



# INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES



## Understanding the Importance of Provisioning Ecosystem Services in Natural Resource-Dependent Poor Household: A Case Study of Jerlun, Kedah

Mohd Azmeer Abu Bakar, Asyirah Abdul Rahim & Mohammad Izzamil Mohd Nasir

To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v12-i9/14492>

DOI:10.6007/IJARBSS/v12-i9/14492

**Received:** 09 July 2022, **Revised:** 11 August 2022, **Accepted:** 26 August 2022

**Published Online:** 04 September 2022

**In-Text Citation:** (Bakar et al., 2022)

**To Cite this Article:** Bakar, M. A. A., Rahim, A. A., & Nasir, M. I. M. (2022). Understanding the Importance of Provisioning Ecosystem Services in Natural Resource-Dependent Poor Household: A Case Study of Jerlun, Kedah. *International Journal of Academic Research in Business and Social Sciences*, 12(9), 339 – 354.

**Copyright:** © 2022 The Author(s)

Published by Human Resource Management Academic Research Society ([www.hrmars.com](http://www.hrmars.com))

This article is published under the Creative Commons Attribution (CC BY 4.0) license. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this license may be seen at: <http://creativecommons.org/licenses/by/4.0/legalcode>

Vol. 12, No. 9, 2022, Pg. 339 – 354

<http://hrmars.com/index.php/pages/detail/IJARBSS>

JOURNAL HOMEPAGE

Full Terms & Conditions of access and use can be found at  
<http://hrmars.com/index.php/pages/detail/publication-ethics>



# INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES



## Understanding the Importance of Provisioning Ecosystem Services in Natural Resource-Dependent Poor Household: A Case Study of Jerlun, Kedah

Mohd Azmeer Abu Bakar, Asyirah Abdul Rahim & Mohammad Izzamil Mohd Nasir

Geoinformatic Unit, Geography Section, School of Humanities, Universiti Sains Malaysia  
Corresponding Author's Email: azmeerm@usm.my

### Abstract

Numerous ecosystem services provided by nature are essential for human survival and well-being. However, the state of some natural resources and associated ecosystem services may undergo extraordinary changes, particularly in rural areas, due to current global developments. By offering benefits, a socio-ecological system's output has the potential to provide a variety of goods that people use daily. The well-being of human life depends mainly on the benefits provided by natural resources, especially for the poor living in rural areas. However, the degradation of natural resources due to developmental limitations and lack of knowledge of the social-ecological system has also affected the availability of human resource benefits. This study aims to assess the degree of knowledge and awareness among poor households regarding the significance of the natural resources surrounding the study area for their livelihoods. This study used a survey method through a questionnaire form. The respondents were selected by snowball sampling, and a total of 124 questionnaires were distributed around Jerlun, Kedah, Peninsular Malaysia. The research found that poor households had high levels of knowledge since, on average, their understanding of the benefits of natural resource supply ranges between 75 and 100 points. With a high level of knowledge of the benefits of natural resources, the poor household is increasingly concerned about caring for and protecting natural resources and various activities utilising natural resources in their lives.

**Keywords:** Knowledge, Natural Resources, Poor Household, Provisioning Ecosystem Services

### Introduction

Ecosystem services (ES) are a process of natural environmental components that provide direct and indirect benefits to sustain the needs of human life (Adhikari et al., 2018; Bretones & Gonzalez, 2011; Costanza et al., 2017; Felix & Burkhard, 2012; Pushpam Kumar & Makiko Yashiro, 2014). Ecosystem services are classified into four types: provisioning services, regulating services, supporting services, and cultural services (Haines-young & Potschin, 2013;

Haines-Young & Potschin, 2018; Wilkinson et al., 2013) that can generate neither social nor economic value for human life (Angelsen et al., 2011; Jerneck, 2015). Therefore, it is critical to recognise and manage local natural resources to maximise ecosystem services (Lee, 2021). For example, based on the Science for Environment Policy (2015), 75 per cent of the protein supply in the oceans and 13 hectares of forest area is degraded and destroyed. This impacts community livelihoods and general well-being, particularly among rural poor people. For instance, rural sub-Saharan African people depend on providing ecosystem services to sustain their livelihoods (Jew et al., 2019). It is also related to population expansion, which shows a significant rise in the need for ecosystem services and benefits, particularly for provisioning services, among the poor population (Eigenbrod et al., 2017; Haines-young and Potschin, 2013; Norshahida and Aziz, 2018; Pritchard et al., 2019).

The assessment and study of ecosystem services are becoming more popular, and it is a topic of increasing interest in ecology (Hou et al., 2014; Liu et al., 2012). It was because studies and assessments of ecosystem services could give information on ecosystem functions and the intricate role that natural resources play in sustaining human welfare, livelihood, and well-being, especially for the underprivileged in rural areas (Nyumbu, 2013). Poverty and natural resources are inextricably linked to human life, and utilising natural resources has a vital influence in determining the livelihood and well-being of poor households (Abu Bakar et al., 2020). According to Walelign (2015), rural people in developing countries often depend heavily on ecosystem services, mainly providing benefits for their economic well-being and quality of life. Fonta et al (2011) have also demonstrated that poor household income increases by 10% due to using natural resources, resulting in a 4.90 per cent reduction in extreme poverty in rural Nigeria. This highlights how crucial natural resources are to enhancing the well-being of the poor in rural areas.

