The contribution of forests on food security and rural poverty: A current status in Johor

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Abstract. In recent years, the issue between forest resources, food security and rural poverty has emerged and globally become a fundamental problem. Forests provide food, fodder and fuel, and somehow the forest goods and services itself provide a means of earning income, especially in rural communities. In understanding the contribution of forests to food security, it is essential to look at the current socioeconomic status of the rural communities especially forest-dependent communities and determine the linkages between them. Therefore, a 2020 study was conducted to analyse the contribution of forests and its related activities to food security and rural poverty within rural households including indigenous people. The study employed rapid rural appraisal and socioeconomic survey on the rural households live within and the adjacent of forest specifically Permanent Reserved Forest. Generally, this study was conducted throughout Peninsular Malaysia. However, this paper only focuses on the state of Johor as an example for this study. A case study in Johor found that forests and its resources provided significant contribution on food security and rural poverty. Where, it contributes up to 21.5% of monthly cash income of rural communities and if there is no income generated from the forests the poverty incidence of these communities will increase up to 13.7% from current incidence.

1. Introduction
Each year, over 800 million of world population still suffer hunger from malnutrition and approximately 20 million of them dying of starvation or other related diseases [1]. Malaysia also experienced the problem, in which, Malaysia ranks 28th on the 2019 Global Food Security (GFS) Index. Committee on World Food Security defined food security as the economic and physical access to food, of all people, at all times. In case of this study on forestry, the food security concept recognises the well-being of people who depends on the forest resources. There is no doubt on the linkage between forest and food security, as this subject has been emerged decades ago. It is estimated around 200-300 million of world population still depends on the forests either direct or indirectly [2]. While socioeconomic study by Falconer and Arnold acts as evidence that forest contribution to household food security is often crucial [3]. In Malaysia, it is estimated about 8.5 million rural dwellers and 3.5 million of them were indigenous people and most of the still highly depend on the forest [4] According to Law et.al [5] indigenous people were having dilemma as the prevalence rate of food insecurity among this population has been reported to be high not only in Malaysia but also in other countries as well.

Forest serves as a habitat for most of the fauna especially animals consumed by human and most importantly fish. These made forests act as a supplementary food provider to rural communities, especially indigenous people or in Peninsular Malaysia known as Orang Asli. Therefore, forestry has a large and indispensable role to play in improving the present and future food security [6]. Forests contributes to food security and nutrition in many ways and improved livelihoods especially for the survival of forest-dependent communities, especially indigenous people.
Well managed forests can increase the resilience of communities and improve human well-being by providing food, as well as by generating income and employment and finally sustain the biodiversity. 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, forest and its resources may have an impact on these community’s food securities either directly or indirectly. Therefore, in 2020 a study was conducted to analyse the relationship and contribution of forests and its resources on food security and rural poverty within rural households in the state of Johor.

2. Methodology
There are two types of data involves in this study which are primary data and secondary data. Primary data involves Rapid Rural Appraisal (RRA), focus group discussion and surveys on households. While, secondary data involves collecting information from printed materials such as annual reports, books, journals and other related materials [7]. In the study, data were collected through rapid rural appraisal (RRA) and household survey guided by a structured questionnaire. In this socio-economic survey, the information was gathered from 1050 households in 29 selected villages at Johor.

This paper only emphasises the contribution of Johor’s Permanent Reserves Forest. Forests in Peninsular Malaysia specifically Permanent Reserves Forest is protected under Forestry Act 1984 and National Forestry Policy 1992, where Forestry Department of Peninsular Malaysia is responsible for the managing, planning, protecting and developing the Permanent Reserves Forest. In 2015, Permanent Reserves Forest in Peninsular Malaysia was recorded as 4,831,801 hectares, which is 37% of Peninsular Malaysia land area. Johor contributes approximately 7% of the total reserved areas.

