

Article

Farmers' Awareness of Ecosystem Services and the Associated Policy Implications

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Abstract: This study analyzes the primary factors influencing farmers' awareness of ecosystem services. This study, through questionnaires, conducts research on farmers' awareness of and demand for ecosystem service functions. The research encapsulates 156 households from 21 groups of villagers in the Guangxi Karst Ecological Immigration District in China. The results of the factors influencing farmers' awareness of ecosystem services, analyzed using a regression model, show that: (1) Farmers are concerned with ecosystem service functions that directly benefit them; however, they do not sufficiently understand the ecosystem's ecological security maintenance or cultural landscape functions; (2) Farmers' awareness of ecosystem service functions is not consistent with their corresponding demand, including the ecosystem's leisure and entertainment, social security, disaster prevention and water purification services; (3) Education level, land area cultivated by the household, proportion of the household's income from agriculture and immigration status directly affect farmers' awareness of ecosystem services; (4) Farmers' personal characteristics, family characteristics and subjective attitudes have different effects on the level of ecological service cognition. Understanding farmers' awareness of ecosystem services, and the influencing factors can help policymakers and development managers plan local development and policies, and enable harmonious development of the human-earth system in immigration regions of China.

Keywords: ecological migration; ecosystem services; farmers' cognition level; policy implications

1. Introduction

Since the 1990s, ecosystem service research has been a focus in the fields of ecology and ecological economics. Many researchers have studied the structures, processes and functions of ecosystem services [1–6]. Some researchers have carried out field experiments to investigate the relationships between ecosystem services and biodiversity or the functional characteristics of plants, and analyzed the mechanisms therein [4,7,8]. This helped explore the processes and mechanisms by which ecosystem services are created. Other researchers have carried out field experiments and model simulations to study ecosystem service dynamics [9–13]. They connected the changes in ecosystem services to basic ecological processes and attempted to use the results of their studies to manage services. However, the progress in this field has been very limited. Most studies still do not sufficiently account for human demands. They focus on the supply of ecosystem services and mechanisms that affect this supply purely from an ecological perspective. They lack research related to humanity's demand for specific ecosystem services. Most studies assume that human society places demands on ecosystem services produced by the structure, processes and functions of the ecosystem. However, they do not inquire about the real demands of humanity on ecosystem service functions or the awareness of these demands.

Currently, the ecological economics perspective is being emphasized, which mainly pertains to the economic value of the ecosystem services. Numerous papers have posited estimations of the economic value of the services of specific regions, species or processes [14–17]. One such influential study by Costanza et al., published in a journal titled *Nature*, concluded that the economic value of global ecosystem services far exceeded the total value of the global economy. Sutton uses a spatially explicit measure of the impact of human consumption and an actual measure of loss of productivity from databases to estimate that lost ecosystem services represent a significantly larger fraction (~10%) of global GDP [14,18]. However, this result proved controversial [19,20]. Smith and Sullivan found that farmers have a high awareness of ecosystem services and that they act as significant contributors to societal well-being and policy optimization [21]. In addition, many Chinese researchers have appraised the value of ecosystem services offered by different types of ecosystems in different areas [22–26]. This resulted in an important database for assessing spatial and temporal variations in the value of ecosystem services at global, national and regional levels. These results appraised ecosystem structures, functions and their contributions to human welfare from an ecological economics perspective. However, further study will determine whether various demands of humans in different regions can meet farmers' actual requirements. Limited studies have been carried out to answer this question. If the assumptions are incorrect, then research cannot provide scientific conclusions of any practical value to ecosystem managers or policy developers.

Farmers, both individually and collectively, are the direct managers and users of ecosystems. In order to increase their enthusiasm for environmental protection, it is necessary to create awareness of the existence and importance of ecosystem service functions in their respective regions [27–29]. Therefore, it is useful to identify the factors that influence farmers' awareness of and demand for ecosystem services of different types, in different places.

