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## ETHNOBOTANICAL KNOWLEDGE BASED ON INDEX OF CULTURAL SIGNIFICANCE IN PRESERVING THE FUNCTION OF WAY BETUNG WATERSHED

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### ABSTRACT:

The Way Betung watershed is critical to the community's water supply, but their activities are causing erosion and degradation of the watershed's function. The role of the community is needed, indicated through plant utilization based on culture in preserving watershed functions. The purpose of the study was to identify the characteristics of respondents related to knowledge of various types of ethnobotany, analyze the correlation of respondents' characteristics with the Index Cultural Significance (ICS) and recommend efforts in preserving the Way Betung watershed, Lampung. The research was conducted through interviews with the community and field observations, and data was analyzed using ICS and correlation between November-December 2023. Based on the result showed that 66 types of plants are utilized, with coconut (*Cocos nucifera* L.) being the most utilized (the value was 112), followed by Sambiloto (*Andrographis paniculata* Ness) at 60 and Rubber Rubber (*Hevea brasiliensis*) and Berenuk (*Crescentia cujete* L.) at 4. The community's knowledge based on ICS indicates that people prioritize their benefits over ecological functions in preserving watershed functions. Ethnic diversity was found to have the highest correlation value with ICS, indicating the need for sustainable preservation of various cultures from different ethnicities in the research location.

**Keywords:** Correlation, Ethnobotany, Erosion, Cultural Significance, Watershed Function Preservation.

## 1. INTRODUCTION

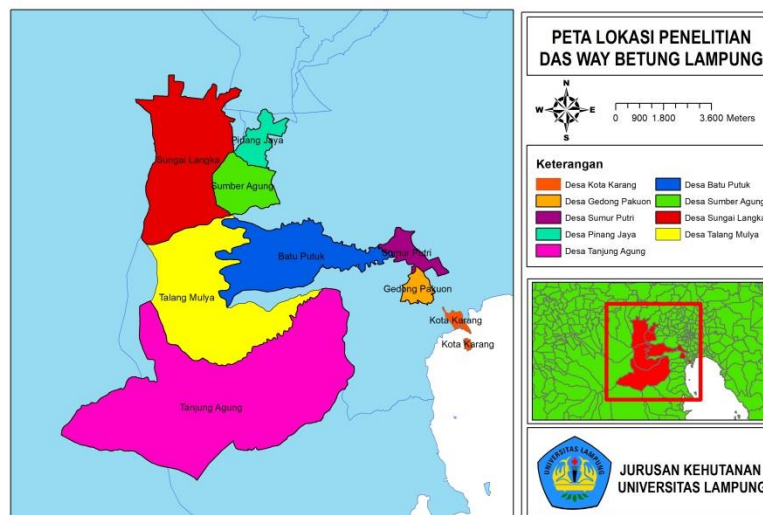
Way Betung Watershed is a watershed located in Lampung Province and has an area of 5,119.63 ha and has an important function for the surrounding community as a source of water to meet the basic needs of the community, including for agricultural and plantation activities (Hendra *et al.*, 2018). Changes in land use change from forest to agricultural land that is widely carried out by the community will result in erosion (Yanti *et al.*, 2017). Activities that have an impact on land use change have been carried out by the community around the Way Betung watershed for a long time. From 1991 to 2006, these activities decreased the area of forest land to agricultural land (from 973.3 ha of forest to 508.1 ha). This changes in forest land area resulted in an increase in the river flow coefficient from 48.6% to 61.6%, causing increased erosion (Yuwono, 2011; Wulandari *et al.*, 2014; Mubarok *et al.*, 2015).

It has been proven that from the past until now, local knowledge of the community in utilizing various types of plants (ethnobotany) around the watershed is used to meet their basic needs such as food, buildings, cultural needs, and other uses (Wulandari *et al.*, 2019; Hafida *et al.*, 2020). Ethnobotany is the use of plants based on local knowledge based on certain cultural values to meet their needs and use in a sustainable manner (Silalahi, 2020). The influence of culture greatly influences the community in making decisions on the types of plants that will be planted by the community (Rahmawati *et al.*, 2019; Wulandari *et al.*, 2024), as well as policies that apply in a country (Wulandari *et al.*, 2019). The use of plants to fulfill daily needs for food, health, and cultural needs has been widely carried out by the community based on their knowledge based on culture and information from generation to generation. Thus, the existence of the community including their socio-culture plays an important role in efforts to conserve the Way Betung watershed, because social factors are very influential in increasing environmental conservation efforts including forest conservation (Wulandari *et al.*, 2021).

