from traditional two-parent families, at 575 (95.8%). For family size, the majority were 4 family members, at 369 (61.5%). Respondents with two children were also in the majority, at 385 (64.2%) (Table 4).

Table 2. Value and evaluation item for school garden education service on this research

| Value      | No. | Evaluation Item                  | No. |
|------------|-----|----------------------------------|-----|
| Educational value | x1 | Learning ability improvement   | y1' |
|            |     | Humanity cultivation             | y2  |
|            |     | Social skills enhancement        | y3  |
|            |     | Agricultural literacy Cultivation | y4  |
|            |     | Ecological sensitivity Enhancement | y5  |
| Health value | x2 | Physical health promotion        | y6  |
|            |     | Mental health promotion          | y7  |
| Welfare value | x3 | Cultural benefit promotion       | y9  |
| Economic value | x4 | Farm household income increase  | y11 |
| Environmental value | x5 | Environmental quality improvement | y14 |

*x' were value indicators and "y' were evaluation items for school garden education services.
Data analysis

A total of 600 responses were collected and the frequency and weight of each measurement item were calculated using SPSS for Windows version 25.0 and Excel 2016. Frequency analysis was performed on demographic data such as gender, age, occupation, highest level of education completed, average monthly income, family type, number of household members and number of children. The difference in the awareness of school garden education service was surveyed using a 5-point Likert scale, so that respondents would answer for each item on a scale of 1 to 5 points.
The effect of school garden education was analyzed through a chi-square ($\chi^2$) test by classifying those who experienced school gardening and those who did not. The importance of each value of school garden education was estimated by giving weights, and then expressed by a self-administered survey method so that the sum of importance was 100%.

**Results and Discussion**

*Respondents' level of interest in urban agriculture, and agriculture, farming areas, and environmental conservation*

As for the level of interest in urban agriculture, and agriculture and farming areas, more than half of the respondents (58.8-59%) displayed their interest, showing similar views to the Rural Development Administration (2014) report on the positive impact of school farms on urban agriculture. They showed a significant interest in environmental conservation at 82.6%, which is similar to the findings reported by Choi et al. (2018) that such education awakened learners to the importance of nature and life and positively influenced thoughts and attitudes toward the environment. It seems to reflect that the expectations of parents have risen based on the interest of parents in the environment in which future generations will live (Fig. 1).

*Effect of school garden education*

In terms of the effect of school garden education, for the experienced respondents, the actual participation effect was surveyed, while for the inexperienced, the expected effects in the future were surveyed on a 5-point Likert scale; overall, there was no difference between both groups for each indicator with the exception of learning ability improvement, cultural benefits enhancement, environmental quality improvement, and climate change mitigation. For the effect on educational value, those who experienced school gardening rated the ecological sensitivity enhancement the highest (4.55 points), followed by social skills improvement (4.23), humanity cultivation (4.22), agricultural literacy cultivation (4.06), and learning ability improvement (3.94); while those who did not experience it scored ecological sensitivity enhancement the highest (4.61), followed by humanity cultivation (4.16), agricultural literacy cultivation (4.15), social skills improvement (4.13), and learning ability improvement (3.74). Both groups evaluated the effect of enhancement of ecological sensitivity the highest, and that of the improvement of learning ability as the lowest. For health value, both groups responded that the effect on mental health promotion (experienced group: 4.41 points, inexperienced group: 4.52) was higher than that on physical health promotion (experienced group: 4.05, inexperienced...
group: 4.20). For welfare value, both groups rated the effect on landscape value (4.09 points for experienced group; 4.10 for inexperienced group) the highest, and evaluated that of relieving social disharmony and improving consideration for others to be the same (4.05). The effect on cultural value was scored the lowest at 3.75 for the experienced group and 3.59 for the inexperienced group. Even for environmental value, the effect on biodiversity promotion was scored the lowest at 3.75 for the experienced group and 3.59 for the inexperienced group. When comparing the experienced and inexperienced groups, the experienced group perceived the overall effect of school garden education to be higher than the inexperienced, but the inexperienced rated the effects on the following sub-indicators higher than the experienced: agricultural literacy cultivation and ecological sensitivity enhancement (educational value), promotion of physical health and mental health (health value), provision of landscape value (welfare value), and climate change mitigation (environmental value) (Table 5). This result is different from that reported by the Rural Development Administration (2014), and seems to be due to the expectations for the pluralistic fields of school garden education based on the government policy that the MOE and the Ministry of Agriculture, Food and Rural Affairs (MAFRA) will start supporting 10 schools with school garden-related projects in connection with the free school year system in middle schools from 2018, and they will support 70 schools in 2021, and more schools every year.