He et al. used a questionnaire survey to study farmers' ecosystem services awareness in the Poyang Lake area [28]. They found that the farmers' awareness of wetland ecosystem services was high; however, there were differences in the importance of ecological services among farmers in different survey areas and farmers paid more attention to the Poyang Lake wetland ecosystem supply services and regulatory services. The study also found that gender, age, occupation and income of farmers had a significant impact on the cognition of farmers' ecosystems [28]. Based on the study of the differences in the awareness level of Jinghe Watershed farmers by the participatory rural appraisal (PRA) method, it was found that farmers had a sense of awareness of 11 ecosystem services. The results showed that farmers' awareness of food supply, clean air and clean water services was the highest and the level of ecological service awareness directly affected their lives. The level of education and income, method of livestock farming and energy structure affected the farmers' ecosystem awareness. The service survey also shows that ecosystem services have changed over the past decade, with air and income showing significant improvement, and food and fuel supplies reduced. These changes also have an impact on land use and land cover [27]. Iniesta-Arandia considered the semi-arid watersheds in south-eastern Spain as a study area for a survey and found that semi-arid watershed provides a variety of ecosystem services for the residents, though each person perceives it in a different way. Farmers believe that traditional agriculture, animal husbandry, fresh water and erosion have the highest impact on ecosystem services. However, according to different socioeconomic characteristics and land management strategies, the farmers in the two basins have different understandings of their ecological systems [30]. Payne and White investigated the environmental awareness of deer farmers in New Zealand. Based on the factors influencing deer farmers' decisions, it was found that they generally understood the environmental problems, though their level of awareness varied according to the farm environment [31]. Wu conducted a survey of farmers' environmental awareness in Beijing and the results show that the farmers' environmental awareness is between the middle and lower levels, and the gender, educational background and household income have a significant impact on the environmental awareness of farmers; which led to the determination of four countermeasures to raise farmers' consciousness based on the survey results [32].

Research on China's migration challenge developed alongside the National Plan for Poverty Reduction (8-7 Plan). Environmental migration is a part of that plan and serves to protect ecologically fragile environments while simultaneously improving the lives and economic prospects of the local inhabitants. Planned environmental migration has already achieved remarkable results throughout the nation. Subsequent to the hard work of the 12th five-year plan, Guangxi's poverty alleviation and development work has achieved the initial results. The rural poverty population in the region decreased from 1012 million in 2010 to 452 million at the end of 2015. The incidence of poverty also changed from 23.9 to 10.5%. During this period, 309,888 people were resettled at a cost of 8.406 billion yuan. According to China's 13th five-year plan, the country is expected to complete the emigration of over 10 million people from ecologically fragile areas in the southwest and northwest. During this period, Guangxi plans to expand the relocation area to Nanning, Liuzhou, Guilin, Wuzhou, Fangchenggang, Qinzhou, Guigang, Yulin, Baise, Hezhou, Hechi, Guests, Chongzuo and 13 other cities in 79 counties (cities and districts). In addition, Guangxi is expected to build 737 centralized resettlement points. This will mitigate the ever-worsening poverty and environmental problems in these areas. Large-scale environmental migration is bound to have a large impact on the balance and development of ecological, social and economic systems in the immigration zones. Thus, the key question yet to be answered is how to effectively and harmoniously develop the human-earth system, rather than creating new ecological destruction in the immigration zones.

Considering this background, this paper uses the Guangxi Karst ecological migration region as an example to analyze the primary factors that influence farmers' awareness of different ecosystem services. This study is based on a questionnaire survey on farmers' awareness of and demand for different ecosystem services. Policy recommendations to increase farmers' awareness of ecosystem services have also been suggested. Policy-makers and managers can use the results presented in this study to undertake ecologically sound construction to accommodate immigrants, while satisfying farmers' individual needs and encouraging sustainable economic, social and environmental development in immigration zones. The remainder of the paper is structured as follows: Section 2 provides an overview of the research zone, Section 3 describes the data sources and methodology used, Section 4 analyzes the results, Section 5 provides the implications and Section 6 concludes the paper.

2. Overview of the Research Zone

Jinqiao Village, located in Daan Township, Huanjiang County, Guangxi Province, China, was chosen as the case study for this paper. Jinqiao Village is a classic example of an immigration village in China. At the end of 2003, Jinqiao Village was designated to be physically and administratively restructured as the centralized resettlement village for immigrants from other places, such as Duan and Dahua in the Karst mountain region. It is the only new immigrant village in Huanjiang County. The farmers in Jinqiao Village are very representative. It is of great significance to study the ecological awareness of farmers in this region. Due to the typicality of the study area, it is also significant to determine the core ecological service of farmers' ecological cognition as it will be a typical reference for other resettlement areas in China. There are 32 groups of villagers in this village, totaling to 939 households. Among these, 797 have emigrated to the village from other places. The main ethnic groups that represent this village are Han, Zhuang, Yao and Maonan, though the different groups live compatibly. Jinqiao Village is a typical agricultural village, with rice and corn being the main food crops cultivated. The supporting industries include cane sugar production and mulberry sericulture. Currently, the village has an area of 3178 hectares, comprised of 343 hectares of arable land (48 hectares are paddy fields and 295 hectares constitute dry land); 2312 hectares of forest; and 522.67 hectares of barren wasteland. The per capita arable land is 0.09 hectares. Most of the arable land was developed for agriculture during the large-scale immigration of the 1990s. However, this was also accompanied by severe deforestation and creation of wasteland. Even though the total land area is large, the proportion suitable for agricultural use is limited. Excluding certain paddy fields, most of the arable land comprises of dry slopes. Over-development poses a potential threat to soil fertility and soil and

