A Study on the Utilization of Urban Garden Design Derived from the Traditional Farming Method Gyeonjongbeop from the Joseon Period: Focused on Imwongyeongjeji Bolliji

In-Kyoung Hong, Hyung-Kwon Yun*, Young Chae, Sang-Mi Lee, Young-Bin Jung, and Mi-Ra Lee

Researcher, Urban Agriculture Research Division, National Institute of Horticultural and Herbal Science, Wanju 55365, Korea

ABSTRACT

Background and objective: Traditional farming is winning recognition as a sustainable alternative farming method. As urban farming increases in South Korea, it is crucial to develop more sustainable farming techniques. *Gyeonjongbeop* is the traditional farming method introduced in the Joseon period. This study was conducted to propose a productive garden model suitable for urban farming through the interpretation of traditional farming methods contained in *Imwongyeongjeji Bolliji* and to test the model on an actual field.

Methods: Using the design and cropping system of *Gyeonjongbeop* as the research materials, we reviewed its tillage and cultivation and examined the applicability. We proposed a modified method by extracting parts applicable to urban farming. According to the methods, we created a garden with ridges and furrows, cultivated proper vegetables, and evaluated their growth.

Results: *Raphanus sativus*, *Allium fistulosum* L., *Brassica juncea*, and *Spinacia oleracea* grown on ridges showed higher growth than those grown on a conventional flat field. The growth of *Hordeum vulgare* var. *hexastichon* and *Triticum aestivum* L. on furrows was also slightly higher. This proved that the method could make up for the deficiencies of barley and wheat that are weak against winds and cold and are easily destroyed by the spring rains.

Conclusion: Ridge and furrow cultivation derived from *Gyeonjongbeop* can be an efficient urban farming system compared to the conventional cultivation in flat fields. The system can use fallow lands in winter for year-round urban farming. In addition, the application of the traditional farming system can enhance the humanistic value of urban farming.

Keywords: Daejeonbeop(Daitianfa), eco-friendly, garden model, traditional agricultural technology, urban agriculture

Introduction

Traditional agricultural technology refers to the spirits, techniques, values and methods inherited by applying, adapting, transforming or originally creating the perceptions, behaviors and technical patterns of agriculture that have been sustained for a long time based on the norms of groups, which have lived within the boundaries of a specific region, so that they are suitable for the natural conditions of the region (Guh, 2009). Traditional agricultural technology, which values the diversity of crops, is

making the best use of available regional resources and transforming into life cycle agriculture, such as catch cropping (intercropping) or shift of crops (crop rotation), soil management using worms, pest control using natural enemies, and sowing crops using rainfall types in each season. They are winning recognition as sustainable alternative farming methods that guarantee ecological circularity and environmental friendliness (Park, 2004). In particular, as the role of urban gardens is becoming more important and urban residents participate more and more in urban agriculture, there is an urgent need to develop more function-

This paper was funded by the research project of Rural Development Administration (PJ012607022019).

Received: June 5, 2020, **Revised:** July 15, 2020, **Accepted:** July 20, 2020

First author: In Kyoung Hong, inkyoung63@korea.kr, <https://orcid.org/0000-0002-7050-5413>

***Corresponding author:** Hyung Kwon Yun, yun0309@korea.kr, <https://orcid.org/0000-0001-9973-4706>

© 2020 by the Society for People, Plants, and Environment. This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ally sustainable agricultural techniques in the field of urban agriculture (Hong et al., 2018). However, it is not easy to shed new light on the ancient agricultural techniques that had been accumulated based on experience and foreknowledge from a long time ago. Yet it is possible to improve the thoughts, experiences, means or methods that appear through the unchanging providence and principles with today's rational thinking. Inheriting traditional technology is not just sticking to the old ways but understanding the background and purpose, materials and techniques, as well as effects, and laying the groundwork to adequately use them from the contemporary perspective. Accordingly, this study selected *Imwongyeongjeji* by late Joseon Silhak scholar Seo Yu-Gu (1764-1845) as the data to examine traditional knowledge from the past. *Imwongyeongjeji* is known to be an encyclopedia focusing on agriculture, of which *Bolliji* is a comprehensive digest of arable farming overall, covering all fields necessary for urban agriculture such as utilization of water, soil property, farming period, reclamation and farming practices, sowing, harvest and storage. Thus, it will be suitable data for examining traditional agricultural technology. In particular, *Gyeonjongbeop* among traditional farming methods included in *Bolliji* is a farming method that has been acquired based on many years of experience. This farming method has sustainable potential value that includes ecological circularity and environmental friendliness.

