




## Article

# Evaluating the Economic Viability of Agro-Ecotourism as a Nature-Based Solution for a Climate Adaptation Strategy: A Case Study of Yuanshan Township, Taiwan

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**Abstract:** This study applied the contingent valuation method to evaluate the economic viability of climate adaptation policies in the climate-fragile Yuanshan Township (YST), Taiwan, focusing on the balance between forest conservation and local livelihoods. Traditional agriculture in YST is transitioning to agro-ecotourism, supported by leisure-oriented and hillside forest protection policies that attract visitors and cause the local economy to thrive. This research used non-market valuation methods to quantify the value of local recreational resources perceived by visitors at NTD 1002.00 per visitor. The findings indicate that visitors' willingness to pay for these resources is significantly influenced by their intention to revisit YST, their trust in local conservation efforts, their gender, and their income. The value that visitors place on recreational resources and the aforementioned significant determinants of their willingness to pay highlight the economic potential of agro-ecotourism in supporting both environmental sustainability and community income. This study emphasizes that successful nature-based climate adaptation must consider the economic interests of resource users and local residents. Agro-ecotourism in YST is shown to be a viable policy for balancing forest conservation with societal benefits, providing a model for the sustainable management of local resources. The economic benefits from this transition underscore the feasibility of agricultural transformation for community income generation and climate resilience, demonstrating that environmental and economic goals can be mutually supportive in addressing climate change.

**Keywords:** climate change; adaptation; agro-ecotourism; recreational value; forest conservation; sustainable development; nature-based solutions



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## 1. Introduction

In the mountainous island of Taiwan, the majority of the crowded population resides along the narrow plains along the coasts; meanwhile, the central mountainous topographic terrains in Taiwan, the high mountain areas, are legally constrained to being covered by forests and governed by public institutions, including the National Park Service, Ministry of the Interior, and Forestry and Nature Conservation Agency. The land in the shallow hillside areas is at the forefront of the natural conservation of forests and human utilization for their livelihoods. With the development of Taiwan's economy, the economic role of agriculture in generating the island's aggregate income has been shrinking, and the public have created a higher demand for a chance to seek release in nature. In line with this trend, the shallow-mountain areas in Taiwan represent a case of a hybrid model

of the transformation of agro-tourism from traditional agriculture to ecotourism; for example, forested trail hikes in hilly conserved areas are common, serving the needs of this high-density population. It is recognized that good governance of natural habitats is a prominent climate adaptation measure in Taiwan. As forest conservation is a measure of nature-based adaptation to climate change, it is not inevitable that nature conservation would mean sacrificing the livelihoods of local residents at the forefront of nature and human society. Yuanshan Township (YST), Taiwan, is a successful example of active agro-ecotourism, via the alliance of local communities and the government, delivering a nature-based climate adaptation strategy to balance the farming and conservation of forest land with soil and water conservation.

The economic viability of climate adaptation measures is essential for their long-term success [1]. Economic viability refers to the ability of a measure to be sustainable over the long term, usually encompassing an assessment of whether the measure can continue successfully from an economic perspective, and this suggests appropriate adaptation measures should ensure that climate change does not have a drastic impact on local community economies. Well-designed and prudently implemented measures of nature-based solutions (NbSs) can simultaneously benefit sustainable natural systems and local economies by offering multiple advantages [2–8], including building resilience and boosting tourism by providing multiple services from a healthy ecosystem [9–14]. To verify whether the development of agro-ecotourism in shallow-mountain areas could allow local farming residents to enhance their economic status, this study evaluated the economic viability of agro-ecotourism from a visitor viewpoint by applying the contingent valuation method for the case of YST.

Amidst the current urgency of climate change, local adaptation measures are necessary to curb the damage caused by severe weather. Implementing climate change adaptation measures based on a well-mediated ecosystem is an effective and low-cost approach adopted in developed and developing countries [15] facing severe weather that threatens traditional agriculture. Nature-based adaptive measures can turn threats and risks into new opportunities through carrying out smart natural protection and forest conservation and securing resident livelihoods by transforming vulnerable local traditional farming into a practice with a more resilient pattern, such as agro-ecotourism [16,17]. In this type of tourism, tourists and residents are dual stakeholders that benefit each other, whereby visitors are attracted by unique local recreational resources that support the livelihoods of local residents who operate agro-ecotourism activities. Visitors, as natural resource users, and residents, as land-dependent stakeholders, often play central roles in agro-ecotourism, especially when acting as tourism demanders and suppliers, respectively. In other cases, feasible measures sometimes need to be taken to resolve tensions between stakeholders [18].

Agro-ecotourism involves a combination of nature-based ecotourism and farm-based agro-tourism [19,20]. Agro-ecotourism is a form of tourism that provides visitors with recreational activities in rural areas or within forests that are in harmony with the environment. It is supported through community engagement in the protection of natural forests and rural landscapes, and it contributes to the well-being of local communities. The tourism activities are diverse and designed to offer visitors an experience of nature and rural farm areas, broadly including eco-tours along forest trails, farm tours in rural areas, forest or farm stays, wildlife watching or animal interaction, educational activities on natural conservancy or sustainable farming, and cultural and heritage tours. Agro-ecotourism creates an opportunity for visitors to create a meaningful connection with the land, sustainable agriculture, forest conservation, and the environment.