water conservation in the area. Jinqiao Village has a subtropical monsoon climate with rich plant and animal resources. However, since the implementation of the immigration policies, controlled burning of mountainsides, deforestation and creation of wasteland, the environment that wild plants and animals rely on for their survival has been seriously damaged. The ecosystem has been significantly modified since the immigration policies were implemented and consequently, biodiversity continues to decrease.

Based on a preliminary investigation completed in 2013—where the study group combined local public opinion and data on Huanjiang County from the Ministry of Land and Resources, Bureau of Agriculture, State Forestry Administration and Office of Poverty Alleviation and Development—we found that Guangxi is a typical ecological immigrants karst area where the relationship between people and the environment is vulnerable, and that the Huanjiang county is the largest ecological resettlement county in the southwest karst area. We further analyzed and selected Jinqiao Village as the study area and selected 21 groups of villagers in Jinqiao Village as a representative sample for further study (see Figure 1). The location of the research zone and distribution of the 21 sample sites are shown below.

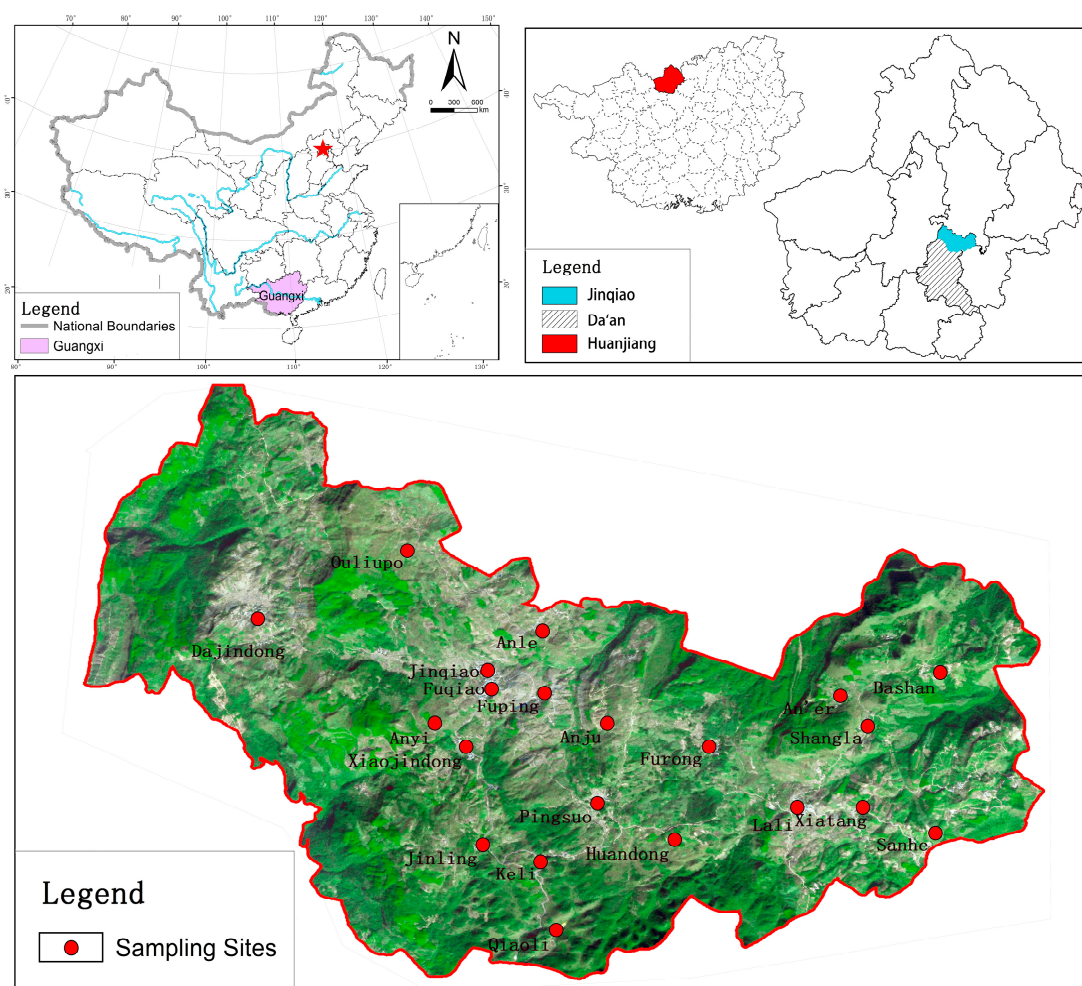


Figure 1. Research zone and distribution of the 21 sample sites.

