

THE DYNAMICS BETWEEN FOREST, FOOD SECURITY AND LIVELIHOOD SUSTAINABILITY IN GUNUNG TEBU FOREST RESERVE, TERENGGANU

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ABSTRACT

Forests are important for food security and better livelihood. Forests provide and maintain the livelihoods of rural and many of those living in severe poverty rely to some degree on forests for their livelihoods. Although many studies have seen significant dependency of the local people on forests resources, the degree of reliance may vary across different localities, within a rural community due to dynamic changes in the socioeconomic status. This study investigated the attitude and perception toward forest conservation and the contribution of forest to the rural community. It also examined how the forest has contributed to rural household's livelihood concerning food security at Gunung Tebu Forest Reserve, Terengganu. Data were obtained from a random sample of 380 surveyed households living within the vicinity of protected forest. The results show that forest conservation was important as a habitat for flora, fauna restoration and climate change control. Forest reserve contributed as a source of household's income in terms of both cash and in-kind income. The monthly cash income was identified from three sources: paid employee, self-revenue, and agricultural resources. The local community had higher cash income compared to in-kind income. The results revealed that the majority of the households rely on agricultural resources (36%). The findings will provide a more thorough picture of the dynamics between forest and food security, thus will help in formulating better suited strategies to tackle issues related to food security and poverty. This study contributed to the theoretical discussion on the importance of tropical forests as a source of food security, environmental products and income for rural livelihoods.

Keywords: socioeconomic, forests, food security, local livelihood, communities.

INTRODUCTION

Forests provide us with shelter, livelihoods, water, food and fuel security and also preserving cultural, recreational and other intrinsic values which enhance people's quality of life (Mok, 1992) other than its direct benefits. Forests in Malaysia are classified into seven categories based on changes in the characteristics of height above sea level, and the combination of flora, habitat, climate, and soil. The forest classification is divided into the mangrove forest, peat swamp forest, lowland dipterocarp forest, hill dipterocarp forest, upper dipterocarp forest, montane forest and ericaceous forest (Forestry Department of Peninsular Malaysia, 2020).

Malaysia is endowed with rich natural resources and is well-known as one of the 17 mega biodiversity countries worldwide. Malaysia has 55% forested land (DOSM, 2019) to be conserved, managed and preserved for future generations. Forest in Malaysia, in particular, the Permanent Forest Reserved (PFR) is administered under the National Forestry Act 1984 (Amendment 1993). Whereas, Forestry Department Peninsular Malaysia is the regulatory body in charge of Permanent Forest Reserve (PFR) areas in Peninsular Malaysia. In 2019, PFR in Peninsular Malaysia was recorded as 4,812,326 ha, which is 43.4% of the total forested areas in the same region. Whereas, PFR in Terengganu was recorded as 540,309 ha (Forest Department of Peninsular Malaysia, 2019),

contributing to 11% of total reserved areas, while Gunung Tebu Forest Reserve alone accounted for 25,259.51 ha or 4.7% of the total PFR in Terengganu (Terengganu Forest Department, 2019).

The most direct connection between forestry and food security is the food items produced by trees. Trees directly supplied varieties of natural healthy foods including fruits, nuts, leaves, roots, seeds and gums are just some of the huge arrays of edible foods. Forests also help to protect land, water, and biological resources, and they play an important role in maintaining the productivity of agricultural and environmental systems. Other than that, forests contributed to food security in many different ways, particularly through their role in protecting the environment and provisioning for ecosystem services (Ferraro and Hanauer, 2011). In this regard, the forest cover is deemed important to maintain the soil and water base that is crucial for sustainable agriculture whilst providing conducive habitat for the crops and livestock to interact biologically, while also reducing climate change impacts and extreme weather events (Calder et al., 2008). In general, the widely accepted definition of food security is: "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. This concept is applied to the family level as household food security, with individuals as the primary concern (FAO 2003:29).

While it is true that forest foods do not always provide staple items, and hardly make up the majority of items in the diet by number or volume. For many rural people, forests supplement what is available from agriculture and various other resources in three main ways, i) forests act as a 'safety net' or 'buffer' in times of shortages due to unforeseen externalities such as droughts, crop failure, disease pandemic, illness and other kinds of emergency or external shocks; ii) forests products are often valued culturally and are important to local food systems and food sovereignty; and iii) diverse healthy foods are produced from the forests which contain high micronutrients and fibre with low sodium, refined sugar and fat.