Gyeonjongbeop is a traditional farming method introduced in Pungseok Seo Yu-Gu's *Imwongyeongjeji*, and it is a dry-field farming method that improved China's *Daejeonbeop* (*Daitianfa*) to be more suitable for Joseon. It is a furrow cultivation or furrow planting method invented to reduce damages from spring droughts. It is suitable for petty farmers and urban farmers, as it is effective in reducing labor and increasing productivity by cultivating wheat and barley. Since crops are planted in the furrows by making up for the deficiency of cultivating in level rows, there are shades and moisture that enable seeds to pop up easily in droughts as well. The method also has good heat conservation and thus easily leads to germination, and both weeding and earthing up are possible at the same time, which reduces labor. It is also efficient as fertilizers and manures can be applied intensively to crops only.

In addition, regular and constant sowing saves the seeds and makes ventilation more even, which evenly ripens the crops. Since roots are covered thickly with soil, the crops take roots deeply and are thus strong against winds and droughts, which is useful in cultivation. Above all, since it has the benefit of using the fallow land and making efforts during the winter off-season, there is an urgent need to implement this method to urban gardens. Accordingly, this study intends to examine how *Gyeonjongbeop*, which is the Joseon version of China's *Daejeonbeop*, is reinterpreted in *Bolliji* as a new technology that used old wisdom, suggest an objective contemporary garden model by reproducing the traditional farming methods included in old agricultural books, and apply this model to urban gardens based on the results of field application.

Research Methods

Theoretical background

This chapter set the traditional farming methods of the past as a concept of traditional knowledge and examined the process in which China's traditional farming method *Daejeonbeop* recorded in the Korean translation of *Bolliji* is interpreted as *Gyeonjongbeop* by Seo Yu-Gu in terms of inheritance. We reviewed the process based on the design and application of *Gyeongjeonbeop* proposed by Seo Yu-gu, examined its applicability, came up with parts that can be applied to urban agriculture, and suggested customized *Jakmyobeop* (how to make rows; how to make ridges) and cultivation method.

China's *Daejeonbeop*

The first record of *Daejeonbeop* is in the chapter *Sikhwaji* (the treatise on food and money) of *Han Seo* (Book of the Han; Ban, 2020) introduced in a Chinese agricultural book, which is presented as follows in the Korean translation of *Bolliji* (Seo, 2008).

“Zhao Guo became the Grain Intendant in the late years of Emperor Wu of Han Dynasty. Zhao Guo created *Daejeon* (*Daitinfa*, alternating fields system)

with three furrows per *myo* (unit of crop field). The name *Daejeon* comes from the fact that the planting spot or site for crops is changed every year, and this is an old rule. Hou Ji first made furrows on fields. A furrow is made by two people plowing the field side by side with two plows in the width and depth of 1 *chi* (unit of measurement, equals to 30.3 cm) each. A furrow leads vertically to the end of 1 *myo*. There are 3 furrows in each *myo*, and thus 1 *bu* (100 *myo*) has 300 furrows. Sowing is done in furrows. After the sprouts leaf out, grass on the ridges is weeded little by little. In this process, the soil on the ridges is top-pled and earthed up on the roots of young sprouts. (Omitted)

In midsummer, the ridges are destroyed and the roots are deepened to endure the winds and droughts. Therefore, they become full and bountiful. The farming tools used in plowing, weeding and sowing seeds in *Daejeon* all have convenient techniques”.

Daejeonbeop (*Daitianfa*) is a farming method developed by Zhao Guo during the years of Emperor Wu of Han and has the same meaning as *Gujeon* (*qutian*). Only the position of furrows is changed every year to cultivate crops and prepare for natural disasters such as droughts, floods, wind damages and cold-weather damage. *Daejeonbeop*, which is a 1-*myo* (a measuring unit for farmland marked as 30 *pyeong* [99.174 m²] in the Japanese colonial era but is currently banned from use) 3-furrow method, is used to reap good harvests (Fig. 1). However, this caused the issue of the sowing method in Joseon since farmland is

wasted by using big plows and making wide ridges, and also because there is a huge gap in the growing speed of crops by scattering sowing instead of strip sowing.