3. Data Sources and Research Methods

3.1. Data Sources

The study group designed a questionnaire based on the preliminary study completed in 2013. The questionnaire mainly comprised of closed-ended questions, supplemented by partially open-ended

questions. It covered the following aspects: (1) Farmers' perceptions and evaluation of ecosystem services; (2) Farmers' desire for environmental protection; and (3) Demographic information of the surveyed individuals, including their basic socio-economic characteristics. The basic demographic information was intentionally collected at the end of the survey to foster mutual trust during the interview process and to prevent refusal to disclose real information. This measure was taken to improve the accuracy and completeness of the data.

Each of the 21 groups of villagers was treated as a unit in the survey. The number of households in each group in the study area was randomly selected. The survey data was collected in April 2014 at the farmers' respective residences. Data was collected by 12 study group members within a span of approximately 20 days. The survey methods included questionnaires, semi-structured interviews and open-ended questions supplemented by participatory rural appraisal (PRA) tools, such as observation and in-depth interviews on key topics. Household surveys were generally conducted door-to-door, beginning with in-depth interviews with village cadres. In order to ensure the quality of the questionnaire data, mainly middle-aged adults (30–60 years of age) were interviewed, followed by the elderly. Local college students were requested to translate in order to ensure the accuracy of the information. The duration of the survey per household was approximately two hours. Overall, the effectiveness of the questionnaire was judged by questionnaire integrity, repetition rate and logical relevance, after which, 156 effective samples (95.12% of the total) were compiled. The validity, accuracy and applicability of the questionnaires are accurate. Table 1 depicts the questionnaire distribution data for each of the 21 groups of the households surveyed.

Table 1. Questionnaire Distribution.

Group Name	Number of Samples	(% of Total)	Group Name	Number of Samples	(% of Total)
Ouliu	5	3	Sanhe	17	10.4
Fuqiao	10	6.1	Anju	1	0.6
Lali	4	2.4	Anle	2	1.2
Jinqiao	19	11.6	Xiatang	6	3.7
Qiaola	9	5.5	Bashan	1	0.6
Anyi	2	1.2	Jinling	4	2.4
Huandong	17	10.4	Shangla	2	1.2
Aner	7	4.3	Xiao Jindong	8	4.9
Furong	4	2.4	Da Jindong	10	6.1
Pingsuo	12	7.3	Keli	7	4.3
Fuping	17	10.4			

The basic household information and data collected in the questionnaires was analyzed using SPSS statistical software. Logistic (ordinal classification) regression models were used to analyze factors influencing farmers' awareness of ecosystem services.

3.2. Research Methods

3.2.1. Questionnaire Design

The questionnaire used in this study was designed based on the Likert [33] scale to quantify the degree of farmers' awareness of and demand for each core ecosystem service in Jinqiao Village. The demand for a given environmental service was only investigated if the farmers recognized the existence of a service. A response of "completely agree" or "agree" to the question on whether or not the service existed qualified as recognition. In order to simplify the calculations and statistics, each possible answer to the closed-ended questions was assigned a Likert scale value. The difference between the Likert scale values for adjacent answers was constant (one point). Higher Likert scale point values were assigned for higher levels on the Likert scale. The description assigned to the scales and their corresponding Likert scale point values are as follows:

Totally agree: 5; Agree: 4; Uncertain: 3; Disagree: 2; Strongly disagree: 1; and
Extremely important: 5; Important: 4; Uncertain: 3; Unimportant: 2; Extremely unimportant: 1.

3.2.2. Farmers' Awareness of and Demand for Ecosystem Services

The following formula was used to calculate farmers' awareness of the core ecosystem services in Jinqiao Village:

$$Y_i = \sum a_{ij} / N_i$$

In the formula, Y_i is the overall awareness level of a certain core ecosystem service; a_{ij} is the number of Likert scale points that the j -th individual household scored for the awareness of a certain core ecosystem service; and N_i is the number of samples of the i -th ecosystem service.

