

Article

Developing Sustainable Indicators for Forest Farm Tourism Services for Senior Citizens: Towards the Establishment of a Comprehensive and Comfortable Environment

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Abstract: The evolving travel preferences of senior citizens have necessitated the customization of tourism services by the industry to cater to their specific needs. Forest ecology landscapes have been identified as offering significant advantages for senior citizens in the context of tourism. This study aims to address the research gap in this area by developing sustainable forest farm tourism service indicators tailored to the senior citizens in Taiwan, taking into consideration the benefits of forest ecology landscapes. The Fuzzy Delphi Technique (FDT) is employed to gather expert opinions and establish indicators, while triangular fuzzy numbers and defuzzification techniques are utilized to evaluate professional opinions from various agricultural fields. The analysis reveals 5 dimensions and 28 indicators that are deemed appropriate for creating a sustainable forest farm tourism service environment for the senior citizens. Key indicators include the ability of service personnel to effectively address guest concerns, cleanliness of farm accommodations, safety of farm routes, friendliness of service staff, and the presence of barrier-free facilities in farm accommodations. This study provides valuable insights for promoting sustainable farm management and the development of forest farm tourism in Taiwan, emphasizing the significance of forest ecology landscapes in enhancing the tourism experience for senior citizens.

Keywords: forest landscape; farm tours; forest and farm management; senior citizens; tourism experience



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1. Introduction

The National Development Council [1] estimates that Taiwan will enter a super-aged society by 2025 and that the proportion of elderly people in the total population will continue to rise, exceeding 30% in 2039 and reaching 43.6% by 2070. The World Health Organization [2] describes active aging as the process of optimizing health, participation, and safety to improve quality of life as people grow older. According to Yang et al. [3], travel has multiple social and health benefits for older adults. Travel not only brings happiness but also contributes to the physical and mental health of the elderly and brings greater satisfaction and happiness in life [4–7], thus, active aging has been shown to be strongly associated with tourism [7–10].

While the main travel objectives of senior tourists are rest and relaxation, sightseeing, and novelty seeking [11], rural agrotourism is one of the ways to meet the travel objectives of senior tourists, and Wong and Musa [12] argue that urban-dwelling seniors are driven to rural areas by the natural beauty, food, and culture of the countryside. Pan et al. [13]

suggest that rural forest farm tourism can help alleviate the stresses of life that are common among urban seniors.

Lin et al. [14] found that recreational farms in Taiwan are a new type of diversified agricultural production that integrates agriculture and tourism into a comprehensive and diversified operation involving a variety of services, such as travel planning, local transportation, accommodation, food, recreational experiences, activities, etc. Visitors can not only experience rural life through sightseeing, picking, and farming and find joy in the countryside, but can also spend their vacation and relaxation on the farm. Forest ecosystems provide a wide range of services that can benefit senior tourists. Landscape design incorporating forest ecosystems can enhance the tourism experience for senior visitors, providing a unique and memorable experience while promoting sustainable tourism development.

Active travel performs a crucial role in facilitating social engagement among older adults, making it imperative to attract this demographic to travel destinations [11]. Blacksher and Lovasi [15] emphasize that the built and physical environment significantly influence individuals' perceptions and behaviors. In the context of senior-friendly travel, the physical environment can effectively promote senior travel behavior [3]. Conversely, an unfavorable travel service environment may discourage seniors from visiting destinations [13]. For instance, Lin et al. [14] primarily focused on exploring innovative service models for sustainability in leisure farms, while Lin et al. [16] concentrated on service touchpoint design and visitor motivation within leisure farms. Chang [17] identified the key factors of product and service strategies based on the characteristics of leisure farm visitors. However, previous studies have predominantly concentrated on the design of service environments, service models, and service strategies, overlooking the crucial aspect of environmental planning, particularly concerning forest farm tourism, for senior citizens.

This study focuses on senior citizens aged 65 years and older, aiming to utilize the fuzzy Delphi technique (FDT) to identify suitable indicators for sustainable forest farm tourism services catering to this demographic. The survey questionnaire was developed by synthesizing previous research on forest farm tourism, and expert opinions from various agricultural fields were collected to propose environmental indicators specifically tailored for sustainable forest farm tourism services for seniors. These indicators aim to provide practical guidance for farm units in designing their service environments. To gain a comprehensive understanding, a survey was conducted among professionals in agritourism and farm management. The purpose was to explore indicators for creating a sustainable tourism service environment on farms for senior citizens and provide practical recommendations for farm service areas. By gathering insights from experts across different agricultural professions, the measurement results were made more comprehensive. The findings of this study will serve as a foundation for future forest farm tourism operators in designing farm service areas suitable for senior citizens.

