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## Article

# Invigorating Care Farm Ecosystem Based on Public Service Innovation: Case of South Korea

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**Abstract:** Recently, the importance of care farming has been emphasized worldwide for the purpose of public health and healing, and, in particular, discussions on innovative transformation and expansion of the care farm ecosystem have continued in terms of convergence of agriculture and welfare. This study aims to present influencing factors based on a hierarchical concept framework for revitalizing care farm ecosystem based on public service innovation. To this end, the AHP methodology was used. Through previous studies, 16 variables were derived within four categories: recognition, structure, leadership, process, and recognition of variables that affect the activation of the care farm ecosystem and conceptualized them through Delphi techniques. In addition, a survey was conducted on 28 stakeholders in care farming to derive the importance of each variable. As a result of the analysis, ‘reliability’ was derived as the most important factor, followed by factors such as human competence, vision, civic participation, and innovation awareness. Hence, it was confirmed that trust and communication between stakeholders are important to lead the innovative public service ecosystem of care farm, and above all, human competence is an important influencing factor.

**Keywords:** care farm; ecosystem; public service; innovative service; analytic hierarchy process



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## 1. Introduction

Efforts have been made continuously since the 2000s, as population aging and urbanization problems spread worldwide. Acts seeking care through farming activities by people who have become weak in body and soul due to stress generated in workplaces, schools, or daily life and congenital defects, namely, care farming, are gaining attention as an essential part of multiple functions of farming (Elings and Hassink 2008). Care farming is an industry promoting people’s psychological, social, cognitive, and physical health through care services using farming, rural area resources, or relevant activities or outcomes (RDA 2013).

Because care farming uses farming and rural area resources based on the natural environment, diversities of care activities exist. Care farming is introduced as a term of green care in Europe, and its familiar and essential factors are physical activities, regulations, social interactions, and opportunities in nature, including various concepts (Anderson 2019). As for places offering care farming, care farming can be performed in diverse spaces where the natural environment is shaped, including parks, botanical gardens, farms, vivarium, forests, rural areas, and where rural areas and agriculture exist. Care farming can be used in spaces to accommodate, protect, or educate people suffering from social, psychological, physical, and mental difficulties such as social welfare facilities for the elderly and adults, correctional facilities, educational and training facilities for children and adolescents, counseling facilities, and particular educational institutions (Leck et al. 2014).

Care farming can be divided into horticultural care, forest care, farm work care, and care through raising animals (Hassink et al. 2013), and its importance is increasing. Care farming has been carried out in full swing in developed countries, centered in Europe, including the Netherlands (Leck et al. 2015; Cho and Vaandrager 2019).

In developed countries where care farming is practiced, such as those in Europe, various terms such as care farming, green care farming, farming for health, and social farming are employed. However, they essentially include a means of using farming to provide care (Sempik 2010). Care farming pursues the healthy life of individuals and groups through activities utilizing farming and rural areas' natural and social environmental factors, whereas the meaning of care includes the roles of healthcare, social rehabilitation, education, and employment (Cutcliffe and Travale 2018).

According to Loue (2016), the history of the modern concept of care farming is over 100 years old. Care farming has diversely developed as an alternative means for farm use or to intervene in people requiring severe mental and physical health treatments in Europe, although it has developed as a trend to maintain a moral treatment perspective for mental diseases. In Japan, under the linkage of farming and welfare that means mutual linkage of farming and welfare, it is understood as welfare farming, namely, mentally impaired people's participating in farming activities, receiving wages, and becoming independent, or as the elderly's participating in farming activities, becoming independent, and enhancing health (Kosugi and Kato 2019). According to the global trend, the Framework Act on Agriculture, Rural community, and Food Industry executed since 2018 clearly states that the Korean government is the principal agent responsible for care farming performance. In 2020, the Act for Care Farming R&D and Fostering was enacted and implemented.

In a situation where the legal and institutional foundation is laid, care farming is defined as an industry creating social and economic added value through various types of farming, rural area resources, and relevant activities used for people's health recovery, maintaining, and promotion as the importance of care farming emerges globally (Kaltenborn et al. 2017). Therefore, discussions on a shift into and expansion of converged (between farming and welfare) and innovative care farming are reinforced (Samoggia et al. 2019; Sasaki and Lee 2016).

This study aimed to identify influence factors for care farming ecosystem invigoration based on public service innovation. Consequently, this study will provide specific alternatives for what factors policymakers, actors, and stakeholders should consider invigorating the care farming ecosystem that is developing into a convergence concept of farming and welfare beyond farming, and for what standards it should be equipped with to make a decision.

## 2. Theoretical Review

### 2.1. Care Farm Ecosystem

The basic concept of care farming means whole farming activities provided for mental and physical health recovery using farms and rural area landscape (Hemingway et al. 2016). Kim et al. (2019) defined care farming as farming activities to care for those who receive job-related stress, unhealthy people, and those who medically and socially need care (mental patients, people with learning disabilities, drug addicts, etc.). Kim et al. (2019) explained that partnership between farm owners, health protection institutions, social security institutions, and program participants is important and that health, social benefits, and educational benefits can be provided to various subjects through farming.

As shown Table 1, Care farming started to spread, centered on European countries including Belgium, the Netherlands, Germany, and Italy after 2000. Italy developed care farming into the concept of social reproduction and multiple and new welfare farming in linkage with medical and educational institutions. The UK established a National Care Farming Initiative (NCFI), reset the concept of care farming and service subjects, and has been providing care farming as programs for social care and renewal for those who need probation, including people with learning disabilities, children with autism, drug and alcohol addicts, and rebellious children (Hine et al. 2008). In France, care farming developed into a shared farm concept at the social level. Therefore, services are provided for the underprivileged people in society. Care farms leading care farming are recognized

for their social functions and developed into various organizations, including institutions and networks (Van Weeghel et al. 2005).

