Planning of ecological agricultural tourist attractions based on the concept of circular economy

Fengbiao Shang and Wenjie Zhu

Introduction

With the increasing development and improvement of information technology, the Internet of Things technology has been scientifically and rationally applied to the agricultural ecological tourism industry to realise the monitoring and integrated management of the backup links of tourism activities. Moreover, an integrated Internet of Things tourism platform has been built to provide tourists with information services, itinerary services, transportation services, commercial services, etc. At the same time, it promotes the intelligentisation and low-carbonisation of eco-tourism, and improves the efficiency and level of eco-tourism management (Choo and Park 2018). In order to change the many problems faced by agricultural eco-tourism, it is necessary to innovate the traditional tourism model, increase the penetration rate of Internet of Things technology, and play an important role in tourism management and tourism services, and tourism environmental protection (Lee and Kwon 2017).

Eco-agricultural tourism is a type of tourism under the background of rural ecological environment. Moreover, it uses ecological agriculture and rural characteristic culture as its resources, applies aesthetics, ecology, economics principles, and sustainable development theories, uses human resources and natural resources to develop eco-agricultural tourism, and plans and constructs the rural environment in accordance with tourism environmental standards. At the same time, it takes eco-tourism as the main body, integrating agricultural production, the application of new agricultural technology, and tourist participation in sightseeing. In addition, it promotes the construction of ecological agriculture, the scientific and technological operation of agriculture, the exhibition of agronomic products, the promotion of agricultural and sideline products, and the good development of the rural ecological environment, so that tourists can feel agricultural modernisation and rural ecologicalisation (Flachs and Richards 2018). Eco-agricultural tourism is based on the rural ecological environment, farmland work, pastoral style, ecological agricultural production content and rural humanities. The importance of modernisation is the achievements in the field of science and knowledge, faster growth of mechanisation and growth, the explanation of social life, the appearance of balanced outlook in every walk of life. Through overall planning, layout, process design and a series of supporting
facilities and services, it provides people with sightseeing, travel, and recuperation services. In addition, through tourist experience and participation in rural characteristic folk life, seasonal fruit and vegetable field visits and picking, and viewing of characteristic flowers and plants under intelligent technology, it combines fun and education to help people understand modern agriculture and increase agricultural knowledge. Eco-agricultural tourism is committed to integrating the economic functions of eco-agricultural production with the socio-economic functions of eco-tourism, and strengthening the economic functions of eco-agriculture, so as to achieve the goal of protecting the environment and promoting ecological sustainable development. At the same time, it combines ecological agriculture and ecological tourism to promote economic growth, social progress, and ecological stability.

The development of eco-agricultural tourism mainly relies on local eco-agricultural tourism resources. Among them, natural resources and human resources reflect the local natural scenery and cultural customs, which are extremely attractive to tourists. As an attractive condition for eco-agricultural tourism, these tourism resources can be used to develop eco-tourism, and these resources have the characteristics of recycling or renewable. In addition, eco-agricultural tourism is developed based on tourists’ ‘clothing, food, housing, and transportation’, and consumes relatively few natural resources. The eco-agriculture is a number of associated systems of connected system of farming practice which are preserving or educating the status of efficiency of soil, organisation at the same period reducing damaging ecological effects. Ecological farming provides healthy agriculture and nutritious eating for yesterday and today by safeguarding soil, moisture, and weather, trying to promote bio-diversity, and attempting to avoid the use of chemical inputs or genetic modification. Recycling is an integral part of a circular economy, but should be regarded only as there are no other choices for re-use, re-manufacture, or fix. This really is the fundamental principle of the waste management hierarchy, that takes precedence most efficient waste management solutions. The main input is human resources, and the human resources provided to tourists have the characteristics of recycling and conform to the concept of sustainable development. Therefore, the development of eco-agricultural tourism is consistent with the green development concept of sustainable development currently required by our country. Eco-agricultural tourism also conforms to the characteristics of low energy consumption, low emission, resource saving, and sustainable development, and fully embodies the green development concept of sustainable development.