Moreover, the results of this study will serve as a reference for researchers involved in agrotourism, senior citizen tourism, and farm counseling. Additionally, they will be valuable to governmental agricultural units in formulating or adjusting regulations related to farm environmental services, senior citizen agrotourism, and other policy evaluation projects.

1.1. The Characteristics of Forest Farm Tourism

Forest farm tourism is a diversified rural tourism that allows visitors to learn about agricultural areas, farm work, local products, rural culture, traditional delicacies, and the daily lives of agricultural residents. It provides activities that bring visitors closer to nature and the countryside, allowing them to participate, appreciate, enjoy, and adventure. Forest farm tourism provides visitors with "experiential activities" on farms or farming operations. In addition, tourists are provided with opportunities for educational recreation and learning in a natural or agricultural environment [18]. Forest farm tourism is defined and differentiated as (1) off-farm forest farm tourism: accommodation services on the origi-

nal farm; (2) passive participation in agricultural activities: accommodation on the farm; (3) indirect participation in agricultural activities: tasting of agricultural products or food production by tourists; (4) direct participation in non-real agricultural activities: farming demonstrations; and (5) direct participation in real agricultural activities: participation in farm activities [19–21]. Agrotourism uses facilities, rural specialties, and traditional cooking to attract visitors to experience farming, spend time on the farm, and provide local activities (e.g., tourism service providers, handicrafts, souvenir stores, museums, etc.), and to promote the development of rural areas [21–24].

In addition, agro-based recreation sites attract the majority of consumers because of the natural landscape they create [25], especially forest tourism sites, which are natural and planted forests, not urban parks or any garden forests, which are very important natural landscape resources for tourists [26,27]. Among the many services offered by agro-tourism, accommodation is significant in terms of income generation [20]. Tourists also pay attention to the tourist environment and enhance themselves from the trip [28]. Chenari et al. [29] identified the elements of agrotourism, such as tourists, farmers, rural environment, facilitators, and common agricultural activities, and their interactions as the elements that can be used to assess the development of agrotourism.

In Taiwan, agricultural tourism mostly refers to “leisure farming”, with leisure farms as the main recreational operation area [14]. The tourism experience of leisure farming not only provides tourists with quality services but also allows them to taste local agricultural products, appreciate natural beauty, and even participate in rural activities, such as DIY (Do It Yourself) crafts, cultural activities, and local regional [25]. The development of leisure farms in Taiwan has been planned in a diversified direction to meet the service needs of different customer segments and new market positioning [25,30,31]. According to Graham et al. [6], the market segmentation of senior tourism is very clear, and the phenomenon and situation of senior tourism are worth further investigation.

As the concept of active aging is an ideal pursuit in the minds of the elderly, the benefits generated by the act of travel are not only facilitated but also make travel an act of mindfulness and a sense of self-benefit in life by filling each trip with pleasure and anticipation [7,32]. Travel has become an important activity option for seniors, and by its very nature, travel can be valuable for visiting, exercising, socializing, and relaxing at the same time, making good travel an inevitable choice for seniors [33].

1.2. Travel Service Environment for Senior Citizens

In previous studies, Jang and Wu [34] mentioned knowledge, cleanliness, and safety as the two most important factors in attracting senior travelers from Taiwan; Caber and Albayrak [35] pointed out that cleanliness and attitude of the service staff were the most important factors for senior travelers in Germany and the UK, while Dutch senior travelers valued food and beverage service most. Patterson et al. [36] showed that seniors prefer comfortable and pleasant room furnishings, high-quality cleanliness, and friendly and positive staff when choosing accommodation; the building and interior design has a high-quality atmosphere and creates a calm indoor environment; in addition, due to physical problems and unsuitability to drive a car, seniors rely heavily on public transportation. In addition, senior citizens are highly dependent on public transportation due to health problems and inability to drive and are therefore sensitive to the availability of transportation facilities when traveling [3,37].

The design for accessibility should be prepared for any health emergencies that may occur, and physical modifications should be encouraged, such as increased lighting in public areas, large print signage, accessible pathways, open living areas, accessible bathrooms, kitchens, rooms, etc., and even the need to provide an accessible travel path to facilities within the travel area [38,39]. In addition, Zandieh et al. [40] point out the environmental characteristics of the travel experience and propose a “micro-build environment”, a concept that includes pedestrian infrastructure, aesthetic appearance, and personal safety, where pedestrian infrastructure includes streetscape design, traffic conditions, and ground

quality, smooth and clean pavement, obstruction-free (litter) pavement; aesthetic pavement. Aesthetic appearance refers to the aesthetics and visual appearance of the environment, including natural landscapes and pleasant walking places.