Up to recent, research related to environmental preservation around watersheds based on social aspects is mostly related to community social capital (Ramli, 2021), and conservation perceptions that correlate with community behavior in preserving watersheds (Salampessy *et al.*, 2019; Langkeru *et al.*, 2022). Preservation of the environment around the watershed based on community knowledge in the selection and utilization of plant species based on culture through ICS is still rarely done (Kasim *et al.*, 2020). Therefore objectives of this study was to identify the characteristics of respondents who has ethnobotany knowledge of plant benefit, and analyze the correlation of respondent characteristics with the ICS.

## 2. RESEARCH METHODS

The research was conducted in the central part of the Way Betung watershed, namely Tanjung Agung, Sumber Agung, and Batu Putuk villages. The selection of locations was based on the profession of most of the population as farmers and are 3 villages with high population density, namely Tanjung Agung village as many as 2007 people, Sumber Agung 5189 people, and Batu Putuk 6930 people in 2022. This research was conducted in November-December 2023, with data collection by interviewing the community using a questionnaire accompanied by field observations. Purposive sampling was used to determine respondents in this study, with the criteria that respondents must be local people who have lived for more than 5 years, are more than 20 years old, and manage their land inside or outside the forest. This data can be seen in Table 1. From the three villages, 33 respondents were purposively selected, of which a minimum of 30 people were eligible to be used as respondents in the study. According to Sugiyono (2017); Mayasari *et al.*, (2016) at least 30 people have fulfilled the validity of the sample number to be used as respondents in the study.



**Figure. 1.** Map of Research Locations

The questionnaire contains questions related to the local knowledge of the community in utilizing various types of existing plants (Andrade et al., 2017). Analysis of the utilization of existing plants using the index of cultural significance (ICS) (Shofiyah et al., 2020; Wulandari et al., 2024). According to Turner (1988), this ICS has three variables including the utilization of plants (quality of use), the intensity of their use (intensity of use), and the exclusivity of their use (exclusivity of use) so that it will produce an ICS value for each plant, following the formula of the ICS.

$$ICS = \sum_{i=1}^n (q \times i \times e)_{ni}$$

$$ICS = \sum_{i=1}^n (q_1 \times i_1 \times e_1)_{n1} + (q_2 \times i_2 \times e_2)_{n2} + \dots + (q_n \times i_n \times e_n)_{nn}$$

#### Description:

q = quality value of plant utilization by local communities.

i = intensity value of plant utilization by local communities.

e = exclusivity value of plants utilized by local communities.

The level categories related to ICS values obtained based on this formula are known to produce values that vary based on use by the community. Categories related to ICS value levels according to Navia et al. (2017) stated that the ICS value is divided into 5 categories based on the calculation results that have been obtained. The results of each individual type of plant have different values from each other so that there are levels for each type of plant based on its use (Fahrirurrahman et al., 2020). Grouping of value categories based on research by Navia et al. (2017), is presented in Table 1.

**Table. 1.** Grouping of ICS values based on 5 categories

No.	ICS value range	Information
1	>100	Highest
2	50-99	High
3	20-49	Moderate

4	5-19	Low
5	<4	Lowest

Correlation Test Analysis with the Spearman Ranks method, this correlation analysis is a method used in the statistical process that aims to determine the relationship between variables (Ponto et al., 2015). Correlation analysis has a known number that can give positive, negative to zero directions if there is no relationship between variables. The Spearman Ranks Correlation Test is a process to prove the relationship between variables known variables can be nominal scale or ordinal scale (Sihombing et al., 2019). The types of variables in this study are divided into two types, namely the dependent variable (dependent) ICS value, while the independent variables are age, type of work, gender, ethnicity to education level. The Spearman Ranks formula is known as follows.

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

#### Description:

r = Correlation

n = Number of respondents (local community)

$\sum x$  = Sum of x results (age, type of work, gender, ethnicity to level of education education level)

$\sum y$  = sum of y results (ICS)

### 3. RESULT AND DISSCUSION

#### Characteristics of Respondents

Respondents in this study are communities around the Way Betung watershed who know various types of plants based on their cultural background.