The following formula was used to calculate farmers' demand for the core ecosystem service in Jinqiao Village:

$$Z_i = \sum b_{ij} / N_i \quad (1)$$

In the formula, Z_i is the overall demand for a certain core ecosystem service; b_{ij} represents the number of Likert scale points that the j -th individual household scored for the demand for a certain core ecosystem service; and N_i represents the number of samples of the demand for the i -th ecosystem service.

3.2.3. Participatory Rural Appraisal (PRA)

PRA is a type of rural research method commonly used in rural project design, implementation and evaluation. Its most prominent feature is to place importance on the participation of farmers in the whole process, so that the results are more operable and easily absorbed by farmers. PRA is mainly used in rural projects to develop community development plans and decisions. The main contents of this method include needs assessment, feasibility study, project activities and their priorities, and project monitoring and evaluation. The function of PRA in this paper is cognitive evaluation.

4. Analysis of the Results

4.1. Sample Demographics

The questionnaire collected eight types of demographic information, including gender, age, education, occupation and income. The surveyed individuals were 62.8% male and 37.2% female. Most of the interviewees (64.1%) were young and middle-aged adults (30–60 years of age). The highest level of education attained by the respondents was generally low. Most only had an elementary school education. Only 13.5% had completed high school. Occupations were mainly agriculture (90.4%) or multiple. A few respondents were also engaged in others jobs, such as transportation and business. The survey included members of four ethnic groups: Zhuang (73.1%), Yao (12.2%), Maonan (8.9%) and Han (5.8%). Most of the individuals interviewed were immigrants (73.1%). Households with an income of 10,000–30,000 Chinese Yuan per year (CNY/yr) represented 35.9% of those surveyed. The second largest income bracket was 30,000–50,000 CNY/yr (23.1%). Among the surveyed households, 62.8% had 20 mu or less of arable land and 30.1% had 20–50 mu. Only 7.1% of the surveyed households had over 50 mu of arable land. The basic demographics of the respondents are summarized in Table 2.

Table 2. Demographics of the Surveyed Farmers.

Element	Group	Number	Proportion (%)	Element	Group	Number	%
Gender	Male	98	62.8	Ethnic Group	Han	9	5.8
	Female	58	37.2		Zhuang	114	73.1
Age	<30	34	21.8		Maonan	14	8.9
	30–60	100	64.1		Yao	19	12.2
	>60	22	14.1		Immigrant	114	73.1
Highest Level of Education Completed	Elementary (or Lower)	76	49.2	Immigration Status	Non	42	26.9
	Middle School	59	37.8		<10,000	35	22.4
	High School	21	13.45	Household Yearly Income	10,000–30,000	56	35.9
Occupation	Agriculture	78	50		30,000–50,000	36	23.1
	Multiple	63	40.4		>50,000	29	18.6
	Other	15	9.6	Household Arable Land Area (mu)	0–20	98	62.8
Proportion of Household that Works	0–0.5	85	54.5		20–50	47	30.1
	0.5–1	71	45.5		>50	11	7.1

4.2. Ecosystem Services—Analyzing Awareness and Demand

Based on the theoretical framework of Zhang [33], combined with the particularity of the study area, this study examines the relationship between farmers' requirements and ecosystem services, and divides the former into three categories: material, security and aesthetic demands. The demand for materials refers to the ecosystem's supply of necessities to support life, including materials related to food, clothing, shelter and transportation. The demand for security refers to the ecosystem's maintenance of ecological security, including aspects such as healthy air, soil, water and biodiversity. Aesthetic demand refers to the demand for a cultural landscape. More specifically, this refers to the aesthetic demand for natural beauty and the cultural demand for places to enjoy cultural achievements.

According to the preliminary analysis of farmers' demands and the ecosystem in Jinqiao Village, the ecological service types were divided into three categories: material provision, ecological security and cultural landscape functions. In addition, based on the preliminary investigation (in 2013) and questionnaire data analysis, we determined the following 11 core ecosystem services from ecological service types: food production, raw material supply, water supply, social security, natural disaster mitigation, air purification, water purification, waste treatment, leisure and entertainment, cultural heritage and biodiversity.

After clarifying these core services, statistical information from the questionnaires was arranged and summarized to reflect farmers' awareness of and demand for these services. A detailed summary is made Table 3.

Table 3. Core Ecosystem Services: Awareness and Demand.