In particular, the limited services and poor quality of the tourism environment in rural areas may discourage senior citizens from choosing rural areas for travel [13], as farm environment facilities, staffing services, accommodation services, and food and beverage services in rural areas may be restricted regionally. Therefore, creating or strengthening the brand, infrastructure, and service quality of a site can bring the advantages of forest farm tourism with attractiveness and economic benefits [41].

Based on the above research background and motivation, the main objectives of this study are as follows:

- (I) Constructing sustainable indicators for senior forest farm tourism services.
- (II) Measuring the weights of sustainable forest farm tourism service indicators for senior citizens.

2. Materials and Methods

2.1. Research Framework

This study commenced by conducting a comprehensive content analysis [42] to synthesize the findings and recommendations put forth by scholars in the domains of senior citizen tourism, sustainable tourism, tourism service environment, and farm service environment. The primary aim of this analysis was to develop a set of indicators specifically tailored to assess and promote a sustainable tourism service environment that caters to the unique needs of senior citizens on farms. To ensure the alignment of the indicators with the study's objectives, the research team assembled an expert panel specializing in sustainable tourism services for the elderly on farms. The panel utilized the focus group method to examine the pertinent questions and consolidate expert opinions into a questionnaire for this study. The Fuzzy Delphi Technique (FDT) was employed to transform the analysis results into triangular fuzzy numbers and to determine the overall scores through defuzzification. This process was based on the fuzzy sets proposed by Lee and Li [43] and Wu et al. [44]. Subsequently, the indicators that aligned with the study's objectives were filtered and selected.

2.2. Research Tools

2.2.1. Questionnaire Design

The questionnaire in this study was designed to screen the indicators of sustainable forest farm tourism service environment for senior citizens in order to measure the representativeness of the indicators. The questionnaire is based on and refers to the framework, results, and recommendations of previous studies [14,18,34,36–40,45], and after synthesizing the views and suggestions of the expert group, the research indicators of this project were derived. A total of 36 items were included in this study as indicators for the FDT.

The FDT expert questionnaire assesses the importance of indicators of a sustainable forest farm tourism environment for seniors in five areas: 1. farm environment; 2. staffing services; 3. accommodation services; 4. shopping and experiential tours; and 5. food and beverage services. The questionnaire was measured on a scale of 1 to 10, with 1 being the least important and 10 being the most important. Then, the total value of defuzzification was determined by using the defuzzify set proposed by Lee and Li [43], and Wu et al. [44], and the threshold of the evaluation criterion was set at 0.70.

2.2.2. Sampling Design and Method

To facilitate the evaluation process, this study diligently invited scholars with expertise in agricultural tourism and senior citizen research, governmental agricultural units, farm owners, and other professionals possessing relevant knowledge and experience in the agricultural field. Due to the professional nature of this study, the study was conducted on agricultural professionals, including industry, government, and academia. The main

targets of the study included: 1. scholars related to agricultural tourism; 2. scholars related to the study of the elderly; 3. farm counselors; 4. government agencies related to agricultural tourism; 5. agricultural tourism associations; 6. farm owners; and 7. the travel industry. In this study, FDT was used to screen the indicators of a sustainable tourism service environment for farm seniors collected through a literature review and interviews, and a total of 35 professionals were selected from related fields (Table 1).

Table 1. Basic information of FDT experts in various fields.