2.1 Rapid Rural Appraisal
Rapid rural appraisal (RRA) technique is a tool that enables a quick assessment of the existing environment and the possible impacts of the forest resource utilization and the other environmental services to the local livelihood [8]. Some of the techniques applied in RRA include group interview; methods of cross-checking information from different sources; methods of obtaining quantitative data in a short time frame, direct observation at study site level and use of secondary data [9]. This technique provides basic information and ethno history of the study site for baseline in questionnaire design. In this study, RRA applied on the preliminary stage to gather baseline information and understanding the relationship between forest goods and services, rural livelihoods and their dependency (food security) within rural households in Johor. A series of discussion with District Forest Office, Department of Orang Asli Development Johor and head of the village was conducted throughout the RRA process. The discussion aimed to identify rural communities to be sampled and also the dependency of these communities towards forest goods and services, especially involving food security either directly or indirectly. The discussion has also given early idea and thought on how forest goods and services contribute to the rural communities and food security of these rural communities.

2.2 Survey Implementation
Sampling Technique: Selection of samples in this study was determined by District Forest Office in which samples were chosen based on the distance 5km or less from the adjacent Permanent Reserved Forest. Total of four District Forest Offices involves in Johor, namely South Johor (Johor Bharu), East Johor (Mersing), Central Johor (Kluang) and lastly North Johor (Segamat). Samplings of rural communities live within and adjacent to forest reserved also considered both local communities and indigenous people.

Sample Size: Meanwhile, the estimation of sample size respondents was based on the number of households living at the selected study site, in which the households’ data was provided by District Council Office, by using the simplified sampling formula from Yamane and taken 5% as the level of precision [10]. A total of 1,050 households were successfully interviewed during the survey.

Questionnaire Design and Data Collection: The study involved household survey using a structured questionnaire. It was constructed into few sections covering demographic characteristic of the
households, household’s income sources and their dependency and lastly perception toward the forests and its related activities. The main objective of this study can be determined through the household’s income and their dependency on forest goods and services. The household surveys were conducted by well-trained enumerators. During the household interview, the respondents were briefed on the objectives and purpose of the survey. Time taken for each interview was about 30 minutes per interview.

3. Results and Discussion

In order to determine the contribution of forests and its resources to food security and rural poverty, a series of surveys were conducted among rural communities live within and adjacent to forest reserved. The survey successfully interviewed 1,050 households from 29 villages in the state of Johor. The rural communities involved both local communities and also indigenous people or known as “Orang Asli”. The information of the rural communities sampled by forest district as shown in Table 1.

Table 1. Information of the rural communities sampled by forest district.

| Forest District | No. of villages | Indigenous people | Local community | Total Sample | Percentage (%) |
|-----------------|-----------------|------------------|-----------------|--------------|----------------|
| South Johor     | 7               | 101              | 179             | 280          | 27             |
| Central Johor   | 8               | 60               | 211             | 271          | 26             |
| East Johor      | 7               | 67               | 176             | 243          | 23             |
| North Johor     | 7               | 40               | 216             | 256          | 24             |
| Total           | 29              | 268              | 782             | 1050         | 100            |

3.1 Sociodemographic characteristics

The results begin with the sociodemographic characteristics of households. A total of 1,050 households live near or adjacent to reserved forest were sampled in this study. The sociodemographic analysis of 4,071 numbers of individual households was carried out by using descriptive and frequency analysis (Table 2). The analysis showed that out of 4,071 individual households, 52.2% of samples was male, and remaining 47.8% was female. This percentage was closed to Malaysia percentage in which male (51.4%) slightly higher than female (48.6%).