Function	Core Ecosystem Services	Awareness	Demand
Material Supply	Food Production	4.4744	4.7628
	Raw Material Supply	4.2244	4.4014
	Water Supply	4.0833	4.4926
	Social Security	3.9744	4.3206
Ecological Security	Biodiversity	3.9231	4.0738
	Waste Treatment	3.7628	4.3868
	Air Purification	3.6795	4.3196
	Natural Disaster Mitigation	3.6538	4.4554
	Water Purification	3.5256	4.3656
Cultural Landscape	Leisure and Entertainment	3.8590	3.5913
	Cultural Heritage	3.3205	3.8205

Listed in order of the farmers' degree of awareness of each of the items, the core ecosystem services in Jinqiao Village are: food production > raw material supply > water supply > social security

> biodiversity > leisure and entertainment > waste treatment > air purification > natural disaster mitigation > water purification > cultural heritage. Most of the farmers who were sampled were considerably aware of the ecosystem's food, raw materials and water provision services, in addition to social security and biodiversity. This is consistent with China's traditional mindset of "everything comes from the land". Furthermore, awareness of the leisure and entertainment services provided by the ecosystem is high; however, the farmers' demand for leisure and entertainment is very low, which could be due to the farmers having relatively smaller pressures and lower spiritual pursuit. Considering that the production lifestyle is ubiquitous in villages similar to Jinqiao Village, resting and relaxation activities generally occur within the village boundaries. Farmers truly experience the comfort of the natural environment and enjoy what is provided by it. However, they do not possess sufficient awareness of the ecosystem's ecological security maintenance and cultural landscape functions. This could be due to misunderstandings, or insufficient education related to ecosystem service functions. Generally, farmers are more concerned about the basic functions of the ecosystem that benefit them directly. They lack an appreciation for and understanding of the ecological and societal functions. There is an urgent need to improve their awareness of the indirect benefits provided by the ecosystem services.

Listed in order of farmers' demand, the core ecosystem services in Jinqiao Village are: food production > water supply > natural disaster mitigation > raw material supply > waste management > water purification > social security > air purification > biodiversity > cultural heritage > leisure and entertainment. It is well understood that food, water and raw materials have the highest demand, as they are essential for life-support. Their importance reflects the pursuit of material wealth, which is a ubiquitous concept among farmers, while there is marginal desire to pursue spiritual wealth. Demand for the maintenance of ecological security is also relatively low. In contrast, the demand for waste treatment is high, indicating that farmers in the research zone have begun to focus on the environment. The methods for treating waste products from farmers' production lifestyles are of particular concern. Their demand for the ecosystem's cultural heritage, leisure and entertainment functions is low. This is mainly due to the general economic conditions in the research zone that continue to warrant improvement. People continue to be concerned about acquiring the basic materials for sustaining their production lifestyle. As social and economic development continues, opportunities for contact and exchange with the outside world are increasing. Farmers will soon rediscover the ecosystem's leisure and entertainment function. Overall, farmers primarily demand ecosystem services for their basic life support, followed by ecological security maintenance. The demand for the ecosystem's cultural landscape services is a distant third.

Certain inconsistencies are observed while comparing farmers' awareness of and demand for individual ecosystem services. Although they are undoubtedly aware of the ecosystem's leisure and entertainment services, there is a relatively low demand for these services. This could possibly be attributed to stress. Farmers are not adequately motivated to actually pursue such activities. Their awareness of social security services exceeds their demand. Diversification of job opportunities and decreased anxiety towards their basic livelihood may contribute to this phenomenon. Farmers have low awareness of the ecosystem's natural disaster mitigation service; however, their demand for this service is very high. This shows that they desire a stable environment to live and work. The basic infrastructure for disaster prevention and mitigation in the research zone should be improved. In addition, more prominent education programs could help focus public attention on disaster prevention. Similarly, farmers' awareness of the ecosystem's water purification services is low; however, their demand for this service is high. This indicates that farmers in Jinqiao Village have a certain level of awareness in relation to water safety, but do not understand the relationship between water quality and the region's ecosystem. An improvement in the education of public ecosystem service functions will play a key role in the coordinated development of the human-earth system in the research zone.

4.3. Analyzing Factors That Influence Farmers' Awareness of Ecosystem Services

Farmers' awareness of ecosystem services is related to their personal characteristics and a series of socioeconomic factors. Individual awareness of core ecosystem services in Jinqiao Village was divided into three levels according to the survey results: low awareness (aware of three to five core ecosystem services); medium awareness (aware of six to eight core ecosystem services); and high awareness (aware of nine to eleven core ecosystem services).