Table 5. Recognition of the results of the effectiveness of the school garden education depending on whether their children experienced vegetable gardens or not

| Item | Division | Experienced group | Inexperienced group | A/B | \( x^2 \) |
|------|----------|-------------------|---------------------|-----|-------|
|      |          | \( z_1^{\ast} \) | \( z_2^{\ast} \) | \( z_3^{\ast} \) | \( z_4^{\ast} \) | \( z_5^{\ast} \) | (point) | \( z_1 \) | \( z_2 \) | \( z_3 \) | \( z_4 \) | \( z_5 \) | B | (point) |
|      |          | n (%)             | n (%)              | n (%) | n (%) | n (%) |       | n (%) | n (%) | n (%) | n (%) | n (%) |
| y1   |          | (14.7)            | (52.3)             | (28.7) | (4.0) | 3.943 |       | (20.3) | (57.0) | (19.3) | (2.7) | 3.740 | 1.054 | 0.043* |
| y2   |          | (18.7)            | (47.3)             | (41.3) | (3.7) | 4.223 |       | (9.0)  | (53.0) | (36.3) | (1.3) | 4.160 | 1.015 | .171** |
| y3   |          | (6.0)             | (54.0)             | (37.7) | (2.3) | 4.233 |       | (10.3) | (53.7) | (34.7) | (1.3) | 4.127 | 1.026 | .199** |
| y4   |          | (11.7)            | (51.3)             | (33.3) | (3.7) | 4.063 |       | (11.0) | (48.3) | (39.3) | (1.0) | 4.153 | 0.978 | .114** |
| y5   |          | (2.0)             | (36.0)             | (60.3) | (1.7) | 4.547 |       | (1.3)  | (35.3) | (63.3) | (0.0) | 4.607 | 0.987 | .129** |
| Ttl  |          | (3.7)             | (48.7)             | (45.0) | (2.7) | 4.350 |       | (4.0)  | (57.0) | (37.3) | (1.3) | 4.270 | 1.019 | .176** |
| y6   |          | (12.7)            | (50.0)             | (34.3) | (2.7) | 4.053 |       | (7.7)  | (51.7) | (39.0) | (0.7) | 4.200 | 0.965 | .056** |
| y7   |          | (3.3)             | (44.3)             | (50.0) | (2.3) | 4.410 |       | (1.7)  | (42.3) | (55.7) | (0.3) | 4.520 | 0.976 | .064** |
| Ttl  |          | (4.3)             | (250.7)            | (43.3) | (1.7) | 4.330 |       | (4.0)  | (49.0) | (46.7) | (0.3) | 4.383 | 0.988 | .362** |
| y8   |          | (10.7)            | (50.3)             | (35.7) | (2.3) | 4.090 |       | (12.0) | (48.3) | (37.7) | (1.0) | 4.097 | 0.998 | .706** |
| y9   |          | (17.7)            | (55.0)             | (20.7) | (5.0) | 3.753 |       | (26.3) | (53.0) | (17.3) | (2.3) | 3.593 | 1.045 | .049*  |
| y10  |          | (11.0)            | (53.0)             | (23.2) | (3.0) | 4.053 |       | (12.7) | (52.0) | (33.3) | (1.7) | 4.053 | 1.000 | .750** |
| Ttl  |          | (13.3)            | (52.7)             | (28.7) | (4.3) | 3.947 |       | (16.0) | (56.0) | (25.7) | (0.7) | 3.880 | 1.017 | .040*  |
Regarding the effect of school garden education, the experienced group rated the educational value as the highest at 4.35 points, followed by health value (4.33), environmental value (4.02), and welfare value (3.95); while the inexperienced group rated the health value as the highest at 4.38 points, followed by education value (4.27), environmental value (4.00), and welfare value (3.88). There were some differences between the two groups in the perception of the effect (Table 5). This indicates that parents who experienced vegetable gardens are more aware of the value of school garden education, and it is thus considered to be urgently necessary to provide experience opportunities that can increase the effect of each value in terms of expanding school garden education services.

By conducting a survey on the effects on domestic agricultural products, organic products, and environmental preservation in the perception change after school gardening education, differences in perceptions of each factor were found as a whole. The inexperienced group evaluated that school garden education would have a more positive effect on the increase in children’s interest in and consumption of domestic agricultural products and organic products, and an increase in interest and practice activities for environmental preservation, compared to the experienced group (Table 6). This seems to reflect parents’ expectations for school garden education, which is consistent with the findings of Jang et al. (2017). In this regard, it is considered necessary to continuously improve education and develop a range of educational programs for the utilization of school gardens, and in particular, to increase educational utilization connected to classes and have a positive impact on students’ dietary life and their awareness of environmental conservation.