Table. 2. Characteristics of Respondents in the Community around the Way Betung Watershed

No.	Characteristics	Amount	Percentage (%)
<b>1</b>	<b>Age</b>		
	<30	1	3
	31-60	30	91
	>60	2	6
<b>2</b>	<b>Gender</b>		
	Man	19	58
	Woman	14	42
<b>3</b>	<b>Education</b>		
	Elementary School	10	29
	Junior High School	17	50
	Senior High School	5	15
	Collage	2	6
<b>4</b>	<b>Job</b>		
	Farmer	13	40
	Housewife	9	27
	Laborer	11	33
<b>5</b>	<b>Ethnic</b>		
	Sundanese	24	73

	Javanese	5	15
	Lampung	2	6
	Palembang	1	3
	Bengkulu	1	3

Source: (Primery Data, 2024).

Based on Table 1, it is known that the highest number of respondents (91%) are in the range of 31–60 years old. The dominant gender is male (58%), while female respondents are 42%. This is logical because in preserving watershed functions, the role of men is needed for land clearing, plant care, and harvesting (Permatasari *et al.*, 2022). The dominant level of education is junior high school, with a percentage of 50. This is because respondents in the research area generally choose to help their parents more than their education (Azizah *et al.*, 2020). The most dominant profession is farming, because almost all people utilize the surrounding land for farming activities (Hafida *et al.*, 2020). Ethnic diversity has the highest correlation score to the management of watershed function sustainability, so the cultural diversity brought by various ethnic groups must be maintained. Ethnic diversity will support nature conservation because the culture of each ethnic group has a strong connection with nature (Cai *et al.*, 2022).

### Index of Cultural Significance (ICS) Analysis Based on Community's Ethnobotanical Knowledge



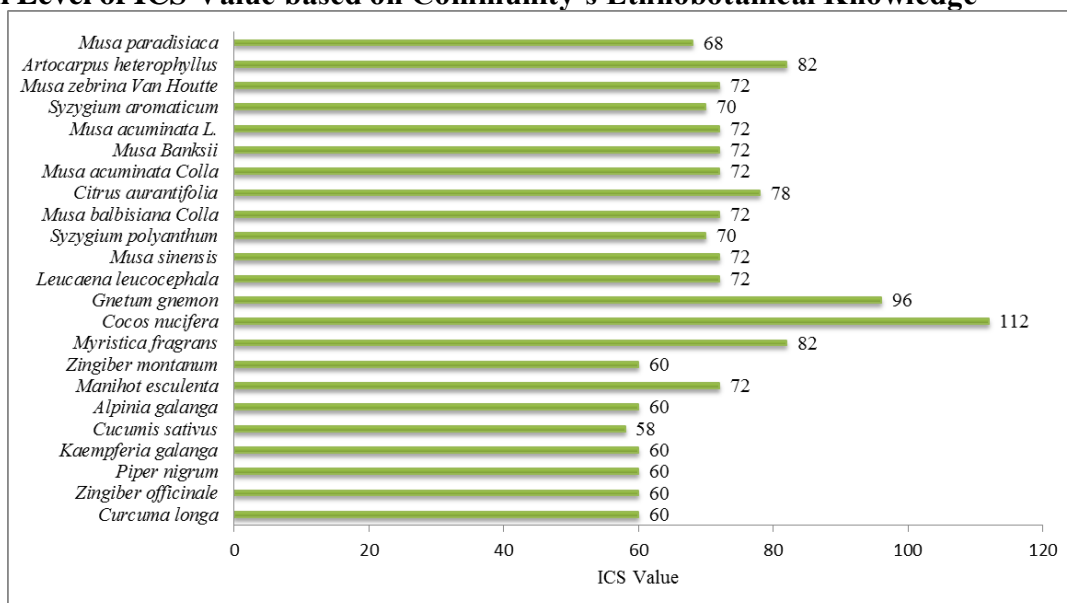
**Figure. 2. Discussions with local community**

Local community knowledge related to plant utilization and management is known based on information passed down from their ancestors based on their respective cultures and local wisdom. As for ICS, it is generated from how much plant utilization is used, how often plants are used by the community, and the priority of plants used based on the utilization and local knowledge of the community (Amboupe *et al.*, 2019). Based on the results of the research that has been done, there are 66 types of plants that are used by the community based on their knowledge. The utilization factor has an ICS value ranging from 4 to 112. The types of plants consist of various types of utilization, including foodstuffs with a percentage of 42%, spices with 11%, medicines with 37%, containers or food wrappers with 6%, and building materials, aromatics, crafts, and culture with a percentage of 1% each.