Locals in rural regions generally lack knowledge of ecosystem services and sustainable natural resource usage (Kikoti, 2009). Similarly, Asah et al (2014); King and Reno (2014); Summers et al (2012) found that human understanding of socio-ecological systems and ecosystem services management actions is still at a low level. Furthermore, Agenda 21 Chapter 36 states that a lack of public awareness about the relationship between humans and the environment is due to a lack of information and knowledge among the population. Consequently, a study should be conducted to assess the poor's level of knowledge on the benefits of supply derived from natural resources in their settlement areas. This is because, in addition to physical factors like technological infrastructure, values and knowledge have emerged as critical impacts on the management and utilisation of natural resources to ensure that they are in good enough condition to be used by future generations (Lamarque et al., 2014; Singh, 2012). Additionally, locals must be aware of ecosystem services to appreciate better the natural resources surrounding their homes (Mohd Azmeer Abu Bakar et al., 2020). Therefore, there are two primary objectives of this study:

1. To determine poor households' understanding and knowledge about provisioning ecosystem services provided by natural resources (land, sea, river), and
2. To identify the perceived benefits of provisioning ecosystem services among poor households.

### Knowledge of Environmental and Natural Resources

According to Jamilah et al (2011), knowledge is the ability to receive, retain, and apply information; it integrates understanding, experience, wisdom, and skill. Furthermore, Mostafa (2007) defines knowledge of natural resources as the branch that supports general knowledge, such as facts, concepts, and relationships between ecosystems and natural resources. According to the study by Said et al (2003), the changes to the environment and natural resources depend on an individual's level of knowledge. However, most Malaysians have experienced environmental issues and cannot relate the ecological problems that have existed to their general knowledge (Tamby et al., 2010). This, put, contributes to a basic level of understanding. Similarly, less responsible social behaviour and attitudes have contributed to changes in environmental quality (Jamilah et al., 2011). Lastly, Ecological behaviour and attitude are shaped and encouraged by the knowledge of the natural environment (Fremerey and Bogner, 2014; Isaac & Zabil, 2012; Lieflander et al., 2015; Siefer et al., 2015).

### Social-Ecological Systems

According to Norstrom et al (2017), the concept of a social-ecological system was introduced by Berkes and Folke in 1998. They argued that an integrated system in the idea of "human-in-nature". In other words, humans are part of an ecosystem and shape that ecosystem from a local scale to a global scale. At the same time, humans also depend on ecosystem processes to benefit from ecosystems for the well-being of life and community development. Leslie et al (2015), a socio-ecological system is a relationship and response between a human and a natural system, and four dimensions interact in a socio-ecological system, namely social, economic, ecological, and policymakers, who produce different outcomes at different spatial and temporal scales. Meanwhile, Fischer et al (2015) stated that the social-ecological system is a human-environmental system relationship that delivers an analytical framework for understanding the dynamic relationship between the environment and society. In this study, the socio-ecological system (see Figure 1) is used because the concept supported is the response relationship between humans and natural resources.

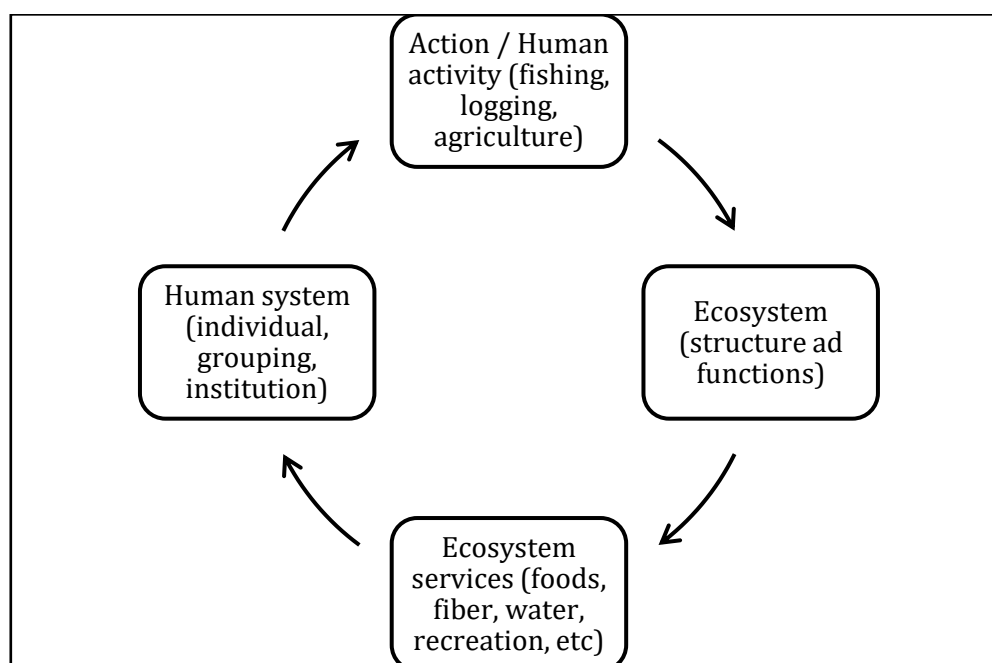


Figure 1. Social-Ecological System Framework (McGinnis & Ostrom, 2014)

Based on the Malaysian Environmental Quality Act (1974), natural resources mean the physical factors that surround human life. Soil, water, air, climate, sound, smell, taste, biological, and social factors are interdependent natural resources, as are biological and physical characteristics. Furthermore, natural resources are referred to as original elements since they include the earth's natural treasures from human life support systems such as air, water, forests, fish and wildlife of the earth's crust, soil, minerals, and solar radiation (Adekola et al., 2015; Defra, 2011; Dunnamah et al., 2016; Ngang, 2015) that play a vital role in satisfying human life's needs (Abe, 2014; Zal et al., 2014; Asante et al., 2017; Mensah et al., 2007; Sarkar & Chakrabarti, 2007; Wallace, 2007). Thus, the objective of this paper is to investigate how poor households in natural resource-dependent communities are aware of and perceive the importance of provisioning ecosystem services based on different types of natural resources – land, sea, and rivers.