**Willingness to pay for school garden education**

Considering that school garden education was conducted for 12 weeks each semester in accordance with the pilot project of the MAFRA, the willingness to pay for the education was surveyed based on an assumption that school garden operation funds would be raised for 8 months a year. The average monthly amount that respondents would be willing to pay for elementary school garden education was 6,217 won for the experienced group and 6,320 won for the inexperienced; the amount to pay for middle school garden education was 5,040 won for the experienced and 5,980 won for the inexperienced, showing that the inexperienced have high willingness to pay. The average amount parents were willing to pay as a flat-rate and voluntary fund for school-garden operation was 5,889 won, and the maximum amount was 30,000 won (Table 7). This result is similar to the findings of RDA (2014), in which the cost that parents were willing to pay for school garden education was 5,000 to 10,000 won, and those of Kim (2014), in which

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**Table 5. (continued)**

| Item | Division | Experienced group | Inexperienced group | A/B | x² |
|------|----------|-------------------|--------------------|-----|----|
|      |          | z1 | z2 | z3 | z4 | z5 | | | | | | |
|      |          | (n) (%) | (n) (%) | (n) (%) | (n) (%) | (n) (%) | (point) | (n) (%) | (n) (%) | (n) (%) | (n) (%) | (n) (%) | | | | | |
| x4  |          | 4  | 45 | 150 | 89 | 12 | 3.917 | 5  | 56 | 141 | 97 | 1  | 3.897 | 1  | 0.005 | 0.023 | |
|     |          | (1.3) | (15.0) | (50.0) | (29.7) | (4.0) | | (1.7) | (18.7) | (47.0) | (32.3) | (0.3) | | | | | | |
| y11 |          | 7  | 68 | 139 | 68 | 18 | 3.643 | 12 | 70 | 136 | 78 | 4  | 3.660 | 0  | 0.005 | 0.027 | |
|     |          | (2.3) | (22.7) | (46.3) | (22.7) | (6.0) | | (4.0) | (23.3) | (45.3) | (26.0) | (1.3) | | | | | | |
| y12 |          | 2  | 33 | 145 | 113 | 7  | 4.113 | 2  | 45 | 139 | 112 | 2  | 4.047 | 1  | 0.016 | 0.309 | |
|     |          | (0.7) | (11.0) | (48.3) | (37.7) | (2.3) | | (0.7) | (15.0) | (46.3) | (37.3) | (0.7) | | | | | | |
| y13 |          | 1  | 38 | 157 | 95 | 9  | 4.023 | 2  | 45 | 151 | 99 | 3  | 4.000 | 1  | 0.006 | 0.384 | |
|     |          | (0.3) | (12.7) | (52.3) | (31.7) | (3.0) | | (0.7) | (15.0) | (50.3) | (33.0) | (1.0) | | | | | | |

x1 = Educational value; x2 = Health value; x3 = Welfare value; x4 = Environmental value.

| Item | Division | Experienced group | Inexperienced group | A/B | x² |
|------|----------|-------------------|--------------------|-----|----|
|      |          | z1 | z2 | z3 | z4 | z5 | | | | | | |
|      |          | (n) (%) | (n) (%) | (n) (%) | (n) (%) | (n) (%) | (point) | (n) (%) | (n) (%) | (n) (%) | (n) (%) | (n) (%) | | | | | |
| x4  |          | 4  | 45 | 150 | 89 | 12 | 3.917 | 5  | 56 | 141 | 97 | 1  | 3.897 | 1  | 0.005 | 0.023 | |
|     |          | (1.3) | (15.0) | (50.0) | (29.7) | (4.0) | | (1.7) | (18.7) | (47.0) | (32.3) | (0.3) | | | | | | |
| y11 |          | 7  | 68 | 139 | 68 | 18 | 3.643 | 12 | 70 | 136 | 78 | 4  | 3.660 | 0  | 0.005 | 0.027 | |
|     |          | (2.3) | (22.7) | (46.3) | (22.7) | (6.0) | | (4.0) | (23.3) | (45.3) | (26.0) | (1.3) | | | | | | |
| y12 |          | 2  | 33 | 145 | 113 | 7  | 4.113 | 2  | 45 | 139 | 112 | 2  | 4.047 | 1  | 0.016 | 0.309 | |
|     |          | (0.7) | (11.0) | (48.3) | (37.7) | (2.3) | | (0.7) | (15.0) | (46.3) | (37.3) | (0.7) | | | | | | |
| y13 |          | 1  | 38 | 157 | 95 | 9  | 4.023 | 2  | 45 | 151 | 99 | 3  | 4.000 | 1  | 0.006 | 0.384 | |
|     |          | (0.3) | (12.7) | (52.3) | (31.7) | (3.0) | | (0.7) | (15.0) | (50.3) | (33.0) | (1.0) | | | | | | |

*x1 = Educational value; x2 = Health value; x3 = Welfare value; x4 = Environmental value.

