

Research Article

Prospects of Guizhou Province's Ecological Agriculture Benefit Evaluation Index System

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Accepted 22 October 2019*Keywords*Ecological agriculture
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benefit evaluation index system**ABSTRACT**

Ecological agriculture is a major reform in the history of world agriculture. The study of ecological agriculture benefits is of great significance to the development of ecological agriculture. In this paper, by referring to the evaluation index system of ecological agriculture at home and abroad, and according to the actual situation of the development of ecological agriculture in Guizhou Province, it is introduced into the evaluation of ecological agriculture benefits in Guizhou Province, and established the evaluation index system of ecological agriculture, which has certain practical and theoretical significance for the evaluation of the development of ecological agriculture in Guizhou Province.

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This is an open access article distributed under the CC BY-NC 4.0 license (<http://creativecommons.org/licenses/by-nc/4.0/>).**1. INTRODUCTION****1.1. Ecological Agriculture**

Ecological agriculture is developed using modern scientific and technological achievements and modern management methods, drawing on the effective experience of traditional agriculture, using ecological principles and economic principles. Ecological agriculture is a modernization that can obtain higher economic, ecological and social benefits of agriculture. Eco-agriculture requires that chemical fertilizers and chemical pesticides are not used, and that the use of farm manure increases soil fertility, uses biological methods to control crop diseases and insect pests, and protects the living environment.

Ecological agriculture is a type of agriculture that is dominated by ecological theories, and uses a systematic engineering method, based on the premise of rational use of agricultural natural resources and protection of a good ecological environment, and plans, organizes, and conducts agricultural production according to local conditions. Utilization rate, conversion rate of bioenergy, recycling utilization rate of waste, etc., to promote the recycling and multiple reuse of materials within the agricultural ecosystem, with as little input as possible, and get as much output as possible, and obtain the unified comprehensive effects of production development, energy reuse, ecological environmental protection, economic benefits, etc., and put agricultural production in a virtuous circle.

Ecological agriculture has high ecological, economic and social benefits, and is one of the important components of agricultural modernization. It has a great impact on the sustainable

development of agriculture. In the 1920s, ecological agriculture first emerged in Europe, and in this concept was first proposed by American soil scientist Will Albert Wedge in 1970, and it has been developing slowly until the early 1990s. Western governments officially introduced ecological agriculture to the field of agricultural development [1], and systematically explained various models of eco-agricultural development in foreign countries [2]. With the development of agricultural modernization, eco-agriculture has received widespread attention from Chinese government departments and scholars in the 21st century. Compared with the traditional agricultural development model, eco-agriculture pays more attention to sustainability and coordination of agriculture, resources and environment [3]. Ecological agriculture mainly solves how to promote the coordinated development of agricultural economy and resources, the environment, and optimize the economic, ecological and social benefits of agriculture. Agricultural development is of great significance.

The development of ecological agriculture is the focus of implementing sustainable development strategies. China is a developing country. The prerequisite for sustainable development is development. Poverty cannot reach the goal of sustainable development. In order to improve social productivity, enhance comprehensive national strength and continuously improve people's living standards we must give top priority to economic development. While maintaining sustained, rapid, and healthy economic development, we must pay attention to the rational use of resources and the continuous improvement of the environment. It should be noted that the implementation of sustainable development strategies is a long-term process. International, regional, national, or local sustainable development strategies should be based on currently formulated reasonable economic, social, ecological and environmental policies and plans, and coordinate with each other. Ecological

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agriculture focuses on the pursuit of ecological benefits, emphasizes the self-sustainment of biological processes in agricultural production, and seldom considers economic benefits. China is a large agricultural developing country. At present, in the process of rapid economic growth, it faces the existence of many developed countries in the world. Problems such as insufficient resources and environmental pollution, as well as a large population and relative resources, the problems of lack of economy, underdeveloped economy, extensive operation, and low level of productivity, so we cannot copy the practices of developed countries. Instead, we should explore a new way of investing in provinces with good returns and pursue sustainable development in accordance with China's national conditions and economic affordability. Specifically, China's ecological agriculture should be based on a careful summary of the rich production practices accumulated in China's rural areas for thousands of years, learn from foreign experience in ecological agriculture, and take development as the primary goal. Ecological agriculture is based on the premise of increasing agricultural comprehensive production capacity and increasing farmers' income. It goes without saying that the focus of China's agricultural implementation of sustainable development strategy is to develop ecological agriculture, which is an inevitable requirement of China's national conditions.