### **Provisioning Ecosystem Services**

Provisioning ecosystem services and their benefits are essential to support the poor's lives, especially in obtaining food and subsistence (Eigenbrod et al., 2017; Pritchard et al., 2019). Haines-young and Potschin (2013) have divided into four recognised main sections, namely nutrition, including all ecosystem outputs used directly or indirectly as foodstuffs (including potable water); inclusive water supply for human and other consumption; materials (biotics) used in the manufacture of goods; and biotics for renewable energy sources. According to the Millennium Ecosystem Assessment (2003); Watson et al (2005); Wilkinson et al (2013), supply benefits have provided various sub-benefits of supply such as food and fibre consisting of food products derived from plants, animals, microbes and materials such as wood, hemp, silk and various other products that can be obtained in the ecosystem. Fuel consists of wood, manure, and other biological materials that serve as a source of energy. Genetic resources include genetic information for animal and plant breeding and biotechnology, such as natural medicines and pharmaceuticals. There are also drugs, pesticides, food additives such as alginates, and biological substances derived from ecosystems. Sources of decoration are animal products, such as skins and shells, and flowers are used as decoration.

### **Methodology**

The purpose of this study is to investigate how poor households in natural resource-dependent communities know and perceive the importance of ecosystem services based on different types of natural resources – land, sea, and rivers in Mukim Jerlun, Kedah, Malaysia. This study applied a quantitative method, a survey method using a questionnaire. Respondents were chosen using a snowball sampling method, in which the researcher uses information from the previous respondent to find the next respondent (Suriati et al., 2012). A total of 124 questionnaires have been distributed throughout the study area. A total of 20 question items on a Likert scale were used to analyse the poor's knowledge of the provisioning benefits provided by natural resources. Previously, the researcher performed a reliability test on the items tested, and the result showed that the value of Cronbach's alpha is 0.755. According to Chua (2014), a Cronbach's Alpha coefficient higher than 0.65 is reliable and suitable for further analysis.

While measuring the knowledge of the poor population in the study area, the researcher will use the following formula to calculate the score and range of scores. As an

outcome, the study categorised the poor's level of knowledge as high, medium, and low, as shown in Table 1.

$$\text{Scorer} = \sum(\text{frequency of each item} \times \text{Item scale}) \quad (\text{Equation 1})$$

$$\text{Range of marks} = \frac{\text{Highest score} - \text{Lowest score}}{\text{Number of levels}} \quad (\text{Equation 2})$$

$$\text{Lowest score scale} \times \text{number of question} = (1 \times 20) = 20 \quad (\text{Equation 3})$$

$$\text{Highest score scale} \times \text{number of question} = (5 \times 20) = 100 \quad (\text{Equation 4})$$

$$\text{Range of marks} = \frac{100 - 20}{3} = 26.7 \quad (\text{Equation 5})$$

In addition, researchers apply the Relative Important Index (RII) to determine the position (ranking) of each item that has been presented to the poor. According to Ramanathan et al. (2002), this RII analysis will translate calculations made on a Likert scale of 1 (Strongly Disagree) to 5 (Strongly Agree) (refer to Table 1). The value ( $0 \leq \text{RII} \leq 1$ ) closest to the value of 1 will be given the highest position, while the one the furthest from the value of 1 will be given the lowest position. The following are the equations used to perform this analysis:

$$\text{RII} = \frac{\sum W}{A * N} \quad (\text{Equation 6})$$

Explanation:

- W = weights given to each statement by the respondent and ranged from 1 to 5  
 A = represents the height of the integer response (5)  
 N = total of respondents

Table 1

*Interpretation of the Value of the Relative Importance Index*

Knowledge Level	RII Value
High	0.67 – 1.00
Middle	0.34 – 0.66
Low	0 - 0.33

## Result and Discussion

The demographic profile of the poor in Mukim Jerlun, Kedah, is shown in Table 2. A total of 124 people participated in answering the questionnaire questions that were distributed. There was a total of 108 male respondents, with 16 female respondents. Three age groups can be classified, with the age group of 38 years to 50 years showing only 46.0 per cent, the age group of 51 years to 60 years leading 45.2 per cent, and the age group over 60 years offering only 8.9 per cent. In this regard, most respondents received their education at the secondary school level, with 89 participants scoring 71.8 per cent.

In contrast, 35 respondents only received education at the primary school level, going to provide a rate of 28.2 per cent. In addition to the monthly income, it is revealed that the

income group tend to range from RM801 to RM1000 and is the most frequently earned by respondents (50.8 per cent). While the income group RM501-RM800 does have the second highest percentage of respondents, with a rate of 42.7 per cent. The income group of RM200-500 was followed by 3.2 per cent, and the income group of RM1001-1300 was followed by 2.4 per cent.