Related work

Eco-agricultural tourism started early in some developed countries and has become an important part of the tourism industry in many countries. Its eco-agricultural tourism revenue accounts for more than 20% of the overall tourism revenue (Park and Oh 2018). Eco-agricultural tourism mainly focuses on two development methods abroad (Alphey and Bonsall 2018). A type of vacation that focuses on leisure viewing functions and belongs to the viewing type. This type of eco-agricultural tourism is more popular in Central and Eastern European countries, mainly including Hungary, Finland and other places. Another way of eco-agricultural tourism is personal contact with farmland, which is participatory vacation. In this mode, tourists want to experience farming by themselves, pick food by themselves, experience the fun of the countryside during busy farming, and watch the countryside scenery. It is mainly popular in Japan, the United States and other places. Ecological farming is the most respectful of wild-life, as it produces lower pollution of aerosols, it produces less carbon dioxide, it prevents the greenhouse effect, it doesn’t generate polluting waste and helps make energy savings since in the crop cultivation and in the production of the products it takes advantage. Tourists who choose eco-agricultural tourism are mostly people in the city who have received higher education and have certain economic conditions. Through eco-agricultural tourism, they release their work pressure in the beautiful countryside, invest in the slow-paced rural pastoral life from the high-pressure working environment, and look for the natural cultural atmosphere brought by nature (Marcis et al. 2019). Up to now, many foreign countries have used their own scientific and technological advantages to introduce intelligence and technology into eco-agricultural tourism to pursue high-tech and high value-added goals, and to build a modern agricultural science and technology park as a carrier to maximise agricultural productivity (Mueller et al. 2017). Some regions are committed to comprehensive development and utilisation of limited land, creating multi-functional high-tech agricultural parks such as ornamental leisure and foreign exchange earnings. At the same time, Singapore’s agricultural park actively invests in infrastructure to increase the entertainment of the park. Moreover, it has carefully distributed the corridor into a characteristic agricultural ecological corridor with tourism characteristics and can provide fresh agricultural products to form a multi-
functional ecological agricultural system (Turner et al. 2019). In some countries, agricultural science and technology parks use a well-established team of experts and a large number of science and technology practitioners to manage (Adama et al. 2018). The nature of the farms in each garden in the agricultural sightseeing garden system designed by Duan et al. (2019) is different, such as chicken farms, fish farms (export ornamental fish), mushroom gardens, bean sprouts farms, and vegetable gardens. These farms of various natures provide sophisticated agricultural technology for global agricultural investors and employ a large number of experts and scholars to promote agricultural technology. For example, Singapore’s high-tech agricultural gardens have formed a complete urban agricultural system, and have achieved very good economic and social benefits.

The closed-loop proposed in Fitz-Koch et al. (2018) is the embryonic form of the idea of circular economy. Corder Jessica and Irlbeck Erica (2018) proposed to apply the idea of closed loop to the whole process of product production. Cleaner production and whole-process control management models are more fundamentally effective than ‘end management’. Therefore, it has received general attention and attention, and the implementation of circular economy has begun to transform from waste disposal to waste recycling. Ebert et al. (2019) believed that the primary goal of the development of circular economy is to establish resource management rules, so that the economic system where humans live and the natural system coexist harmoniously and sustainably develop. Alola Andrew Adewale and Uzuner Gizem (2020) reinterpreted the concept of circular economy from the perspective of resource scarcity. Moreover, it believes that there is a perfect and highly efficient material and energy cycle in nature, and the collection, transmission and decomposition of materials and energy in different ecosystems are realised through solar energy. The circular economy offers us with techniques we have to address respectively global warming and species extinction all while going to meet important social needs. It enables us to boost wealth, employment, and adaptability while reducing carbon emissions, disposal, and air quality. The idea of circular economy is to use nature as a prototype to artificially design material and energy cycles. Therefore, the development of circular economy is necessary and feasible for achieving sustainable development.

Roberts Richie and Robinson J. Shane (2018) built a wireless local area network to monitor crop growth and remote control of farmland and greenhouse. Zamani Naser and Mohammadi Maryam (2018) developed an approximately distributed wireless data acquisition and control system for managing a group of greenhouses. The process of sampling messages that quantify real-world physical circumstances and trying to convert the eventually results specimens into digital numeric values which can be modified by a computer is known as data acquisition. Lintern et al. (2020) proposed a wireless environmental monitoring system for precision agriculture and environmental monitoring industries to achieve real-time environmental monitoring and dynamic early warning. Kansanga et al. (2019) pointed out that the agricultural Internet of Things includes three layers: information perception layer, information transmission layer and information application layer. Douthwaite et al. (2017) used sensor and information fusion technology and Internet technology to design an agricultural information platform covering the whole country, and formed a hierarchical system structure for the collection, monitoring, transmission, processing and release of agricultural information.