The following process was used to analyze the factors influencing farmers' awareness. A cumulative logistic regression model analysis method was used, with farmers' individual awareness levels as the dependent variables. Overall, 14 independent variables such as gender, age, education, occupation and income were included (see Table 4). An SPSS co-linearity diagnosis was used on the dependent variable. An iterative backward elimination method was used, in which the most significant variable was culled, the cumulative logistic regression model re-constructed (Xie, 2011) and the process repeated. The final results are shown in Table 5.

Table 4. Variable Definitions and Assignments.

Variables	Assignments
Awareness Level	Ordered Variable. Low: 1; Medium: 2; High: 3
Gender	Categorized Variable. Female: 1; Male: 2
Age	Ordered Variable. Actual data (age of interviewee in years)
Education Level	Ordered Variable. None: 1; Elementary or lower: 2; Middle School: 3; High School: 4; College or higher: 5
Occupation	Categorized Variable. Agriculture: 1; Multiple: 2; Other: 3
Marital Status	Categorized Variable. Unmarried: 1; Married: 2
Ethnicity	Categorized Variable. Han: 1; Zhuang: 2; Maonan: 3; Yao: 4
Immigration Status	Categorized Variable. Immigrant: 1; Non-immigrant: 2
Household Yearly Income	Ordered Variable. 0–5000: 1; 5000–10,000: 2; 10,000–30,000: 3; 30,000–50,000: 4; 50,000 and more: 5
Portion of Household Income from Agriculture	Ordered Variable. Actual data
Portion of Household that works	Ordered Variable. Actual data
Household's Arable Land	Ordered Variable. Actual data
Willingness to Return Arable Land to Forest Land	Categorized Variable. Not willing: 1; Willing: 2
Level of Concern for Environmental Protection	Categorized Variable. Not concerned: 1; Undecided: 2; Concerned: 3
Responsibility for Environmental Stewardship	Categorized Variable. Government: 1; Farmers: 2

Table 5. Cumulative Logistic Model: Final Results.

	Estimate	Std. Error	Wald	Df	P Val. Sig.	95% Confidence Interval	
						Lower Limit	Upper Limit
Gender	1.476	0.392	14.149	1	0.000	0.707	2.245
Age	−0.29	0.13	4.877	1	0.027	−0.055	−0.003
Education Level	0.631	0.225	7.882	1	0.005	0.19	1.071
Immigration Status	−1.837	0.456	16.216	1	0.000	−2.732	−0.943
Portion of Household Income from Agriculture	1.251	0.487	6.603	1	0.010	0.297	2.205
Household's Arable Land	0.041	0.014	8.423	1	0.004	0.013	0.068
Willingness to Return Arable Land to Forest Land	1.517	0.538	7.955	1	0.005	0.463	2.571
Level of Concern for Environmental Protection	0.80	0.275	8.439	1	0.000	0.269	1.339

1. An analysis of the farmers' personal characteristics found that gender, age, education level and immigrant status have a significant impact on the level of ecosystem services; however, the

nation has limited affection towards the level of cognition of ecosystem services. The ecosystem awareness is high for a male, immigrant and young individual with a high level of education. A larger proportion of males had high awareness than females. The proportion of male and female interviewees with high awareness was 62.2% and 29.3%, respectively. Age had a negative effect on the ecosystem services awareness level. The proportion of each age group with high awareness was: under 30 years old, 61.76%; 30–50 years old, 51.35%; and over 50 years old, 39.58%. A higher level of education corresponded with a higher awareness. Immigrants had significantly higher awareness than the non-immigrants. The proportions with high awareness were 58.77% and 26.19%, respectively.

2. An analysis of the family characteristics of the farmers found that a farmer with a higher proportion of household income from agriculture and possessing more arable land has a higher awareness of ecosystem services. Such households relied more on land and natural resources, and therefore, they were more sensitive to ecosystem service functions and experienced them more intensely. They focused more on the relationship between humans and nature, and contemplated more about how to reduce the land's demand for materials. Consequently, they had relatively high awareness. All farmers representing households with 3.3 hectares of arable land or more had a high awareness of ecosystem services.
3. An analysis of the farmers' subjective attitude showed that farmers' willingness to return their arable land to forestland had a positive effect on the awareness of the ecosystem services. The willingness to return arable land to farmland reflects farmers' enthusiasm to improve the ecological environment and reform unreasonable production methods, and also reflects their awareness of ecosystem services. The farmers' level of concern for environmental protection also reflected their awareness. Farmers who were more concerned about the environment had a clearer understanding of ecosystem service functions.