At the local scale of vulnerable communities, nature-based climate change solutions focus first on disaster reduction and climate adaptation while delivering social and economic benefits to communities [21]. This study demonstrates the economic viability of the climate adaptation policy in the climatically, geographically, and socially fragile Yuanshan Township (YST), Taiwan. The Lanyang River Basin, to which it belongs, also shares these vulnerabilities. The terrain of YST is characterized by steep vertical drops within a small

land area, and the local villages in this township are at the forefront of human–nature interactions. Forest conservation in hilly areas is an NbS to climate change because it strengthens ecosystem services that improve climate adaptability. This region has adopted a policy of management through community participation to achieve sustainable outcomes [22], thus blending environmental conservation with societal development. Traditional agriculture is gradually transitioning to a leisure-oriented model [23]. This shift has successfully integrated ecotourism with the historically preserved mountainous forest environment, popularizing rural tourism [24,25].

By maintaining a tree-covered forest in this sensitive area, this strategy exemplifies a nature-based adaptation through the stewardship of forest ecosystem services. Enhancing community self-sufficiency in environmentally protected areas can be achieved by developing recreational activities such as ecotourism, which boosts economic vitality and reduces economic pressures on land development in these regions [2].

This transformation into agro-ecotourism has created economically viable climate adaptation measures for hillside regions. This economic viability has been realized in the context of government support for forest conservation in hillside areas, which has simultaneously attracted visitors and supported the local economy. The transformation of leisure agriculture further promotes local prosperity and the vigorous development of the agricultural industry [26–28]. Chen et al. [16] showed that local transformation toward leisure presents a viable policy from a socioeconomic perspective. This shift toward a hybrid leisure model has been recognized as a feasible long-term adaptation measure for mitigating the risks of climate change. Protecting local forest ecosystems and their services is crucial, with forest conservation serving as a key eco-based adaptation strategy [14,15].

YST has unique geographical landscapes, natural scenery, and recreational, cultural, and ecological resources. The high quality of its recreational resources has attracted visitors from the neighboring Yilan City and Luodong Township, from the metropolitan Taipei area, which is separated from YST by only a mountain, and from all over Taiwan. This study assessed the perceived value of local recreational resources among visitors to YST.

Under the sustainable funding and management of the government, the economic viability assessment of climate-resilient governance and nature-based climate adaptation strategies evaluates whether these measures can provide benefits to the resource users, visitors, and relevant communities. Specifically, this investigation aimed to provide empirical evidence of the economic value that visitors place on local recreational resources. Accordingly, this study highlights the benefits of climate-resilient governance through the transformation of the recreational industry, which attracts visitors and causes the local economy to thrive, and it has been shown that the long-term transformation of local traditional agricultural industries can ensure residents' livelihoods [16]. These thorough verifications through multiple methodological perspectives are conducive to the formulation of reliable on-the-ground climate policies.

The economic value of the local hybrid model in YST, which combines traditional agriculture with leisure activities and ecotourism, was explored in this study by investigating the economic value of recreational resources according to visitors. This approach not only enhances the economic viability of rural communities but also promotes sustainable development, environmental conservation, and climate adaptation. The transformation of traditional agriculture into a leisure–agriculture hybrid model developed alongside ecotourism. To explore the integrated economic value of leisure agriculture and ecotourism in YST, this study applied the single-bounded contingent valuation method with an open-ended survey of visitors. The recreational commodities that were evaluated for their economic value were the culture and amenities of cherished recreational resources that were protected by the government. The recreational resources included natural resources (i.e., landscapes, flora and fauna, and ecology), cultural resources (i.e., agricultural and culture, and local drama), and recreational facilities [25].

## 2. Materials and Methods

### 2.1. The Literature on the Assessment of Nature-Based Solutions

Natural systems are essential to humans because they provide beneficial services from ecosystems. Under the pressing challenge of climate change, it is vital to adopt climate adaptation strategies based on natural systems to mitigate climate shocks toward enhancing climate-resilient governance. Nature-based solutions (NbSs) have recently gained popularity as an integrated approach that could address the common global challenges of climate change and biodiversity loss [9]. The IUCN (International Union for Conservation of Nature and Natural Resources) [10] and Seddon et al. [11] clearly defined NbSs as actions to achieve the sustainable governance of natural ecosystems, benefiting people and nature at the same time [10]; they form an integrated approach to solving societal challenges that involve working with nature [11]. The solutions to these challenges are accomplished through well-designed actions or policy programs that provide good governance of nature for healthy ecosystem services, protect people, and safeguard a stable future. A wide range of guidelines have been suggested in the literature for successful NbSs [9,11,12], with their applicability differing according to variations in natural conditions and community localities, and economic viability to local communities or stakeholders is among the common guideline components.

NbSs for climate change usually encompass climate mitigation and adaptation [13]. Severe weather due to climate change is increasing in strength and frequency, resulting in an increase in the intensity and magnitude of hazards and impacting the vulnerability of human communities. Environmental degradation contributes to the growing disaster risk and threatens to exceed the capacity of traditional farming to respond to change. To combat this, NbSs for climate adaptation can help communities prepare for, cope with, and recover from disasters. These benefits to humans can be considered ecosystem services, and a healthy ecosystem can deliver strong ecosystem services [14].

### 2.2. Study Site

#### 2.2.1. Dynamics of YST's Ecology and Economy

YST, situated in the northeast of Taiwan (Figure 1), presents a unique blend of ecological and socioeconomic characteristics. It is a hilly region characterized by its vertical-drop terrain within a small land area and positioned at the forefront of human–nature interactions. The township's landscape and the population's adaptation strategies are pivotal in shaping its resilience to climate change and its attractiveness as a leisure destination.