**Construction of an eco-agricultural tourism attractions management system based on the concept of circular economy**

Based on the design concept of the Internet of Things, this paper combines the current development status of agro-ecological parks to apply the Internet, big data, cloud computing and image recognition and other cutting-edge mainstream technologies to establish an intelligent integrated management system for modern agro-ecological parks based on the Internet of Things. Agritourism gives tourists with experiences them to straight recognise the characteristics of local food even while integrating the social component of local food, suggesting that there are family members and small farms behind local food. Agritourism also encourages more people to spend a lot more money on local foods. Users can log in to the cloud platform directly through a computer or view the status of the park through an APP designed and developed for mobile devices such as mobile phones and tablets, and manage the entire park. The specific structure of the entire system is shown in Figure 1. Figure 1 illustrates the process of adaptive irrigation system where the information is collected in the next 3–5 days then it is feed into irrigation programming system for identifying the weather forecast and actual weather. Then it performs the irrigation process.

Adaptive agronomy technologies include smart irrigation and automatic mulching. That is, through the comprehensive park crop growth, soil moisture, park environment, etc., Agriculture agronomy is focused on
producing plants with greater nutritional value and greater crop yields under a wide range of environmental conditions. Crops could be specially bred to achieve. Crop adaptation mainly refers to relationships between significant environmental factors and agricultural plant response. This life science branch, which really is mainly eco-friendly in environment, could be assumed of as a synthesising of important aspects of geographic location, physiology, genetic factors, atmospheric science, and agronomy. Smart irrigation technology determines the landscape’s irrigation requires using weather information or soil moisture data. Smart irrigation technology consists of the three products, these products optimise irrigation productivity by minimising wastage of water while preserving plant health and the quality. Mulching is the process or practicing of trying to cover the ground in terms of improving plant life, advancement, and agricultural production effectiveness. Mulch is a technological term that means soil covering. automatic irrigation and automatic mulching management of crops are realised, as shown in Figure 2. At the same time, the weather forecast is incorporated into the irrigation and mulching control, so that corresponding decisions can be made in advance according to future weather changes (Adat et al. 2017; Vangala et al. 2020).

The entire adaptive irrigation system integrates weather forecast data obtained from authoritative weather stations into the system on the basis of existing automatic irrigation. In addition to making real-time irrigation decisions based on soil moisture, crop growth, and real-time environmental conditions, the system can also integrate future weather changes, automatically adjust irrigation procedures, and make irrigation plans in the next few days in advance. When the actual weather conditions are quite different from the forecasted weather, the system will make corresponding adjustments to the preset irrigation programme. The specific process is shown in Figure 3 (Tong et al. 2019).

As shown in Figure 4, the automation exhibition hall (management room) and the on-site remote communication relay module realise wireless data transmission and control through GPRS. The expansion of GPRS is General Packet Radio Service. General Packet Radio Service is a packet-oriented cellular data requirement used on the universal mobile telecommunications communication systems of 2G as well as 3G g cellular networks. One of the primary goals of GPRS is to make things easier to communicate a mobile phone to certain other packet-switched channels, which opens a door to the internet world. With the emergence of packet mode, mobile communications and the Internet combined to create mobile Broadband technology. The on-site remote communication relay module transfers the data collected by the short-distance wireless data transmission module through the radio frequency short wave. The gate valve well substation in the pilot area is installed at the branch pipe. Remote communication refers to the communication and through digital communication, convention telephone, teleconference, the web, or any other implies by which individuals who are just not present physically in the same place can interact with others considerably all at the same. According to the different requirements of sprinkler irrigation and drip irrigation, high-performance
micro-power solenoid valves are installed separately to implement segmented control and hierarchical management, which is scientific and reasonable. The requirements used in sprinkler irrigation are sprinkler heads, pipes, valves and time controller. Among these time controllers is equipped in modern sprinkler. The components involved in drip irrigation system are control valves, fertiliser tanks and mains. The pilot area collects information such as flow rate, pressure, soil temperature, soil moisture and soil nutrients at branch pipes, and implements automatic irrigation. The self-adaptive sub-station of the pump house and the substation of the high-level pool realise the automatic start and stop of the water pump, the automatic transmission and distribution of water in the pipe network, and the automatic adjustment of the pressure of the pipe network. The remote network video sub-stations are set up in multiple channels, installed in different sub-zones as needed, to monitor crop growth, water pump operation and auxiliary park daily management work in real time (Krčmářová 2020).