5. Implications

The survey of the 21 groups of villagers in Guangxi indicated that even during periods of persistent environmental constraints, farmers do not clearly acknowledge the significance of ecosystem services. The ecosystem does not provide only food and raw materials. While sharing the efficacy of these services, it is particularly important to connect individual behaviors with environmental protection. Based on the study of Jinqiao Village, we derived the following implications:

1. Farmers in the research zone generally consider ecosystem services in terms of basic life-support functions. They focus less on and lack sufficient understanding of the ecological and societal functions of ecosystem services. Farmers do not completely recognize the important role of the ecosystem in guaranteeing human well-being and sustainable development. Increasing education efforts in relation to the ecological benefits of ecosystems, increasing farmers' awareness of ecosystem services and shaping ecologically conservative behaviors to enable managers and policy-makers to effectively increase farmers' participation in environmental conservation and render them the main actors to simultaneously promote sustainable economic development and maintain the environment, will create a more holistic and integrated society.
2. The analysis of farmers' demands for ecosystem services revealed that those in the research zone primarily demand life-supporting materials from the ecosystem. Farmers are primarily concerned with the pursuit of material goods. Their desire for spiritual goods is low. However, it is worth noting that they have a strong demand for natural disaster mitigation, which is one of the core ecosystem services. Interview records indicate that farmers are particularly interested in strengthening the basic infrastructure for disaster prevention and mitigation, restructuring middle- and low-yield fields, and converting slopes to terraces.
3. Individual characteristics, such as migration status, gender, education level and age, have an important impact on farmers' awareness of ecosystem services. The government should consider

this while formulating policies to improve farmers' awareness. A diversified, multi-path approach to education and ecosystem services education is needed. The primary targets of the education efforts should be groups with lower awareness of ecosystem services, such as women, the elderly and non-immigrants. Development of education and the economy should receive equal emphasis. Governments should strengthen farmers' awareness, their ability to understand ecosystem services and their indirect benefits. In addition, governments should strengthen the education of conservation of resources and raise awareness of environmental protection, particularly in the fragile areas of Guangxi. The educational programs should be combined with cultural customs in ethnic areas in order to strengthen the education on Golden Hill's beautiful scenery. They should increase investment in education, improve the infrastructure of schools, formulate educational policies that specifically target immigration zones, increase local cultural education and increase farmers' appreciation for science and culture. These efforts will improve farmers' enthusiasm to participate in resource protection and management.

4. Household characteristics, such as the proportion of household income from farming, proportion of the household that is working and arable land per person, also influence farmers' awareness of ecosystem services. This implies a need to undertake significant efforts to develop modern agriculture, promote ecological agriculture and gradually reform traditional, low-tech, and single-mode production methods by increasing the value of agricultural products and the effectiveness of cultivated land. In Jinqiao Village, a feasible method to popularize ecological agriculture could be to offer financial and technical support to farmers who already possess high awareness of ecosystem services, such as immigrant farmers owning large areas of cultivated land.
5. The farmers' overall concept of ecological protection (as indicated by their willingness to return their cultivated land to forestland and their level of concern for environmental protection) directly affects their awareness of ecosystem services. Farmers in Jinqiao Village live in a relatively closed environment and have limited communication with the outside world. This has narrowed their perspective and hindered their ability to broaden their horizons. Through organized labor export (where farmers spend some time working in distant locations), exchange visits and exchange learning, the government can strive to increase farmers' knowledge and experience, broaden their horizons and gradually reform their perception of the relationships of people with both the society and environment. This will foster harmonious coexistence of people and nature in the research zone.

6. Conclusions

The main objective of this paper was to analyze the primary factors that affect farmers' awareness of different ecosystem services. Through the questionnaire survey on Jinqiao Village, we obtained certain research results and prospects, and further analysis concluded as follows: the farmers' personal characteristics (such as age, gender, educational level and immigration), family characteristics (such as the proportion of agricultural income and cultivated area) and subjective attitude (such as returning farmland to forest and protecting the environment), certainly influence farmers' understanding of ecological services. Based on the needs of the farmers and the characteristics of the resettlement area, we first identified the core ecosystem services. The farmers' perspective survey can promote environmental protection of the resettlement area, improve the enthusiasm of farmers to participate in environmental protection and alleviate the contradiction between economic development and environmental protection. Ecosystem services and human well-being are difficult matters; however, we should pay more attention to this subject and provide more effective recommendations.

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