YST is situated at the southern end of the Xueshan Mountain Range, its terrain characterized by significant elevation changes within a compact area (approximately 111.91 square kilometers), ranging from the highest peak, that of Auyu Mountain, at 1419 m above sea level, to Lanyang River, at 8 m above sea level. Along this southern border stretches a 9.39-km-long embankment that has been shaped by the river [25], and this sharp gradient contributes to the area's fragility, particularly during the typhoon season, when shallow mountain slopes on the windward side are highly susceptible to the impacts of severe weather.

Land is the fundamental basis for human survival. Most of the mountainous land in the area is covered by forests and managed by the government. Whether marginal spotted land should be protected and maintained with its original forest cover or developed for use has long been a focal point of debate. Utilization is restricted, requiring one to apply for a permission document issued by the government [18]. Forest conservation in YST is recognized as an NbS for mitigating the adverse effects of climate change. The township's topography, predominantly consisting of mountains, hills, and narrow valleys with alluvial fan plains, requires meticulous management to maintain ecological balance and support sustainable development [25].



**Figure 1.** Location of the study site of Yuanshan Township in Yilan County.

In recent years, YST has witnessed a transformation from traditional agricultural practices to agro-ecotourism, which has been driven by government initiatives. This shift is intended to integrate ecotourism into mountainous forest environments, thus enhancing climate adaptation measures on hilly slopes. Leisure farms that evolved from conventional tilling farms now combine agricultural activities with tourism, offering unique experiences in mountain forest settings.

This transformation not only bolsters local economies but also strengthens ecosystem services, which are crucial for improving climate adaptability, and the government's promotion of agro-ecotourism underscores its commitment to hillside forest conservation and sustainable economic development.

YST's attractive location, which features distinctive geographical landscapes, natural scenery, and rich cultural and ecological recreational resources, draws visitors from neighboring regions, such as Yilan City, Luodong Township, and the greater Taipei metropolitan area. The township's ability to lure visitors is instrumental in fostering its local economic growth and enhancing its community's resilience. With a population of 32,000 as of 2020, YST benefits significantly from the influx of visitors who engage in high-quality leisure activities. The development of agro-ecotourism has become a critical factor in shaping climate adaptation measures, promoting hillside conservation, and supporting local economies.

YST exemplifies the intersection of natural beauty and proactive adaptation strategies in a fragile ecological setting. By leveraging agro-ecotourism and forest conservation, YST not only mitigates the impacts of climate change but also enhances its socioeconomic vitality. The township's landscape and development trajectory serve as a model for sustainable and resilient community planning in similar regions.

#### 2.2.2. Sustainable Land Utilization and Forest Conservation in YST

Due to the fragility of the land's features, forest protection, soil and water conservation, and the sustainable provision of ecosystem services must be prioritized in its utilization. It is thus imperative to conserve and protect forest ecosystems. Land utilization in the area is restricted by scientific land zoning based on the sloping topography and climatic conditions of YST [18]. As indicated in the literature, forest ecosystems are among the most important ecosystems on Earth [29], and the conservation of forest ecosystems is an NbS to climate change that can promote the provision, regulation, cultural use, and support of forest ecosystem services [16,30–32].

Local people in YST often have a high reliance on forests for their livelihoods, so land conservation achieved by reducing nature disasters stemming from the area's fragility is essential to their welfare. However, local utilization of forest land often leads to forest degradation, and it is thus necessary to initiate measures for local residents to escape the pressures of intense land utilization and at the same time secure their livelihood.

The land in Taiwan is fragmented and geologically fragile; therefore, the government controls forest management in mountainous areas to protect the natural resources and ensure sustainability. Taiwan has passed legislation to protect forests, prohibit logging in state-owned forests on low mountains, encourage non-destructive forest ecotourism, and make full use of forest resources in protected areas. Ecotourism policies, in combination with the transformation of traditional community agriculture into leisure forms, have become a national strategy in Taiwan to restore marginal forestlands, revitalize local declining forests, and boost weak community economies.

The Community Forestry Program in Taiwan, which is promoted by the Taiwanese government, is a forest management plan that involves community participation, especially through ecotourism on low mountain trails [22,31,33]. The purpose of this plan is for the community and the government to jointly protect forests and promote ecotourism. The forest co-management model of community forestry is particularly suitable in low-mountain areas, where society and nature meet. Ecological development programs can have mutually reinforcing effects on forest resource protection. Such integrated policies can help promote forest management in protected forest areas where legislation prohibits the acquisition of timber and non-timber products. This model has been perfected in the Lanyang River Basin in northeastern Taiwan and especially in YST, which is close to the greater metropolitan area of Taipei and attracts visitors from the local area, the metropolitan area, and all over Taiwan. The Community Forestry Program aims to achieve the goal of natural conservation through the support of the community. The community has complied with the government's legal regulations and has given up taking fuelwood from the government-owned forest reserves to earn a living, and the legal norms that prohibit logging and strictly prohibit reclamation are obeyed.

In addition to forest conservation and co-management with communities, the forests are open to the public, and forest ecotourism in Taiwan is thriving [33–35]. In conjunction with ecotourism policies, the government mobilizes communities to transform traditional agriculture into a leisure activity and start small businesses to earn a living, providing subsidies for plans for the development of the community leisure industry.