The development of ecological agriculture is the only way for Guizhou Province to achieve sustainable agricultural development and agricultural modernization. As a "underdeveloped" western province, Guizhou is one of the typical economic and agricultural poor provinces. Guizhou's agricultural development faces many problems and many people. The lack of land, ecological fragility, weak foundation, and low comprehensive agricultural production capacity have always restricted Guizhou's economic development. At the same time, Guizhou's ecological environment belongs to the extremely fragile karst landform mountain area. It is a mountainous agricultural province without plain support. In ecological agriculture construction there are various problems and difficulties. Poverty in rural Guizhou is the root of the problem, and the lack of food and self-sufficiency is the core of the problem. The agricultural development of Guizhou's karst areas is facing a growing agricultural population, a fragile agricultural environment, worsening. There are a series of very serious problems such as the lack of agricultural resources such as water and land resources, backward economic development in rural areas, low average annual income of farmers, and slow economic growth. Therefore, the construction and development of ecological agriculture will affect the whole of Guizhou. Increased economic growth rate. Ecological agriculture is a comprehensive agriculture, because the comprehensive development of agriculture, forestry, animal husbandry, fisheries and the joint operation of agriculture, industry and commerce in accordance with local conditions and conditions will not only help solve the problem of the transfer of rural surplus labor to non-agricultural industries, but also gradually develop regional products to drive rural people out of poverty and become rich. Continuously increasing farmers' income has played an important role in building a new socialist countryside.

Guiyang is the provincial capital of Guizhou. In April 2012, the Guiyang Municipal People's Government issued Guiyang's implementation opinions on adhering to the path of ecological agriculture development and accelerating the adjustment of the agricultural industrial structure. In order to seriously implement the Central

and Provincial Party Committee Rural Work Conference, the city The spirit of the Ninth Party Congress, and the implementation of the spirit of the "Opinions of the People's Government of Guiyang Municipality of the Communist Party of China on Vigorously Developing Ecological Agriculture," the local governments adopted the concept of ecological cluster economic development, highlighting regional advantages, breaking administrative boundaries, and implementing Regional vertical and horizontal integration and vigorous development of ecological agriculture. Therefore, vigorously developing high-efficiency ecological agriculture with Guizhou characteristics and in line with Guizhou's actual conditions will be an effective way to comprehensively solve the agricultural development in Guiyang.

1.2. Foreign Research Status

Foreign studies on ecological agriculture started earlier than domestic ones. The agricultural development of western developed countries generally first experienced the modern agricultural stage. After the high-input and -output production process, the ecological environment was caused great damage, and the government began to reflect on it. And gradually embarked on the path of ecological agriculture. We will summarize it as "destroy first, then protect". At present, western countries have made world-renowned achievements in the development of ecological agriculture, and foreign countries' evaluation and research on ecological agriculture systems are gradually being carried out. From the perspective of evaluation content, foreign scholars usually focus on the evaluation of construction effectiveness, and combine economic, ecological and social benefits for comprehensive evaluation. Barnet et al. [4] summarized various indicators that can be used to measure sustainable agricultural development, including the total factor productivity index (P), and the input-output ratio related to soil health index, and concluded that the Tornqvist-Theil index is the most suitable for estimating the sustainable agriculture. The Tornqvist index used to measure the growth of Total Factor Productivity (TFP) is an exact index, and the Tornqvist index is a measure of the Divix index. Obtained by discrete approximation. Herdt and Steiner [5] pointed out that the sustainable development capability of the system should be measured from three aspects: biophysical, economic, and social benefits. Nowadays, the more widely used evaluation systems include TFP, Actuator Sensor Interface (ASI) and other systems, but due to TFP There are some disadvantages that cannot accurately measure the role of sustainable development in the system, and this is exactly the basis for the sustainable and stable development of agriculture. There are also systems that focus on the evaluation of ecological benefits and cannot compare different ecological agricultural systems. Foreign studies on ecological agriculture mostly focus on evaluation methods, evaluation criteria, and evaluation index systems. Among them, the design of evaluation systems is the focus of ecological agriculture evaluation. In recent years, most of the foreign countries have adopted frameworks for the creation of ecological agriculture evaluation systems. Systems, such as goal-oriented-concept-system-stress-state-response-system, etc., the development trend of evaluation methods has gradually changed from qualitative analysis to quantitative evaluation analysis, of which the research on index method is more and more mature, and it also appears newer methods, such as gray system theory, fuzzy mathematical statistics, etc., and more evaluation content focus on con-

struction effectiveness. Barnett also believes that the Tornqvist-Theil index is the best factor for assessing agricultural sustainability, and he has constructed various indicators to measure the sustainable development of agriculture. In terms of economic benefits, agricultural costs, agricultural production, agricultural profits and other indicators are usually selected. In terms of ecological benefits, it is mostly evaluated from the aspects of energy conversion, ecological environment status, and nutrient conversion.