Although many studies have seen significant dependency of the local people on forests resources, the degree of dependency might vary across various localities of rural community, due to dynamic changes in the socioeconomic status. Some studies have revealed that locals and forests are significantly dependent on each other, through direct and indirect contributions. Direct contribution referred to the forest resources as a food supply, source of water supply, land use for agricultural purposes, wildlife abundance (Nelson et al., 2015) and household livestock holding (Dhakal et al., 2011). While indirect contributions included the total income perceived by local communities from tree products (Van Chu et al., 2019), tree crops, wood products, and other non-timber forest products (Dao and Holsher, 2018).

Forests and their goods may have impacted these rural communities significantly through the diversity of forest food. As the forests and their goods aimed for the production of diverse, high-quality yields, it also aims to generate supplementary income through the diverse sources. The communities, especially in rural areas perceived the diversity of yields through various sources in herbal products, nurseries, vacation homes, tours and workshops as an additional income related to the forest (Park et al., 2017). The community's dependencies on the forest and its resources have become an important topic being heavily discussed and debated in developing countries including Malaysia. Malaysia ranks 28th – from 113 countries on the 2019 Global Food Security (GFS) Index. Over the decades since its conception on the contribution of the forest, researchers from a wide range of geographical locations have provided evidence showing consequences of biodiversity loss and deforestation and the importance of the forest to food security. Despite increasing awareness of the forest contribution to agricultural and food security, however, it is astonishing how little is known about the phenomenon especially for the developing tropical forest such as Malaysia. Indeed, although there is a growing literature that concerns the direct connection between forestry and food security, the majority of attention has so far been focused to the food items produced by trees (Park et al., 2017; Aju, 2014). A more comprehensive discussion is still lacking. Here, we present the current state of understanding (with particular emphasis on the direct and indirect scenarios of the forest contribution and food security), summarize income level generation and suggest future directions.

This paper focused on the contribution of Gunung Tebu Forest Reserve (GTFR), Terengganu to food security elements in the adjacent localities, which has a diverse range of socioeconomic backgrounds and has been exposed to a certain degree of development. The primary objectives of this study are to investigate the perception toward forest conservation and the contribution of forest to the rural community. Then, it examined how the forest has contributed to rural household's livelihood in relation to food security at GTFR, Terengganu. Besides, this research will provide inputs to enhancing the potential of Terengganu state in terms of forest biodiversity, tourism and food security.