Table 2  
*Respondents' Demographic Profile*

Variable	No. Of Respondents (f)	Percentage (%)
<b>Gender</b>		
Male	108	87.1
Female	16	12.9
<b>Age (years old)</b>		
38-50	57	46.0
51-60	56	45.2
>60	11	8.9
<b>Level of Education</b>		
Primary School	35	28.2
Secondary School	89	71.8
<b>Monthly Income</b>		
RM 200- RM 500	4	3.2
RM 501- RM 800	54	43.5
RM 801- RM 1000	63	50.8
RM 1001- RM 1300	3	2.4

### **Provisioning Ecosystem Services Knowledge**

The analysis shows that the respondents strongly understand the provisioning services offered by natural resources. For example, 119 respondents (96.0 per cent) scored 75 to 100 for the benefits of supply provided by natural resources, while five respondents (4.0 per cent) only managed to score 48 to 74 (Refer to Table 5). This is since delivering ecosystem services are benefits that the poor may instantly use, such as food, medicines, sources of liquids, wood, electricity, and ornaments that are earned either directly or indirectly (Adekola et al., 2015; Haines Young & Potschin, 2013; MEA, 2005; Price, 2014; Watson et al., 2005; Wikilson et al., 2013). In addition, the benefits of provisioning services are frequently used by poor rural households to fulfil their daily survival needs, particularly in obtaining food, protein, and fibre. These findings are supported by Campbell et al (2002); Shackleton (2004); Shyamsundar (2002), which proved that the lives of the poor in rural areas are highly dependent on natural resources to survive. The distribution of respondents' knowledge of the benefits provided by natural resources is shown in Table 3.

Table 3

*Interpretation of Knowledge Levels*

Level of Knowledge	Range of Marks	Number of Respondents (f)	Percentage (%)
High	75-100	119	96.0
Middle	48-74	5	4.0
Low	20-47	-	-

**Relative Important Index (RII) Analysis**

The relative importance index (RII) study findings show that the Mukim Jerlun, Kedah poor have a high level of knowledge on provisioning ecosystem services provided by land, sea, and rivers. This is illustrated by the fact that 19 items have an RII value ranging from 0.67 to 1.00. (Refer to Table 7). Therefore, the study can conclude that the benefits of a plentiful supply of food significantly benefit the livelihoods of the poor in the study area. This is because food security is a benefit that may be provided for people throughout ongoing life, and poor households frequently embrace and use this resource in their everyday lives. Following that are benefits such as water transportation, ornaments, medicines, and water resources. According to Hummel et al (2017); MEA (2003), communities living in rural areas commonly acquire and utilise benefits in the form of food and drink as well as shelter to continue their everyday lives.

Furthermore, food sources, such as fruits, vegetables, and protein, are a basic need always obtained and used by poor households, whether eaten directly or cooked. This means that natural resources can ensure that people have enough food to survive (Adekola et al., 2015; Chan and Ruckleshaus, 2010; Fisher and Turner, 2008; Hummel et al., 2017; Marc et al., 2005; MEA, 2003; Haines-Young and Potschin, 2010). Overall, Mukim Jerlun's low-income poor households are well informed about the advantages and benefits of using these natural resources.



Table 4

*Ranking of Knowledge Level of Respondents Based on RII Value*

Item	Question Statement	Mean	Standard deviation	RII	Ranking
1	Agriculture is your primary source of food production.	4.90	0.10	0.98	1
4	Rivers and coastal also provide food sources for your life, like fish and shrimp.	4.88	0.12	0.97	2
3	Animal farming, such as fish, ducks, and cows, can give you lots of food.	4.84	0.15	0.97	2
2	Farming activities can supply you with vitamins, fibre and nutrients.	4.79	0.27	0.96	4
13	Rivers and seas can function as water transport routes.	4.79	0.26	0.96	4
17	Plants, such as flowers, can be used to decorate your home.	4.71	0.25	0.94	6
14	Plants and some other natural resources can be used to supply herbal remedies in your life.	4.59	0.58	0.92	7
18	Animal products, such as horns and leather, can also be used as decorations.	4.59	0.26	0.92	7
9	Rivers can serve as an essential source of water for the agricultural sector.	4.58	0.26	0.92	7
16	Natural sources also provide you with supplements such as vitamins.	4.45	0.43	0.89	10
19	Products from the forest and the sea, such as shells and corals, can also be used to furnish your home.	4.43	0.36	0.88	11
7	Rivers, seas, and lakes supply water for your regular lives.	4.38	0.54	0.87	12
5	Natural areas, such as forests, provide food for the population, such as fruit, honey, etc.	4.35	0.36	0.87	12
11	Natural resources (water, plants, gas, etc.) can also supply energy for life.	4.01	1.29	0.80	14
8	The river also provides clean water for food preparation and safe drinking.	3.95	0.97	0.79	15
12	Firewood, faecal, and biological materials can all be used to generate energy in your life.	3.91	1.27	0.78	16
20	Rocks can also be used as ornaments such as marble, sculptural, etc	3.81	1.41	0.76	17
15	Aside from being medicines, natural sources can also produce poisons.	3.64	1.50	0.73	18

6	Forests can also provide you with various items such as cottonwood and silk.	3.56	1.25	0.72	19
10	Ocean waves might provide electric energy to your life.	3.31	1.51	0.66	20

Additionally, this study was able to identify some of the provisioning benefits that the poor households in Mukim Jerlun, Kedah, commonly receive and utilise. Different kinds of provisioning services are shown in Figure 2. Benefits derived from land resources include benefits in the form of food (96.7 per cent), side dishes (1.60 per cent), benefits used in cooking such as spices (75.0 per cent), vegetables (24.2 per cent), benefits in the form of medicine/health such as herbs (17.7 per cent), benefits in the form of decorations such as flowers (44.4 per cent) in residential areas, paddy crops (6.5 per cent), and cash crops (11.3 per cent).