**Table 1.** Details of development countries' care farming promotion.

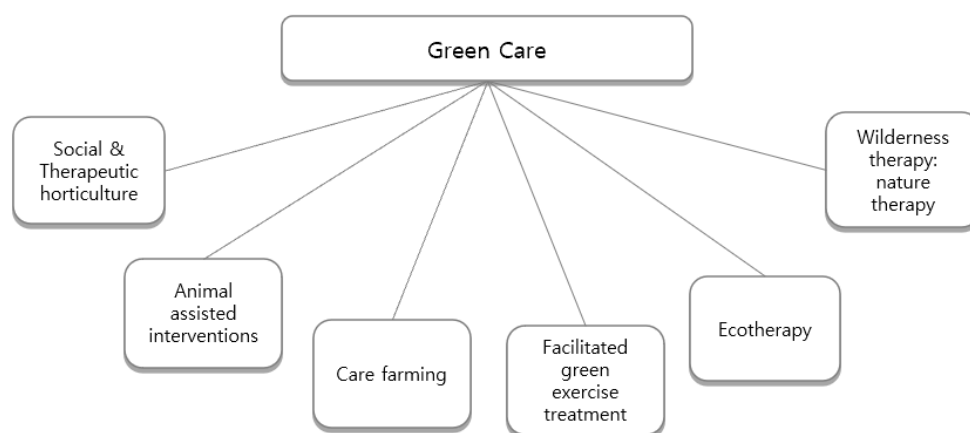
Countries	Details
Norway	Establishment of an integration committee of governmental ministries (supervised by the Norwegian Ministry of Agriculture and Food), operation of quality control and warranty system, care farm agreement system, care farming degree courses, and life-long education, national financial support
The Netherlands	Establishment and operation of national support institutions, operation of the quality management system (care farm owners association), linkage with national health insurance, enactment of care farming laws, and care farming research projects
Belgium	Establishment and operation of national and local support institutions, education and training centers for agricultural people, devising care farm recognition method (laws, regulations), and financial support for care farms
The UK	National care farming scheme establishment, construction of linkage system of local care farms and partnership with care farming institutions, care farming programs (mentoring, facilitator), and securing finance
France	Care farm expansion and network construction, education and training for care farming providers, implementation of national and local governments' public subsidies, and local government assistance for costs
Germany	400 hospitals and social rehabilitation centers, 180 communities, application of EU standards to 500 green workplaces, and budget support in the health insurance occupational disease treatment items
Italy	Support of local governments for agreement system and research, including local health organizations, cooperative associations, farm owners, and associations, as well as partial national support for prisons through social integration and return to society
Japan	Paying attention to welfare and care functions of farming, including national agricultural, forestry, and fishery policies (welfare farms) centered on the recruitment, employment, and rehabilitation of disabled people, as well as elderly welfare and effect analysis from national research institutes

Source: RDA, National Institute of Horticulture and Herbal Science, 2016.

Through active national support, Belgium and the Netherlands foster and support care farms and care farming operators. In Belgium, the care farming invigoration business is established within local development schemes, and Belgium is implementing varieties of support programs for care farm operators' financial support and care business promotion (Myren et al. 2017). In the Netherlands, a national coalition for care farm operators is formed. As individuals entering into contracts with farm owners have increased since 2003, a care institution approval system of care farms has been operating since 2005. Although diverse programs are invigorated in each region alongside the establishment of farm type care farming program development guide, centered on Rural Development Administration (RDA) in Korea, business promotion is the mainstream, centered on diffusion and expansion of farms, rather than care or rehabilitation (Sherwin 2022).

According to Buist et al. (2018), there are various factors in the care farming development process of the Netherlands, Belgium (Flanders), the UK, and the USA (Montana). Innovative shift process to care farming starts in the niche innovation between the farming and welfare sectors, and point of view and recognition change starts, structure and system change follows, and varieties of processes are in progress. In the development process, the nation's leadership and the participants play a pivotal role, which plays a massive part in the linkage of farming and welfare.

The care farming ecosystem can be divided into care-oriented, employment-oriented, and education-oriented depending on goals. The structure and process of service that can be concentrated on care, employment, and education are provided depending on goals and subjects. According to the green care umbrella classification of [Ibsen and Eriksen \(2021\)](#), care farming belongs to a detailed area of green care. The green care area is divided into social and therapeutic horticulture, therapy through raising animals, care farming, facilitated green exercise as treatment, ecotherapy, and wildness (nature) therapy (see Figure 1).



**Figure 1.** Green care areas: Green care umbrella (Source: [Sempik 2010](#)).

Recent care farming functions as a new means to realize new functions and roles or social welfare, and interest in the convergence of farming and social welfare areas is gradually rising ([Bjørnar et al. 2021](#)). Research in the care farming field includes finding convergence cases of welfare and farming for the rehabilitation, education, social adaptation, employment, and independence of the elderly, disabled people, children, and verification of effectiveness ([Marija et al. 2008](#)). According to [Knapik et al. \(2020\)](#), the vulnerable social group, the subjects of participation in care farming, can be diversely defined depending on the selection of a country or a community. However, they generally include intellectually impaired people, physically disabled people, people who cannot adapt to the social or educational system well, the elderly, adolescents, and long-term unemployed people. Care farming activities provided by care farming are invigorated from the body and soul care and restoration aspect of the vulnerable social group.

## 2.2. Public Service Innovation Ecosystem

According to temporal environmental changes, the public sector has discussed diversification of measures to seek innovative measures for the consumer-oriented service delivery system. Companies, schools, and public institutions that were just agents of a nation and its groups have shifted into organizations with a status as an actor. They exert their capabilities based on universal operating principles throughout society ([Drori 2003](#); [Meyer et al. 2006](#)). As the scope of competition and cooperation expands and uncertainties increase, an organizational structure to solve complex problems is much needed ([Meyer 2002](#)).