**Figure 3. The Area used for Growth various types of Plants**

**High Level of ICS Value based on Community’s Ethnobotanical Knowledge**



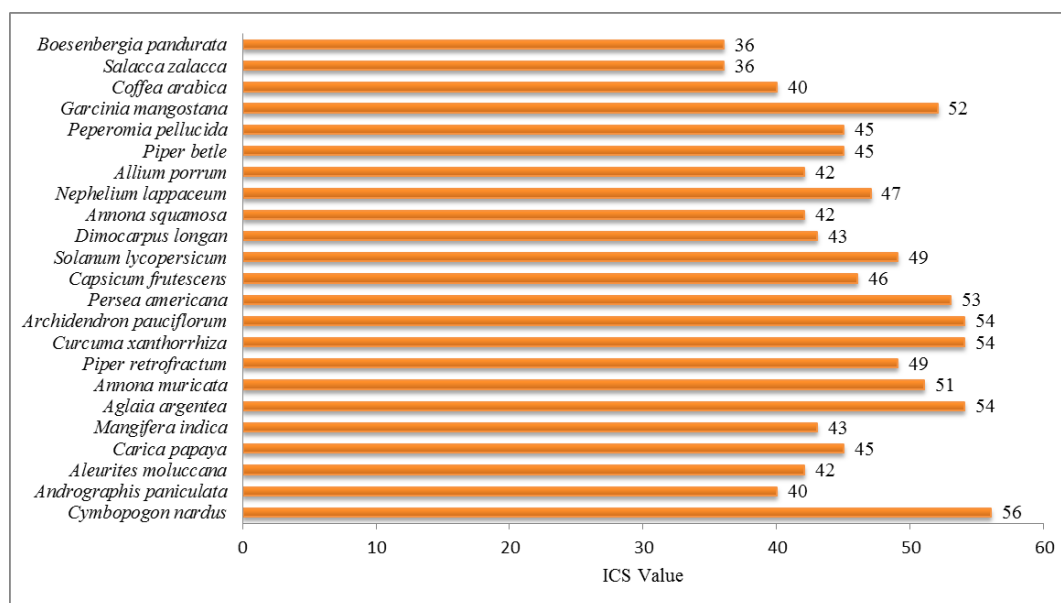
**Figure 3. Variety of Plants Species which has High ICS Value**

Based on Figure 1, it is known that out of 66 species, there are 23 types of plants that has categorized as high ICS value (60-112), and the highest ICS value (112) is coconut. This plant because is widely used by the community for cooking ingredients, buildings, crafts, drinks, traditional medicine, and even ceremonial needs in culture. The Javanese and Sundanese ethnics believe that coconut water is sacred, so for the Sundanese tribe, it is used in wedding ceremonies (Ryandita et al., 2020). The Javanese also use coconut for the needs of the four-month womb ceremony (Silvia et al., 2017). These types of high ICS value plants are used by the community to meet certain needs, such as banana plants used for consumption of the fruit and the leaves used as food wrappers (Nugrahani et al., 2022). Plant species that are used as spices, such as cloves and salam (Robi et al., 2019). The recommendation for plants that fall into the high ICS value category is to preserve their species and plant them in agroforestry. With agroforestry, the types planted will vary in type and stratification of the canopy as well

as the type of roots so that we can anticipate the impact of erosion and a decrease in the function of the watershed.