*y1 = Improving learning ability; y2 = Cultivating character; y3 = Improving social skills; y4 = Cultivating agricultural literacy; y5 = Enhancing ecological sensitivity; y6 = Promoting physical health; y7 = Promoting mental health; y8 = Landscape value; y9 = Enhancing cultural benefits; y10 = Social integration; y11 = Improving environmental quality; y12 = Mitigating climate change; y13 = Promoting biodiversity.

z1 = Didn't contribute at all; z2 = Didn't contribute much; z3 = Contributed a bit; z4 = Contributed a lot; z5 = Do not know.

*A = Experience people five-point scale average; B = Inexperience people five-point scale average.

ns * Non significant or significant at p < 0.05 by x²-test.
the acceptable cost was 3,000 to 10,000 won. However, it is a lower amount than the findings of the previous study by Hong et al (2021b), in which the amount that experienced and inexperienced groups were willing to pay was 12,780 won and 13,399 won, respectively, based on income tax. In the previous study, parents' opinions were surveyed by raising the amount they were willing to pay up to a maximum of 50,000 won or more regarding their willingness to pay for the education as additional individual income tax; while in this study, the flat-rate and voluntary amount they were willing to pay was surveyed by lowering the amount to 20,000 won or more based on previous studies, so the amount seemed to be lower than that of the previous study. However, since the parents were still will-

**Table 6.** Recognition of the effects of school garden education on domestic agricultural products, organic products and environmental preservation

| Item | Division | z1^* | z2 n (%) | z3 n (%) | z4 n (%) | z5 n (%) | A^* | z1 n (%) | z2 n (%) | z3 n (%) | z4 n (%) | z5 n (%) | B | A/B | X^2 |
|------|----------|------|----------|----------|----------|----------|------|----------|----------|----------|----------|----------|---|------|------|
| x1 y1 | Experienced group | 1 | 28 | 154 | 112 | 5 | 4.157 | 1 | 12 | 146 | 138 | 3 | 4.361 | 0.953 | 0.043^* |
| | Inexperienced group | (0.3) | (9.3) | (51.3) | (37.3) | (1.7) | | (0.3) | (4.0) | (48.7) | (46.0) | (1.0) | | |
| x2 y1 | Experienced group | 1 | 62 | 139 | 58 | 6 | 3.721 | 1 | 31 | 152 | 96 | 4 | 4.094 | 0.909 | 0.000*** |
| | Inexperienced group | (0.4) | (23.3) | (52.3) | (21.8) | (2.3) | | (0.4) | (10.9) | (53.5) | (33.8) | (1.4) | | |
| x3 y1 | Experienced group | 1 | 57 | 144 | 78 | 6 | 3.743 | 2 | 34 | 153 | 106 | 5 | 4.089 | 0.915 | 0.002** |
| | Inexperienced group | (1.7) | (22.3) | (48.0) | (26.0) | (2.0) | | (0.7) | (11.3) | (51.0) | (35.3) | (1.7) | | |
| y2 | Experienced group | 2 | 45 | 128 | 45 | 2 | 3.765 | 0 | 20 | 150 | 82 | 7 | 4.135 | 0.910 | 0.000*** |
| | Inexperienced group | (0.9) | (20.3) | (57.7) | (20.3) | (0.9) | | (0.0) | (7.7) | (57.9) | (31.7) | (2.7) | | |
| Total | | 1 | 33 | 156 | 106 | 4 | 4.107 | 1 | 19 | 139 | 137 | 4 | 4.305 | 0.954 | 0.066** |

^*x1 = Domestic agricultural products; x2 = Organic products; x3 = Environmental preservation.
^*y1 = Increased interest; y2 = Increased consumption; y3 = Increased practical activities.
^*z1 = Not at all; z2 = Not so much; z3 = Do not know; z4 = Slightly so; z5 = It really is.
^*A = Experience people five-point scale average; B = Inexperience people five-point scale average.
^*Abbreviation: Div = Division; V AT = Value added tax; WTP = Willingness to pay; Avg = Average; Max = Maximum.