Meanwhile, communities around marginal forest lands can still obtain economic income from protected forest areas, allowing residents living in YST to seek a better way of life despite concerns about their reliance on the land. The livelihoods of residents are one of the central concerns illustrated in the existing literature, which considers the rights of the residents, asks "Resilience for whom?", and discusses how to ensure the resilience of their livelihoods in the pursuit of social–ecological resilience [36].

### 2.2.3. Thriving Leisure Agriculture

The local mountainous terrain is protected by the government, and agriculture thrives along narrow valleys in alluvial fan plains on which various types of produce, such as tangerines, pineapples, bamboo shoots, ginger, starfruit, leeks, guava, lotus mist, shallots, and pears, are cultivated. Fruit-picking services are provided during the ripening season. The green hills and fruit fields are particularly suitable for the promotion of YST's abundant agricultural recreational activities [24].

Since the early 2000s, the government of Taiwan has implemented strategies to promote the development of leisure agriculture by designating Recreational Agricultural Zones and supporting leisure farms [37,38]. The transformation of traditional agriculture into leisure farms reflects a strategic response to changing consumer demands and economic trends, in addition to recognizing their economic potential. The Taiwanese government supports the development of leisure agriculture with the purpose of offering experiences

that blend economic, social, educational, and environmental benefits. The government has established three Recreational Agricultural Zones in YST, namely Zhentoushan Agricultural Leisure Area (ZALA), Hengshantou Agricultural Leisure Area (HALA), and Dahudi Agricultural Leisure Area (DALA), serving as focal points for agro-ecotourism activities and showcasing the region's agricultural heritage and natural splendor. The local communities in YST were actively engaged in the local eco-agro-leisure transformation [23].

Moreover, YST also presents cultural heritage and entertainment activities, including the tradition of Taiwanese opera, which is also known as Gezaixi and is deeply rooted in the local culture. The origin of this opera can be traced back to YST, where old trees once served as gathering places for opera performances. These ancient trees stand today as cultural landmarks symbolizing the township's rich heritage [23].

Furthermore, YST's green mountains, meandering rivers, picturesque countryside, and traditional rural life attract visitors seeking rejuvenation in the embrace of nature, making it a charming destination for agro-leisure tourism and ecotourism.

This local transformation is a feasible long-term measure for addressing the local climate risks and creating new opportunities for the traditional agriculture sector [16]. The community management committee offices in YST actively play a crucial role in the protection of local forests through the government's community forest management program. These offices have guided residents to earn their livelihood by engaging in the local agro-ecotourism business, and serve as local institutions involved in Taiwan's Community Forestry Program and devoted to operating agro-ecotourism with the support of Taiwan's government.

### *2.3. Single-Bounded Dichotomous Contingent Valuation Method*

#### *2.3.1. Elicitation Process and the Survey Design*

A contingent valuation method was applied in this study, and the value assessment was based on data collected from a questionnaire survey completed by visitors. In the questionnaires, the visitors were surveyed on their visiting patterns, stated willingness to pay in a hypothetical market, intention to visit, and demographic information.

This approach especially involves revealing stated preferences by creating a hypothetical market for the goods or services being evaluated, and the value of the recreational resources to visitors was elicited directly via the survey.

In the survey, a bidding payment is hypothetically assigned to the respondent to elicit and reveal the value they assigned. The bidding amount was generated from a pilot survey conducted in 2022 which included an open question. From the survey, a range of values for respondents' willingness to pay were generated, and accordingly, the bidding value was designed and assigned in the survey used in this investigation. It is noteworthy that the contingent valuation method is used to survey the respondents' stated values, and the bidding amount offered in the formal survey is a hypothetical payment; in fact, it is not a fee, nor an amount applied in practical practices. In the survey, the respondents were made aware of this hypothesis condition regarding the bidding amount, and that their response given for willingness to pay the amount should be according to their perceived value of the recreational resources.

As mentioned, local committee offices are actively running agro-ecotourism attractions and allying with the government to manage local forests and promote ecotourism. The local community offices play a critical role in the local tourism businesses, complying with forest conservation efforts, and participating in co-managing forests in the shallow-mountain regions. Taiwanese residents often argue that they pay government taxes for public services, and in Taiwan, contingent valuation surveys on paying taxes to government agencies often result in protests from respondents and are not a viable payment channel. Hence, the Taiwanese government plays a vital role in recreational resource and forest conservation; however, the payment channel designed in this study is straightforward, and the bidding value is hypothetically offered to the community offices in the survey question.

The economic value of YST's recreational resources, as provided by visitors, was calculated based on the neoclassical economics theory of welfare economics. This method was found to be effective, particularly when employing a single-bounded approach with closed-ended questions complemented by binary-choice regression techniques, as suggested by Hanemann [39] and Cameron [40,41].

The single-bounded discontinuous contingent valuation method used in this study was based on a closed-ended value-eliciting questionnaire. The respondents were required to simply indicate whether they were willing to pay the amounts designated in the questionnaire. The following question was asked to the respondents:

*With the knowledge of the present resources in YST for public recreation, would you be willing to pay BID New Taiwan Dollars to the committee offices for local community management to conserve these recreational resources?*

The dichotomous choices to be selected were "yes" (willing to pay the bidding value, BID) and "no" (unwilling to pay the assigned amount). The binary responses corresponding to the bidding values were designed as a dependent variable to fit a logit model. If a response was "yes" to paying a bidding value, this respondent's real willingness to pay would lie in a range from this bidding value to an infinite value. If the response was "no", the real value ranged from 0 to the assigned bidding value.