No.	Seniority	Field	Expert	Unit
1	5–10 years	Agriculture	Forest farm tourism Academics	Professor, Department of Tourism
2	11–15 years	Government Agencies	Forest farm tourism-related government agencies	Tourism Bureau
3	11–15 years	Industry	Farmers	Farmers
4	More than 21 years	Ecotourism	Forest farm tourism-related scholars	Professor, Department of Tourism
5	6–10 years	Industry	Farmers	Farmers
6	11–15 years	Agriculture	Related scholars of senior research	Professor, Department of Tourism
7	More than 21 years	Industry	Travelers	Travel agency owner
8	16–20 years	Government Agencies	Tourism Association	Forest farm tourism Association
9	16–20 years	Psychology	Related scholars of senior research	Professor, Department of Psychology
10	More than 21 years	Government Agencies	Tourism Association	Rural Tourism Association
11	16–20 years	Tourism Economy	farm counselor	Management Consulting Company
12	11–15 years	Tourism Economy	farm counselor	Management Consulting Company
13	16–20 years	Tourism Economy	Forest farm tourism-related scholars	Professor, Department of Tourism
14	11–15 years	Tourism Economy	farm counselor	Management Consulting Company
15	11–15 years	Agriculture	Forest farm tourism related scholars	Professor, Department of Tourism
16	More than 21 years	Government Agencies	Forest farm tourism-related government agencies	Agriculture Committee
17	More than 21 years	Home Economics	Related scholars of senior research	Professor, Department of Family
18	11–15 years	Government Agencies	Tourism Association	Tourism Association
19	16–20 years	Industry	Travelers	Local Tour Guide
20	11–15 years	Tourism Economy	farm counselor	Management Consulting Company
21	16–20 years	Industry	Travelers	Local Tour Guide
22	5–10 years	Home Economics	Related scholars of senior research	Professor, Department of Home Economics
23	More than 21 years	Industry	Farmer	Leisure farm owner
24	16–20 years	Industry	Travelers	Local Tour Guide
25	11–15 years	Tourism Economy	farm counselor	Management Consulting Company
26	16–20 years	Government Agencies	Forest farm tourism-related government agencies	Agriculture Committee
27	16–20 years	Government Agencies	Forest farm tourism-related government agencies	Agriculture Committee
28	More than 21 years	Tourism Economy	Forest farm tourism-related scholars	Professor, Department of Tourism
29	11–15 years	Government Agencies	Tourism Association	Regional Tourism Association
30	11–15 years	Government Agencies	Forest farm tourism-related government agencies	Tourism Bureau
31	More than 21 years	Health Care	Related scholars of senior research	Professor, Department of Long-term Care
32	More than 21 years	Government Agencies	Tourism Association	leisure association
33	More than 21 years	Industry	Farmer	Leisure farm owner
34	11–15 years	Industry	Farmer	Leisure farm owner
35	16–20 years	Industry	Travelers	Travel agency owner

The questionnaire for this study was designed to survey the opinions of experts on the topic, and the selection and ranking of indicators was completed by combining the opinions of experts. Therefore, before distributing the questionnaire, the research team confirmed that the respondents understood the topic of this study and had knowledge and experience related to agricultural tourism and the travel needs of senior citizens. The selection of experts in academic fields was based on the research expertise of the scholars, who must have published research articles on agrotourism or senior citizen tourism in international journals; the selection of experts in farm counseling was based on the number of years of counseling, who must have 10 years of counseling experience; the selection of experts in government-related units was based on experienced personnel in charge of agrotourism and farming, who must have served in the field for more than 10 years; and the selection of

experts in tourism associations was based on the number of years of experience in the field. The selection of experts was based on the manager or CEO of the association; the selection of experts for the farm industry was based on farm operators with more than 10 years of experience, and the farm must provide tourism facilities and activities for senior citizens. The selection of travel industry experts was based on tour guides, tour leaders, and owners with 10 years of experience in travel services for senior citizens.

2.2.3. Fuzzy Delphi Technique (FDT) and Data Verification Analysis

The Delphi Method, originally proposed by Helmer and Dalkey in 1960, is a group decision-making process that employs anonymous expert predictions. It aims to achieve consensus among experts and seek agreement on specific prediction targets through an iterative process [46]. To address potential issues, such as information omission, expert withdrawal, and semantic ambiguity. The Fuzzy Delphi Method was developed by Ishikawa et al. [47], which combines the traditional Delphi method with fuzzy set theory (Figure 1).

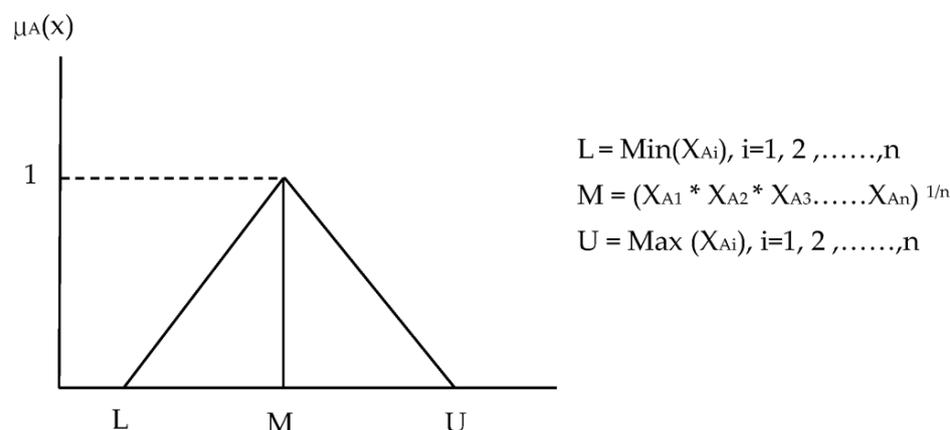


Figure 1. Graph of triangular fuzzy numbers.