Meanwhile, the Korean government has actively constructed a social security net and expanded various social and economic regulations ([Lee and Strang 2006](#)). However, government size expanded, and the economic crisis was caused in the latter part of the 1970s. Consequently, new public management (NPM) emphasizing result and performance emerged as a crucial paradigm ([Moynihan 2006](#)). The government transferred its functions to the private sector through privatization and outsourcing and adopted market principles such as performance evaluation and performance-related pay ([Brown and Potoski 2003](#); [Dahlström and Lapuente 2010](#); [Lee and Strang 2006](#)).

In the public sector, efficiency management through varieties of innovation offers high-quality public services to people without waste of finance ([Bae 2012](#); [Teixeira Filho](#)



et al. 2022). By emphasizing the value of efficiency and responsibility, harmony between responsibility and efficiency is pursued. Nonprofit organizations are paying attention to diverse market principles. Nonprofit organizations were traditionally organizations with voluntary nature and with distance from professionalism/expertise or rationalization. As autonomy of acts is awarded to those and authority and responsibility increase, the nonprofit organizations started to exert their abilities through business management activities to attain specific goals (Hwang and Colyvas 2011; Meyer 2002). As manpower that underwent manager/operator courses in business schools, etc., is recruited, private companies' management models are applied, thus changing structures or practices. As stakeholders' needs on fund procurement increase, the strategic plans and evaluations have become included in major organizational activities (Pickel 2001; Hardyman et al. 2021). As social contribution is being shifted from a charity based on personal altruism to strategic philanthropy, economic value prioritizing business performance has emerged (Marginson 2014; Marit et al. 2021).

Regardless of the public or private sector, various organizations' roles are changing, simultaneously accepting values conflicting with those pursued before, alongside the appearance of a new paradigm, namely sustainable development. The government is pursuing efficiency beyond providing public services to people and safely protecting them, and the market is pursuing profit maximization and the value of responsibility. This means that the public and private values are converged, centered on efficiency and responsibility. Social enterprises such as care farming have a company-oriented nature and use created profits for communities or underprivileged people, so they belong to organizations with social, environmental, and ethical goals. Specifically, care farming seeks universal profits based on social and economic concepts, focusing on social solidarity reinforcement (Dart 2004; Mercan and Goktas 2011; Upham et al. 2020). On the other side of care farming expansion, a background putting importance on harmony between social and economic values that have been regarded as exclusive is being in place.

The convergence of shared values can produce multidimensional results at the whole society level. A social system can evolve and develop through the coexistence of various values and principles is a positive effect that a convergence paradigm may bring. In addition, additional effects that promote new social group types, including expert groups or spontaneous associations playing a pivotal role in the management paradigm, may exist as the demand for resources for organizational and social changes increases.

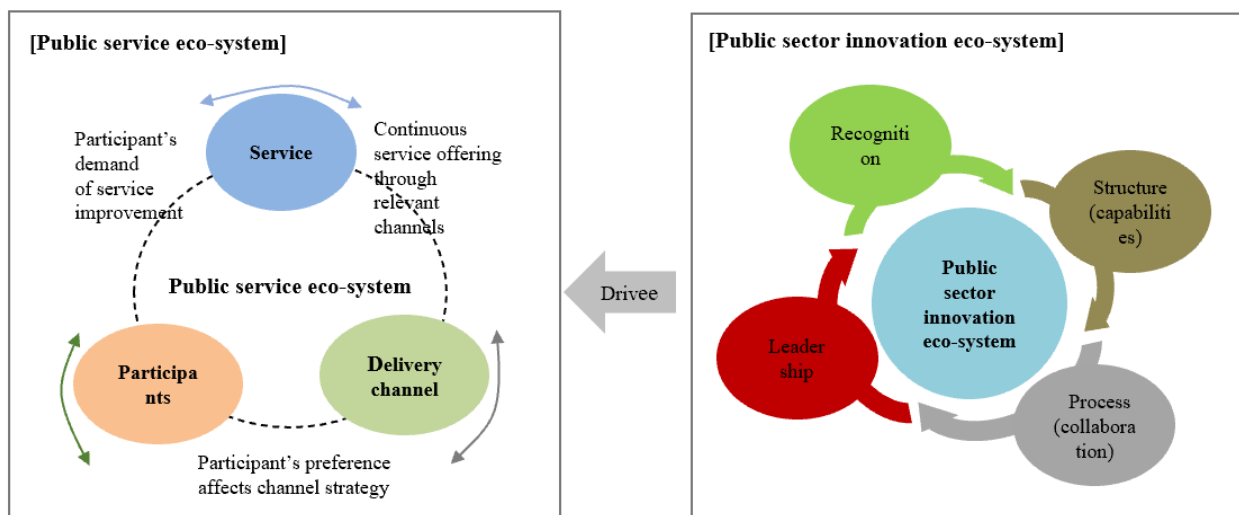
As Liebman et al. (2016) emphasized, reviewing customer needs and improving the service details to meet such needs are essential. A public service delivering organization should pay attention to customer needs based on a consistent recognition system faithful to the goals and clarify service details to the level that customers satisfy, centered on customers. To this end, there is a need to improve administrative organizations and processes with which customers can be satisfied, rather than the improvement of service-delivering actors.

To identify public service innovation performance, it is vital to examine the innovation ecosystem of the service-delivering actors. Rubalcaba et al. (2022) said that the uncertainties of the execution process are still high, although plans for the innovation of public organizations are in place. Papcunová et al. (2021) put weight on the possibility of innovation failure, he pointed out that an analysis is essential in considering all these. For an effective consumer-oriented public service delivering system's innovation, there is a need to establish a plan considering the public service ecosystem and the innovation ecosystem in the public sector. The public service ecosystem consists of public service, customers of the public service, and delivering path of the public service. The innovation of the public service delivering system is achieved when a dynamic balance between the needs of people, the beneficiaries of the public service, and the public service delivering path is pursued (OECD 2012).