RESEARCH METHODOLOGY

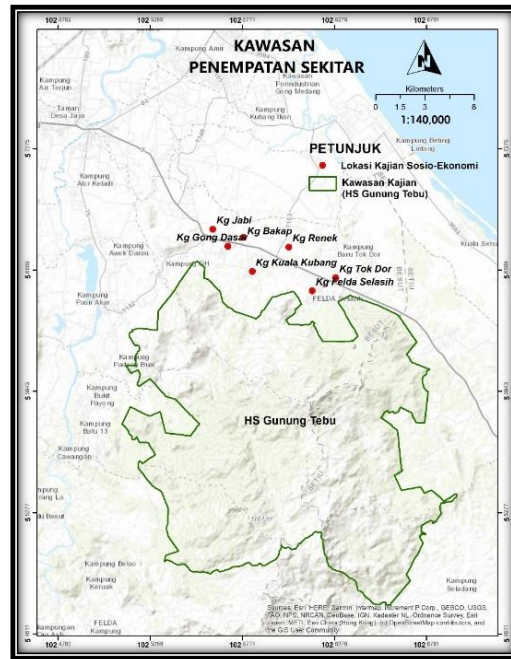
Study site

This study focused on the local communities in Gunung Tebu Forest Reserve, Terengganu as the forest adjacent to their house location. The total of amenity forests in Terengganu state is 11 (Terengganu Forestry Department, 2021) with a total area of forested land is 542, 411 hectares (in 2018). This is equivalent to 42% of the total state's land area (TRDI.my, 2021). The local communities near the forest are involved as part-time tour guides, as the main attraction of GTFR is the peak mountain, which is popular among hikers. The entry point to the peak Mountain Tebu (locally known as *Gunung Tebu*) is Lata Belatan Amenity Forest, which is under the jurisdiction of the Terengganu State Forestry Department. This recreational forest is located as the base of *Gunung Tebu* (5°63'90"N, 102°58'78"E). Although the forest reserve is surrounded by oil palm and rubber plantations, there is a waterfall here that attracts many visitors weekly for recreational activities. The clear water attracts visitors not only from Terengganu, but other states in Malaysia, including foreigners. This area consists of fast-flowing cascades and characterized by lowland riparian forest and low hill dipterocarp forest (Sumarli et al., 2015). Gunung Tebu Forest Reserve (GTFR) is located at the northeast of the Banjaran Timur in Besut, which is the northernmost district of Terengganu, bordering the state of Kelantan. At almost 1,097 m

above sea level, this mountain is considered the fifth highest peak in Terengganu. It consists of a dipterocarp forest containing a significant variety of flora and fauna of conservation interest, indicating that the forest reserve is in a green scenery and untouched (Sulaiman et al., 2014).

Previously, the research focused on forest conservation among the indigenous communities in the Semaq Beri tribe in Hulu Terengganu and their large dependency on forests especially food and income generation (Abdullah et al., 2014). The conception of this aboriginal group on forests as a resource “bank” that benefits them and their futures has motivated this study, which focuses on the role of forest in the daily lives of local communities especially the Malay group.

Figure 1. Study location of Gunung Tebu Forest Reserve (GTFR)



Data collection and questionnaire form

Data collection in this study involves four main techniques, namely rapid rural appraisal (RRA), survey research, field research and stakeholders’ consultation workshop. The rapid rural appraisal technique is crucial to enable the research team to have an overview of the existing environment and the extent of forest resource utilisation by the local community living near GTFR.

In July 2020, 380 respondents from 7 villages bordering Gunung Tebu Forest Reserve (GTFR) participated in a cross-sectional study using face-to-face interviews. Locally known as *kampung*, the villages included were Kampung Kuala Kubang, Kampung Gong Dasar, Kampung Tok Dor, Kampung Felda Selasih, Kampung Bakap, Kampung Jabi and Kampung Renek. These villages were selected due to their proximity to the study area, which was less than a 6km radius from GTFR. The questionnaire consisted of scaled (Likert-scale), pre-coded and green-ended questions. The questionnaire covered respondents’ socio-demographic and economic background, their perception of forest conservation programs, the household member information (without a name and identification number), the status of employment, and finally the households’ sources of monthly income to relate their dependency on forest resources.

Methods of analysis

The study was carried out in seven localities bordering GTFR. A total of 380 households head (**Table 1**) were interviewed and the data were analysed using Microsoft Excel and SPSS. The descriptive and the quantitative data analyses were carried out using the SPSS statistic software (Version 22).

Table 1: Information on the household involved in the research survey

No	Settlement/ Name of village(s)	Number of the house (A)	Number of interviewed households (B)	% (B)/(A)
1	Kg Kuala Kubang	112	61	54
2	Kg Felda Selasih	158	60	38
3	Kg Renek	260	51	20

4	Kg Bakap	300	52	17
5	Kg Tok Dor	230	56	24
6	Kg Gong Dasar	320	52	16
7	Kg Jabi	300	48	16
Total		1,680	380	23

Source: Field survey (2020)

RESULTS AND DISCUSSION

Sociodemographic profile of localities in the study area

Table 2. Demographic and socioeconomic characteristics of household (n=380)

Basic Information of Head of Household		N	Frequency (%)
Gender	Male	312	82.1
	Female	68	17.9
Education level	No formal education	22	5.8
	Primary school	88	23.2
	Lower secondary school	204	53.7
	Upper secondary school	12	3.2
	Tertiary education	54	14.2
Marital Status	Single	58	15.3
	Married	292	76.8
	Widow	30	7.9
Age (Mean = 48)	<21	5	1.3
	21-30	48	12.6
	31-40	80	21.1
	41-50	72	18.9
	51-60	80	21.1
	>60	95	25.0

Source: Field survey, 2020

Table 2 showed that the male respondents were higher (82%) than the female respondents (18%). In terms of age, most respondents were ranged in the middle-aged from 31 to 40 years old (21%) and 51-60 years old (21%). Only 5% of respondents were under the age of 21 (18 to 21 years old). In terms of education, 57% of respondents completed their secondary school, followed by 23% of respondents finished primary school. The majority of the respondents (77%) were married.