How to develop ecological agriculture in poor and backward areas does not provide practical experience for our country, so we must study the development path of ecological agriculture suitable for our country on the basis of learning from foreign experiences, but we must not go abroad to “damage first, then protect” “old road”.

1.3. Status of Domestic Research

Although domestic research on ecological agriculture started relatively late, in recent years China has made great breakthroughs in the development of ecological agriculture. Li and Zhu used a combination of qualitative analysis and quantitative judgment to build a three-level, 18 An index system for evaluating the comprehensive benefits of ecological agriculture based on specific indicators, using the Analytic Hierarchy Process (AHP) method to calculate the weight of each indicator, using the method of fuzzy membership function to perform dimensionless processing, and linearly weighting the function of each indicator's weight and dimensionless value. Finally, the comprehensive benefit index of ecological agriculture is calculated, and the statistical analysis method of comprehensive benefits is provided [6]; Zhou [7] established the comprehensive benefit index system of ecological agriculture, specifically analyzed the development status of ecological agriculture in counties in Jiangsu Province, and proposed the realization The path of ecological agriculture; Jun and Jianmin used the AHP method and followed a series of paradigms to build an indicator system for the development of China's ecological agriculture and reached the final conclusion: the most important factors affecting the development of ecological agriculture is the main body of agricultural production and the benefits of agricultural production; according to the principles of systems engineering, Ye et al. [9] use the principle of combining AHP and mathematical statistics to study and establish an ecological agricultural comprehensive benefit evaluation system with three sub-benefits of ecological and environmental benefits, economic benefits and social benefits, and divide the three sub-benefits into several specific indicators. AHP calculates the index weight coefficient of the contribution of the specific response index. After obtaining the weighted index value of each index, it is summed to obtain the sub-benefit and comprehensive benefit values. Zhu and Ma [10] established a comprehensive benefit indicator system for ecological agriculture, analyzed the development of ecological agriculture in counties in Jiangsu Province, and proposed a path to achieve ecological agriculture. Zhao and Fu [11] proposed an effective projection pursuit (PP) model using the projection direction information to evaluate the development level of ecological agriculture and provide a basis for decision-making for the rational construction of ecological agriculture. Yang et al. [12] analyzed the system coupling relationship between ecological agriculture and tourism from the perspective of industry coupling, and concluded that the development

of eco-agriculture not only promotes ecological benefits, it can also make a great breakthrough in economic benefits, especially in the ecological tourism industry. Wang [13] and others comprehensively used the analytic hierarchy process and Delphi method to discuss the comprehensive evaluation index and the weight of each index. Deng and Xiao [14] used a multi-level fuzzy evaluation method to evaluate ecological agriculture. Wang used factor analysis to analyze the impact. The factors of comprehensive benefits of ecological agriculture are divided into comprehensive capacity factors, balance capacity factors and sustainable capacity factors. Based on the data indicators of 18 provinces and municipalities in Henan Province, a neural network model is constructed for simulation testing. The comprehensive agricultural benefits are ranked, and it is found that the comprehensive capacity factor has the greatest impact on the benefits of ecological agriculture. Therefore, we should start from the aspects of increasing the economic output ratio, accelerating the transfer of rural surplus labor, increasing the per capita net income of farmers, and the comprehensive production capacity of ecological agriculture. In the development of ecological agriculture, Li and Zhang [16] explored the efficiency, regional differences, and influencing factors of agricultural waste conversion and utilization from the perspective of industrial linkage, and pointed out that the current scale efficiency of the development of the ecological edible fungus industry in China is low, which is the development of the ecological edible fungus industry seeking a path breakthrough.

Domestic scholars have systematically researched and discussed the development of the system of eco-agriculture and the sustainable development of eco-agriculture. According to the above research, the comprehensive benefits of eco-agriculture have become a hot topic that society and scholars pay close attention to, so based on the previous literature, this article explores how to construct an index system for evaluating the benefits of eco-agriculture through field investigations in parts of Guizhou Province, with a view to providing a reference for the development of eco-agriculture in Guizhou Province.

2. DETERMINATION OF GUIZHOU PROVINCE'S ECOLOGICAL AGRICULTURE BENEFIT EVALUATION INDEX SYSTEM

2.1. Principles for Setting up an Ecological Agriculture Indicator System

The term indicator is derived from the Latin indicator. It has the meaning of revealing, indicating, or making the public aware. It is a “sign” that reflects the characteristic information of things. According to the different forms and functions of indicators, it can be divided into quantitative indicators and non-quantitative indicators are qualitative indicators. Both types of indicators can reflect the “quality” of things. Indicators can make concepts and theories easier to understand and operate, the goals are clear and clear, and people's actions and efforts are more effective. During monitoring, the indicator system is a structural system that can comprehensively reflect all aspects of “characteristics” of the characteristic information of things.