Peppers and Rogers Group (2010) said that identifying the preferences of public service stakeholders and users to apply the ecosystem model of public service should be prioritized. As the studies (Osborne et al. 2021; Petrescu 2019; Wauters and Raats 2018)

emphasized, setting priorities among services' diversities and designing delivery channels after identifying the inter-dependence, need for integration, and possibility between services. They also stressed the importance of resource management, including government institutions' organizations, processes, information, and technologies to devise delivery cost-saving measures and maintain the public service ecosystem. As [Dudau et al. \(2019\)](#) mentioned, they insisted that the public service ecosystem can be continuously invigorated by leading service adoption and channel innovation through insight on customers in the service ecosystem when the government delivers unique and differentiated customer experiences.

To maintain the public service ecosystem in a desirable direction, maintaining the innovation ecosystem in the public sector can be an essential precondition. [Selden et al. \(2006\)](#) and [Endter-Wada et al. \(1998\)](#) emphasized that innovation should be routinized in the public sector, saying, "The government cannot be self-contented with an ability to innovate." [Bason \(2018\)](#) presents the innovation ecosystem for innovation routinization in the public sector using four areas such as recognition, structure (capabilities), process (collaboration), and leadership (see Figure 2).



**Figure 2.** Ecosystem model of public service innovation ([Bason 2018](#)).

Table 2 summarized that continuous innovation implementation and performance creation are possible when innovation areas are classified as critical factors. These factors enabling innovation by each critical factor are reinforced, and constraints are minimized.

### 2.3. Characteristics of Care Farm

According to [Bragg et al. \(2016\)](#), care farming is a type of green care, a collective concept encompassing social and horticultural care and care service accompanied by livestock. Green care, including care farming, is an activity to increase physical, social, and educational therapy effects through contact with nature by vulnerable social groups (intellectually and physically impaired people, people who cannot adapt to the social or educational system, the elderly, and long-term unemployed people). Green care provides mental and physical health benefits to participants and offers positive social effects such as welfare improvement and reinforcement of linkage between cities and rural areas ([Hassink et al. 2007](#)).

**Table 2.** Critical factors of public sector innovation ecosystem.

Ecosystem Area	Critical Factor	Factors Enabling Public Sector Innovation
Recognition	Innovation environment	Sharing the concept of innovation and recognition, routinization of communication through innovation cases
Structure (capabilities)	Overall structure	Securing legitimacy for innovation, identification of limitations in innovation, minimization of political influence and regulations
	Strategy	Establishment of innovation strategies depending on overall organizational strategy (focusing on strategic innovation rather than strategic planning)
	Organization	Organizational constitution for collaborative innovation and systematic e-government efforts (new digital commercialization)
	People and culture	Shaping spontaneous innovation-oriented culture and expansion of diversity through active employees' participation
Process (collaboration)	Thinking as a designer	Exploring answers that users want (need) such as a designer
	Citizens' participation	Propelling innovation, centered on beneficiaries with the active participation of citizens and companies in the process
	Co-creation and coordination	Securing platform including means and methods for innovation and promoting innovative activities through collaboration
	Measurement and learning	Setting innovation performance indicators and performance evaluation Extending innovation performance through organizational learning and feedback
Leadership	Inspiration of innovative mindset	Setting clear vision and innovation scope, invigoration of various opinion presentation by the supply of external workforce
	Decision-making	Designing a new alternative for decision-making, focusing on future decisions beyond decision-making

Source: [Selden et al. \(2006\)](#), [Peppers and Rogers Group \(2010\)](#), [Bason \(2018\)](#), [Papcunová et al. \(2021\)](#), [Rubalcaba et al. \(2022\)](#).

As shown in Table 3, care farming can be classified into production-oriented and care-oriented care farming. Regarding production-oriented care, care is carried out through farm owners' farming activities in the countryside. Concerning care-oriented care farming, farming and care activities led by therapists in farms linked with external institutions or charity organizations are carried out. The care farming ecosystem can be diversely constituted, and different characteristics can be shown depending on domains/areas ([Scuderi et al. 2014](#); [Hine et al. 2008](#)).



**Table 3.** Operation of care farming.

Classification	Farming-Oriented Care Farming	Care-Oriented Care Farming
Type of farms	Independent private farm	Farms linked with external institutions (prisons, therapy institutions, schools, hospitals, care institutions, charity organizations)
Participant's recognition and needs	Participants as part of the farming system should undergo farming and care experiences (recovery of stress)	Participants independent from farming Perfect physical rehabilitation is required (drug/alcohol abuse treatment) Requirements on a certain level related to care (adolescents, young children, mental health)
Process and function	Farms requiring multifunction	The diversity that farms are not always needed.
Size of participants	Small scale	Large scale
Type of care	Ease of tension	Therapy and care
Region	Countryside-centered	Countryside and city
Main income source	Farming production	Care
Leadership and leader	Led by farm owners	Led by therapists and cares

Source: [Hassink et al. \(2007\)](#), [Hine et al. \(2008\)](#), [Scuderi et al. \(2014\)](#), [Bragg et al. \(2016\)](#).

Countries have diverse processes and influence factors in terms of the development process of innovative care farming for care and social convergence. According to [Hassink et al. \(2013\)](#), the Netherlands is one of the most successful countries in constructing a care farming innovative ecosystem. The most significant tasks were easing the gap between farming and caring and constructing a sustainable fund procurement structure. The Dutch case shows that problems were solved by considering diverse social factors, including various stakeholders' recognition and participation, and understanding of process and structure in adopting and developing care farming. Moreover, the case shows that they are crucial factors of care farming growth.