Moreover, three statements in the questionnaire were designed to survey visitors' intention to revisit: (1) prioritizing YST as their next outgoing destination, (2) recommending YST to their relatives and friends, and (3) revisiting YST in the near future. The intention to revisit expressed in these three questions was measured using a five-point Likert-type scale, with strongly agree, agree, neutral, disagree, and strongly disagree for the scores of 5, 4, 3, 2, and 1, respectively, where the first statement demonstrated the strongest intention to revisit.

The committee offices for local community management in YST play a crucial role in the protection of local forests and guide the local community to earn their livelihood by engaging in the local agro-ecotourism business. In the survey, the offices were designed to be the payment channel. The following additional question was used to assess the capabilities of these local institutions:

*Are the committee offices for local community management feasible institutions for safeguarding local natural recreational resources?*

The respondents could answer "yes" if they agreed that the agency was a viable organization for protecting local natural recreational resources; otherwise, they could answer "no". The demographic characteristics of the respondents, including their age, occupation, education, gender, and income, were also included in the questionnaire.

### 2.3.2. Evaluation Procedure

The procedure for evaluating the single-bounded method was based on the report by Hanemann [39]. The economic value was estimated by fitting the questionnaire data with a binary logit function. The logit function was as follows:

$$P(\text{BID}_{\text{YES}}) = \left(1 + \exp^{-(\beta_0 + \beta_1 \text{BID} + X\Phi) + e}\right)^{-1} \quad (1)$$

where  $P(\text{BID}_{\text{YES}})$  is the probability of a respondent saying "yes" in response to the bidding value, BID, and "exp" is the exponential value (equals 2.71828...);  $X$  is a vector of independent variables, including the demographic characteristics of the respondents and the key features of the recreational resources;  $\beta_0$ ,  $\beta_1$ , and  $\Phi$  are parameters; and  $e$  is the random error.

After performing a logistic regression with Equation (1), the point estimate of the economic value was calculated with reference to Cameron [40,41]. The value was inverted according to the estimated coefficient of the bidding variable  $\hat{\beta}_1$ .



$$E(WTP) = -\frac{1}{\hat{\beta}_1} \quad (2)$$

where  $E(WTP)$  is the point estimate of the economic value, and the estimated coefficient of the bidding variable is  $\hat{\beta}_1$ .

### 2.3.3. Bidding Values and Survey

To collect information on visitors' willingness to pay to conserve recreational resources, an on-site questionnaire was performed during the peak season in January and February of 2023, which was around the Chinese Lunar New Year. The on-site interviews were performed in recreational resorts in YST, and a total of 500 residents were randomly selected through convenience sampling. Due to the large influx of visitors in the resorts around the Chinese Lunar New Year, the number of incomplete questionnaires reached 100 samples. Especially with the continuous influx of visitors, the on-site retrieval and review of questionnaires became more difficult. Overall, a total of 400 respondents completed the questionnaire.

The bidding values, derived from the aforementioned pilot survey conducted in 2022, were established at NTD 250, 500, 1000, 2000, and 3000, and were randomly and equally allocated to respondents in the survey (Table 1). To further index the value of the bidding prices, it is noted that the price of a cup of Starbucks coffee is NTD 150 in Taiwan, or about USD 5 (in the survey year, 2023, the exchange rate was USD 1 to NTD 31.15).

**Table 1.** Statistics of the distribution of responses across different bidding amounts.

Bid (NTD/Year)	Number of Respondents	Number Consenting	Number Dissenting
250	83	52	31
500	78	38	40
1000	78	24	54
2000	84	12	72
3000	77	13	64
Total	400	139	261

### 2.4. Technique Applied for Choice of Model Specification and Model Estimation

The logit regression technique is adopted for the contingent valuation method used in this study, and via this technique, the value assessment is performed based on a chosen model specification which contains only the significant determinants. The data were collected from a questionnaire survey completed by visitors, and interpolative and extrapolative mechanisms are used to obtain the determinant variables that affect the visitors' payment willingness. The chosen specification is determined after analyzing the significance of all the data surveyed in the questionnaires, including visiting patterns and visitors' assigned bidding value for their stated willingness to pay in a hypothetical market, intention to visit, and demographic information. However, although the actual visiting time is surveyed in the questionnaire, it is not a significant variable in the logit regression for the single-bounded contingent valuation method, and the variable has thus been removed from the present study.

## 3. Results and Discussion

### 3.1. Distribution of Responses across Different Bidding Amounts

In the survey, interviewees indicated their willingness to pay the designated bidding amount. Respondents replied "yes" if their assessment of the resources exceeded the bidding amount and "no" if it fell below the specified amount. As observed in Table 1, the proportion of respondents consenting to pay decreased as the bid value increased.

Among the respondents, those who disagreed with the bidding value in the hypothetical market indicated that they assigned a lower economic value to the service than the bidding amount. This group also included individuals who did not benefit from the recreational services and those who were explicitly protesting the bid amount, all of whom were categorized as unwilling to pay. The number of those who were unwilling to pay was 261, as shown in Table 1. Table 1 demonstrates two key points: the distribution of respondents for each bidding amount was evenly spread, and there was a noticeable decline in the willingness to pay at higher bidding prices.

### 3.2. Empirical Model Specifications and Data Statistics of the Determinant Variables

A logit regression was performed in this study to analyze the determinants of the visitors' willingness to pay the randomly assigned bidding amounts to protect local recreational resources, which were specified as encompassing the combination of ecotourism and leisure agriculture activities. Based on the estimates of the logit regression, the economic value was calculated by following Cameron [40,41]. The logit model was applied to fit the data collected from the survey.