The forest contribution

The forest and community were related. The community forest is important and plays a significant role in improving forest conservation by providing basic needs of the local communities and for socio-cultural purposes including as a source of livelihood. This current article is concerned with the forest contribution, especially to the food security element. Therefore, the dynamics between forest and food security are perceived through the household's monthly income. The relationship can be identified through sources of monthly income, in which the household's income was divided into a few main categories namely paid employee, business revenues, agricultural resources and other sources. The contribution of forest resources to rural communities and livelihood could be determined through the number of households perceived income from the forest reserve.

Monthly household income

Table 3. Sources of average monthly household income (n=380)

Sources of income	Local communities adjacent to GTFR	
	RM (MYR)	%
A. Cash/Direct income		
1. Paid employee/ Employed	2607	47.5
2. Sales revenue/ sales income (Self- employed)	563	10.2
3. Forests and agricultural resources	1618	29.4
4. Other (family members giving, dividend, bonus, rental and services)	270	4.9
Subtotal (RM)	5,057	92
B. In-kind income		
Subtotal (RM)	430	8
TOTAL (RM)	5,486	100

Source: Fieldwork data (community survey), 2020

The monthly income of households in the villages near GTFR reflects the socioeconomic status of the rural communities. Overall, the highest distribution of cash income is from employment income as a paid employee (47.5%) as in **Table 3**. The forest and agricultural sectors contributed 29.4%, while sales revenue, businessman, and self-employees resulted in 10.2% of the cash income distribution. When compared to Johor (the southernmost state in Peninsular Malaysia) forests and agricultural income contributes to only 21.5% of the cash income source and only 0.6% for an in-kind income source (Abdullah et al., 2021).

There are two types of income namely cash income and in-kind income. Cash income includes earnings from employment, businesses and other sources of income received in cash including forest-related such as the sales or business-related to forestry, agriculture, food and beverages business and ecotourism. The non-cash income or known as in-kind income contributed 8% of the average monthly income of the households interviewed. Results found that the local community average monthly household's income was RM 5, 486 per month (**Table 3**). The average income is near to the average household monthly income for Besut district in 2019 (RM 5,819) and the rural Terengganu state's average income of RM 5,742 in 2019. This finding differed slightly from the case study in Johor (southern region of Peninsular Malaysia), which found that the average monthly household income in the local community was RM3,410, while the average monthly household income in rural Malaysia was RM 3,080 in 2020 (Abdullah et al., 2021).

The agriculture sources include paddy crops, cash crops such as vegetables, rubber, oil palm, orchard products, animal livestock, fish and seafood. The main sources of income to the local communities near GTFR have been acknowledged from the two major cash crops that were rubber estate and oil palm plantation. Even though in Peninsular Malaysia that the conversion and scenario of forested land into the two major cash crops has been identified as driving significant to the environmental change, this is no doubt for the local communities to gain a fast-track cash income from these agricultural activities. This research confirmed previous findings in Malawi that rural daily essential needs has relied on both agricultural and forest income (Kamanga et al., 2009). Forest has been acknowledged for its contribution especially to the total income of rural dwellers (Van Chu et al., 2019); through the sale and exchange of forest products or goods (Aju, 2014). Meanwhile, in-kind income refers to income other than money such as properties (etc., house, transports and other vehicles) and forest resources consumed by households such as food sources and water intake. The findings showed that, in terms of income types, the local communities had higher cash income compared to in-kind income.