Focal points of main factors affecting the success of care farming vary depending on the convergence characteristics of farming and welfare per care farm, which is a core participant in care farming ([García-Llorente et al. 2016](#)). The essential hybrid characteristics of care farming integrating heterogeneous and independent sectors, namely farming and welfare, generate several problems in the implementation process, and the convergence here can be the key to success.

According to [Di Iacovo et al. \(2014\)](#), farm owners lead care farms through farming activities in the countryside. Therapists and carers lead care through linkage with external institutions or charity organizations regarding care-oriented care farms. From this, differences in leadership in farming and care activities are revealed. Therefore, various characteristics are revealed in participants' recognition and needs, the structure of type and region, functional process, and leadership of leading operators of care farms

According to [Rotheram et al. \(2017\)](#), care in care farming promotes personal health and value for life through natural and social factors that rural areas have, and diverse roles such as medical service, rehabilitation, education, and employment are included. Because care farming needs detailed service offerings depending on therapy or personal or group characteristics beyond the concept of just interchange between people or rest, consideration from the social welfare system aspect is required. The [RDA \(2013\)](#) emphasized expert fostering, reinforcement of educational centers, R&D, and law enactment. [Geels \(2004\)](#)

stressed that success factors include professionalism/expertise, stability, and accessibility. Hwang and Hwang (2020) presented such factors as PR, economic support, service specialization, facility expansion, and accessibility improvement. Bae (2012) presented the need for accessibility, PR and information, diversification of programs, and specialized personnel consolidation.

Especially to analysis these characteristics of care farm, this research uses the Analytics Hierarchy Process (AHP) which is a quantitative analysis technique when comparison scale is different or does not exist, although the quantitative analysis is scientific and objective (Saaty 1989, 1990) to overcome the use limitations of decision-making by. The AHP method supports systematically and hierarchically by digitalizing (in numeric values) relative comparison information on major influence factors by simultaneously analyzing qualitative and quantitative data, drawing the importance and priority of the AHP analysis methodology. It also evaluates relative importance through a pair-wise comparison to draw critical factors through the evaluator's knowledge, experience, and insight using a questionnaire survey and constitute a hierarchical decision-making structure (Sinuany-Stern et al. 2000).

### 3. Research Method

#### 3.1. Delphi Technique

The ecosystem invigoration influence factors of care farming were designed through previous studies, as shown in Figure 3 and Table 4. By selecting recognition, structure, process, and leadership as critical areas, centered on the previous studies, the mutually exclusive and collectively exhaustive model in terms of all components of all hierarchies was designed. To enhance the objective reliability of the critical factors of AHP and revise and supplement the detailed items, a Delphi survey was carried out. The Delphi technique is to resolve problems by drawing top-down opinions through repetitive feedback targeting experts (Landeta 2006). This study used the Delphi technique to review factors drawn in the previous studies and add and supplement the factors discussed in the field. The factors were checked through a survey interview to ask the factors are suitable for the research for targeting five experts with more than 20 years of experience in the care farming field, and this study confirmed that 16 factors in four areas could be used.

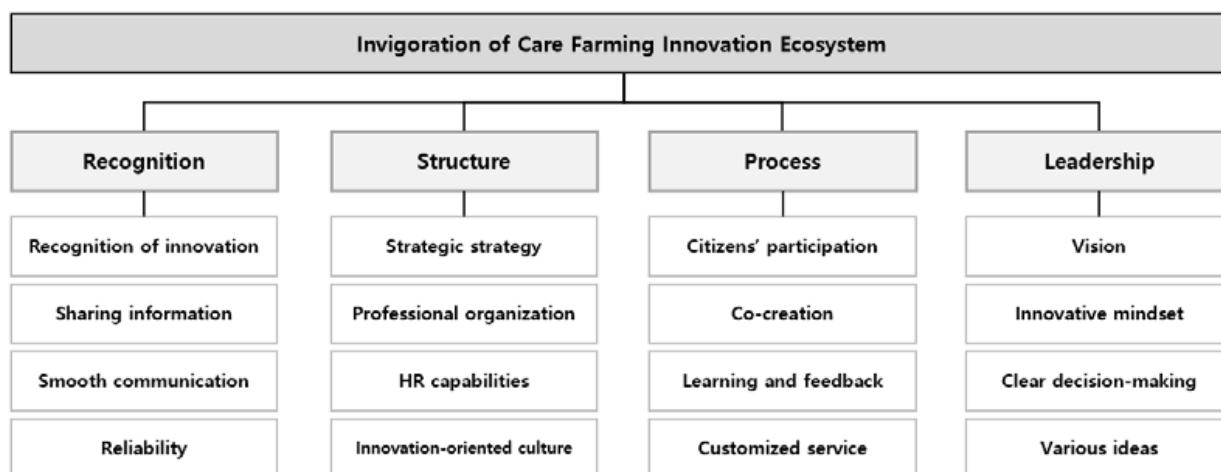


Figure 3. Research concept framework.

**Table 4.** Evaluation factors and definition.

Evaluation Area	Evaluation Factor	Definition	Reference
Recognition	Recognition of innovation	Recognition of the need for care farming innovation and sharing of the recognition	Bason (2018), Hassink et al. (2013), Hine et al. (2008), Ibsen and Eriksen (2021), Leck et al. (2015)
	Sharing information	Sharing information and knowledge needed for care farming innovation	
	Smooth communication	Smooth communication and sharing opinions for care farming innovation	
	Reliability	Mutual reliability within communities on the innovation of care farming	
Structure	Systematic strategy	Innovative and systematic strategy construction and implementation for innovation ecosystem shaping of care farming	Bason (2018), Brown and Potoski (2003), García-Llorente et al. (2016), Geels (2004), Hwang and Colyvas (2011), Mercan and Goktas (2011)
	Professional organization	Professional organization composition and proper governance for shaping the care farming innovation ecosystem	
	HR capabilities	HR composition with professionalism/expertise through various communities and stakeholders to implement the care farming innovation ecosystem	
	Innovation-oriented culture	Innovation-oriented culture and flexible and accessible environment to shape the care farming innovation ecosystem	
Process	Citizens' participation	Offering diverse citizens' free participation systems and processes to reinforce the care farming innovation ecosystem	Anderson (2019), Bae (2012), Bason (2018), Elings and Hassink (2008), Hwang and Hwang (2020), Kosugi and Kato (2019)
	Co-creation	Emphasizing co-value realization and co-creation activities to reinforce the care farming innovation ecosystem	
	Learning and feedback	Learning consolidation through education for reinforcement of the care farming innovation ecosystem and developmental activities through continuous evaluation and feedback	
	Customized service	User-centered customized service development and various services offering to reinforce the care farming innovation ecosystem	

Table 4. Cont.