The logit model was estimated using interpolative and extrapolative techniques, and only the significant dependent variables were included in the model specifications at a significant level of 0.10. The specifications of the logit model for the single-bounded contingent valuation procedure adopted in this study were as follows.

$$P(\text{BID}_{\text{YES}i}) = f(\text{BID}_i, \text{RI}_{\text{PRIO}i}, \text{FI}_{\text{COM}i}, \text{MALE}_i, \text{INCOME}_i) + \mu_i. \quad (3)$$

where  $\mu$  is the residual, and the subscript  $i$  represents the  $i$ th respondent;  $P(\text{BID}_{\text{YES}})$  is the dependent variable representing the binary responses of the residents to the bidding values assigned in the survey;  $\text{BID}$  is the assigned bidding value;  $\text{RI}_{\text{PRIO}}$  is a binary dummy variable for the intention to revisit, representing the respondents' consent for prioritizing YST as their next outgoing destination;  $\text{FI}_{\text{COM}i}$  is a dummy variable reflecting agreement that the local community is a feasible institution for safeguarding local natural recreational resources; and  $\text{MALE}$  and  $\text{INCOME}$  are demographic variables of the respondents. The insignificant demographic variables of age, occupation, and education were left out of this final chosen specification, but the details of the definitions for these variables are shown in Table 2.

**Table 2.** Definitions of the variables used in the empirical regression model.

Variable	Definition
$\text{BID}_{\text{YES}}$	Binary variable elicited from first-stage question in the second part of the survey: =1 if the response is "yes", they are willing to pay the bidding amount. =0 otherwise.
$\text{BID}$	Bidding value. A hypothetical individual annual payment distributed to the interviewees according to the order of sampling: NTD 250, 500, 1000, 2000, and 3000.
$\text{RI}_{\text{PRIO}}$	Intention to revisit. Agreement with the statement that YST is the first priority for the next trip, measured with a five-point Likert-type scale, with strongly agree, agree, neutral, disagree, and strongly disagree for the scores of 5, 4, 3, 2, and 1, respectively.
$\text{FI}_{\text{COM}}$	Dummy variable reflecting the crucial role of local forest protection and earning one's livelihood by engaging in the local agro-ecotourism business as guided by the committee offices for local community management. The question in the survey was the following: Are the offices feasible institutions for safeguarding local natural recreational resources? =1 if the response is "yes", they agree that the offices are capable of protecting local natural recreational resources. =0 otherwise.
$\text{MALE}$	Gender dummy variable. =1 if male. =0 otherwise.
$\text{INCOME}$	Personal monthly income in NTD.

The variables' statistics are illustrated in Table 3, and the statistics of the bidding values are not applicable because they were designed as part of the study and assigned to the respondents; the distribution of the bidding variables is shown in Table 1.

**Table 3.** Statistics of the variables for the complete sample of 400 respondents.

Variable	Mean	SD
BID <sub>YES</sub>	0.35	0.48
BID	-	-
RI <sub>PRIO</sub>	3.96	0.82
FI <sub>COM</sub>	0.11	0.31
MALE	0.53	0.50
INCOME	45,395.00	23,551.87

Table 3 presents statistical summaries for a sample of 400 respondents across variables included in the empirical model specifications. Among these, the mean and standard deviation are provided; the statistics of BID<sub>YES</sub> show that respondents answered 'yes' in approximately 35% of cases. The statistics of RI<sub>PRIO</sub>, measured using a Likert-type scale, has an average of 3.96, suggesting a tendency toward a higher priority for the intention to revisit with some slight dispersion among respondents. FI<sub>COM</sub>, with a mean of 0.11 and a standard deviation of 0.31, indicates a low average value for variability. The gender distribution (MALE) shows that 53% of the respondents identified as male, reflecting a fairly balanced sample. INCOME data reveal an average monthly income of NTD 45,395.00, with a substantial standard deviation of NTD 23,551.87, indicating a wide range of income levels among respondents. Overall, these statistics provide insights into the central tendencies and variations within the sample across different variables.

In addition, the statistics of the significant variables are provided in Table 3. More descriptive analyses of the demographic attributes of the respondents are offered. The average number of times in the past year is 2.80, with a standard deviation of 4.08. The average age is 36.88 years old, with a standard deviation of 12.23. The average number of years of schooling is 15.40 years, with a standard deviation of 1.92. The respondents' occupations were in the fields of agriculture (1%); industrial, commercial, and service sectors (43%); military, public, and educational sectors (6%); freelancers (10%); students (20%); housewife (5%); and others (15%).

### 3.3. Estimation Results and Point Estimate of Economic Value

Table 4 lists the estimated results of the logit regression based on treating uncertainty about paying as an unwillingness to pay; hence, the estimated economic values were lower. The significance of the variables in the regression model was examined using the z-test at a significance level of 0.1. High collinearity was not observed among the explanatory variables. The logistic regression analysis identified several significant variables related to the respondents' willingness to pay the bidding amount.

In the estimated logit regression model, the bidding amounts assigned to the respondents (BID variable) were significantly negatively correlated with the tendency of the agreement to pay. The bidding amount was not the only significant variable in the regression, with the following variables also positively related to the tendency to pay the bidding value. An interpretation of these variables is presented below.