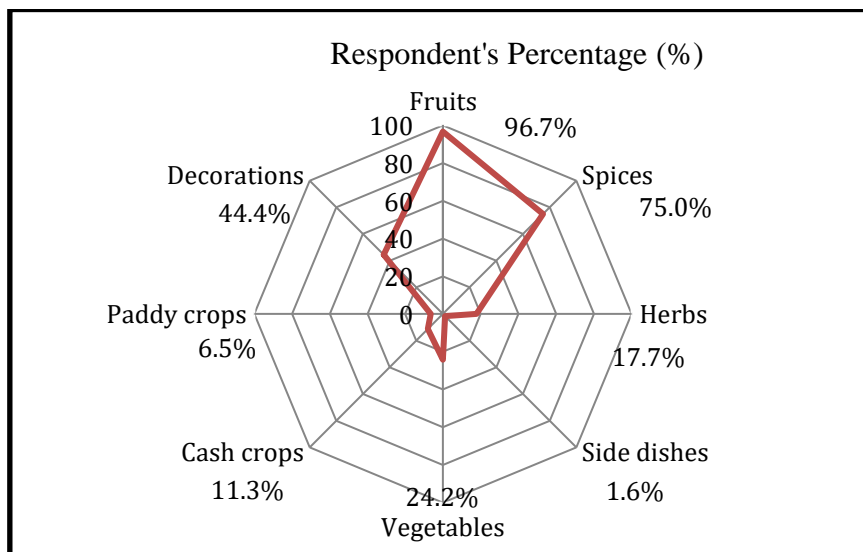


Figure 2. Percentage of Provisioning Benefits obtained from Land Resources

In addition, Figure 3 illustrates the provisioning benefits from the river and marine resources. 100% of respondents have obtained river fish, namely freshwater fish such as *lampam* fish, *puyu* fish, *haruan*, catfish, etc. Meanwhile, the marine and coastal resources showed that marine fish (100%), shrimp (66.9%), crabs (80.0%) and squid (3.2%) were obtained by the respondents.

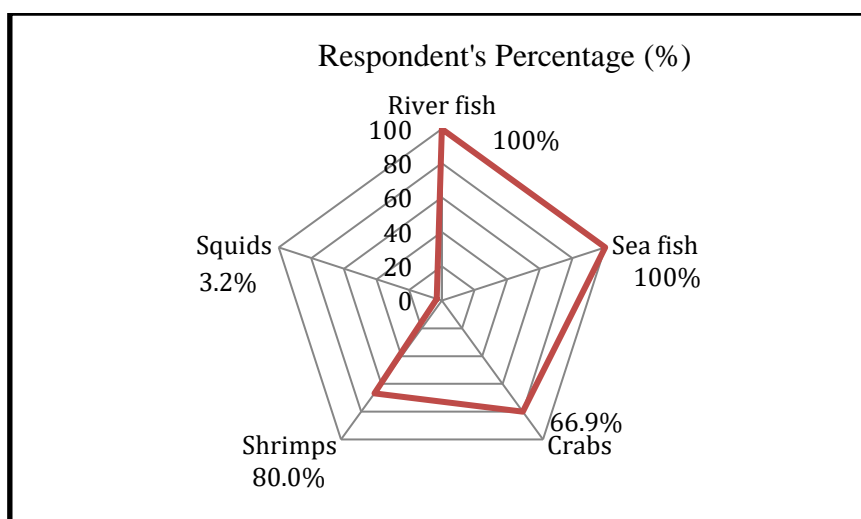


Figure 3. Percentage of Provisioning Benefits obtained from River Resources and Sea/Coastal

The social-ecological system illustrated the connection between natural resources and human life, especially the poor, and emphasised ecosystems' contribution to improving societal conditions. Similarly, Angelsen et al (2011); Babulo et al (2008); Kandel et al (2018) stated that natural resources significantly improve population well-being, particularly for the poor and rural populations. According to Nostrom et al (2017), the human socio-ecological concept has explained that human beings in this world depend on processes occurring in ecosystems to benefit the well-being of life and community development. The processes that take place in an ecosystem are known as ecosystem services. In this study, the provisioning services that have provided various food items, including protein sources, fruits, vegetables, herbs, and medicines that significantly positively impact the lives of the rural poor, are examined. Human beings, particularly the rural poor, who desperately need benefits to maintain their life, particularly in the supply of food, place a high value on provisioning services. As stated by Fellmann et al (2003); Getis et al (2014); Kerry (2007); Sluyter (2003), natural resources are significant factors influencing human activities and life, such as human actions and thoughts. In terms of poverty, food supply is one of the dimensions of poverty for the world's population (Alkire & Sath, 2012; Naveed & Tanweer, 2010; Nutten, 2008).

Rural poor households frequently depend on natural resources from land resources like agriculture, river resources like fishing and nets, and forest resources like gathering forest products to exist (Shackleton et al., 2008). Meanwhile, according to Campbell et al (2002), most households in rural areas have incomes closely related to using natural resources. That implies that rural poor people grow more informed, clever, and creative in utilising natural resources to meet essential requirements, especially in getting food and generating income for their families. As a result, this study demonstrates how knowledge levels have influenced how people interact with natural resources, including activities and culture, as described in the socio-ecological system. As a result, the poor have been engaging in various activities in Mukim Jerlun, including farming and fishing, which have become traditional ways of surviving.

The existence of a relationship between people and their environment can influence how cultural characteristics and activities are formed and how people live in a community. For example, like Mukim Jerlun, the Jerlun region has fishing villages where most of the

population are Malays. This type of subsistence economy is common among locals in the Jerlun region. These cultural characteristics can be learned and inherited by family members and the local community so that future generations can maintain the identity of Mukim Jerlun as a fishing village and agricultural area.