Seo Yu-Gu's *Gyeonjongbeop*

Seo Yu-Gu, who intensified the research on *Daejeonbeop* so that it is settled in Joseon suitably according to the natural features, closely reviewed *Daejeonbeop* from ancient China left in historical records as well as *Daejeonbeop* accepted by Chinese agriculturists from Ming and Qing, and also *Daejeonbeop* that was implemented in Liaodong in the late Joseon period, after which he newly interpreted them and provided his own unique version of *Daejeonbeop*. This is based on China's *Daejeonbeop* and yet is an entirely new suggestion that is different from any other *Daejeonbeop* systems before. It is about shaping the field (Fig. 2) and was also referred to as *Gyeonjongbeop*, *Gyeongjong-ji-beop*, *Gyeonjeonbeop* and *Gyeonjeon-ji-beop*. *Gyeonjongbeop* in *Bolliji* is generally the same as *Daejeonbeop*: creating three furrows and three ridges at the width and depth of approximately 30 cm (1 *chi*) on 30 *pyeong* (1 *myo*) of the field that is about 182 cm (6 *chi*) wide, and then strip sowing on the furrows. Seo Yu-Gu thought that it is necessary to create an environment in which crop roots growing in the furrows can grow out easily by deep plowing in order to implement the 1-*myo* 3-furrow method mentioned in *Sikhwaji*. He also created drainage channels between *myos* and even made bigger drainage channels around the field to prepare for the rainy season. Seo (2008) concretely described *Gyeonjongbeop* in culti-

Fig. 1. *Daejeonbeop* of China, showing how the alternating fields system works (A) and the composition of 1 *myo*. Adapted from “*Imwongyeongjeji. Bolliji*”, by Y.G. Seo, translated by M.H. Jeong and J.G. Kim, 2008, Seoul, Korea: Sowadang.

Fig. 2. *Gyeonjongbeop*, Seo Yu-Gu's new interpretation of *Daejeon*. Adapted from "*Imwongyeongjeji. Bolliji*", by Y.G. Seo, Translated by M.H. Jeong and J.G. Kim, 2008, Seoul, Korea: Sowadang.

vation of *Hordeum vulgare* var. *hexastichon* and *Panicum miliaceum* L. First, the entire farmland is deep plowed three times with a big plowshare in September and October, after which harrowing (puddling) is done six times to crush the soil. Then, a big ditch with the depth and width of 2 *chi* is dug up around the field using a spade. Small ditches with the depth and width of 45 cm (1.5 *chi*) are made horizontally inside the field every 182cm (6 *chi*). In the next spring, three furrows are created in 182 cm-wide (6 *chi*) rows with a small plowshare. Then, three furrows and three ridges are made (Fig. 3). This is the newly interpreted version by Seo Yu-Gu that suggests precise measurements unlike China's *Daejeonbeop*.

Moreover, Seo provided specific number of times each task is performed, such as deep plowing once and harrowing (puddling) three times, and laid stress on crops taking root and the drainage effect by creating drainage channels between rows. In particular, he insisted on using *Gyeonjongbeop* in cultivating *Hordeum vulgare* var. *hexastichon*. Moreover, drainage channels around the field were not mentioned since drainage channels can be made between rows (big *myo*). This implies that *Hordeum vulgare* var. *hexastichon* can endure spring rains even without the drainage channels on all sides. As such, Seo Yu-Gu was convinced that *Gyeonjongbeop* is the best dry-field

Fig. 3. Reconstructed *Gyeonjongbeop* for barleys and millets by Seo Yu-Gu. Adapted from "*Imwongyeongjeji. Bolliji*", by Y.G. Seo, Translated by M.H. Jeong and J.G. Kim, 2008, Seoul, Korea: Sowadang.

farming method that must be accepted at the time in Joseon where intercropping (catch cropping) and double-cropping (two crops a year) are commonly used. Thus, while he did not precisely implement China's *Daejeonbeop*, he naturally created an opportunity to teach *Panicum miliaceum* L. farming method to Gyeonggi farmers as garrison farms so that he could establish a bridgehead to supply *Gyeonjongbeop*. Furthermore, he could newly interpret this into his own style of *Daejeonbeop* called *Gyeonjongbeop* by embracing and internalizing the discussions on *Daejeonbeop*. However, despite his enthusiastic efforts, *Gyeonjongbeop* failed to change the old customs of the private sector like intercropping and double-cropping, and thus ended up being a farming method that was merely an experiment of a few intellectuals including Seo Yu-Gu. Even though a firm, solid theory could be established by the experiment, it failed to have a great ripple effect to influence farmhouses because of the perception among farmers at the time, such as wastage of land due to idle ridges and burden of labor in shaping the fields.