RI<sub>PRIO</sub> (intention to revisit): This variable represents the degree of respondents' agreement (expressed on a Likert-type scale) with the statement that they intend to prioritize YST as their next travel destination. The positive relationship suggested by the estimated coefficient revealed that a strong personal intention to return to YST increased the likelihood of financial support for the conservation of local recreational resources. Among the three statements about revisiting in the questionnaire ((1) prioritizing YST as the next travel destination, (2) recommending it to relatives and friends, and (3) revisiting in the near future), the first and strongest had a significant impact on visitors' willingness to pay. The other two variables were not significant and were not included in the final logit model.

**Table 4.** Logit model regression results (treating uncertainty about paying as unwillingness).

Dependent Variable: P(BID <sub>YES</sub> ), Included Observations: 400				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	−3.03857	0.67781	−4.48294	<0.00001 ***
BID	−0.000998	0.00014	−6.96851	<0.00001 ***
RI <sub>PRIO</sub>	0.55366	0.15234	3.63432	0.00030 ***
FI <sub>COM</sub>	0.92538	0.36655	2.52455	0.01160 **
MALE	0.46781	0.24155	1.93671	0.05280 *
INCOME	0.00002	0.00001	4.21078	<0.00001 ***
Log likelihood		−209.1956	Obs. Dep = 0	261
LR statistic		98.31699	Obs. Dep = 1	139
Prob. (LR statistic)		<0.00001	Total Obs.	400

Note: E(WTP) = NTD 1002.00 according to a single-bounded dichotomous contingent valuation technique. The variables of significance are included in the final chosen specification of the logit model by using a z-test at a significance level of 0.1; \*, \*\*, and \*\*\* denote significance at 0.1, 0.05, and 0.01, respectively.

FI<sub>COM</sub> (feasibility of the local community as an institution): This dummy variable reflected the respondents' agreement with the statement that the local community is a feasible institution for safeguarding natural recreational resources. Its positive correlation with willingness to pay implied that respondents who believed in the local community's ability to protect natural resources were more inclined to financially support these efforts.

MALE: This dummy demographic variable indicated that a respondent's gender was male. The positive relationship observed suggests that male respondents were more likely to agree to pay the bidding amount than female respondents were. This could reflect differing attitudes or financial willingness between genders regarding recreational resource conservation.

INCOME: This demographic variable represented the respondents' income level. Its positive correlation with willingness to pay indicated that higher-income respondents were more likely to agree to the bidding amount. This makes sense, as individuals with higher incomes may have more disposable income to allocate toward contributions to recreational resource conservation.

The visitors with a stronger intention to prioritize revisiting YST as their next destination demonstrated a greater intention to pay for the local recreational resources. The local community institution was designated as the payment channel for the bidding amounts in the survey. A higher payment tendency was revealed among visitors who held the designated payment channel in high regard as a feasible institution for safeguarding recreational resources. Male and higher-income visitors were more willing to pay the bidding amounts. These were key determinants in enhancing the value for the visitors.

The point estimate of the visitors' willingness to pay was estimated based on the estimated results of the regression analysis using Equation (3). The estimated value of  $\hat{\beta}_1 = -0.000998$  was substituted into Equation (2), and the point estimate for the economic value was NTD 1002.00. The point estimate of the visitors' willingness to pay, E(WTP), was estimated as follows:

$$E(WTP) = -\frac{1}{\hat{\beta}_1} = -\frac{1}{-0.000998} = 1002.00 \quad (4)$$

The economic value of the recreational resources in YST, according to the visitors, was determined by evaluating their willingness to pay to conserve the resources that they received and enjoyed.

To further index the value of the estimated value of the local recreational resources to an average visitor, the point estimate of NTD 1002.00 is about USD 32.17 (in the survey year, 2023, the exchange rate was USD 1 to NTD 31.15). In addition, the average monthly income of the respondents is NTD 45,395.00, as mentioned in Table 2 for the variable definition and Table 3 for the statistics. The average personal monthly income is about USD 1457.30. The estimated value of local leisure resources accounts for 2.21% of the average monthly income of respondents.

### *3.4. Balancing Economic Viability and Forest Conservation with Agro-Ecotourism in YST*

The study results provide evidence supporting that the NbSs for climate change do not always involve erasing local opportunities to earn a livelihood. Prioritizing economic viability while ensuring forest conservation as a measure of an NbS to climate change is essential for the success of community climate adaptation policies. This study demonstrated an assessment of the economic viability of a climate adaptation policy in a fragile township, YST, Taiwan, where traditional agriculture there is transforming into agro-ecotourism. Hillside forest protection has historically been supported by the government and can be seen as promoting NbSs to climate change on hillsides and as boosting the local economy by attracting visitors. Visitors are consumers of the local ecosystem services and recreational resources, their visits enhancing the local economy, which has undergone a transformation into agro-ecotourism, and thus supporting the livelihoods of residents. This study evaluated the value of the local recreational resources through the lens of consumers' (visitors') perceived value. This investigation aimed to provide empirical evidence of the economic value that visitors place on local recreational resources, highlighting the benefits of climate-resilient governance through the transformation of the recreation industry. This study applied non-market valuation methods for the performed assessment and showed that the value of recreational resources for an average visitor was NTD 1002.00.

The determinant components of the visitors' willingness to pay were addressed. The likelihood of agreeing to pay the bidding amount was higher among respondents who intended to revisit YST, believed in the local community's ability to protect recreational resources, were male, and had higher incomes. This analysis offers significant insights into the economic viability of forest conservation when adapting to climate change.