Evaluation Area	Evaluation Factor	Definition	Reference
Leadership	Vision	Presenting future-oriented vision and values for care farming innovation ecosystem construction and invigoration	Bason (2018), Buist et al. (2018), Hassink et al. (2007), Hemingway et al. (2016), Sasaki and Lee (2016), Knapik et al. (2020)
	Innovative mindset	Innovation-pursuing mindset and strategy-orientation for care farming innovation ecosystem construction and invigoration	
	Clear decision-making	Clear and rational decision-makers and organizations for care farming innovation ecosystem construction and invigoration	
	Various ideas	New and diverse opinions and ideas presented for the construction and activation of the care farming innovation ecosystem	

The recognition factor was defined as a factor meaning recognition and relevance between communities and stakeholders affecting the construction and invigoration of the care farming innovation ecosystem. Structure means the organizational, structural, and environmental base affecting ecosystem invigoration. Process means user-oriented operating process and system affecting ecosystem invigoration. Leadership means a leader's active support, implementation capabilities, and activities affecting ecosystem invigoration. Centered on the four critical areas, 16 detailed sub-variables were composed (See Table 4).

### 3.2. Analytic Hierarchy Process (AHP)

This study defined care farming's innovative ecosystem invigoration factors and used the AHP methodology to identify its importance. A hierarchical concept model was made based on the drawn factors, and the factors' relative importance was produced based on each factor's geometric average using the AHP analysis technique. To maintain the consistency of the questionnaire survey responses, this study produced a measured consistency index (CI) and consistency ratio (CR) and presented the reliability and validity.

Vargas (1990) recommends constructing a layer in the following order of progress. First, it defines the hierarchy and the elements within the hierarchy. Second, it constructs a survey based on pairwise comparison between elements. Third, if a respondent encounters a problem when responding to these questions, its layers and elements must be corrected. Fourth, questions are created by the modified elements, and then questions the decision maker again until no problem occurs.

According to the standard suggested by Harker and Vargas (1987), the AHP analysis procedure gives importance in the same way as the 9-point scale to the degree of contribution to the higher elements through pair comparison. Therefore, if you want to compare  $n$  alternatives for each criterion in pairs, all  $n(n-1)/2$  analyses must be performed. The created pairwise alternating matrix  $A$  takes the form of an inverse around the square of the matrix as follows:

$$A = \begin{matrix} & 1 & w_1/w_2 & \cdots & w_1/w_2 \\ w_1/w_2 & & 1 & \cdots & w_1/w_2 \\ \vdots & & \vdots & 1 & \vdots \\ w_1/w_2 & w_1/w_2 & \cdots & & 1 \end{matrix}$$

The AHP analysis procedure is to estimate the relative weight of the decision-making factors using the eigenvalue method. When we consider the relative importance vectors of

$n$  alternatives, the relationship between the pairwise comparison matrices  $A$  and  $w$  shown in the above equation is as follows:

$$A \cdot w = n \cdot w$$

However, if the respondent does not know the weight  $w$  for each element of the pairwise alternating matrix  $A$ , we derive it using the following equation.

$$A' \cdot w' = \lambda_{\max} \cdot w'$$

Additionally, the degree of consistency can be obtained through the consistency index (CI) and the consistency ratio (CR) as follows:

$$CI = \frac{\lambda_{\max} - n}{n - 1} \quad CR = \frac{CI}{RI} \times 100(\%)$$

By making an AHP questionnaire centered on a pair-wise comparison based on the designed model, the response copies of the questionnaire were collected for five weeks during January and February 2022. The participants in the questionnaire survey were the care farm provider group operating farms and stakeholder group related to the public care farm operation service. The provider group operated various care farms such as apple farms, chestnut farms, and forest farms. The stakeholders were the experts within public service organizations affecting care farm operation, including agricultural technology centers, care farm research institutes, and university research institutes.

The survey scale consisted of a two-way 1–9 point scale by AHP questionnaire design guideline (Podvezko 2009). A face-to-face questionnaire survey was carried out using a video interview mode online. Based on an accurate understanding of the background of the questionnaire and critical factors, the detailed guideline was presented so that the respondents could answer the questions. In total, 35 response copies were collected, and ultimately, 28 response copies were used except for seven inconsistent response copies. Using the drawn data, this study used Microsoft Excel software to perform an analysis. Only response results within 0.1 of CR were assessed to ensure the reliability of the questionnaire response results.

As shown in Table 5, the respondents' information shows that males were 57.1% and females were 42.9%. As for age, subjects in their 50s logged the highest percentage at 39.3%, followed by those in their 40s at 28.6%, those in their 30s at 25%, and those in their 70s at 7.1%. Concerning work experience, 10–15 years took up the highest proportion at 71.4%, 15–20 years at 14.3%, and 20 years at 14.3%. The provider and stakeholder groups registered the same ratio at 50%.