**Table 7.** School garden operation fund, willingness to pay based on support budget, and maximum value added tax increase rate

| Item | Division | School garden operation fund | Government support budget | VAT |
|------|----------|-----------------------------|---------------------------|-----|
| | | Willingness to pay (Won / Month) | WTP = 0 | Support amount (Won / Month) | WTP = 0 | Education tax growth rate (%) | WTP = 0 |
| | | Avg | Max | n % | Avg | Max | n % | Avg | Max | n % |
| x1 A | 6,217 | 30,000 | 20 | 13.3 | 6,833 | 50,000 | 14 | 9.3 | 0.531 | 5.000 | 27 | 18.0 |
| B | 6,320 | 30,000 | 15 | 10.0 | 7,080 | 20,000 | 11 | 7.3 | 0.545 | 5.000 | 24 | 16.0 |
| T | 6,268 | 30,000 | 35 | 11.7 | 6,957 | 50,000 | 25 | 8.3 | 0.560 | 5.000 | 51 | 17.0 |
| A/B | 0.984 | 1.000 | 1.333 | 1.333 | 0.965 | 2.500 | 1.273 | 1.273 | 0.973 | 1.000 | 1.125 | 1.125 |
| x2 A | 5,040 | 30,000 | 16 | 10.7 | 6,525 | 100,000 | 11 | 7.3 | 0.716 | 33.000 | 22 | 14.7 |
| B | 5,980 | 30,000 | 17 | 11.3 | 6,380 | 49,000 | 15 | 10.0 | 1.181 | 49.000 | 29 | 19.3 |
| T | 5,510 | 30,000 | 33 | 11.0 | 6,452 | 100,000 | 26 | 8.7 | 0.948 | 49.000 | 51 | 17.0 |
| A/B | 0.843 | 1.000 | 0.941 | 0.941 | 1.023 | 2.041 | 0.733 | 0.733 | 0.606 | 0.673 | 0.759 | 0.759 |
| Total | 5,889 | 30,000 | 68 | 11.3 | 6,705 | 100,000 | 51 | 8.5 | 0.747 | 49.000 | 102 | 17.0 |

*Abbreviation: Div = Division; VAT = Value added tax; WTP = Willingness to pay; Avg = Average; Max = Maximum.
^*x1 = Elementary school; x2 = Middle school.
^*A = Experience people; B = Inexperience people; T = Total.
ing to pay, it can be seen that they actively want school garden education services.

The amount required to be subsidized by the government for school garden education was surveyed to be 6,833 won and 7,080 won for experienced and inexperienced parents of elementary school children, respectively, and 6,380 won and 6,525 won for experienced and inexperienced parents of middle school children, respectively. Inexperienced parents were found to request a higher amount of government subsidy, with an average of 6,705 won and a maximum of 100,000 won (Table 7). That is, the amount of government subsidy they requested was higher than the flat-rate amount of voluntary school-garden operation fund they were willing to pay. Therefore, to promote school gardens, it can be seen that continuous interest, support, maintenance, and management from central and local governments are required, which includes financial support and material resources, and cultivation of leaders with professional knowledge on school garden management. Regarding the question of by what percentage the education tax rate should be increased from the current rate of 30% to the maximum to promote school garden education, the experienced and inexperienced parents of elementary school students responded 0.531% and 0.545%, respectively, with the inexperienced accepting an increase 0.014% higher than the experienced; while the experienced and inexperienced parents of middle school students responded 0.716% and 1.181%, respectively, a difference of 0.465%. It was found that an education tax increase was evaluated as appropriate by the inexperienced, rather than the experienced (Table 7). This is similar to the findings of Hong et al. (2021b), in which those who experienced school garden education services recognized the need for such services more highly than those who did not, and were also willing to pay, but they rated the amount or tax rate they were willing to pay as lower because they knew the operating conditions through actual experience.

Importance of and satisfaction with each value of school gardening education

By describing each value of the school garden education services value evaluation indicators, and conducting a self-administered survey on it so that the sum of importance for each value that school garden education provides to students becomes 100%, it was found that the experienced parents with elementary school children evaluated the importance in the order of educational value (33.1%), health value (27.2%), environmental value (23.6%) and welfare value (16.1%), while the inexperienced did so in the order of educational value (32.5%), health value (26.4%), environmental value (23.9%), and welfare value (17.2%); overall, the importance of educational value was the highest at 32.8%, followed by health value (26.8%), environmental value (23.8%) and welfare value (16.6%). The experienced parents with middle school children ranked the importance in the order of educational value (32.8%), environmental value (26.4%), health value (23.3%), and welfare value (17.5%), while the inexperienced did so in the order of educational value (30.7%), environmental value (26.6%), health value (26.3%), and welfare value (16.4%); overall, the importance of educational value was the highest at 31.7%, followed by environmental value (26.5%), health value (24.8%), and welfare value (16.9%). As for the importance of each value, education value was evaluated as the highest by both groups, but elementary school parents rated health value as the second highest, while middle school parents rated environmental value as the second highest after education value, showing some differences between them (Table 8). This is similar to the findings of Hong et al. (2020), and seems to be the result of the development of subject-related educational programs and the presentation of educational directions to increase the educational effect according to group life based on implications of a "school garden" created for students and teachers to use for educational activities (MOE, 2021).