The primary approach employed in this study involves the utilization of triangular fuzzy numbers to effectively integrate expert opinions, particularly in relation to the development of test items and the allocation of scores. Initially, the researcher formulates the question and invites experts within the relevant field to provide their insights on the question’s significance. To compute the values of the left boundary (L), middle boundary (M), and right boundary (U), the defuzzification of fuzzy sets is employed, as proposed by Lee and Li [43] and Wu et al. [44]. Subsequently, the total value (T) is determined. Following this, a screening process is conducted to eliminate indicators that score below 0.7 (Table 2).

Table 2. Triangular fuzzy number table.

Threshold Value	Formula
left threshold value (L)	$L_{ij} = \text{Min}(L_{ij}), i = 1, 2, 3, \dots, n; j = 1, 2, 3, \dots, n$
right threshold value (U)	$U_{ij} = \text{Max}(U_{ij}), i = 1, 2, 3, \dots, n; j = 1, 2, 3, \dots, n$
Median value (M)	$M_{ij} = \left(\prod_{i=1, j=1}^{n, m} m_{ij}\right)^{1/n} i = 1, 2, 3, \dots, n; j = 1, 2, 3, \dots, n$
Total value (T)	$T_{ij} = \frac{U_j + M_j + L_j}{3}$

3. Research Results

3.1. Triangular Fuzzy Number Analysis of Environmental Indicators of Sustainable Tourism Services for Farm Senior Citizens

Experts from various fields assessed the significance of environmental indicators for sustainable forest farm tourism services targeting senior citizens. Triangular fuzzy numbers

were established to represent the evaluations (see Table 3). Regarding the farm environment, the left boundary (L) values ranged from 0.200 to 0.700, the geometric mean (M) ranged from 0.602 to 0.909, and the right boundary (R) ranged from 0.900 to 1.000. Concerning staff services, the left boundary (L) values varied from 0.300 to 0.800, the geometric mean (M) ranged from 0.675 to 0.902, and the right boundary (R) was 1.000. For accommodation services, the left boundary (L) values ranged from 0.600 to 0.700, the geometric mean (M) ranged from 0.813 to 0.935, and the right boundary (R) was consistently 1.000. In terms of shopping and experiential tours, the left boundary (L) values ranged from 0.300 to 0.500, the geometric mean (M) ranged from 0.676 to 0.788, and the right boundary (R) ranged from 0.900 to 1.000. Lastly, for restaurant services, the left boundary (L) values ranged from 0.300 to 0.700, the geometric mean (M) ranged from 0.738 to 0.912, and the right boundary (R) was 1.000.

Table 3. Fuzzy triangle analysis of various professionals.

Aspects	Criterion	Triangular Fuzzy Number		
		L_i	M_i	R_i
Farm environment	1. The air quality on the farm is good.	0.700	0.868	1.000
	2. The ambient temperature and humidity in the farm are appropriate.	0.700	0.842	1.000
	3. The environment on the farm has appropriate music.	0.200	0.602	0.900
	4. The environment on the farm has a pleasant smell.	0.300	0.722	1.000
	5. The farm has barrier-free building space.	0.400	0.822	1.000
	6. The materials of the facilities on the farm are suitable for the elderly.	0.600	0.883	1.000
	7. The environment on the farm has a theme style.	0.600	0.769	1.000
	8. The environment inside the farm has a bright color design.	0.300	0.678	1.000
	9. The specifications of the facilities on the farm are suitable for the elderly.	0.600	0.852	1.000
	10. The spatial configuration of the farm is clear and simple.	0.500	0.757	1.000
	11. The space configuration on the farm is comfortable and pleasant.	0.600	0.776	1.000
	12. The signs on the farm are clear and easy to understand.	0.700	0.874	1.000
	13. The environment on the farm is clean and tidy.	0.700	0.881	1.000
	14. The means of transport on the farm is clean and comfortable.	0.600	0.777	1.000
	15. The route in the farm has a safety design.	0.700	0.909	1.000
Personnel service	16. The service personnel on the farm have a sense of responsibility.	0.700	0.888	1.000
	17. The service personnel on the farm are friendly.	0.700	0.902	1.000
	18. Service personnel on the farm have the ability to coordinate with consumers.	0.600	0.837	1.000
	19. The service personnel in the farm have professional explanation ability.	0.600	0.818	1.000
	20. Service staff on the farm have good leadership skills.	0.500	0.783	1.000
	21. The service personnel on the farm are professionally dressed.	0.300	0.675	1.000
	22. The service personnel on the farm can effectively solve the problems of customers.	0.800	0.895	1.000
	23. The service staff on the farm can give customers individual care and customized services.	0.700	0.870	1.000
	24. The service personnel on the farm can provide prompt service.	0.600	0.842	1.000

Table 3. Cont.