For the evaluation of the benefits of ecological agriculture, we must examine the ecological agriculture indicator system of Guizhou Province from the perspective of systems science. At the macro level, we must fully consider the characteristics of the integrity, dynamics, hierarchy, and diversity of the system. We must also consider that the eco-agricultural indicator system is a large system with a strong hierarchy. In this large system, there are multiple subsystems, and each subsystem contains many single indicators according to the system's coherent action principle and diversity characteristics. When we establish the ecological construction indicator system of Guizhou Province, we must try to be comprehensive and not repeated.

The indicator system is used to describe and evaluate the goals, conditions, levels, and trends of ecological agriculture construction in Guizhou Province. The basic purpose is to seek a set of characteristic indicators that have typical representative meanings and can comprehensively reflect all aspects of ecological construction requirements. These indicators and their combinations can appropriately expressing people's quantitative judgments on the construction goals of ecological agriculture. This requires us to start from the system structure and elements of ecological agriculture when researching the indicator system, and set the indicators based on some basic principles. It is generally believed that the following principles should be followed:

- (1) Purpose: The evaluation index system must be able to reflect the final effect of the comprehensive benefits of ecological agriculture.
- (2) Comprehensiveness: The evaluation system can systematically reflect the organic unity of ecological, economic and social benefits.
- (3) Scientific: The selection of evaluation indicators must strictly abide by certain principles of ecological economics, and the evaluation methods selected should be able to be weighed and expressed quantitatively using modern means as far as possible.
- (4) Importance: Ecological agriculture is a complex system. For the current production status and development trend, it is necessary to choose indicators that can reflect the final effect.
- (5) Comparability: The selected index can be quantified without dimensions, and it is easy to collect, and it is feasible and comparable within the range.

2.2. Setting of Guizhou Province's Ecological Agriculture Index System

Based on the principle of the selection of the above index system, this article combines the actual investigation of Guizhou Province, selects the ecological agriculture benefit evaluation index from the theoretical and practical aspects, and builds an evaluation index system based on this. The constructed evaluation index system can be comprehensively reflected. In the development of ecological agriculture in Guizhou Province, the following factors are considered when selecting evaluation indicators:

1. Eco-agriculture in our country is an agricultural eco-economic composite system with synergistic growth of economic, ecological and social benefits established in accordance with

the principles of ecology and economics, and the structure and function of which are constantly optimized within different ecological conditions and business scopes. The selection of methods and indicators should conform to the following principles: (1) Whether the system structure of ecological agriculture is optimized depends on whether it can increase the biomass production and conversion efficiency, and the focus should be on the evaluation of the system's function. (2) The economic benefit is the primary purpose of building ecological agriculture. Whether the system structure is reasonable depends on whether the resource advantage can be converted into the product advantage and the commodity advantage to the greatest extent. The development speed of commodity production is the key to measuring economic benefits. (3) Social benefits are related to the material and cultural living standards of the rural population. The selection of evaluation indicators should reflect the relationship between people and the system, and the indicators that are most closely related to the function of the system should be found. (4) Environmental benefits are related to urban and rural areas, people's production and life, and the ecological and social benefits produced by a beautiful, comfortable, and pollution-free environment are difficult to calculate by value, but they can be comprehensively reflected using fuzzy evaluation methods. (5) The evaluation index system must finally reflect the overall effect of the system, and it must consider dynamic changes, compare history with the current situation, and predict the development trend. (6) The source of the variables for the evaluation index cannot be separated from the existing statistical system, but also convenient for the necessary field surveys, measurements, and supplements.

Therefore, based on the above principles, this article summarizes the comprehensive benefits of Guizhou's ecological agriculture into three aspects, namely: ecological benefits, economic benefits and social benefits. These three indicators are highly unified, and these three indicators should be fully considered when evaluating. Level and status.

2. Eco-agriculture is a regional and composite agricultural production system. It is a composite agricultural ecosystem that is a combination of natural and economic systems under artificial control. Therefore, it is necessary to consider the agricultural ecosystem and macroeconomics in a comprehensive manner. Restrictive and coordinated relationships between systems and social systems.