### Moderate Level of ICS Value based on Community's Ethnobotanical Knowledge

Plant species that have moderate ICS values are in the range of from 36-56. This condition is usually influenced by the infrequent use of these plant species and are known to be rarely used for various things. The community has limited knowledge so that they only utilize these plant species for certain needs (Wulandari et al., 2024)

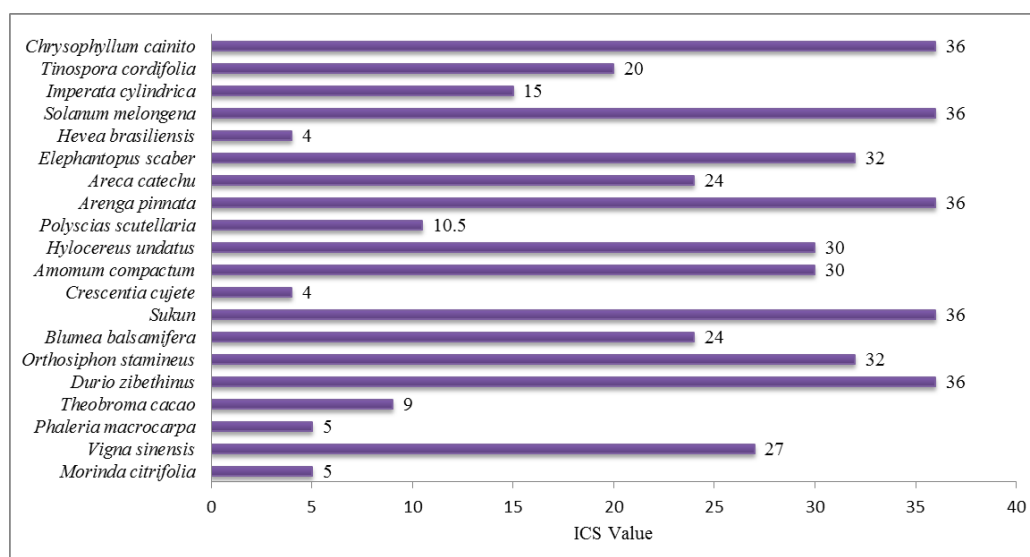


**Figure. 3. Variety of Ethnobotanical Species of Moderate ICS Value**

The type of plant with the highest category of medium ICS value is lemongrass (56), because this type of plant is widely used by the community for spices, aromatics in cooking, and herbal medicines (Robi *et al.*, 2019). Lemongrass is able to cure various types of diseases, such as coughs, and increase immunity (Maulana *et al.*, 2023). The types of plants mentioned in Figure 2 in the moderate ICS value category are the types of plants that are consumed, for example rambutan, mangosteen, and avocado; chili, tomatoes, jengkol, and others such as temu kunci, kemiri are used as cooking ingredients; and Javanese chili is used for herbal ingredients. There is a need for the role of extension workers because the community does not have adequate knowledge about post-harvest processing modifications.

### Low Level of ICS Value based on Community's Ethnobotanical Knowledge

The type of plant with the lowest ICS value has a value range of 4-36, generally because its use is rare and is only used when basic needs must be met immediately. Usually, plants with low ICS fulfill nutritional needs for the body as well as immunity and heatiness, such as the sambiloto plant (Priyani, 2020). For coffee, it is usually consumed when doing certain jobs, serving guests, and other activities (Tania *et al.*, 2022).



**Figure 4. Variety of Ethnobotanical Species Lowest ICS Value**

Based on Figure 3, it is known that the variety of ethnobotanical types that have the lowest value is 4. This is influenced by several factors, such as having one type of utilization or its use being very rare, as well as the lack of community knowledge about utilizing these types of plants. Plant species with the lowest ICS value category, especially plants with an ICS value of 36, are fruiting plants that are used for cooking ingredients such as eggplant and breadfruit (Robi *et al.*, 2019), consumed directly such as sawo and durian (Rohani *et al.*, 2023), and those used to produce sugar such as sugar palm (Ningsih *et al.*, 2022). Brotowali and Alang-alang plant species, are utilized when needed by the community for herbal medicine ingredients (Alfiani *et al.*, 2021). Plant species with the lowest ICS value in the value range of 4 are known to be very rare, and their utilization is not known by the community due to a lack of information related to these plant species, such as rubber and berenuk. It is known that berenuk has cytotoxic properties in its fruit flesh, so that it can induce cell death in the body and has a high toxic content (Arel *et al.*, 2018).