Aspects	Criterion	Triangular Fuzzy Number		
		L_i	M_i	R_i
Accommodation service	25. Appropriate floor configuration for accommodation on the farm.	0.600	0.813	1.000
	26. Comfortable accommodation on the farm.	0.700	0.868	1.000
	27. Accommodation on the farm is clean and tidy.	0.700	0.935	1.000
	28. Accommodation on the farm is accessible for the disabled.	0.700	0.894	1.000
Shopping and Experience Tour Service	29. The shopping store on the farm can meet the needs of consumers.	0.300	0.676	0.900
	30. The shopping store on the farm has a good reputation.	0.500	0.788	1.000
	31. Details of the optional itinerary on the farm.	0.300	0.711	0.900
	32. The optional itinerary within the farm is reasonably priced.	0.300	0.747	1.000
Catering Services	33. The restaurant on the farm can provide customized catering content.	0.300	0.738	1.000
	34. The restaurant on the farm uses seasonal and local ingredients.	0.600	0.845	1.000
	35. The restaurant dining environment on the farm is clean and tidy.	0.600	0.912	1.000
	36. The restaurant on the farm can match the theme of the farm.	0.700	0.880	1.000

Note: L_i is the left threshold value of the triangular fuzzy number; M_i is the geometric mean of the triangular fuzzy number; R_i is the right threshold value of the triangular fuzzy number.

3.2. Numerical Analysis of Fuzzy Sets of Anti-Fuzzy Environmental Indicators of Sustainable Forest Farm Tourism Services for Farm Senior Citizens

The triangular fuzzy numbers representing the environmental indicators of sustainable forest farm tourism services for senior citizens were defuzzified using the fuzzy set inverse fuzzification method proposed by Lee and Li [43] and Wu et al. [44] (refer to Table 4). The defuzzification process yielded three distinct values: the left limit (μ_L), the right limit (μ_R), and the total value (μ_T) of the defuzzification.

Table 4. Environmental defuzzification analysis of sustainable forest farm tourism services for senior farmers by professionals.

Aspects	Criterion	Defuzzification			Ranking
		(μ_L)	(μ_R)	(μ_T)	
Farm environment	1. The air quality on the farm is good.	0.884	0.257	0.813	11
	2. The ambient temperature and humidity in the farm are appropriate.	0.864	0.263	0.800	14
	3. The environment on the farm has appropriate music.	0.694	0.570	0.562	36
	4. The environment on the farm has a pleasant smell.	0.782	0.492	0.645	31
	5. The farm has barrier-free building space.	0.849	0.422	0.714	27
	6. The materials of the facilities on the farm are suitable for the elderly.	0.895	0.312	0.792	15
	7. The environment in the farm has a theme style.	0.812	0.342	0.735	24
	8. The environment inside the farm has a bright color design.	0.757	0.508	0.624	33
	9. The specifications of the facilities on the farm are suitable for the elderly.	0.871	0.320	0.776	16
	10. The spatial configuration of the farm is clear and simple.	0.805	0.398	0.703	28
	11. The space configuration on the farm is comfortable and pleasant.	0.817	0.340	0.738	23
	12. The signs on the farm are clear and easy to understand.	0.888	0.256	0.816	9
	13. The environment on the farm is clean and tidy.	0.894	0.254	0.820	7
	14. The means of transport on the farm is clean and comfortable.	0.817	0.340	0.739	22
	15. The route in the farm has a safety design.	0.916	0.248	0.834	3

Table 4. Cont.