2.3. Development Status of Ecological Agriculture in Guizhou Province

On the premise of theoretical factor analysis, combined with the actual situation in some areas of Guizhou Province, through field surveys and data collection of various factors affecting eco-agriculture, the current status of the development of eco-agriculture in Guizhou is deeply explored:

1. Jiuzhou Town, Anshun City, Guizhou Province is one of the top 10 historical and cultural towns in Guizhou Province and one of the 20 national villages and towns that are important for protection and construction. It is one of the five economically strong

towns in southeast Guizhou. Acres, of which 65,000 acres of land are occupied; 86,000 acres of forest and grassland, 104,000 acres of pasture grassland; 15,000 acres of economic fruit forest. The old state has a milder environment and abundant rainfall, which belongs to the subtropical warm and humid climate, with an average annual rainfall of 1121 mm. The temperature is 15.7°C, which is a relatively high-yield commodity grain and livestock base in the eastern part of Guizhou.

In addition, the local environment is pleasant and it is very suitable for agricultural development. At the same time, its cultural tourism is developing. The unique “Tunbao” culture is a cultural treasure accumulated by the accumulation of local history. This shows that the old state has been a town suitable for survival since ancient times. The agricultural products are rich, and the development of the original ecological agriculture has well protected the local environment and climate. The development of ecological agriculture in Jiuzhou Town has a high degree of correlation with the development of human history, population, and fertilizer use, such as per capita farmland, Factors such as the per capita net income of farmers have an effect on the development of eco-agriculture by affecting the production consciousness of farmers in the cultivated land. Projects such as the “mountain river south” tourism complex attract agricultural transfers to the towns and beautiful villages, while concentrating small towns The combination of construction and relocation of poverty alleviation in different places will relocate the poor households living in areas with extremely poor public security conditions, fragile ecological environments, and frequent natural disasters. They will be concentrated near the townships and help them find employment.

Xinwan Modern Agricultural Industry Ecological Core Demonstration Park in Xinwan Village, Jiuzhou Town surrounds the fange industry and serves as a key project of characteristic agricultural upgrading projects. The demonstration park promoted the adjustment of agricultural structure, boosted farmers’ income, and made a solid step forward in the construction of ecological villages.

2. Xifeng County is a county under the jurisdiction of Guiyang City, Guizhou Province. It is located in the Qianzhong Economic Zone in Guizhou Province and is an important

area for ecological protection in Guiyang City. Its total area is 1036.5 km² and the total population in 2013 was 260,000. The area is located in the northern subtropical and southern temperate monsoon climate zone. The climate is more suitable for living and pleasant. The average annual rainfall is 1111 mm and the temperature is 14.5°C. It has the three-dimensional characteristics of “one mountain with four seasons and ten miles of different days” in climate. The growth of a variety of agricultural and forestry crops in the warm temperate zone. In 2013, the per capita disposable income of rural residents in Xifeng County was 8988 yuan; the total agricultural output value was 1.432 billion yuan; the total grain output was 67,400 tons. Figure 1 shows the interest rate in October 2015 County survey.

Through field investigations in Xifeng County, we found that the local place attaches great importance to the protection of the ecological environment and the rich growth of agricultural and forestry vegetation. This not only protects the ecological environment, but also provides important support for the development of ecological agriculture. At the same time, the sales of agricultural products is high, which indicates that local agriculture is more developed, and in addition, the quality of agricultural products is high, and original agricultural products are favored by the consumer market, which indicates that the development of ecological agriculture is positively related to factors such as the degree of forest coverage and the degree of commercialization of agricultural products. Forest coverage is an important indicator for evaluating the benefits of ecological agriculture in Guizhou, and the degree of commercialization of agricultural products is also an important indicator for evaluating the economic benefits of ecological agriculture in Guizhou.

At the same time, the climate of many villages in Xibei County is due to the special micro-climate formed by the Wujiang Reservoir area, the agricultural infrastructure is weak, and farmers’ incomes are increasing slowly. In recent years, with the support of higher authorities, they have been actively seeking funds and projects due to the situation. Qianben Village, Liuchang Township, Xi’an County has helped farmers to grow fruit trees in seedling subsidies, technical training, marketing, and infrastructure construction. The potential rich function of agriculture, seized the favorable time for the Xisha Jinsha



Figure 1 | Survey of Xifeng County, Guiyang City, Guizhou Province, October 2015.

Wujiang Bridge to be completed and opened to traffic, and hired experts from Guizhou Province to carry out scientific planning for the planting of many rural fruit forests, focusing on the creation of Qianben Pear, Xiaonanjiang Orange, Yingzhong The “four” fruit bases of purple grapes and tea garden jujube and pears are used to develop ecological agriculture and promote farmers to become rich. Through this survey, we have provided some ideas for the study of the ecological agricultural indicator system in Guizhou Province. We can study from economic benefits and other aspects The impact of agricultural product commodity rate and economic output-to-investment ratio on ecological agriculture.