The adaptive film mulching technology accurately analyses the future environmental weather, and then adjusts and arranges the corresponding film mulching procedures in the next few days according to the growth conditions of different crops in the park, which fully guarantees the demand for crop growth. In the cold season, the mulching film starts acting as a warm air and cooler insulating material; mulch helps to prevent land from quickly freezing, and that in the summer, it helps maintain soil temperature. Mulching acts as a barrier between both the land and droplets, trying to slow the coastal erosion (Gupta et al. 2021). Among them, the growth status of crops is mainly determined by image recognition technology and data collected by other terminals in the park. The specific process is shown in Figure 5 (Easterly III and Myers 2017).

In the park, observation points are set up for each crop planting area, and each observation point includes trapping equipment such as video monitors, pest inducing boards, and insecticidal lamps. Under normal circumstances, the monitor is used to collect the growth of plants in the area and the working conditions of automated equipment. At regular intervals, the monitor monitors and captures the pest induction equipment at fixed points, and transmits the collected field information to the pest monitoring and early warning system after being processed by the controller. The system calculates the occurrence rate and occurrence index of various diseases and insects, and displays the survey statistics in real time on the GIS map, which intuitively reflects the damage degree of the diseases and insects in each region. Incidence rate and occurrence index refer to the incidence rate and disease index for diseases, and the occurrence rate and insect situation index for pests. Users can view the corresponding early warning information through smart agriculture APP software on mobile devices such as mobile phones and tablets. If no one takes measures to eliminate pests within a certain period of time, the system will take

Figure 3. Process of adaptive irrigation system.
corresponding measures to control the occurrence of pests and diseases and ensure the healthy growth of crops. The specific implementation process is shown in Figure 6.

**Planning of eco-agricultural tourist attractions based on the concept of circular economy**

Leisure farm classification has a variety of categories in different standards and methods, and there are several common classification methods. There are numerous pest control methods from which to choose, and they can be widely categorised into six groups hygienic, biological, pesticide, physiological, filtration, condensation, and thermal treatment (Mangalraj et al. 2020). (1) According to the land size division, the ecological agriculture can be divided into four levels such as small, medium, large, and extra large. 1 Small Ecological Agriculture: Total area \(\leq 5\) hectares. 2 Medium Ecological Agriculture: 5 hectares \(<\) total area \(\leq 100\) hectares. 3 Large-scale ecological agriculture: 100 \(<\) 200 hectares. 4 Extra-large farms: Total area \(> 200\) hectares. (2) The ecological agriculture can be divided into three types according to different reliance. 1 Urban Leisure: Mainly in the suburban area of urban edge, it is a place in urban citizens, such ecological agriculture has a good ecological environment, superior geographical position, convenient transportation. 2 Scenic Area Leisure: Within the scope of the famous scenic spots, relying on the people’s current advantages of the scenic area, combined with local characteristic cultures provide tourists to visitors and leisure activities. 3 Agricultural Industry Type: Such ecological agriculture is formed under the development of local agricultural industries, which is to rely on agricultural industrialisation bases, mainly providing tourists with sightseeing, purchasing, and taste and other activities. (3) According to the experience
Figure 5. Adaptive film technology.

Figure 6. The specific process of pest prevention and control.
mode, the ecological agriculture can divide two types depending on the experience model. 1 Traditional activity experience: Multi-use planting specialty agricultural products to attract tourists to experience leisure activities such as farming, picking, barbecue. 2 Modern Science and Technology Participation: Use high-tech technology such as agricultural Internet of Things to achieve ecological agriculture visual, sense, controlled, tourists can directly access farms directly through the Internet, to realise online perception, online purchase, online experience. The advantages of the agricultural sector include lesser risk, better quality, livestock tracking, greenhouse mechanisation, crop management, and business mechanisation.

The planning principles are as follows:

1) People-oriented principles; People-oriented is the fundamental principle in ecological agricultural planning and design. The development goal of ecological agriculture is to provide a better and more comfortable leisure environment for tourists. At the same time, developing modern agriculture to enhance crop benefits is for the betterment of human life. Ecological agriculture is an important part of the rural cultural system. It is one of the effective ways of cultural heritage and inheritance of rural areas. It is an important window for reacting local historical features. Improve rural environment and economic appearance, improve the quality of life quality and level of rural areas is an important principle of landscape planning.