### Conclusion

The socio-ecological notion describes how natural resources and human life are intertwined, generating a complicated interaction. This relationship has demonstrated how crucial provisioning services are to improving the lives of the rural poor. Additionally, this study's findings suggest that utilising natural resources could help address rural poverty. In addition, experience, observation of one's environment, and use of the benefits themselves can all impact one's level of knowledge regarding the provisioning services provided by natural resources. Therefore, these factors can affect one's understanding of the benefits provided by natural resources. Knowledge can also support the poor in making decisions about the kinds of activities that fit the natural resources available in their living environment, preventing the destruction of such resources so future generations can utilise them.

### References

- Abe, O. O. (2014). Utilisation of Natural Resources in Nigeria: Human Right Considerations. *India Quarterly*, 70(3), 257–270. <https://doi.org/10.1177/0974928414535294>
- Adekola, O., & Fanen, T. (2015). Integrating ecosystem services approach in achieving development goals: The role of the geographer. *J. Environ. Earth Sci*, 5, 92-100. [10.1016/j.geosus.2021.03.002](https://doi.org/10.1016/j.geosus.2021.03.002)
- Adhikari, S., Baral, H., & Nitschke, C.R. (2018). Identification, prioritisation and mapping of ecosystem services in the Panchase Mountain Ecological Region of Western Nepal. *Forests*, 9(9). <https://doi.org/10.3390/f9090554>
- Ainslie, A., Cloete, J., Ariyo, J., Bila, M., Faye, A., Swift, J. (2008). Situation Analysis of Ecosystem Services and Poverty Alleviation in arid and semi-arid Africa. Retrieved from [https://www.espa.ac.uk/files/espa/Final Report Africa.pdf](https://www.espa.ac.uk/files/espa/Final%20Report%20Africa.pdf)
- Akta Kualiti Alam Sekeliling. (1974). Undang-Undang Malaysia. Jabatan Alam Sekitar Malaysia. Retrieved from <http://www.doe.gov.my>
- Angelsen, A., Larsen, H., & Lund, J. (2011). Measuring livelihoods and environmental dependence: Methods for research and fieldwork. <https://doi.org/10.4324/9781849775694>
- Asah, S. T., Guerry, A. D., Blahna, D. J., & Lawler, J. J. (2014). Perception, acquisition and use of ecosystem services: Human behavior, and ecosystem management and policy implications. *Ecosystem Services*, 10, 180–186. <https://doi.org/10.1016/j.ecoser.2014.08.003>
- Asante, E. A., Ababio, S., & Boadu, K. B. (2017). The use of indigenous cultural practices by the Ashantis for the conservation of forests in Ghana. *SAGE Open*, 7(1).
- Atkins, J. P., Burdon, D., Elliott, M., & Gregory, A. J. (2011). Management of the marine environment: Integrating ecosystem services and societal benefits with the DPSIR framework in a systems approach. *Marine Pollution Bulletin*, 62(2), 215–226. Retrieved from <http://dx.doi.org/10.1016/j.marpolbul.2010.12.012>
- Bretones, F. D., & Gonzalez, M. J. (2011). Subjective and Occupational Well-Being in a Sample of Mexican Workers. *Social Indicators Research*, 100(2), 273–285. <https://doi.org/10.1007/s11205-010-9616-5>

- Costanza, R., de Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., Grasso, M. (2017). Twenty years of ecosystem services: How far have we come and how far do we still need to go? *Ecosystem Services*, 28, 1–16. <https://doi.org/10.1016/j.ecoser.2017.09.008>
- Chan, K. M., & Ruckelshaus, M. (2010). Characterising changes in marine ecosystem services. *F1000 biology reports*, 2, 54. <https://doi.org/10.3410/B2-54>
- Defra. (2011). The Natural Choice: securing the value of nature. English. United Kingdom. Retrieved from <http://www.official-documents.gov.uk/document/cm80/8082/8082.pdf>
- Dunnamah, A. Y., Williams, J. J., Hamangamdo, W. W., & Kwale, J. M. (2016). The Role of Traditional Religion and Socio-Cultural Practices in the Natural Resources Conservation and Management of the Lunguda Land, Adamawa/Gombe State Nigeria. *International Journal of Education and Research*, 4(5), 37–52. Retrieved from [www.ijern.com](http://www.ijern.com)
- Eigenbrod, F., Tang, Z., Eisner, S., Florke, M., & Zhao, G. (2017). Spatial covariance of ecosystem services and poverty in China. *International Journal of Biodiversity Science, Ecosystem Services and Management*, 13(1), 422–433. <https://doi.org/10.1080/21513732.2017.1397750>
- Felix, M., & Burkhard, B. (2012). The indicator side of ecosystem services. *Ecosystem Services*, 1, 26–30. <https://doi.org/10.1016/j.ecoser.2012.06.001>
- Fellmann, J. D., Getis, A., & Getis, J. (2003). *Human Geography; Landscapes of Human Activities*. Seventh Edition. New York; McGraw-Hill.
- Fischer, J., Gardner, T. A., Bennett, E. M., Balvanera, P., Biggs, R., Carpenter, S., Tenhunen, J. (2015). Advancing sustainability through mainstreaming a social–ecological systems perspective. *Current Opinion in Environmental Sustainability*, 14, 144–149. <https://doi.org/10.1016/j.cosust.2015.06.002>
- Fisher, B., & Turner, K. R. (2008). Ecosystem services: Classification for valuation. *Biological Conservation*, 141, 1167–1169. <https://doi.org/10.1016/j.biocon.2008.02.019>
- Fonta, W. M., Email, T., & Ayuk, E. (2011). The Distributional Impacts of Forest Income on Household Welfare in Rural Nigeria. *Journal of Economics and Sustainable Development*, 2(1), 1–13.
- Getis, A., Bjelland, M. D., & Getis, V. (2014). *Introduction to Geography*. Fourteenth Edition. New York; McGraw-Hill.
- Haines-young, R., & Potschin, M. (2013). Common International Classification of Ecosystem Services (CICES): Consultation on Version 4, August-December 2012. UK.
- Haines-Young, R., & Potschin, M. (2018). CICES V5. 1. Guidance on the Application of the Revised Structure. Fabis Consulting. UK.
- Hummel, D., Jahn, T., Keil, F., Liehr, S., & Stieß, I. (2017). Social Ecology as Critical, Transdisciplinary Science-Conceptualizing, Analysing and Shaping Societal Relations to Nature. *Sustainability*, 9(1050), 1–20. <https://doi.org/10.3390/su9071050>
- Hou, Y., Zhou, S., Burkhard, B., & Müller, F. (2014). Science of the Total Environment Socio economic influences on biodiversity, ecosystem services and human well-being: A quantitative application of the DPSIR model in Jiangsu, China. *Science of the Total Environment*, 490, 1012–1028. <https://doi.org/10.1016/j.scitotenv.2014.05.071>
- Ishak, S., & Zabil, N. F. M. (2012). Impact of consumer awareness and knowledge to consumer effective behavior. *Asian Social Science*, 8(13), 108–114. <https://doi.org/10.5539/ass.v8n13p108>
- Jerneck, A. (2015). Understanding Poverty: Seeking Synergies Between the Three Discourses of Development, Gender, and Environment. *SAGE Open*, 5(4).