On August 11, 2015, Xiyi County introduced the Linyiju Modern Leisure and Tourism Ecological Agriculture Industrial Park project, which adopts the company + cooperative + farmer model and relies on the modern tourism ecological agriculture project built in the tourism resources of the Wujiang Reservoir Basin. Mainly, the development of a core area of 0.2 acres in Yanglongsi Town has formed a demonstration driving effect, driving seven towns including Yongjing Town, Xiaozhaiba Town, Shijie Town, Qingshan Miao Township, Jiuzhuang Town, and Luwo Township. The towns and villages form a radiation zone. At the same time, the ecological agriculture demonstration zone in Xifeng County has been officially listed, which shows that the vigorous development of ecological agriculture in Xifeng County has produced certain benefits.

3. Liupanshui City, Guizhou Province is called “China’s Liangdu”. It is located in the west of Guizhou. At the end of 2013, Liupanshui covers an area of 9965 km². It has a humid climate zone in the north subtropical monsoon climate 14°C. According to the 2010 national census data survey, the number of permanent residents was 2.85 million, which is seventh in Guizhou Province. Compared with 2000, the birth rate decreased by 8.9%, the natural growth rate decreased by 7.7%, and Liupanshui Most of the local population has gone out to work in recent years, and the situation of left-behind children and women is more obvious.

Figure 2 is part of the results of a survey in Liupanshui City, Guizhou Province in November 2015. Through the survey, we found that the local natural environment is superior and there are

extensive agricultural production areas and natural conditions. However, as the labor force continues to work outside, with the continuing shortage of labor for future generations, and the prospect of left-behind children receiving education is not optimistic, which has caused the problem of insufficient motivation for the development of eco-agriculture. This article believes that the consideration of the comprehensive benefits of eco-agriculture should consider the number of rural surplus labor and the education level of the labor. Indicators such as population growth rate and population growth rate are included in the system construction. The number of rural surplus labor force, labor education level, and rural population growth rate are the social benefits in the study of ecological agriculture benefits in Guizhou Province, which is conducive to the development of rural human resources in Guizhou Province. To open up employment opportunities for the remaining millions of labor in rural areas. Ecological agriculture is a comprehensive agriculture that comprehensively develops agriculture, forestry, animal husbandry, vice, fisheries, and joint operations of agriculture, industry, and commerce in accordance with local conditions, which is beneficial to Guizhou Provincial poverty-stricken areas to solve the problem of the transfer of rural surplus labor to non-agricultural industries, But also the gradual development of the region competitive products, promote rural masses to become rich, have an important role in building a new socialist countryside. The Liupanshui research will certainly help to build social indicators of ecological agriculture.

At the same time, National Agricultural Science and Technology Office [2015] Document No. 76 approved “Guizhou Liupanshui National Agricultural Science and Technology Park” as the seventh batch of national agricultural science and technology parks. Guizhou Liupanshui National Agricultural Science and Technology Park is divided into three areas: core area, demonstration area, and radiation area. The overall layout is divided into “four parks, one belt and one center”, including Panxian Pear Industrial Park, Liangdu Kiwi Industrial Park, Shuicheng Taxus Industrial Park, Liuzhi Konjac Industrial Park, and Dalaxianguniangniang. The mountain plateau ecological wetland health tourism belt, high-tech technology incubation platform and industrial service center, with the core of increasing the income of the poor and poverty alleviation, industrial development and capacity building as the starting point, focusing on the goal of building a “modern and highly efficient agriculture”, focusing on



Figure 2 | Survey of Liupanshui City, Guizhou Province, November 2015.

creating advantageous features. The agricultural industry focuses on scientific and technological innovation transformation capabilities, scientific and technological entrepreneurship service capabilities, driving industry development capabilities, and increasing farmers' income to become rich. It promotes scientific and technological research and development, technical training, information networks, and infrastructure construction; a new journey of poverty.

2.4. Construction of Guizhou Ecological Agriculture Benefit Index System

On the basis of the above research, the selected indicators were collected according to the actual situation of Guizhou Province, and the highly relevant and difficult to identify indicators were further eliminated, and finally a three-level ecological agricultural benefit evaluation with a total target, three sub-targets, and 22 specific indicators was formed. Index system: Based on the collection of relevant opinions, through analysis and screening, construct the index system shown in Table 1.