Aspects	Criterion	Defuzzification			Ranking
		(μ_L)	(μ_R)	(μ_T)	
Personnel service	16. The service personnel on the farm have a sense of responsibility.	0.900	0.252	0.824	6
	17. The service personnel on the farm are friendly.	0.911	0.250	0.831	4
	18. Service personnel on the farm have the ability to coordinate with consumers.	0.860	0.323	0.768	19
	19. The service personnel on the farm have professional explanation ability.	0.846	0.329	0.759	20
	20. Service staff on the farm have good leadership skills.	0.821	0.390	0.716	26
	21. The service personnel on the farm are professionally dressed.	0.755	0.509	0.623	34
	22. The service personnel on the farm can effectively solve the problems of customers.	0.905	0.183	0.861	1
	23. The service staff on the farm can give customers individual care and customized services.	0.885	0.256	0.814	10
Accommodation service	24. The service personnel on the farm can provide prompt service.	0.863	0.322	0.771	18
	25. Appropriate floor configuration for accommodation on the farm.	0.842	0.330	0.756	21
	26. Comfortable accommodation on the farm.	0.884	0.257	0.813	11
	27. Accommodation on the farm is clean and tidy.	0.939	0.243	0.848	2
Shopping and Experience Tour Service	28. Accommodation on the farm is accessible for the disabled.	0.904	0.251	0.826	5
	29. The shopping store on the farm can meet the needs of consumers.	0.735	0.509	0.613	35
	30. The shopping store on the farm has a good reputation.	0.825	0.388	0.718	25
	31. Details of the optional itinerary on the farm.	0.757	0.496	0.630	32
Catering Services	32. The optional itinerary within the farm is reasonably priced.	0.798	0.484	0.657	29
	33. The restaurant on the farm can provide customized catering content.	0.792	0.487	0.653	30
	34. The restaurant on the farm uses seasonal and local ingredients.	0.866	0.321	0.772	17
	35. The restaurant dining environment on the farm is clean and tidy.	0.919	0.305	0.807	13
	36. The restaurant on the farm can match the theme of the farm.	0.893	0.254	0.820	8

Note: (μ_L) is the left threshold value of defuzzification; (μ_R) is the right threshold value of defuzzification; (μ_T) is the total value of defuzzification.

In terms of the farm environment, the total value of the indicators ranged from 0.562 to 0.834. For people services, the demodulated values ranged from 0.623 to 0.861; for accommodation services, from 0.756 to 0.848; for shopping and experiential tours, from 0.613 to 0.718; and for food and beverage services, from 0.653 to 0.820. For food and beverage services, the demo deled values ranged from 0.653 to 0.820. After calculating the triangular fuzzy number and the total value of defuzzification by the FDT questionnaire, the subjective judgment of this study was that indicators with a total value below 0.700 should be removed from the indicators of sustainable forest farm tourism services for the elderly on farms, so the total value of all indicators in this study exceeded 0.700. Therefore, all indicators in this study had a total value of more than 0.700. After analyzing the FDT, a total of 7 indicators were removed, and 5 components and 28 indicators were selected as indicators of a sustainable forest farm tourism service environment for elderly farmers.

4. Discussion

Through a meticulous examination of the pertinent literature and active engagement in focus groups, we have effectively devised a comprehensive set of 36 indicators to be utilized in the screening process. The primary objective of these indicators is to establish a

sustainable service environment for forest farm tourism, specifically tailored to address the unique requirements of senior individuals visiting farms. This study makes a noteworthy contribution by applying theoretical concepts and expanding the scope of research practices, thereby fostering the advancement of a sustainable service environment for forest farm tourism. It is crucial to emphasize that the compiled indicators in this study encompass all essential aspects that necessitate consideration when designing a sustainable service environment for forest farm tourism targeted at senior citizens. These indicators provide a holistic perspective and function as assessment points during the planning and design phase of farm sites catering to the senior population.

Furthermore, based on the results of the FDT screening, our study identifies several critical factors that hold significance across different dimensions. For instance, in the staff service dimension, the indicator of “effective on-farm service staff in solving guests’ problems” emerges as particularly important, aligning with the findings of Lin et al.’s [16] research on staff professionalism. Similarly, the indicator of “clean on-farm accommodation” within the accommodation environment and service dimension echoes the conclusions drawn by Jang and Wu [34], Caber and Albayrak [35], and Patterson et al. [36] regarding environmental tidiness. Additionally, the indicator of “safety of on-farm routes” within the farm environment dimension aligns with the findings of Darcy et al.’s [38] study.

The natural forest landscape offers numerous advantages for senior citizens participating in farm tourism [48–50]. It provides a wealth of natural resources and ecological surroundings that greatly contribute to the health and well-being of seniors. The presence of fresh air, negative ions, and aromatic scents emitted by trees in the forest enhances respiratory function, boosts immunity, and mitigates the adverse effects of air pollution on their bodies [51,52]. Additionally, the forest fosters rich biodiversity and opportunities for wildlife observation, enabling seniors to connect with nature and embrace its beauty and tranquility [53]. Moreover, the forest facilitates activities, such as picnicking, allowing seniors to enjoy quality time with their loved ones in a relaxed and enjoyable manner [54,55].