2) Ecological priority principle; the planning and design of ecological agriculture should fully combine local natural resources and ecological landscapes, and its planning and construction cannot conflict with environmental protection, and to coordinate the ecological protection of visitors and farms. The fundamental goal of ecological priority is to create a comfortable, ecological, healthy, harmonious leisure environment.

3) The principle of co-ordination planning of agricultural materials; the purpose of coordinating plan is to take care of the details to avoid blind development and repeated construction. Ecological agricultural planning and construction in the context of agricultural Internet of Things should be a unified planning of agricultural Internet of Things planning, ecological protection, landscape design and industrial planning, should reflect the connection between agricultural Internet of Things systems and landscape systems.

4) Cultural display and specialty principles; any landscape form requires cultural integration, ecological agriculture is also supported by a cultural

![Figure 7. Project flow chart.](image-url)
connotation as an agricultural landscape. At the same time, avoiding duplication of construction and project mini, and has a characteristic ecological agriculture that has its own characteristic ecological agriculture.

(5) Brand and benefit principle brand is the soul of enterprise development, and the development of ecological agriculture also needs to continue to develop and improve their own brands. In the course of the planning and construction of the ecological agricultural project, we must make full use of relevant theories and methods, set the brand strategic awareness, create a corporate image, create high-quality tourism environments, and improve tourism images to achieve fermented economic benefits.

Eco-agriculture projects generally go through a five-stage process of analysis, positioning, layout, planning, and development. Under the guidance of the introduction of the related theory of the integration of the agricultural Internet of Things, the vertical process focuses on the stage of the agricultural Internet of Things planning, and the horizontal development also integrates the needs of the agricultural Internet of Things. In terms of leisure and entertainment, the experience of agricultural Internet of Things is emphasised, and agricultural Internet of Things technology is also involved in industrial production. The ecological agriculture project process that integrates the agricultural Internet of Things is more complete and specific, more scientific and reasonable. Figure 7 shows the project flow chart.

‘Agricultural Ecological Demonstration Are + Agricultural Tourism’ is based on rural areas as the main carrier, organised by rural collectives, and taking advantage of the rural natural ecological environment. Based on agriculture, it combines ecological agriculture demonstration with agricultural tourism to develop tourism. The emergence and development of this model have played a significant role in the improvement of rural economic levels, the improvement of farmers’ living environment, and the green development of agriculture. Moreover, it promotes the mutual promotion and public development of agriculture, ecology, and tourism, and brings huge economic, ecological and social benefits. The eco-agriculture demonstration zone is a relatively independent and open to the outside of the complex ecosystem, which combines natural, social, and economic attributes, and focuses on the coordinated development of the internal

Figure 8. The development model of agro-ecological demonstration area.
subsystems of the system and the internal and external systems. Among them, ecological agriculture is the focus of the ecological demonstration area, and the rural area is an important form of the ecological agriculture demonstration area. A certain level of human development, inventive abilities and skills, conveyed in types and forms of living and formed universal values, which is characterised by a deep and overall awareness of environmental issues in the complexities of humanity, Culture of the Ecosystem. Starting from the goal of developing ‘big agriculture’, the eco-agriculture demonstration zone implements the planning and overall planning of agriculture, forestry, animal husbandry, by-product processing industry, and fishery based on the principle of overall coordination. Moreover, it promotes the coordination of all aspects of development, enables them to support and promote each other, and realise the rapid and healthy development of agriculture. In addition, it protects the rural ecological environment and achieves the unity of ecological benefits, social benefits, and economic benefits, as shown in Figure 8.

With the continuous expansion of the construction scale of the agro-ecological park, the variety of crops in the park will continue to increase. However, many crop tourists can’t distinguish clearly, and it will even cause great distress to park managers. Therefore, it is necessary to establish a two-dimensional code traceability system for tourists in the park (as shown in Figure 9), and paste the corresponding crop identification two-dimensional codes on various plants in the park. After that, the user only needs to scan the QR code corresponding to each area with a mobile phone to clearly understand the relevant situation of the crops grown.

Figure 9. System architecture of the two-dimensional code traceability system.
in the area, recognise their growth habits, health benefits, etc. and the corresponding recipes. Figure 9, illustrates the system architecture of two-dimensional code traceability system, by QR code chasing the chase. Then it is categorised into visitor QR code traceability system and administrator QR code database and it finds the information of crop management planting method and crop-related cognitive information.