Based on field investigations and investigations, through analysis of the relevant theoretical content of ecological agriculture development, the following policy implications for ecological agriculture development are proposed:

1. Intensify the government's support and protection for ecological agriculture.

The government should formulate relevant policies for the reasonable transfer of land. The high efficiency of ecological agriculture development must form economies of scale, and the government must formulate corresponding policies to allow reasonable transfer of land, improve agricultural efficiency

to form economies of scale, and promote the implementation of ecological agriculture. Vigorously strengthen government support establish a reliable and stable input system. At present, the agricultural development of developed and newly industrialized countries is inseparable from the country's vigorous support. Aimed at the shortage of agricultural funds and insufficient investment in Guizhou Province, the establishment of a sustainable agricultural development system attention should be paid to the adjustment and application of input policies. On the basic policy of stabilizing the rural joint production contract responsibility system, it is necessary to strengthen the leadership of ecological agriculture, especially paying attention to establishing typical models and organizing promotion in time. Through typical demonstrations, mobilize the enthusiasm of the majority of farmers to lead the masses to modernize ecological agriculture. Due to the characteristics of agriculture, while actively exploring collective, individual, foreign investment and other input channels, the state input should still be the main channel, and a stable input ratio should be gradually defined. In the national income distribution pattern, the establishment of fixed funding channels for investment is inherent special funds for water conservancy construction, cultivated land reclamation, and agricultural wasteland should be opened as soon as possible. Due to the large price gap between industrial and agricultural products, the prices of agricultural production materials (fertilizers, pesticides, mulch, diesel, etc.) have risen sharply, which is difficult for farmers alone continue to increase agricultural inputs, so increasing agricultural inputs is the key to increasing agricultural stamina for sustainable and rapid development. Of course, it is also necessary to classify inputs scientifically, highlight priorities, clarify responsibilities, and prevent interception and misappropriation. To ensure timely arrival and produce maximum benefits.

Table 1 | Evaluation index system of comprehensive benefits of ecological agriculture in Guizhou Province

The target layer	First grade indexes	The secondary indicators
The evaluation index system of comprehensive benefit of ecological agriculture in Guizhou	Ecological benefits	Forest cover success rate Water and soil loss area ratio System vulnerability Organic matter content of soil The system energy ratio Farmland irrigation area accounted for saving Land cropping index
	Economic benefits	The per capita net income of rural areas Farmers per capita occupancy of grain The VCR Agricultural land productivity Agricultural labor productivity Agricultural and sideline products processing capacity Agricultural machinery use intensity The first total industrial production of Gross Domestic Product (GDP)
	Social benefits	Rate of the rural population health Rural labor force employment proportion of the population Engel coefficient Agricultural science and technology contribution ratio The urbanization level Forage-livestock system of agricultural and sideline products Fixed number of year of the rural labor force per capita by education

2. Improve the rural financial system and strengthen regulations.

At present, the scale of rural areas is small and the ability to resist risks is low. Large-scale funding is needed to implement ecological agriculture, so Guizhou should increase the bank's credit for agriculture. The state should allocate special funds to support the pilot work of ecological agriculture in Guizhou Province and improve the financial system. Increase farmers' income and encourage farmers to invest in the construction of ecological agriculture. Ecological agriculture is a revolution in agriculture, which has transformed agriculture from a traditional production method to a new one. To regulate people's behavior. According to the actual situation of Guizhou, we should formulate laws and regulations that are suitable for Guizhou, and we can learn from the advanced ideas and successful experiences of agricultural development in western developed countries to ensure the healthy development of regional ecological agriculture.

3. Establish a technical system suitable for agricultural development in Guizhou Province.

In the construction of ecological agriculture, the establishment of a technological system suitable for agricultural development in Guizhou is a guarantee for the sustainable development of agriculture in Guizhou. Advanced and practical agricultural technology is the main means and basic work for current agricultural growth, and it is also one of the main indicators for measuring the contribution rate of science and technology. To strengthen and improve agricultural science and technology innovation capacity, reserve capacity, and transformation capacity. Implement a closer integration of agriculture, science and education, grasp major scientific research projects that affect grain development in Guizhou Province, and effectively strengthen supporting facilities focusing on the selection and improvement of major grain and oil crops. Research on technology and original technology should promote high-yield, stable-yield, high-quality crop varieties according to local conditions. According to the basis of past work, the following technologies should be promoted: construction of hybrid seed production bases and construction of seed projects to ensure self-sufficiency of hybrid seeds; May adopt the results of the new technological revolution, advanced practical technologies and various supporting measures to improve cultivation techniques, implement intensive cultivation and increase the output rate of agricultural products; strengthen infrastructure construction, promote efficient water-saving irrigation technologies, improve agricultural production conditions, and improve agricultural disaster resistance disaster prevention capabilities to lay a solid foundation; it was found in the agricultural process that the use of pesticides and chemical fertilizers is very large, resulting in pollution of water resources and soil, so reducing the use of pesticides and using biological fertilizers is the key to the construction of ecological agriculture. At the same time, we must increase fertilizer inputs and expand green fertilizers. Optimize fertilizer use technology; improve soil and land, increase slope and ladder improvement, expand the use of biotechnology, increase cultivated land, and improve the quality of cultivated land; use advanced technology to prevent various disasters and reduce losses; organize large-scale high-quality and high-yield demonstration projects