Utilization in modern urban agriculture

The effective cropping system in the modern times is based on land management and cultivation technology that increases use of farmland and agricultural productivity. In particular, repeated cultivation (continuous cropping) that cultivates crops every year without idling the land is an efficient way of managing fields without fallow ground by establishing a consistent cropping system. Traditional farm-

Fig. 4. Suggested urban farming method.

ing methods formed throughout many years are receiving attention as alternative agricultural techniques to ensure stability of agricultural products while constantly increasing agricultural biodiversity (Jeong et al., 2016).

Manjong (flatland sowing without making ridges and furrows), which is a conventional form of vegetable garden cultivation, has low germination rate and requires much labor in weeding. There is poor ventilation for crops as well due to uneven sowing, and fertilizing is also inefficient. Earthing up is also not possible in this method, which makes the crops vulnerable to winds and droughts. On the other hand, *Gyeonjongbeop* is a farming method that can solve all these problems; it is a response to climate change from on-ridge sowing to furrow sowing to reduce damage from spring droughts (Kim, 2010). Therefore, it is still highly appreciated among a few farmhouses that do not use machinery (Jeong, 2012). As such, *Gyeonjongbeop* is a farming method absolutely necessary for urban gardens, and its disadvantages mentioned in old agricultural books can be resolved by applying modern technology. Therefore, we reconstructed Seo Yu-Gu's *jakmyobeop* to better suit the modern times and suggested it as follows (Fig. 4). Here, the number of ridges and furrows could be adjusted according to the area required and the user's needs.

Methods

Making a field

Through the research on the topic, we set up the *Gyeonjongbeop jakmyobeop* that can be applied to urban

gardens in the actual field. First, we deep plowed the entire field in September and softened the ground by harrowing (puddling) it multiple times, after which we shaped the field in all sides and created four ridges and three furrows. We created furrows to be width 30cm and depth 25cm based on historical research. Here, deep plowing is done because shallow plowing keeps the roots from properly growing out since the ground soil of the furrows is untillied; and crops can grow well only when the soil below the newly plowed ground is soft. Moreover, unlike Seo's field shape, we made the small ditches about 15cm (0.5 *chi*) wider to facilitate water drainage (Fig. 5). This layout considers the field conditions depending on modern climate change. Here, the number of ridges and furrows can be adjusted depending on the area.

Planting time, crops and survey method

The field for *Gyeonjongbeop* in urban agriculture was designed to use both ridges and furrows unlike Seo Yu-Gu's *Gyeonjongbeop*. Based on the design, a field was plowed in August 2019 in the experimental field of National Institute of Horticultural and Herbal Science (NIHHS). After basic manuring, the field was created in early September. Seeds of *Raphanus sativus* var. *longipinnatus* (hill sowing), *Brassica juncea* var. *integrifolia* and *Spinacia oleracea* (strip sowing) were sowed as winter crops on the ridges on September 6, 2019. Compound fertilizers were applied after 2 weeks, and then additional fertilizers after 3 weeks for cultivation. Every other Thursday, growth of the crops such as above-ground weight, under-

Fig. 5. Preparing a field for planting.

Fig. 6. Photo of crops grown on ridges (photo taken on November 17, 2020).

ground weight and length (plant height) was examined three times repeatedly on two fields formed for each crop. Seedlings of *Allium fistulosum* L. were raised 2 weeks before and transplanted properly during the same period, after which growth of the crops including above-ground weight and length were examined. The winter crops were all harvested on December 9, which is Day 82 after planting.

For furrows, we sowed seeds of *Triticum aestivum* L. and *Hordeum vulgare* var. *hexastichon* introduced as effective crops in *Bolliji* with strip sowing on November 6, 2019 and then covered them in rice husks for germination. Buds started to open on November 18, Day 12 after sowing, and the length and stem height were surveyed for 7 months until early June 2020 to verify the average state of growth of crops.