- <https://doi.org/10.1177/2158244015614875>
- Jew, E. K., Burdekin, O. J., Dougill, A. J., & Sallu, S. M. (2019). Rapid land use change threatens provisioning ecosystem services in miombo woodlands. In *Natural Resources Forum* (Vol. 43, No. 1, pp. 56-70). Oxford, UK: Blackwell Publishing Ltd.
- Kerry, A. M. (2007). *Islands and human impact: Under what circumstances do people put unsustainable demands on island environments? Evidence from the North Atlantic*. [PhD Thesis]. University of Edinburgh.
- Kikoti, Z. (2009). *Livelihoods and Ecosystem Services around Protected Areas. A case study from Ugalla Ecosystem, Tabora, Tanzania* [Master Thesis]. University of Klagenfurt, Austria.
- King, M. F., Reno, V. F., & Novo, E. M. L. M. (2014). The Concept, Dimensions and Methods of Assessment of Human Well-Being within a Socio-ecological Context: A Literature Review. *Soc Indic Res* 116, 681–698. <https://doi.org/10.1007/s11205-013-0320-0>
- Lamarque, P., Meyfroidt, P., Nettiér, B., & Lavorel, S. (2014). How Ecosystem Services Knowledge and Values Influence Farmers' Decision-Making. *PLoS ONE*, 9(9), e107572. <https://doi.org/10.1371/journal.pone.0107572>
- Lannas, K. S. M., & Turpie, J. K. (2009). Valuing the provisioning services of wetlands: Contrasting a rural wetland in lesotho with a peri-urban wetland in South Africa. *Ecology and Society*, 14(2). <https://doi.org/18>
- Lee, J. H. (2021). Mapping local participatory assessment of ecosystem services of natural resources. *Landscape and Ecological Engineering*, 17(4), 459-470. [10.1007/s11355-021-00461-y](https://doi.org/10.1007/s11355-021-00461-y)
- Leslie, H. M., Basurto, X., Nenadovic, M., Sievanen, L., Cavanaugh, K. C., Cota-Nieto, J. J., Aburto-Oropeza, O. (2015). Operationalising the social-ecological systems framework to assess sustainability. *Proceedings of the National Academy of Sciences*, 112(19).
- Lieflander, A. K., Bogner, F. X., Kibbe, A., & Kaiser, F. G. (2015). Evaluating Environmental Knowledge Dimension Convergence to Assess Educational Programme Effectiveness. *International Journal of Science Education*, 37(4), 684–702.
- Liu, Y., Li, J., & Zhang, H. (2012). An ecosystem service valuation of land use change in Taiyuan City, China. *Ecological Modelling*, 225, 127–132. <https://doi.org/10.1016/j.ecolmodel.2011.11.017>
- Marc, L., Babu, S., & Hamilton, K. (2005). Ecosystem Conditions and Human Well-being. Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being: Current State and Trends*, 123–164.
- McGinnis, M. D., & Ostrom, E. (2014). Social-ecological system framework: initial changes and continuing challenges. *Ecology and Society*, 19(2). 30. <http://dx.doi.org/10.5751/ES-06387-190230>
- McMichael, Scholes, R., & Hefny, M. (2005). Linking ecosystem services and human well-being. *Ecosystems and Human Well-Being: Our Human Planet*, (October), 43–60. Retrieved from <http://www.maweb.org/documents/document.341.aspx.pdf>
- Mensah, H. K., Sif, H., & Aubell, J. (2007). Linkages and Impact on Rural Households in Asutifi District in Ghana. [PhD Thesis]. Faculty of Economics and Social Sciences in collaboration with United Nations University, Agder University College.
- Millennium Ecosystem Assessment. (2003). *Ecosystems and their services. Ecosystems and Human Well-Being: A Framework for Assessment*, 49–70. Retrieved from <http://www.millenniumassessment.org/en/Framework.html>
- Millennium Ecosystem Assessment. (2005). *Ecosystems and Human Well-being: Synthesis*.