Efforts should be made to increase the scientific and technological content of agricultural products and achieve a comprehensive and balanced increase of agricultural products.

4. Improve agricultural ecological conditions.

At present, due to the low efficiency of grain production in Guizhou, land, capital, technology, labor and other factors of production flow from grain production to other industries, resulting in insufficient agricultural infrastructure, reduced disaster resistance, and worsening agricultural ecological conditions. In order to further improve agricultural ecological conditions, construction a good agricultural ecosystem must first strengthen the construction of farmland water conservancy and other infrastructure in various regions of Guizhou Province, improve agricultural ecological conditions, and develop ecological agriculture. Governments at all levels must closely integrate the construction of ecological agriculture with the strategic goals of the western development. Make ecological agriculture construction an important part of the region's economic and social development goals. Second, we must make full use of market mechanisms to promote the continuous improvement and development of the joint production contract responsibility system, strengthen the protection of cultivated land, and accelerate the construction of basic farmland protection areas. Investigate and punish violations of national interests such as illegal land occupation, excessive land grants, and the use of powers to substitute laws. Take back barren land, expand cultivated land resources, further improve the land contract system, and improve collective unified management. Combine adjustments to the agricultural structure and improve the agricultural ecological environment. Natural ecological characteristics of Guizhou Province, karst vegetation should be protected to prevent soil erosion, gradually establish a new industrial economic structure that focuses on the development of forestry and animal husbandry products and combines agriculture, forestry, and animal husbandry, rational use of natural resources, and gradually establish a virtuous cycle of agricultural ecology. Finally, we must strengthen the environmental management of township and village enterprises and protect the agricultural ecology. Environment: According to the state's regulations for township and village enterprises, develop industries that are pollution-free and less polluting according to local conditions, and carefully investigate industries that are more polluted, carry out technical transformation and environmental treatment within a time limit, and meet emission standards in accordance with national regulations. The development of township and village enterprises in the protection of agro-ecological environment, and the protection of agro-ecological environment in the development of township and village enterprises.

5. Strengthening the popularization and education of the sustainable development strategy of ecological agriculture in Guizhou Province.

The construction and development of agro-ecological environment is not only a problem of agricultural production development, but also related to the implementation of the entire economic development strategy of Guizhou Province. It can only be done by the joint efforts of the cadres and the masses. One of the main reasons for the serious pollution and destruction of the agricultural environment in Guizhou Province It is because people lack understanding of the serious consequences

of environmental pollution and ecological damage, and do not act in accordance with ecological laws and sustainable development strategies. Therefore, strengthening the popularization and education of ecological agriculture and sustainable development strategies has become a protection and construction of agricultural ecology an important issue for the environment. In addition, the environmental protection legal system should be one of the components of China's socialist legal system construction. Popular legal knowledge should include the content of environmental law, vigorously publicize the principles and policies of environmental protection, and environmental protection regulations. The vast number of cadres and the masses pay attention to the protection of the agricultural environment and consciously abide by the law.

3. SUMMARY OF INDICATOR SYSTEM CONSTRUCTION

1. Through the study of the above indicators, a more objective index system of ecological agricultural benefit evaluation was constructed, which provided a certain theoretical basis for the evaluation of the development performance of ecological agriculture in Guizhou Province.
2. If comprehensive evaluation is made on ecological agriculture in different regions of Guizhou Province, the selected evaluation indicators and weight distribution can be adjusted appropriately by experts according to the specific development of different regions and different ecological agriculture.
3. According to the principles of system engineering, a comprehensive evaluation system of ecological agriculture benefits was established, and the comprehensive benefits of ecological agriculture were divided into three sub-benefits of ecological and environmental benefits, economic benefits, and social benefits. The idea of sustainable development provides a theoretical basis and reference for the construction and benefit evaluation of ecological agriculture in Guizhou Province.

CONFLICTS OF INTEREST

The authors declare they have no conflicts of interest.

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