Figure 9, illustrates the system architecture of two-dimensional code traceability system, by QR code chasing the chase. Then it is categorised into visitor QR code traceability system and administrator QR code database and it finds the information of crop management planting method and crop-related cognitive information.

Food safety issues are getting more and more attention from relevant departments and consumers. Moreover, from the field to the table, food will go through a complicated process. Therefore, to ensure the absolute safety of food, the process from planting, picking and processing to sales should be transparent. In order to ensure the safety and transparency of the food produced in the park, corresponding QR code labels are affixed to the packaged food. When purchasing, consumers scan the QR code on the product with their mobile phone, enter the query platform to query the identification label for basic information of agricultural products and related information of the park enterprises, and can feed back information to the system. This realises the supervision of the safety of agricultural products, which is conducive to the realisation and promotion of ecological agricultural products. The specific process is shown in Figure 10.

Effectiveness verification of the planning method of ecological agricultural attractions based on the concept of circular economy

Based on the concept of circular economy, this paper constructs a planning system for agricultural attractions, applies the Internet of Things system to the system, and builds an agricultural ecological attractions management model, and combines the actual experience of tourists in agricultural ecological attractions to construct an IoT module system. On this basis, this paper verifies the performance of the system constructed in this paper, and explores the planning effect of eco-agricultural tourist attractions. This article first evaluates the system’s intelligence, verifies the system performance by means of expert scoring, and analyses the system performance in combination with the simulation test research method. In the system performance verification, 78 sets of data are used to explore the operating

| Number | Expert rating Number | Expert rating Number | Expert rating |
|--------|----------------------|----------------------|--------------|
| 1 93.7  27 96.0  53 91.1   |
| 2 90.2  28 92.5  54 95.5   |
| 3 89.9  29 89.1  55 92.6   |
| 4 90.8  30 95.4  56 89.4   |
| 5 94.7  31 93.8  57 90.0   |
| 6 87.8  32 92.2  58 94.8   |
| 7 89.0  33 91.8  59 93.1   |
| 8 87.3  34 94.3  60 90.2   |
| 9 93.0  35 89.5  61 89.5   |
| 10 88.1  36 90.2  62 93.4   |
| 11 94.8  37 89.0  63 96.8   |
| 12 90.7  38 92.2  64 95.5   |
| 13 93.4  39 95.4  65 91.4   |
| 14 93.5  40 95.3  66 94.0   |
| 15 89.4  41 95.6  67 95.0   |
| 16 88.9  42 91.8  68 96.9   |
| 17 92.1  43 92.0  69 94.2   |
| 18 93.4  44 87.5  70 93.9   |
| 19 88.1  45 89.1  71 92.2   |
| 20 95.6  46 87.6  72 92.1   |
| 21 92.6  47 95.1  73 93.4   |
| 22 96.1  48 92.7  74 96.6   |
| 23 92.2  49 92.6  75 95.6   |
| 24 94.3  50 95.6  76 89.5   |
| 25 87.8  51 90.6  77 89.4   |
| 26 88.1  52 87.8  78 93.5   |

Figure 10. Traceability system of agricultural product quality.

Table 1. Statistical table of the expert score results of the planning system of agricultural attractions based on the concept of circular economy.
Figure 11. Statistical diagram of the expert score results of the planning system of agricultural attractions based on the concept of circular economy.

Table 2. Statistical table of user satisfaction of the planning system of agricultural ecological attractions based on the concept of circular economy.