Results and Discussion

Growth of vegetable crops on ridges

We sowed seeds of *Raphanus sativus*, *Brassica juncea*, and *Spinacia oleracea*, and raised seedlings of *Allium fistulosum* L. and then transplanted them properly, after which we examined the growth of the crops on Day 60 and Day 82 (Tables 1-4). According to the report by Rural Development Administration (RDA, 2018b), the growth period of winter crops is 40-60 days. In this experiment, we surveyed the growth on the 60th day, which is the optimal harvesting time. Then, we cultivated the crops for 22 more days to determine the point in which they mingle with the upland crops growing on the furrows, compared their growth, and harvested them in early December when the sprouts of barleys shoot up on the furrows (Fig. 6). After sowing the seeds, the number of germinations was

Table 1. Growth results of *Raphanus sativus* sowed on ridges

Crop No.	Day 60 after direct sowing (n=18)			Day 82 after direct sowing (n=15)		
	Above-ground weight (g)	Underground weight (g)	Length (cm)	Above-ground weight (g)	Underground weight (g)	Length (cm)
1	19.26	102.62	21.50	15.13	123.89	24.70
2	40.50	207.25	27.70	28.15	218.02	28.30
3	20.47	145.49	25.30	13.44	93.02	20.60
4	15.76	90.68	24.00	23.17	234.19	27.10
5	27.48	138.78	27.80	23.53	145.47	23.20
Total	123.47	684.82	126.30	103.42	814.59	123.90
Average	24.69	136.96	25.26	20.68	162.92	24.78

Note. At the time of sowing, n = 23.

Table 2. Growth results of *Brassica juncea* sowed on ridges

Crop No.	Day 60 after direct sowing (n=83)				Day 82 after direct sowing (n=77)			
	Above-ground weight (g)	Length (cm)	Leaf length (cm)	Leaf width (cm)	Above-ground weight (g)	Length (cm)	Leaf length (cm)	Leaf width (cm)
1	65.81	34.50	33.70	12.40	86.52	39.10	12.50	43.70
2	45.89	36.80	34.60	9.50	215.80	41.70	16.00	49.10
3	71.35	37.70	33.50	10.70	224.64	45.60	16.80	52.00
4	54.50	41.20	40.80	12.00	109.46	41.00	13.10	44.30
5	42.31	33.80	33.50	9.50	90.27	39.40	11.80	41.50
Total	279.86	184.00	176.10	54.10	726.69	206.80	70.20	230.60
Average	55.97	36.80	35.22	10.82	145.34	41.36	14.04	46.12

Note. At the time of sowing, n = 88.

8 to 11 for each crop. As a result of examining the growth of crops after harvest in comparison with the conventional culture reported by RDA (2018b), the above-ground weight of *Raphanus sativus* decreased by 4 g on average compared to the optimal harvesting time, but the underground weight that is actually used increased by 26 g. The above-ground growth of *Brassica juncea* (mustard) increased by 89 g on average compared to the optimal harvesting time, and the length increased by 4 cm and leaf width by 35 cm, whereas the leaf length decreased by 21cm. The above-ground growth of *Spinacia oleracea* increased by 21 g on average compared to the optimal harvesting time, and the length increased by 0.16cm and leaf width by 1.94 cm, whereas the leaf length decreased slightly by 0.08 cm. The above-ground growth of *Allium fistulosum* L. increased by 6.7 g on average compared to the optimal harvesting time, and the length also increased by

4 cm. Winter crops are short and thus can be harvested in late fall to early spring with simple heat retention, thereby proving the efficient use of *Gyeonjongbeop* in which vegetables can be cultivated in empty gardens.

Growth of upland crops on furrows

Hordeum vulgare var. *hexastichon* that germinated on Day 12 after direct planting on November 18 was 1.9 cm and *Triticum aestivum* L. was 1.7 cm. The ears of *Hordeum vulgare* var. *hexastichon* were formed in late April 2020, and the ears of *Triticum aestivum* L. were formed in early May 2020. The average growth results of each crop are as shown in Fig. 7, and it was carried out in early to mid-June, which is the same as the conventional culture harvesting time of *Hordeum vulgare* var. *hexastichon* suggested by RDA (2018a).