Based on a survey on the reasons for participation and satisfaction for those who experienced school gardening education, the most common chance to participate in school garden education was in regular classes (35.3%) for elementary schools, and in extracurricular activities (4H) or club activities (32.7%) for middle schools. On average, the most frequent chance for participation was in regular classes, accounting for 30.7% (elementary school: 35.3%; middle school: 26%), followed by in after-school classes or activities at 28.7% (elementary school: 34%; middle school: 23%),
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Based on a survey on the reasons for participating in school garden education in which multiple responses were allowed, the most common reason was the promotion of physical and mental health (26%) for parents of children in elementary school, and obligatory participation (24.8%) for parents of children in middle school. Overall, the most common reason for participation was the promotion of physical and mental health, accounting for 25.8% (elementary school: 26%; middle school: 23.8%), followed by obligatory participation with 23.0% (elementary school: 19.6%; middle school: 24.8%), interest in gardening at 21.3% (elementary school: 20.9%; middle school: 20.2%), helpful for improving friendship and social skills at 21.0% (elementary school: 19.6%; middle school: 20.8%), improving learning ability at 12.0% (elementary school: 13%; middle school: 21.1%).

Table 8. Importance of each school garden value

| Item | Div | Value | Detail value importance (%) | Importance = 100% | Importance = 0% |
|------|-----|-------|-----------------------------|-------------------|-----------------|
|      |     |       | Avg | Max | Min | n | % | n | % |
| A    |     |       |     |     |     |   |    |   |    |
| x1   | y1  | 33.1  | 100 | 10  | 1   | 0.7 | 0 | 0.0 |
|       | y2  | 27.2  | 70  | 0   | 0   | 0.0 | 2 | 1.3 |
|       | y3  | 16.1  | 40  | 0   | 0   | 0.0 | 5 | 30.3|
|       | y4  | 23.6  | 80  | 0   | 0   | 0.0 | 2 | 1.3 |
| B    |     |       |     |     |     |   |    |   |    |
| x1   | y1  | 32.5  | 100 | 10  | 1   | 0.7 | 0 | 0.0 |
|       | y2  | 26.4  | 90  | 0   | 0   | 0.0 | 2 | 1.3 |
|       | y3  | 17.2  | 40  | 0   | 0   | 0.0 | 3 | 2.0 |
|       | y4  | 23.9  | 60  | 0   | 0   | 0.0 | 5 | 3.3 |
| T    |     |       |     |     |     |   |    |   |    |
|      | y1  | 32.8  | 100 | 10  | 2   | 0.7 | 0 | 0.0 |
|      | y2  | 26.8  | 90  | 0   | 0   | 0.0 | 4 | 1.3 |
|      | y3  | 16.6  | 40  | 0   | 0   | 0.0 | 8 | 2.7 |
|      | y4  | 23.8  | 80  | 0   | 0   | 0.0 | 7 | 2.3 |
| A    |     |       |     |     |     |   |    |   |    |
| x2   | y1  | 32.8  | 100 | 2   | 2   | 1.3 | 0 | 0.0 |
|       | y2  | 23.3  | 70  | 0   | 0   | 0.0 | 3 | 2.0 |
|       | y3  | 17.5  | 35  | 0   | 0   | 0.0 | 4 | 2.7 |
|       | y4  | 26.4  | 95  | 0   | 0   | 0.0 | 2 | 1.3 |
| B    |     |       |     |     |     |   |    |   |    |
| x2   | y1  | 30.7  | 70  | 5   | 0   | 0.0 | 0 | 0.0 |
|       | y2  | 26.3  | 60  | 10  | 0   | 0.0 | 3 | 1.0 |
|       | y3  | 16.4  | 50  | 0   | 0   | 0.0 | 6 | 2.0 |
|       | y4  | 26.6  | 70  | 0   | 0   | 0.0 | 4 | 1.3 |
| T    |     |       |     |     |     |   |    |   |    |
|      | y1  | 31.7  | 100 | 2   | 2   | 0.7 | 0 | 0.0 |
|      | y2  | 24.8  | 70  | 0   | 0   | 0.0 | 3 | 1.0 |
|      | y3  | 16.9  | 50  | 0   | 0   | 0.0 | 6 | 2.0 |
|      | y4  | 26.5  | 95  | 0   | 0   | 0.0 | 4 | 1.3 |

*Abbreviation: Div = Division; Avg = average; Max = maximum; Min = minimum.

x1 = Elementary school; x2 = Middle school.
A = Experienced people; B = Inexperienced people; T = Total.
and other at 0.7% (elementary school: 0.9%; middle school 0.3%). Other reasons included lack of opportunities to experience it separately, classes, part of field-based experiential learning, or no idea about reasons for participation (Fig. 3).