**Table 5.** Demographic information.

Characters		Frequency	Ratio (%)
Gender	Male	16	57.1
	Female	12	42.9
	Total	28	100
Age	40s	8	28.6
	50s	11	39.3
	60s	7	25.0
	70s	2	7.1
	Total	28	100

**Table 5.** *Cont.*

	Characters	Frequency	Ratio (%)
Work Experience	10–15 years	20	71.4
	15–20 years	4	14.3
	Over 20 years	4	14.3
	Total	28	100
Professional Area	Provider Group	14	50.0
	Stakeholder Group	14	50.0
	Total	28	100

## 4. Results

### 4.1. Comparison of Evaluation Variables

As a result of analyzing the care farming ecosystem invigoration influence factors, the consistency ration(CR) was 0.0336–0.0380, so the CR values was valid in less than 0.1.

The weight of evaluation factors was calculated as average value. The average value based on a total of 16 factors is global part, and local means the average value for each four factors of individual evaporation area.

As shown in Table 6, recognition (0.440) was the most important factor, followed by structure (0.231), leadership (0.171), and process (0.158). When looking at detailed items, reliability (0.290) was the most crucial factor in the recognition area. In the structure, leadership, and process areas, HR capabilities (0.365), vision (0.343), and citizens' participation (0.310) were important factors. When looking at the top 5 standing factors among 16 factors, they were in the following order: reliability (0.129), recognition of innovation (0.119), smooth communication (0.114), HR capabilities (0.365), and sharing information (0.079). For care farming to be invigorated as an innovative public service ecosystem, mutual reliability and communication between actors leading care farms are crucial, and it was ascertained that HR capabilities could work as a material influence factor.

### 4.2. Comparison of Evaluation Areas between Demander and Provider Group

As examined in Table 7, according to the comparative analysis result of the provider and stakeholder groups, recognition (0.487, 1st), structure (0.208, 2nd), process (0.154, 3rd), and leadership (0.151, 4th) were revealed in the order in the provider group. It was revealed in the following order in the stakeholder group: recognition (0.401, 1st), structure (0.255, 2nd), leadership (0.188, 3rd), and process (0.156, 4th). Although the two groups showed the same standings in recognition and structure, the process factor was more important than leadership in the provider group. Meanwhile, leadership was a more important factor than the process factor in the stakeholder group.



**Table 6.** Weights and priority of evaluation variables.

Evaluation Areas	The Weights of Areas	Evaluation Factors	The Weights of Evaluation Factors			
			Local *	Priority	Global **	Priority
Recognition	0.440	Recognition of innovation	0.271	2	0.119	2
		Sharing information	0.179	4	0.079	5
		Smooth communication	0.260	3	0.114	3
		Reliability	0.290	1	0.128	1
Structure	0.231	Systematic strategy	0.277	2	0.064	6
		Professional organization	0.166	4	0.038	13
		HR capabilities	0.365	1	0.084	4
		Innovation-oriented culture	0.192	3	0.044	11
Process	0.158	Citizen's participation	0.310	1	0.049	8
		Co-creation	0.194	4	0.031	15
		Learning and feedback	0.197	3	0.031	14
		Customized service	0.300	2	0.047	9
Leadership	0.171	Vision	0.343	1	0.059	7
		Innovative mindset	0.232	3	0.040	12
		Clear decision-making	0.269	2	0.046	10
		Diverse ideas	0.156	4	0.027	16
Total	1.000		4.000		1.000	

\* Local: mean value of evaluation factors in each group of criteria. \*\* Global: mean value of evaluation factors in total criteria.

**Table 7.** Comparison analysis result on evaluation areas.

Evaluation Areas	The Weights of Areas			
	Provider Group		Stakeholder Group	
	Importance	Priority	Importance	Priority
Recognition	0.487	1	0.401	1
Structure	0.208	2	0.255	2
Process	0.154	3	0.156	4
Leadership	0.151	4	0.188	3
Total	1.000		1.000	

#### 4.3. Comparison of Evaluation Factors between Demander and Provider Group

The detailed factors were comparatively analyzed, as shown in Table 8. As a result of a comparative analysis of the three major standings—reliability (0.192), smooth communication (0.153), and HR capabilities (0.064)—factors were emphasized in the provider group. The recognition of innovation (0.161), systematic strategy (0.092), and sharing information (0.086) factors were emphasized in the stakeholder group, which showed a difference in both groups. In the provider group, recognition of innovation (0.078, 4th), sharing information (0.063, 5th), citizens' participation (0.054, 6th), vision (0.052, 7th), and customized service (0.050, 8th) were revealed. In the stakeholder group, smooth communication (0.077, 4th), reliability (0.075, 5th), HR capabilities (0.064, 6th), innovative mindset (0.056, 7th), and vision (0.055, 8th) were revealed. The provider group emphasized citizens' participation or customized service, but the stakeholder group stressed an innovative mindset. It was

confirmed that the two groups commonly stressed the importance of reliability, smooth communication, HR capabilities, and vision.

**Table 8.** Comparison analysis result on evaluation factors.

Evaluation Factors	The Weights of Evaluation Factors				Priority of Factors (by Global)	
	Local		Global		Provider Group	Stakeholder Group
	Provider Group	Stakeholder Group	Provider Group	Stakeholder Group		
Recognition of innovation	0.161	0.403	0.078	0.161	4	1
Sharing information	0.130	0.214	0.063	0.086	5	3
Smooth communication	0.314	0.193	0.153	0.077	2	4
Reliability	0.395	0.190	0.192	0.076	1	5
Systematic strategy	0.203	0.359	0.042	0.092	9	2
Professional organization	0.127	0.205	0.026	0.052	13	9
HR capabilities	0.482	0.251	0.100	0.064	3	6
Innovation-oriented culture	0.188	0.185	0.039	0.047	11	10
Citizens' participation	0.352	0.263	0.054	0.041	6	12
Co-creation	0.162	0.231	0.025	0.036	14	16
Learning and feedback	0.162	0.236	0.025	0.037	14	14
Customized service	0.324	0.271	0.050	0.042	8	11
Vision	0.343	0.294	0.052	0.055	7	8
Innovative mindset	0.232	0.296	0.035	0.056	12	7
Clear decision-making	0.269	0.217	0.041	0.041	10	13
Diverse ideas	0.156	0.193	0.024	0.036	16	14
	4.000	4.000	1.000	1.000		