Table 3. Growth results of *Spinacia oleracea* sowed on ridges

Crop No.	Day 60 after direct sowing (n=36)				Day 82 after direct sowing (n=32)			
	Above-ground weight (g)	Length (cm)	Leaf length (cm)	Leaf width (cm)	Above-ground weight (g)	Length (cm)	Leaf length (cm)	Leaf width (cm)
1	31.11	18.50	18.00	8.70	54.94	19.00	18.20	11.70
2	36.92	19.50	18.80	9.70	60.52	21.20	19.10	11.50
3	47.79	21.90	21.00	11.10	40.27	19.80	19.50	10.20
4	34.24	19.30	18.80	10.20	91.97	22.20	21.50	13.80
5	33.22	20.00	19.20	7.60	43.66	17.80	17.10	9.80
Total	183.28	99.20	95.80	47.30	291.36	100.00	95.40	57.00
Average	36.66	19.84	19.16	9.46	58.27	20.00	19.08	11.40

Note. At the time of sowing, n = 42.

Table 4. Growth results of *Allium fistulosum* L. sowed on ridges

Crop No	Day 60 after direct sowing (n=28)		Day 82 after direct sowing (n=24)	
	Above-ground weight (g)	Length (cm)	Above-ground weight (g)	Length (cm)
1	14.48	33.00	19.96	42.20
2	22.85	38.30	17.82	37.00
3	14.26	37.20	27.59	37.10
4	22.29	38.00	39.71	45.40
5	16.92	36.70	19.58	43.00
Total	90.80	183.20	124.66	204.70
Average	18.16	36.64	24.93	40.94

Note. At the time of sowing, n = 32.

(A) *Triticum aestivum* L.(wheat) (B) *Hordeum vulgare* var. *hexastichon* (barley)**Fig. 7.** Growth result of *Triticum aestivum* L. (A) and *Hordeum vulgare* var. *hexastichon* (B).

Glutinous *Triticum aestivum* L. used in this study is a variety nurtured by RDA in 2012, and its ripening period is early June. Its stem height is less than 80cm and it is resistant to lodging. The results of this study also showed the stem height of less than 80cm, which is the same as

the results of RDA (2015), and *Triticum aestivum* L. was matured and harvested in 210 days on June 11, which was sooner than the report by Rural Development Administration that it requires approximately 260 days in Suwon.

The ripening period of *Hordeum vulgare* var. *hex-*

(A) *Hordeum vulgare* var. *hexastichon* germination

(B) *Triticum aestivum* L. germination

(C) Cultivation

(D) Ears of *Triticum aestivum* L. and *Hordeum vulgare* var. *hexastichon*

Fig. 8. Photo of crops grown on furrows.

astichon is around June 5 in Suwon, and its length is about 60-100 cm. In this experiment, we harvested *Hordeum vulgare* var. *hexastichon* on June 1, which is 4 days earlier than the base area, and the length was 105 cm, which is slightly longer than the result of conventional culture in RDA (2018a; Fig. 8). This is due to the warm weather of the southern region. This proved that this *Jakmyobeop* can make up for the deficiencies of *Hordeum vulgare* var. *hexastichon* cultivation that concerned Seo Yu-Gu, such as being weak against winds and cold, easily destroyed by the spring rains, and not properly flourishing.

As such, modern *Gyeonjongbeop* that can use both ridges and furrows can efficiently increase the use of gardens and improve productivity, and also enables use of gardens in winter, thereby being a customized farming method for urban agriculture. In particular, by sowing on the ground, farm products cultivated on the furrows are kept warm and easily germinated, and they have deep roots by earthing up, thereby well enduring winds and droughts. Moreover, both weeding and earthing up are possible at the same time without much labor, thereby resolving the issue of labor raised in the Joseon period. In addition, fertilizers can be applied intensively only on crops, which increases efficiency. It is an effective farming method that meets the needs of urban dwellers as urban gardens can be used as farms. This will further activate and promote urban agriculture and help create a sustainable and healthy green environment.

Conclusion

Traditional agricultural technology formed throughout many years is receiving attention with the growing interest in environment-friendly agriculture. It is acknowledged as an alternative agricultural technique that can efficiently operate and manage gardens while also constantly increasing agricultural biodiversity. This study is to find a customized garden management plan based on the benefits of using the fallow land and making efforts during the off-season by modernizing *Gyeonjongbeop*, one of the traditional farming methods from the late Joseon period.