The overall satisfaction of those who experienced their children's school garden education was 4.00 out of 5, indicating that they were generally satisfied. For each item, satisfaction with educational programs was the highest at 3.91 points, followed by events or activities related to vegetable gardens at 3.90, training hours and frequency at 3.73, and educational facilities and equipment at 3.66, showing their overall satisfaction was above average (Table 9).

A survey on perceptions of operation methods and programs in school garden education

Based on data on school garden education conducted once a week, 2 hours per session, for 12 weeks per semester, for middle schools that participated in the "School Garden Activity Program" conducted by the MAFRA in 2020, appropriate time, activity contents, theory classes, and maintenance plan were investigated for school garden education.

In terms of an appropriate time for school garden education, regular class hours during the semester accounted for the majority at 58.5%, followed by after school during the semester at 28.7%, and weekends (Sat./Sun.) during the semester at 8.3%, vacation at 3.7%, and other times at 0.8%; such other times included incorporating relevant training into a specific subject (practice class), or relevant education
into all subjects; right after arriving at school in the morning; during lunchtime; and only for those who want it (Fig. 4). This is a result consistent with the findings of Jang et al. (2017) that education using vegetable gardens was mainly conducted during regular class hours. Although the effect can be increased by connecting school garden education with regular classes or extracurricular activities, this puts it in danger of being reduced in the school curriculum to some extent. To prevent this reduction and expand school garden education, it is important for agricultural institutions to promote the educational effects of school gardens and inform the MOE or institutions related to curriculum revision.

According to a survey in which multiple responses were accepted about the activities parents wanted their children to experience in school gardening education, planting, growing, and harvesting plants in vegetable gardens accounted for the largest share of responses at 19.3%, followed by garden harvest sharing event (13.3%), creating vegetable gardens (13.1%), activities using garden crops (11.2%), interacting with insects and earthworms living in vegetable gardens (9.7%), interacting with animals such as rabbits and chickens (9.0%), smart farm experience (8.2%), farm visits and experience activities (7.3%), making materials for vegetable gardens (fertilizer, pesticide; 5.8%), cultural events in vegetable gardens (concerts, plays, etc.; 3.1%) and other activities (0.1%). Such other activities included eating their own crops they grew. It can be seen that responses such as smart farm experiences and farmhouse visits are gradually increasing in line with recent trends (Fig. 5).

In addition, for theory classes that parents want their children to take during school garden education, as good eating habits and the importance of consuming vegetables had the largest share at 12%, it is considered that education to improve eating habits will be important in school garden education. It was found that about half of the respondents showed an increased interest in agriculture, which has recently become a social issue, including climate crisis and agriculture (10.1%), characteristics and importance of eco-friendly agriculture (9.8%), pluralistic functions and public value of agriculture (8.8%) (Fig. 6).

In terms of methods for maintaining school gardens, hiring of professional management personnel was the most common response at 41.8%, followed by operation by designated teachers (25.5%), student-led management (24.8%), joint management by parents (7.7%), and others (0.2%). Other responses included no need for maintenance (Fig. 7). This reflects the finding of Kim (2014) that management by professional personnel was the most necessary.

**Recognition of the need to expand School garden education**

Regarding the need to expand school garden education, 89.8% of the parents (91.7% for elementary school, and 88% for middle school) answered that an increase in school garden education is an appropriate trend; 93.2% of them (95.7% for elementary school, and 90.7% for middle school) responded that they are willing to have their children participate in school garden education in the future, indicating a high parental awareness overall. In particular, it was found that elementary school parents were more aware of the need to expand school garden education. In
addition, 81.2% of them (80.0% for elementary school, 82.3% for middle school) answered that they were willing to recommend it to parents who have not participated in school gardening, showing that middle school parents' willingness to recommend it was somewhat higher than elementary school parents. Based on this, it can be seen that most parents positively recognize the expansion of school garden education (Table 10). This is a view similar to the report of the Rural Development Administration (2014), and it can be considered as reflecting an increased interest in participating in school garden education when opportunities are created. Accordingly, to promote school gardens, continuous support and maintenance are needed, including the interest of central and local governments, financial support, materi-