| Number | Satisfaction | Number | Satisfaction | Number | Satisfaction |
|--------|--------------|--------|--------------|--------|--------------|
| 1      | 86.8         | 27     | 90.7         | 53     | 82.2         |
| 2      | 92.8         | 28     | 84.6         | 54     | 90.9         |
| 3      | 91.4         | 29     | 83.3         | 55     | 93.5         |
| 4      | 87.5         | 30     | 89.4         | 56     | 88.6         |
| 5      | 83.9         | 31     | 86.5         | 57     | 92.7         |
| 6      | 89.8         | 32     | 88.3         | 58     | 86.9         |
| 7      | 83.4         | 33     | 84.8         | 59     | 91.2         |
| 8      | 90.8         | 34     | 84.4         | 60     | 91.0         |
| 9      | 86.6         | 35     | 90.2         | 61     | 89.4         |
| 10     | 93.5         | 36     | 87.2         | 62     | 85.1         |
| 11     | 92.1         | 37     | 93.8         | 63     | 88.5         |
| 12     | 90.8         | 38     | 87.6         | 64     | 86.5         |
| 13     | 84.4         | 39     | 84.8         | 65     | 93.4         |
| 14     | 89.9         | 40     | 88.9         | 66     | 84.6         |
| 15     | 93.4         | 41     | 87.6         | 67     | 85.5         |
| 16     | 84.0         | 42     | 86.3         | 68     | 91.0         |
| 17     | 83.6         | 43     | 85.4         | 69     | 89.7         |
| 18     | 89.9         | 44     | 86.3         | 70     | 90.5         |
| 19     | 85.1         | 45     | 83.5         | 71     | 85.0         |
| 20     | 82.6         | 46     | 93.4         | 72     | 87.4         |
| 21     | 83.3         | 47     | 85.8         | 73     | 92.2         |
| 22     | 89.4         | 48     | 87.4         | 74     | 83.9         |
| 23     | 91.2         | 49     | 88.5         | 75     | 85.8         |
| 24     | 86.2         | 50     | 82.9         | 76     | 89.1         |
| 25     | 85.6         | 51     | 91.8         | 77     | 92.3         |
| 26     | 92.5         | 52     | 93.1         | 78     | 88.6         |
effects of the data in the system to evaluate the intelligence of the system. The results obtained are shown in Table 1 and Figure 11.

Through the above analysis, we can see that the agricultural attraction planning system based on the concept of circular economy constructed in this paper can effectively improve the planning effect of ecological agricultural attractions. On this basis, the satisfaction survey results of the system constructed in this paper are analysed, and the statistical results are shown in Table 2 and Figure 12.

Through the above experimental analysis, it is further proved that the planning system of eco-agricultural tourist attractions based on the concept of circular economy has a certain effect.

Conclusion

In recent years, the continuous innovation of agricultural Internet of Things technology has brought many benefits to agricultural production, such as liberating productivity, improving production efficiency, and enhancing safety. In the case of repeated construction, no special features, and no breakthrough in overall planning and design in the development of ecological agriculture, it is urgent to re-plan and design ecological agriculture from the perspective of agricultural Internet of Things, so as to achieve the goal of improving the landscape and entertainment experience of ecological agriculture. Under the interactive guidance of the related theories of the Internet of Things, Agriculture, Tourism and Landscape, this paper combines agricultural production, agricultural landscape, agricultural tourism and agricultural Internet of Things, improves the overall planning and design level of ecological agriculture, realises the sustainable development of ecological agriculture, and promotes the development of agricultural tourism and modern agriculture based on ecological agriculture. Moreover, this paper improves the information management level of ecological agriculture and realises a better experience of modern information agriculture for tourists. In addition,
through the explanation of related concepts, this paper puts forward the principles, contents and methods of ecological agriculture planning and design based on the integration of agricultural Internet of Things, and explores a new model of ecological agriculture planning and design.

Acknowledgements

2020 Zhejiang Provincial Department of Culture and Tourism, Exploration on the Path of Developing Potential and Tourisms Products Development of Health Tourism Industry in the Post-COVID 19 Pandemic Era, 2020KYC004.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by 2020 Zhejiang Provincial Department of Culture and Tourism: [Grant Number 2020KYC004].

Notes on contributors

Fengbiao Shang, associate professor of school of humanity and tourism, Yiwu Industrial and Commercial College. He graduated from Southeast University China. His research interests include tourism planning and exploitation, more than five papers published on core journals.

Wenjie Zhu, teacher of school of humanity and tourism, Yiwu Industrial and Commercial College. She graduated from City University of Hong Kong. Her research interests include tourism marketing, more than four papers published on core journals.

References

Adama IJ, Asaleye AJ, Oye AJ, et al. 2018. Agricultural production in rural communities: evidence from Nigeria. J Environ Manage Tour. 9(3):428–438.

Adat DM, Deshmukh PV, Tilekar SK, et al. 2017. Smart fusion based cSoC for wireless sensor network for agricultural applications. Int J Sci Res Sci, Eng Technol. 3(5):161–168.

Alola AA, Uzunor G. 2020. The housing market and agricultural land dynamics: appraising with economic policy uncertainty index. Int J Finance Econ. 25(2):274–285.