Gyeonjongbeop is a traditional farming method introduced in *Imwongyeongjeji* written by Pungseok Seo Yu-Gu. It is a dry-field farming method that improved China's *Daejeonbeop* to better suit the conditions in Joseon. It adopts furrow cultivation or furrow planting as a response based on the little ice age designed to reduce damages from spring droughts. It is effective in reducing labor and increasing crops by cultivating *Triticum aestivum* L. and *Hordeum vulgare* var. *hexastichon* and thus is a suitable method for petty farmers and urban farmers. This method makes up for the deficiencies of cultivating on level rows as an empirical agricultural method with proved utility and scientific accuracy among many traditional agricultural techniques recorded in old agricultural books. Accordingly, we analyzed data based on ancient agricultural books and reconstructed them according to our conditions, ultimately proposing a customized design plan. This indicates that the traditional farming method proposed

to help farmers in the late Joseon period is a customized method that can promote a system in urban agriculture by organizing and delivering familiar information more systematically. It can also preserve and supply the traditional values through urban agriculture by using traditional knowledge in addition to popular knowledge. Moreover, the humanistic value of urban agriculture can be increased by applying the traditional farming method with cultural and historical context. A highly efficient cropping system can be operated by using gardens without a resting period and anticipating increased harvest. In fact, as a result of applying this method to an actual garden and testing the growth of crops, it was found that the crops showed growth almost the same as general crops, thereby proving the strength in vegetable garden management using fallow lands.

This study has its limitations in conducting the experiment only on winter crops and coming up with results using only the experimental plot without testing hypotheses. Further research must establish a cropping system for garden crops that can be run year-round by plowing the fields after harvest and cultivating other crops, and prove the excellence of *Gyeonjongbeop* with objective verification by comparing with the control plot. This will verify the potential utility value of Korean traditional agricultural technology and increase completeness of the traditional vegetable garden model. In addition, applying historical knowledge to modern urban gardens will help increase completeness of the garden model and expand the base of people that intend to participate in urban agriculture.

References

- Ban, G. 2020. Han Seo, Zi 1 [Book of Han, Aspiration 1]. Vol. 24-25. (H.W. Lee, Trans.) Seoul, Korea: 21st Century Books.
- Guh, J.O. 2009. Up-to-date significance of Korean conventional agriculture. *Korean J. Agric. Hist.* 8(3):157-207.
- Hong, I.K., Y. Chae, Y. Jang, S.M. Lee, and J.N. Su. 2018. Analysis of urban agricultural effects by factors according to the urban citizens income level: Socially sustainable effect, negative effect, and economically sustainable effect. *J. People Plants Environ.* 21(6):461-471. <http://doi.org/10.11628/ksppe.2018.21.6.461>
- Jeong, M.C., S.J. Kim, and H.Y. Mun. 2016. The valuation of traditional agricultural technology for modern utilization: Focusing on traditional knowledge in old agriculture book. *J. Namdo Folklore Res.* 33:207-238. Retrieved from <http://www.namdofolk.net>
- Jeong, M.H. 2012. The historical study of the discussions on the dissemination of Kyunjong-beop in the Joseon Dynasty. *Korean J. Agric. Hist.* 11(2):27-60.
- Kim, J.H. 2010. Characteristics of agriculture in late Chosun and its eco-climatological background. *Asian Comp. Folklore* 41:97-127. Retrieved from <https://www.bigyominsok.org>
- Park, S.K. 2004. A case study of Cuba's organic agriculture management. Master's thesis. Korea University, Seoul, Korea.
- Rural Development Administration. 2015. Wheat. *Agricultural Technology Assistant* 44. Wanju, Korea: Author.
- Rural Development Administration. 2018a. Barley. *Agricultural Technology Assistant* 118. Wanju, Korea: Author.
- Rural Development Administration. 2018b. Leafy vegetables. *Agricultural Technology Assistant* 140. Wanju, Korea: Author.
- Seo, Y.G. 2008. Imwongyeongjeji. Bolliji (M.H. Jeong and J.G. Kim Trans.). Seoul, Korea: Sowadang.