Table 10. Recognition of the need to expand school garden education

| Item                                | Elementary school |         |         |         | Middle school |         |         |         | Total   |         |         |         |
|-------------------------------------|------------------|---------|---------|---------|---------------|---------|---------|---------|---------|---------|---------|---------|
|                                    | A               | B       | C       |         | A             | B       | C       |         | A       | B       | C       |         |
|                                    | n %             | n %     | n %     |         | n %           | n %     | n %     |         | n %     | n %     | n %     |         |
| Yes                                 | 275 91.7        | 287 95.7| 240 80.0|         | 264 88.0      | 272 90.7| 247 82.3|         | 539 89.8| 559 93.2| 487 81.2|         |
| No                                  | 4 1.3           | 6 2.0   | 27 9.0  |         | 7 2.3         | 13 4.3  | 22 7.3  |         | 11 1.8  | 19 3.2  | 49 8.2  |         |
| Do not know                         | 21 7.0          | 7 2.3   | 33 11.0 |         | 29 9.7        | 15 5.0  | 31 10.3 |         | 50 8.3  | 22 3.7  | 64 10.7 |         |

* A = Evaluation of the trend of increasing school garden education; B = Willingness to involve children in school gardening education in the future; C = Willingness to recommend to parents who have not participated in school gardening in the future.
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Conclusions

To develop a plan for school garden education by determining overall awareness of school garden education, and willingness to participate in and pay for such education, in this study, an online survey of 600 parents of elementary and middle school children in four major regions was conducted from October 22 to 26, 2021 by a specialized research company. The collected data were analyzed using the \( \chi^2 \) test by obtaining the frequency and weight of each measurement item. The importance of each value of school garden education was calculated by assigning weights and then expressed by a self-administered survey method so that the sum of importance was 100%.

First, respondents with the following demographic characteristics were represented the most: 319 female respondents (53.2%), slightly more than male respondents; 449 people in their 40s (74.8%); 359 salaried employees (59.8%); 446 university students/graduates (74.3%); 133 people with an average monthly household income of 4 to 4.99 million won (22.2%); 575 people in two-parent families (95.8%); 369 people with 4 family members (61.5%); and 385 people with two children (64.2%).

Second, regarding the effect of school garden education, both parents whose children had experienced school garden education and parents whose children had not rated the following as the highest: ecological sensitivity enhancement for educational value; the promotion of mental health for health value; landscape value for welfare value; and promotion of biodiversity for environmental value. Overall, experienced parents had a high awareness of the effect of school garden education. Regarding the effect of each sub-indicator of school gardening, experienced parents recognized educational value (4.35 points) as the highest, while inexperienced parents saw health value (4.38 points) as the highest. As for the change of perception after school garden education, overall, inexperienced parents evaluated that school garden education had a more positive effect on their children's increased interest in and consumption of domestic agricultural products and organic products, and increased their interest in hands-on activities related to environmental conservation, compared to experienced ones.

Third, the amount that parents were willing to pay for school garden education as a voluntary school garden operation fund was found to be an average of 5,889 won and a maximum of 30,000 won, while the amount required to be subsidized by the government for school garden education was found to be an average of 6,705 won, and a maximum of 100,000 won. To the question of by what percentage the education tax rate should be increased from the current rate of 30% to the maximum to promote school garden education, the experienced and inexperienced parents with elementary school children responded 0.531% and 0.545%, respectively; while the experienced and inexperienced parents with middle school children responded 0.716% and 1.181%, respectively. It was found that the inexperienced considered an increase in education tax to be appropriate, compared to the experienced.

Fourth, with regard to the importance of each value of the school garden service, both the elementary and middle school parent groups answered that the educational value was the most important. The most common chance for children's participation in school garden education was in regular classes (30.7%), and the most common reason for their participation was the improvement of physical and mental health. The overall satisfaction was found to be 4.00 points, which was generally good, and the satisfaction with the education program was the highest for each sub-item.

Fifth, regarding an appropriate time for school garden education, regular class hours during the semester had the most support at 58.5%; the activities parents want their children to experience were planting, growing, and harvesting plants in vegetable gardens; and theory classes that parents want their children to take were found to be about the importance of good eating habits and eating vegetables. The most common way to maintain school gardens was found
to be hiring professional management personnel. Regarding the necessity of expanding school garden education, 89.8% of parents (91.7% for parents of elementary school children; 88% for parents of middle school children) answered that the trend of increasing school garden education is appropriate. 93.2% of them (95.7% for parents of elementary school children; 90.7% for parents of middle school children) answered that they are willing to have their children participate in school garden education in the future. 81.2% of them (80.0% for parents of elementary school children; 82.3% for parents of middle school children) responded that they are willing to recommend it to parents who have never participated in school gardening. Most of the parents positively perceived the expansion of school garden education.

As it is expected that the creation and use of school gardens will continue to increase given the current social climate, the diverse values and effects of school gardens presented in this study will be used as basic data when developing educational plans for school gardens in the future. Based on this, the social and economic monetary value of school garden education services will be converted into market value and evaluated, and additional management of school garden education services using an evaluable logic model should be performed, which will be proposed as policy materials to revitalize school garden education.

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