- Ecosystems* (Vol. 5). <https://doi.org/10.1196/annals.1439.003>
- Mostafa, M. M. (2007). Gender differences in Egyptian consumers' green purchase behaviour: the effects of environmental knowledge, concern and attitude. *International Journal of Consumer Studies*, 31(3), 220-229.
- Ngang, F. D. (2015). *The Contribution of Community-Based Natural Resources Management to Livelihoods, Conservation and Governance in Cameroon. A Comparative Assessment of Three Community Forests*. [PhD Thesis]. Pan African Institute for Development-West Africa.
- Niaura, A. (2013). Using the Theory of Planned Behavior to Investigate the Determinants of Environmental Behavior among Youth. *Environmental Research, Engineering and Management*, 1(1), 74–81. [10.5755/j01.erem.63.1.2901](https://doi.org/10.5755/j01.erem.63.1.2901)
- Norstrom, A. V., Balvanera, P., Spierenburg, M., & Bouamramne, M. (2017). Programme on Ecosystem Change and Society: Knowledge for sustainable stewardship of social-ecological systems. *Ecology and Society*, 22(1), 47.
- Nyumbu, M. E. (2013). *Poverty and Environment: A Case Study of Stone Crushing as a Sustainable Livelihood in Lasuka*. [PhD Thesis]. University of South Africa. <https://doi.org/10.1007/s13398-014-0173-7.2>
- Othman, P., & Rosli, M. (2011). The Impact of Tourism on Small Business Performance: Empirical evidence from Malaysia Island. *International Journal of Business and Social Science* 2(1), 11-21.
- Price, C. (2014). Regulating and supporting services and disservices: customary approaches to valuation, and a few surprising results. *New Zealand Journal of Forestry Science*, 44(Suppl 1), S5. <https://doi.org/10.1186/1179-5395-44-S1-S5>
- Pritchard, R., Grundy, I. M., Van der Horst, D., & Ryan, C. M. (2019). Environmental incomes sustained as provisioning ecosystem service availability declines along a woodland resource gradient in Zimbabwe. *World Development*, 122, 325–338. <https://doi.org/10.1016/j.worlddev.2019.05.008>
- Ramanathan, C., Narayanan, S. P., & Idrus, A. B. (2012). "Construction Delays Causing Riska on Time and Cost - a Critical Review". *Australasian Journal of Construction Economic and Building*, Vol. 12(1). 37-57.
- Robertson, G. P., Gross, K. L., Hamilton, S. K., Landis, D. A., Schmidt, T. M., Snapp, S. S., & Swinton, S. M. (2014). Farming for ecosystem services: An ecological approach to production agriculture. *BioScience*, 64(5), 404–415.
- Roe, D. (2004). The Millennium Development Goals and natural resources management: reconciling sustainable livelihoods and resource conservation or fuelling a divide in Local action, global aspiration. *Natural Resources Issues No. 4*. 18-29.
- Haines-Young, P., & Potschin, M. (2010). Common International Classification of Ecosystem Goods and Services (CICES): Consultation on Version 4, August-December 2012. EEA Framework. Diakses daripada <https://doi.org/10.1038/nature10650>
- Said, A. M., Ahmadun, F. R., Paim, L. H., & Masud, J. (2003). Environmental concerns, knowledge and practices gap among Malaysian teachers. *International Journal of Sustainability in Higher Education*, 4(4), 305–313. Retrieved from <https://doi.org/10.1108/14676370310497534>
- Sarkar, R., & Chakrabarti, B. (2007). Chapter 9: Rural environment. Indian Infrastructure Report. Diakses daripada <http://osou.ac.in/eresources/Rural%20Environment.pdf>
- Siefer, P. D., Neaman, A., Salgado, E., Diez, J. L. C., & Otto, S. (2015). Human-environment system knowledge: A correlate of pro-environmental behavior. *Sustainability*, 7, 15510–

15526. <https://doi.org/10.3390/su71115510>
- Singh, S. (2012). *A Study of The Relationship Between Ecosystem Services and Human Well-being in The Coastal Villages of The Kubulau District in Vanualevu, Fiji*. [PhD Thesis] University of the South Pacific.
- Sluyter, A. (2003). *Neo-Environmental Determinism, Intellectual Damage Control, and Nature / Society Science*. Louisiana State University, Baton Rouge, USA.
- Summers, J. K., Smith, L. M., Case, J. L., & Linthurst, R. A. (2012). A Review of the Elements of Human Well-Being with an Emphasis on the Contribution of Ecosystem Services, *AMBIO Vol. 41*, 327–340. <https://doi.org/10.1007/s13280-012-0256-7>
- The European Environment. (2010). Environment, health and quality of life. Retrieved from <https://www.eea.europa.eu/>
- Walelign, S. Z. (2015). Livelihood strategies, environmental dependency and rural poverty: the case of two villages in rural Mozambique. *Environment, Development and Sustainability*, 593–613. <https://doi.org/10.1007/s10668-015-9658-6>
- Wallace, K. J. (2007). Classification of ecosystem services: Problems and solutions. *Biological Conservation*, 139, 235–246.
- Watson, R. T., Rosswall, T., Steiner, A., Topfer, K., Arico, S., & Bridgewater, P. (2005). Ecosystems and human well-being. *Ecosystems (Vol. 5)*. <https://doi.org/10.1196/annals.1439.003>
- Wilkinson, C., Saarne, T., Peterson, G. D., & Colding, J. (2013). Strategic Spatial Planning and the Ecosystem Services Concept-an Historical Exploration. *Ecology and Society*, 18(1). <https://doi.org/10.5751/ES-05368-180137>
- World Bank. (2002). Linking poverty reduction and environmental management-Policy challenges and opportunities. Washington, DC