In conclusion, the natural forest landscape offers various physical and mental health benefits, promotes relaxation, and provides abundant opportunities for outdoor activities for senior citizens engaging in farm tourism. This environment serves as an ideal setting for seniors to immerse themselves in the splendid, serene, and rejuvenating effects of nature, thereby enhancing their overall well-being and happiness. Therefore, when designing and planning the service environment for farm tourism, it is crucial to integrate and protect the identified key indicators associated with the natural forest landscape. This ensures the effective fulfillment of the needs and expectations of senior citizens. Thus, when developing a sustainable forest farm tourism service environment for senior citizens on leisure farms in Taiwan, forest farm tourism operators and governmental agricultural units should carefully consider the dimensions and indicators outlined in this study.

The findings of this study serve as a valuable reference for future farm owners, venue designers, and relevant organizations. It is crucial to recognize that the forest farm tourism service environment required by the elderly community entails specific considerations and requirements for this demographic. Furthermore, the results of this study should serve as a framework for evaluating and assessing venues, aiming to facilitate the creation of an enhanced forest farm tourism service environment that caters to the needs of senior citizens in the forest farm tourism market.

5. Conclusions

After establishing the triangular fuzzy numbers and fuzzifying the triangular fuzzy numbers, the study screened the assessments of professionals in various agricultural fields and finally selected a total of 5 components and 28 indicators that are suitable for the sustainable forest farm tourism service environment for senior citizens. The results of this study, ranked by the total value of the defuzzification, showed that: “The service staff at the farm can effectively solve guests’ problems (0.861)”; “The farm’s accommodation is clean

(0.848)”; “The safety of the farm’s routes (0.834)”; “The service staff is friendly (0.831)”; and “The farm’s accommodation is equipped with barrier-free facilities (0.826)”. These are the five most important indicators found in this study, indicating that the experts consider the above indicators to be relatively important for the construction of a sustainable forest farm tourism service environment for elderly farm residents.

As a result, agricultural experts and scholars believe that the construction of a sustainable forest farm tourism service environment for the elderly on farms requires an emphasis on the service capabilities of the service staff. Good and friendly service and quick and correct problem-solving are also important in this study.

In addition, the safety of farm routes is influenced by the physical environment. The width, flatness, and cleanliness of the roads affect the safety of the routes. Due to the special needs of the senior citizen clientele, the need to provide barrier-free spaces for safety is a key consideration for seniors. In short, the construction of a sustainable forest farm tourism service environment for senior citizens on farms requires greater attention to the ability of service personnel and the safety of the environment.

5.1. Meaning of Practical Management

The FDT performs a pivotal role in the development of indicators for a sustainable forest farm tourism service environment that is specifically tailored to meet the needs of senior citizens on farms. By integrating expert opinions from diverse fields, this method ensures a comprehensive consideration of all pertinent factors. The practical implications derived from this study provide valuable insights into the realm of forest farm tourism for senior citizens. Given the escalating demand for forest farm tourism within this demographic, it is of utmost importance for farm operators to remain attuned to market trends and adapt their current service environment accordingly to effectively cater to the unique needs of senior citizens. To establish a more suitable forest farm tourism environment for senior citizens in Taiwan, it becomes imperative to gain a deeper understanding of their preferences and requirements.

The analysis of expert opinions from various fields has revealed that problem-solving ability, affinity, and sense of responsibility of service personnel are all indicators of professional ability. Hence, this study recommends that future leisure farms prioritize the needs of the elderly when training professionals and incorporate the characteristics of the elderly into professional training programs. Another crucial aspect identified by experts in various fields is farm safety design, including the accessibility of accommodation and the safe design of farm travel routes. The sanitation of the farm environment, whether in the accommodation or dining areas, is also a paramount concern for experts in various fields. Therefore, this study suggests that farmers should provide a clean, hygienic, and orderly environment when catering to elderly tourists.

In conclusion, future leisure farms should use the indicators proposed in this study as a basis for design and evaluation. By doing so, they can enhance the overall quality of their services and provide a more comfortable and suitable forest farm tourism environment for senior citizens.

5.2. Future Research and Limitations

The indicators presented in this study were constructed through a comprehensive review of the relevant literature and a focus group of experts. These indicators are specific to the sustainable forest farm tourism services provided for senior citizens on farms and cannot be generalized to other agricultural forest farm tourism services. It is important to note that this study has certain limitations. First, given the diverse nature of forest farm tourism services provided to the elderly, the indicators established in this study may not be comprehensive enough. Second, this study is based solely on the opinions of the surveyed experts and scholars, and experts from different fields may hold different opinions. Finally, the results of this study represent subjective views, and further research should include sample interviews with elderly tourists to better understand their perspectives. Therefore,

future research should consider including interviews with elderly tourists to gain a more comprehensive understanding of the sustainable development of forest farm tourism for senior citizens.

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