## 5. Discussion

To build an innovation ecosystem with care farming in traditional agriculture, a new shift of ideas can be a prerequisite, and reliability towards the need for linkage of farming and welfare and recognition of innovation are very important (Bragg et al. 2016). For consent to recognize innovation based on reliability, sharing information and smooth communication are indispensable factors. Because linkage of farming and welfare is essential in constructing the care farming ecosystem, the recognition and communication of innovation in the public sector, centered on governmental ministries, is vital in the initial stages of business (Hassink et al. 2007). As Hwang and Hwang (2020) suggests mutual organic cooperation between the central government and local governments in charge of farming and welfare is necessary for care farming invigoration. Innovation of existing business areas and practices of each governmental ministry is crucial for starting a business. The recognition and practice of public sector innovation functions as motivation to participate in the business for private sector participants, who are care farming invigoration actors. The care farming ecosystem can be smoothly constructed and expanded through private-public sector cooperation and recognition and communication of innovation.

In constructing the care farming innovation ecosystem, reliability towards business validity and its prospect can play a pivotal role in constructing a stable foundation and expanding business. Care farming, with which farming and welfare are linked for care farming providers and stakeholders, is the mechanism for innovative farming and welfare that needs to enhance recognition and expand into practice (Peppers and Rogers Group 2010). If care farming actors' prospects and business recognition are premised, reliability

between participants is essential. In the shifting process accompanying important changes in the farming and welfare areas, the formation and consolidation of reliability between participants become a driving force and are critical factors in business success.

As the studies (Selden et al. 2006; Hine et al. 2008) had mentioned, the study results show that the priority of leadership and process in the stakeholder and provider groups is different. Leadership is regarded as the priority in the stakeholder group because care farming can be settled early. The process can be applied and promoted to be expanded, as leadership needs to be prioritized to overcome difficulties from the settlement and expansion of the initial stages of care farming. In the provider group, a trend of care farming business process, which is the next step factor based on their existence and the core of leadership, seems to be prioritized. As care farming providers based on recognition of innovation, it seems to reflect their will towards care farming ecosystem invigoration through the process.

The difference seems to show the difference in terms of the judgment in priority of consciousness and practice direction of each group's existence condition. Shift into care farming in both provider and stakeholder groups in traditional agriculture is the mechanism of innovative farming and welfare. From the position of care farm operators, namely providers, the challenge of a new business model construction is dominant. Wauters and Raats (2018) emphasized the stakeholder's activities and importance. For the success of the initial stages of business, reliability should be obtained from internal members and users. Mutual communication between care farm operators and users is regarded as necessary in full swing business process, and the HR capabilities of operators are regarded as crucial in deciding the business quality and quantity in the structure aspect.

The stakeholders regard that business settlement and development process can only normally function if recognition of care farming innovation is premised, so they regard systematic strategy establishment and execution as critical factors for business development (Osborne et al. 2021). It was confirmed that both provider and stakeholder groups regard that innovation ecosystem foundation can be laid through reliability, recognition of innovation, sharing information, smooth communication, HR capabilities, and vision. The reasons for the priority selection of various influence factors are thus presented, and a combination of factors for care farming ecosystem invigoration is emphasized.

## 6. Conclusions

This study examined a conceptual framework for the public service innovation-based care farming ecosystem invigoration in a situation where care farming emerges as a solution to promoting a human's mental and physical health due to the aging population and urbanization globally. By the AHP methodology which is primarily a valuable method to analyze priority influence factors for plans, resource distribution, and prediction (Podvezko 2009), the research results confirmed that recognition of innovation by the actors leading the care farms, mutual reliability, and communication through sharing information are vital for invigorating the care farming ecosystem, and that HR capabilities can be material influence factors. It was also confirmed that care farming ecosystem invigoration affects policy development.

For the invigoration of the care farming ecosystem, the positive recognition of the need for innovation of care farming providers and stakeholders should be sought. Since linkage between farming and welfare is paramount, recognition and communication of the public sector innovation, centered on governmental ministries, is essential. The reason is that recognition of the providers and stakeholders decides the direction of care farming ecosystem innovation, and it becomes the basis for the driving force formation of business implementation through sharing the recognition of innovation. Efforts to build reliability between stakeholders for care farming ecosystem invigoration will be necessary. Similar to this Korean case, for the construction and invigoration of the care farming ecosystem, mutual reliability within the community on the care farming innovation implementation

of stakeholders shares conviction and prospect of business based on the sympathy of innovation recognition.

This study drew results based on the public service innovation ecosystem construction theory to make a model for care farming ecosystem invigoration. It was confirmed that policy decisions and actors' strategic recognition diffusion were critical to spreading care farming. However, this study has the following limitations: First, care farming's influence factors were defined based on influence factors for existing public sector innovation. Although experts' opinions were reflected using the Delphi survey technique to draw detailed factors affecting care farming, additional factors were not presented. In a further study, there is a need to draw more detailed factors on the elements affecting care farming operation and seek suggestions.

Second, this study has a limitation in that the study targeted Korean care farming operators and stakeholders. A comparative analysis can be carried out with a study targeting various countries such as Europe, the USA, and Japan that lead care farming. Lastly, this study has a limitation because only the result of importance on the influence factors was presented through the AHP methodology. In a further study, an empirical study, which can draw and present the causal relationship of success factors on what effects the care farming influence factors have on actual farming operation results, can be performed.

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