### **Spearman Ranks Correlation Analysis between Respondent Characteristics and ICS Values**

Ranks-Spearman correlation analysis was conducted to analyze the relationship between independent variables (age, type of work, gender, ethnicity, and education level) and the dependent variable (ICS). The Spearman Ranks Correlation Analysis is a process to prove the relationship between these two types of variables based on a nominal or ordinal scale. Correlation analysis in the direction of positive, negative, or zero if there is no relationship between variables. (Sihombing *et al.*, 2019; Wulandari *et al.*, 2024). The results of the Ranks-Spearman correlation analysis test data are seen in Table 2.

**Table 3. The Correlation Results between Respondent Characteristics and ICS Value**

Correlations								
			AGE	SEX	EDU	JOB	ETH	ICS
Spearman's rho	AGE	Correlation Coefficient	1.000	-0.057	.693*	.395*	.806*	.825*
		Sig. (2-tailed)		0.755	0.000	0.023	0.000	0.000
		N	33	33	33	33	33	33



	SEX	Correlation Coefficient	-0.057	1.000	-	-	-	-
		Sig. (2-tailed)	0.755		0.190	0.068	0.229	0.128
		N	33	33	33	33	33	33
	EDU	Correlation Coefficient	.693**	-0.234	1.000	.489*	.844*	.908*
		Sig. (2-tailed)	0.000	0.190		0.004	0.000	0.000
		N	33	33	33	33	33	33
	JOB	Correlation Coefficient	.395*	-0.321	.489*	1.000	.649*	.621*
		Sig. (2-tailed)	0.023	0.068	0.004		0.000	0.000
		N	33	33	33	33	33	33
	ETH	Correlation Coefficient	.806**	-0.215	.844*	.649*	1.000	.957*
		Sig. (2-tailed)	0.000	0.229	0.000	0.000		0.000
		N	33	33	33	33	33	33
	ICS	Correlation Coefficient	.825**	-0.270	.908*	.621*	.957*	1.000
		Sig. (2-tailed)	0.000	0.128	0.000	0.000	0.000	
		N	33	33	33	33	33	33
*. Correlation is significant at the 0.05 level (2-tailed).								
**. Correlation is significant at the 0.01 level (2-tailed).								

Based on Table 2, it is known that the five independent variables have a relationship (correlation) with the dependent variable (ICS). The relationship between respondent characteristics and ICS Value of variables has a correlation value of  $0.000 < 0.05$ , so the variables are correlated with each other. Of the five independent variables used in this study, it is known that the ethnic variable has a very high correlation value; the coefficient value is 0.957. Tribes in an area have a role related to the applicable laws and regulations and also have their own uniqueness in utilizing plant species (Shofiyah *et al.*, 2020). Ethnicity itself has a positive number direction, so the more types of tribes in the area, the greater the diversity of ethnobotanical utilization (Anggraini *et al.*, 2018). Furthermore, Cai *et al.* (2022) stated that the existence of ethnic diversity in a region will better support environmental sustainability because of the specific culture of each ethnic group. The variable with the lowest coefficient correlation value is gender, at -0.270. In addition, the direction of the correlation between gender and ICS is negative, according to Marwati *et al.* (2018) gender does not affect the level of community knowledge in utilizing plant species (ethnobotany) to meet daily needs.

#### 4. CONCLUSIONS

The conclusion of the research that has been carried out based on the local knowledge of the community from the various types of ethnobotany around them, as follows :

1. There are 66 types of plants that are utilized by the community The highest ICS value is coconut with an ICS value of 112, and plants that have a medium ICS value are Sambiloto at 40. Thus, the types of plants in the high and moderate categories must be preserved

through agroforestry because they are widely used by the community and to preserve the function of the Way Betung watershed. Rubber and Berenuk plants each have an ICS value of 4, because they are rarely used and their benefits are not widely known by the community around the Way Betung watershed, The role of extension agents is needed in increasing community knowledge in processing post-harvest products.

2. The results of the Spearman Ranks correlation test show that the five independent variables have a relationship (correlation) with the dependent variable (ICS). It is known that the ethnicity variable has a very high correlation value; the coefficient value is 0.957. So there needs to be government efforts to preserve the existence of diverse ethnic groups at the research location. The lowest correlation coefficient is gender (-0.270), because gender does not affect the level of community knowledge in utilizing plant species (ethnobotany).

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