This reflects the high esteem for local resources utilized in recreation and has implications for the potential commercial interests of residents operating local recreational businesses, making this a two-sided coin. This is an economic indicator that the Taiwanese society values maintaining the rich natural resources in this area. These findings can provide a crucial basis for the sustainable management of local resources as an NbS to climate change. In this case, successful nature-based measures for adapting to climate change must consider the economic rights and interests of the resource users—the visitors who utilize the recreational resources and the residents who rely on the local resources for their livelihoods. Agro-ecotourism in YST is an economically viable policy that can balance the requirements of nature and society in the local area. The evidence from the estimated economic value shows the recreational benefits and suggests the viability of agricultural transformation for potential income generation in the community.

## **4. Conclusions**

The hybrid agro-tourism and ecotourism model is common in shallow-mountain areas in Taiwan, and is especially active and successful in the climate-fragile terrain of Yuanshan Township, Taiwan. The economic value of recreational resources in Yuanshan Township, as perceived by visitors, was investigated in this study. The estimated results for the visitor perceived value of the agro-ecotourism transformation from traditional agriculture empirically showed the viability of the integrated measures. The economic value of these recreational resources highlights the benefits of climate-resilient governance through the evolving leisure industry.

Agro-ecotourism is the dominant local industry in YST, its characteristic components being agriculture tourism and ecotourism. This study demonstrated that hybrid measures implemented through the long-term transformation of traditional agriculture and forest conservation are viable nature-based solutions to climate change. By applying non-market valuation methods, this study assessed the value of local recreational resources, as perceived by visitors, providing crucial information for the sustainable management of natural resources amid climate change. This analysis reveals significant economic benefits and offers insights that are essential for preserving the area's abundant natural resources through the continuous development of the leisure industry. The performed logit regression analysis identified determinant factors of the value assigned by visitors. The positive correlation between visitors' willingness to pay and their intention to revisit, belief in the local community as an institution, gender, and income level highlighted the key factors that influenced the visitors' recreational benefits. These factors are the key components driving the success and viability of the integrated forest conservation and climate adaptation efforts. The integration of leisure agriculture and ecotourism, which is supported by government initiatives, has proven to be a valuable strategy in YST and the Lanyang River Basin. This approach not only fosters economic development but also ensures the sustainable management of natural resources. The continued development and promotion of leisure agriculture and tourism will thus be crucial in maintaining the region's natural resources and achieving long-term climate resilience.

It is common in Taiwan, especially in shallow-mountain areas, for local residents to address forest conservation in the hillslopes and identify opportunities for agriculture in areas of fertilized soils. The Yuanshan Township is therefore a place that demonstrates how this hybrid type of recreation can thrive. The recommendations given to the authorities are that an ideal nature-based solution to climate adaptation can meet the multiple needs of people simultaneously. Within the context of the currently proposed Anthropocene epoch, the high population density in the small island of Taiwan presents a high demand for outdoor recreation. Furthermore, with climate change becoming an emergency, forest conservation efforts in the fragile hilly areas of Taiwan have protected people from disaster and have become feasible and cost-effective measures of nature-based solutions to adapt to climate change. The agro-ecotourism industry in shallow-mountain areas in Taiwan, especially in the study site and other local feasible terrains, can (1) support forest conservation efforts to stabilize slopes as feasible measures of nature-based adaptation to climate change, (2) provide the opportunity of recreation by fulfilling visitors' desire for ecosystem-provided cultural services to release the pressure caused by the high density of Taiwan's population, and (3) support the livelihoods of local residents in communities with viable incomes. However, what must be carefully noted is that this hybrid measure has its locality and applicability and should not be blindly and extensively implemented.

Furthermore, the development of agro-ecotourism has noticeable constraints, with the cultural shift requested of traditional local farmers to transform their farms into tourist attractions and the commodification of cultural heritage and natural landmarks being critical points of debate for local communities. The opportunities for economic viability should be accompanied by an awareness of the relevant threats to traditional communities, cultures, practices, and knowledge. A reflection worth noting here refers to the need to establish a market mechanism and the accompanying regulation for local agro-tourism governing practices. Local communities can take lessons from their previously experiences of the huge influxes of visitors that occurred following Taiwan becoming open to visitors from mainland China in 2008 [42]. As a superior ecotourism system within Yuanshan Township, the popular and famous Fushan Botanical Garden has established a public visiting screen and reservation mechanism to regulate the visiting areas and visitor numbers [43]. Visitor regulation in Fushan Botanical Garden is evidence of delivering higher-value and higher-quality ecotourism [44,45]. The experience of Fushan Botanical Garden represents a model for local market expansion in terms of natural resource management addressing the risks relating to tourism exploitation and the anthropic pressure on fragile natural ecosystems due to the increased touristic activity.

In the literature, the quality and value of ecotourism in the famous Fushan Botanical Garden within Yuanshan Township have been investigated, but the value of agro-ecotourism is hardly explored. This research is based on a visitor-stated value in a hypothetical market, and the actual visiting time is omitted from the regression analysis in this study. In future work, to properly incorporate the visiting time in the value assessment, we suggest using real-world data and including the actual visiting time. However, an alternative method for obtaining the value of recreational resources is to use the travel cost method, which directly applies the frequency of visiting to reflect actual activity in a realized exchange market. In future studies, it will be worthwhile adopting the travel market as a surrogate to evaluate the value of local resources.

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