Alphey N, Bonsall MB. 2018. Genetics-based methods for agricultural pest management. Agric For Entomol. 20 (2):131–140.

Choo H, Park DB. 2018. Potential for collaboration among agricultural food festivals in Korea for cross-retention of visitors. J Sustainable Tourism. 26(9):1499–1515.

Corder J, Irlebeck E. 2018. Agricultural communications skills, abilities and knowledge desired by employers compared to current curriculum: a literary review. J Agric Educ. 59 (4):177–193.

Douthwaite B, Apgar JM, Schwarz AM, et al. 2017. A new professionalism for agricultural education research for development. Int J Agric Sustainability. 15(3):238–252.

Duan X, Chan C, Marafa LM. 2019. Does authenticity exist in cultural theme parks? A case study of millennium city park in Henan, China. J Tourism Cult Change. 17(3):321–338.

Easterly III RG, Myers BE. 2017. You seize what pops up: a qualitative investigation of the core features of school-based agricultural education professional development. J Agric Educ. 58(3):056–071.

Ebert CE, Hoggarth JA, Awe JJ, et al. 2019. The role of diet in resilience and vulnerability to climate change among early agricultural communities in the Maya Lowlands. Curr Anthropol. 60(4):589–601.

Fitz-Koch S, Nordqvist M, Carter S, et al. 2018. Entrepreneurship in the agricultural sector: a literature review and future research opportunities. Entrepreneurship Theory Practice. 42(1):129–166.

Flachs A, Richards P. 2018. Playing development roles: the political ecology of performance in agricultural development. J Political Ecol. 25(1):638–646.

Gupta N, Gupta S, Khosravy M, et al. 2021. Economic IoT strategies: The future technology for health monitoring and diagnostic of agriculture vehicles. J Intell Manuf. 32(4):1117–1128.

Kansanga M, Andersen P, Kpienbaaeh D, et al. 2019. Traditional agriculture in transition: examining the impacts of agricultural modernization on smallholder farming in Ghana under the new Green revolution. Int J Sustainable Dev World Ecol. 26(1):11–24.

Krcmářová J. 2020. Loss of agroforestry: symbolic annihilation of mixed cultures in 19th century agricultural science. Eur Countryside. 12(4):618–635.

Lee Ji, Kwon JW. 2017. Strategy and basic planning for creating an urban agricultural park-focusing on Gosangol Village in Daegu City. J Korean Inst Landscape Archit. 45 (4):23–34.

Lintern A, McPhillips L, Winfrey B, et al. 2020. Best management practices for diffuse nutrient pollution: wicked problems across urban and agricultural watersheds. Environ Sci Technol. 54(15):9159–9174.

Mangalraj P, Sivakumar V, Karthick S, et al. 2020. A review of multi-resolution analysis (MRA) and multi-geometric analysis (MGA) tools used in the fusion of remote sensing images. Circuits Syst Signal Process. 39(6):3145–3172.

Marcis J, Bortoluzzi SC, de Lima EP, et al. 2019. Sustainability performance evaluation of agricultural cooperatives’ operations: a systemic review of the literature. Environ, Dev Sustainability. 21(3):1111–1126.

Mueller NG, Fritz GJ, Patton P, et al. 2017. Growing the lost crops of eastern North America’s original agricultural system. Nat Plants. 3(7):1–5.

Park JH, Oh CS. 2018. The utilization of urban park for the activation of rural area-focus on the Baelyeonje nearby tourism
Roberts R, Robinson JS. 2018. The motivational changes pre-service agricultural education teachers endure while facilitating quality supervised agricultural experiences: a six-week project-based learning experience. J Agric Educ. 59(1):255–270.

Tong Y, Shu B, Piotrowski M. 2019. Migration, livelihood strategies, and agricultural outcomes: a gender study in rural China. Rural Sociol. 84(3):591–621.

Turner PAM, Ximenes FA, Penman TD, et al. 2019. Accounting for biodiversity in life cycle impact assessments of forestry and agricultural systems—the BioImpact metric. Int J Life Cycle Assess. 24(11):1985–2007.

Vangala A, Das AK, Kumar N, Alazab M. 2020. Smart secure sensing for IoT-based agriculture: blockchain perspective. IEEE Sensors J. 21(16):17591–17607.

Zamani N, Mohammadi M. 2018. Entrepreneurial learning as experienced by agricultural graduate entrepreneurs. High Educ. 76(2):301–316.