The source of income based on the type of household occupation

Table 4. Type of occupation of the head of household (n=380)

Type of main occupation		Frequency	Percentage (%)
Employed		110	28.9
1	Government services/ Public sector	39	10.3
2	Private sectors	39	10.3
3	Chalet/Resort staff	1	0.3
4	Factory staff/ Industrial workers	1	0.3
5	Contract staff	28	7.4
6	Others	2	0.5
Sales revenue and self-employment		103	27.1
7	Own a self-business	32	8.4
8	Store dealer/small business and shop owners and retailers	6	1.6
9	Food and beverages stall business	21	5.5
10	Self-employed/Freelance	44	11.6
Forests and agriculture sources		135	35.5
11	Cash crop farmer	19	5.0
12	Rubber tapper	43	11.3
13	Orchard/Farm worker producer	1	0.3
14	Oil Palm plantation owners	51	13.4
15	Livestock farmers	1	0.3
16	Fish producers- fisherman	2	0.5
17	Paddy field – farmers or rice producers	18	4.7
Not employed (No working)		32	8.4

Source: Field community survey, 2020

Local livelihood adjacent to GTFR had varieties of occupations to sustain their livings. Some of them are employed as general workers, government servants and contract staff (28.9%). **Table 4** showed that the majority of the household depends on the forests and agriculture resources (36%) and is mostly involved in the oil palm plantation (51%) and rubber crop or estates (43%). While for the unemployed including pensioners, housewives and no working household only accounted for 32%.

This finding demonstrated the importance of agricultural resources to their daily livelihood, as agriculture be their essential food resource. The study results revealed that, while most households were highly dependent on modern living as paid salary workers, a minority (35.5%) were dependent on forests, mainly through forest income including cash crop and vegetable farmers, orchard owners, livestock farming, fish and seafood producers and paddy farmers. This is consistent with the findings of Porro et al. (2015), who found that agricultural and forest-based economic strategies in Ucayali-Peruvian communities, the households shared “forest income” through forest goods and environmental income and revenues from fishing and agricultural income relied on livestock and animal products (except fish). The total income sources are defined through the forest, fish, agriculture, livestock, wages, business (Porro et al., 2015).

The uniqueness and varieties of agriculture and recreation activities surrounding GTFR indicate multiple options for forest and landscape restoration. Locals had an opportunity focused on the agricultural segment for a wide variety of purposes that enhance their livelihood, and help them to purchase food and other vital necessities. Otherwise, some of the communities assessed their food sources from the total amount of cash crop trees production, from their fruit orchard or vegetable farm, as a fisherman and also as livestock farmers. There was also a minority group (11.6%) who worked as a daily forest producer or self-employed that obtained the wild foods gathered and hunted from the adjacent forest. This finding supports the role of forests in natural resource conservation, production and at the same time maintaining biodiversity.

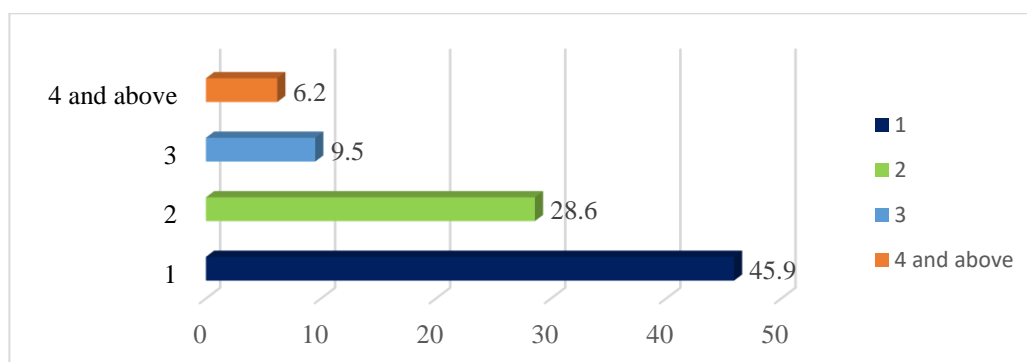
The relationships between forest communities, income and employment have been debated thoroughly in previous studies. Forests which are classified as natural capital are used as the main source in generating income through employment related to forest and environmental products including the use of fuelwood for cooking (FAO, 1989, Vedeld and Sjaastad, 2009), agriculture activities (Aju, 2014; Van Chu et al., 2019), fishing, livestock and animal-derived products, wages, and business (Porro et al., 2015). Forests use and environmental products including fish have been revealed to enhance about 40% of annual income among livelihood in Ucayali, Peru. It showed a strong indicator that income from the forest is higher compared to other sources such as agriculture (25%, wages (17%) and livestock and animal products (11%) for both indigenous communities and non- Amazonian settlers in the Peruvian region (Porro et al., 2015).

The monthly income contribution to the number of households

The monthly household income indicates the local economic situation and is an important proxy for the measurement of socioeconomic status or standard of living. In this section, the result showed the number of households who perceived their monthly income directly from the forest reserve and contribution. The contribution is calculated based on the percentage of a household number.

Therefore, the household income refers to receipts (whether monetary or material), that are earned repeatedly and accrued (confirmed received) on a weekly, monthly or annual basis and used to meet current needs. In this context, the number of income recipients in the adjacent GTFR on average is 2 people (**Figure 2**), compared to 1.9 for the average number of income recipients in the state of Terengganu in 2019. Households with only one income recipient recorded the largest percentage composition with 45.9%. This was followed by two income recipients (28.6%) and three income recipients (9.5%). Meanwhile, households with four income earners and more accounted for 6.2%. Income received individually was usually shared with other household members and forms the household income.

Figure 2: Percentage of households by the number of recipients’ income



In Malaysia, the household head is typically a man or husband who serves as the pillars of a family and a culture for local Malay tradition. However, for the better and livelihood strategies, eradication of poverty and enhance wealth in the rural communities, the role of women and youth should also be considered. Women and youth should be given more support and opportunities in long-term planning for food security and rural livelihoods. Women play a prominent role in the food availability and marketing strategies of selling forest foods (Roy and Deepika, 2020). Since then, the household could sustain their livelihoods and are

substantially reliant on forests and agriculture sectors. It is notably that forests are essential not only providing their basic needs, thus also contribute to cash savings and safety nets (Shackleton et al. 2007). In a developing country, the forest is an important source of energy, employment, medicine and other subsistence needs for the majority of local communities (Bahuguna, 2000).

In Malaysia, these results also contributed to one of the main important roles of social forestry in the country. This paper revealed that forest and agriculture crucially have contributed to the livelihood of local communities in GTFR. Despite the results of Table 3 and Table 4 showed a small contribution (from income level generation), the forest-dependent communities in Malaysia continue to play a significant role in promoting conservation of natural resources, environmental protection and utilizing forest resources sustainably.

CONCLUSIONS

The study was set out to explore the current situation of the community's forest dependency and the role of forests in the community's economic well-being. The forest and the community have developed a significant relationship or mutual dependency as a result of their involvement. To answer the contribution of forest to food security at GTFR, the results showed the forest contributed to the local communities and they benefited from forest contributions in various ways. The dependency of the local people on forest resources could be extending to the indirect benefits too. In this research, it was determined that the multiple dimensions of forest goods included earning cash and total income, improving employment standards and uplift the living standard of locals. The locals perceived the monthly incomes through the agricultural resources sector. The average monthly household income was RM 5,486 per month, which was closed to the average household monthly income for Besut district in 2019 (RM 5,811) and RM 5,742 average for Rural Terengganu state in 2019. While in-kind income contributed 8% or RM 430 for the average monthly income in the 380 surveyed households. These benefits made forests fundamental to the livelihoods and well-being of people, not only for the people who live in them but also for those living in peripheral landscapes. Thus, the forest and its resources showed a direct and indirect contribution to the community's food securities. In this article, some recommendations can be outdrawn. The local government's action plan must be strengthened to improve the livelihoods of rural residents, including rural women. The diversity of rural women's participation is important because they are well known for growing crops in the backyard of houses and ensuring the food stock availability to the entire family, their survival is essential for ensuring food security. The variation on forest dependency can be contributed to the local management and conservation strategies as key factors in the planning, designing and implementation of future programs and activities for forest sustainability.

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REFERENCES

- Abdullah, M., Mamat, M. P. & Tuan Hussain, F. N. (2021). The contribution of forests on food security and rural poverty: A current status in Johor. *IOP Conf. Ser.: Earth Environ. Science*, 756 012090.
- Abdullah, R., Acciaioli, G., Ramle, N.H., & Mat Rasat, M.S. (2014). Forest significant and conservation among the Semaq Beri Tribe of Orang Asli in Terengganu State, Malaysia. *American Journal of Basic and Applied Sciences*, 8 (7): 386-395.
- Aju, P. C. (2014). The role of forestry in agriculture and food security. *American Journal of Research Communication*, 2(6), 109-121.
- Bahuguna V. K. (2000). Forests in the economy of the rural poor: an estimation of the dependency level. *AMBIO: A Journal of the Human Environment*, 29(3), 126-129.
- Calder, I., Hofer, T., Vermont, S., & Warren, P. (2008). Towards a new understanding of forests and water. *UNASYLVA-FAO*, 229, 3.
- Dao, T.H.T. and Holsher, D. (2018). Impact of non-timber forest product use on the tree community in North-Western Vietnam. *Forestst*, 9 (431), 1-15.
- Dhakai, B., H. Bigsby, and R. Cullen. (2011). Forests for food security and livelihood sustainability: Policy problems and opportunities for small farmers in Nepal. *Journal of Sustainable Agriculture*, 35(1), 86-115.
- DOSM. Department of Statistics. (2019). Department of Statistics Malaysia, <https://www.dosm.gov.my>.
- FAO. (1989). Chapter 2. Wood energy and livelihoods. <http://www.fao.org/3/V9728E/v9728e03.htm>.
- FAO (2003). Trade reforms and Food Security. Conceptualizing the linkages. Rome: FAO. <ftp://ftp.fao.org/docrep/fao/005/y4671e/y4671e00.pdf>.

Ferraro PJ and Hanauer MM. (2011). Protecting ecosystems and alleviating poverty with parks and reserves: “win-win” or tradeoffs?. *Environmental Resource Economics*, 48, 269–286.

Forestry Department of Peninsular Malaysia (2019). Annual Forestry Report for Peninsular Malaysia. Ministry of Water, Land and Natural Resources. Malaysia, 94.

Forestry Department of Peninsular Malaysia. (2020). Forest types. Retrieved from: <https://www.forestry.gov.my/en/2016-06-07-02-31-39/2016-06-07-02-35-17/forest-type>.

Kamanga, P., Vedeld, P., & Sjaastad, E. (2009). Forest incomes and rural livelihoods in Chiradzulu District, Malawi. *Ecological Economics*, 68(3), 613-624.

Mok (1992). Article 1. Potential for sustainable tropical forest management in Malaysia <http://www.fao.org/3/u6010e/u6010e07.htm>.

Nelson, J., Muhammed, N., & Rashid, R.A. (2015). Community’s forest dependency and its effects towards the forest resources and wildlife abundances in Sarawak, Malaysia. *International Journal of Sustainable Development & World Ecology*, 22, 401 - 412.

Park, H., Turner, N. & Higgs, E. 2017. Exploring the potential of food forestry to assist in ecological restoration in North America and beyond. *Restoration Ecology*, 26, 284-293.

Porro, R, Lopez-Feldman, A. & Vela-Alvarado, J. (2015). Forest use and agriculture in Ucayali, Peru: Livelihood strategies, poverty and wealth in an Amazon frontier. *Forest Policy and Economics*. 51. 47-56. 10.1016/j.forpol.2014.12.001.

Roy E., Deepika,P .2020. Role of women and youth in food security and rural livelihood. *International Journal of Agriculture Extension and Social Development*, 3(2), 68-70.

Shackleton CM, Shackleton SE, Buiten E, Bird N. (2007). The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa. *Forest Policy Econ*, 9(5), 558–577.

Sulaiman, N., Mohd Bakri, M. A., Kahar, K. M., Yaacob, M. Z., & Boler, I. (2014). Moth fauna (Lepidoptera: Heterocera) of Gunung Tebu Forest Reserve, Terengganu, Malaysia. *Malayan Nature Journal*, 66(4), 376–389.

Sumarli AX, Grismer LL, Anuar S, Muin MA, Quah ES, 2015. First report on the amphibians and reptiles of a remote mountain, Gunung Tebu in northeastern Peninsular Malaysia. *Check List* 11:1679.

Terengganu Forest Department (2019). Annual Forestry Report for Terengganu. Ministry of Water, Land and Natural Resources. Malaysia, 40-41.

Van Chu, T.V., Thoai, T.Q., An, C.Q., Toai, P.M., Camacho, L.D., & Sâm, H. (2019). Contribution of forest to rural households’ livelihood: evidences from Da river basin in the northwest mountainous region of Vietnam. *Forest and Society*,3(2), 235-247.