Table 2. Sociodemographic characteristics of households.

| Demographic character | Frequency | Percentage |
|-----------------------|-----------|------------|
| Gender (N=4071)       |           |            |
| Male                  | 2127      | 52.2       |
| Female                | 1944      | 47.8       |
| Age (N=4071)          |           |            |
| Below 14 years old    | 1032      | 25.4       |
| 15-64 years old       | 2608      | 64.1       |
| Above 65 years old    | 431       | 10.6       |
| Average               | 33.7 years old | 100   |
| Marital status (N=4071)|          |            |
| Single                | 2054      | 50.5       |
| Married               | 1984      | 48.7       |
| Divorced              | 33        | 0.8        |
| Education (N=3648)    |           |            |
| No formal education   | 348       | 9.5        |
| Primary school        | 1265      | 34.7       |
| Secondary school      | 1667      | 45.7       |
| Diploma/STPM          | 53        | 1.5        |
| University            | 351       | 9.6        |
| Occupation (N=2748)   |           |            |
| Employed              | 738       | 26.9       |
| Self-employed         | 414       | 15.1       |
| Agriculture & forest related | 515 | 18.7       |
| Retiree               | 76        | 2.8        |
| Unemployed            | 1005      | 36.6       |
The analysis also showed the highest age frequency (64.1%) in the age group of 15-64 years old, with a mean of 33.7 years old. This finding is in line with the Third Quarter of Demographic Statistics in 2020 by the Department of Statistics Malaysia (DoSM), where age group of 15-64 years old has the highest frequency with 69.7% [11]. As high as 90.5% of the individual households had attended formal education and the balance of 9.5% of respondents never attended formal education. For education analysis, only individual household age 7 years old and above (3648 individual households) were taken into account. Whereas, the other 387 individual households were aged below 7 years old. Most of the respondents’ received education until secondary school, followed by primary school and university with a percentage of 45.7%, 34.7% and 9.6% respectively. Other than education, the sociodemographic analysis involved was on the occupation. In this analysis, occupation is based on DoSM labour force, where the labour force refers to the population in the working-age group of 15 to 64 years who are either employed or unemployed. That means, if the individual age 15 years old but did not further their study neither working, that individual will be assumed as unemployed (36.6%). A total of 2,748 numbers of individual households were taken into account. The remaining 1,323 individual households either below aged 15 years old, above 65 years old or depending on other family members.

3.2 Perception towards forest contribution

In order to determine the contribution of forest resources, rural community and possible linkage to food security, their perception towards forest contribution to them was recorded. Respondents were asked to select a scale of 1 (not important at all) to scale 5 (very important) on the importance of forest contributions to them. The result of their perception translated as in Table 3. Frequency analysis shows a majority of respondents choose scale 4 (important) and scale 5 (very important). These results proved that forest and its resources contribute to these rural communities. Where, the highest mean score was forest contribution as habitat flora and fauna, followed by forest contribution as sources of income generation for these communities with a mean score of 4.45 and 4.25 respectively. Other than that, 97.1% of respondents agree, forest contributes to their sources of daily food with mean score of 3.83.

| Forest contribution                              | Mean | Not important | Slightly important | Moderately important | Important | Very important |
|-------------------------------------------------|------|---------------|--------------------|----------------------|----------|---------------|
| Habitat for flora and fauna                     | 4.45 | 0.1           | 0.1                | 1.8                  | 51.1     | 46.9          |
| Income generation from forest resources         | 4.25 | -             | 0.7                | 10.7                 | 52.1     | 36.6          |
| Habitat for fauna breeding                      | 4.25 | -             | 0.7                | 10.6                 | 52.2     | 36.6          |
| Ecotourism and recreational spot                | 4.04 | 4.2           | 2.8                | 9.7                  | 51.4     | 31.9          |
| Source of daily foods                           | 3.83 | 2.9           | 9.0                | 13.9                 | 50.7     | 23.5          |
| Source of traditional medicine                  | 3.71 | 4.6           | 9.5                | 15.8                 | 50.5     | 19.6          |
| Source of fuel and building materials           | 2.98 | 22.1          | 19.2               | 3.9                  | 47.7     | 7.0           |

Other than households’ perception of forest contribution, they were also asked to choose from scale 1 (strongly disagree) until scale 5 (strongly agree) on statements regarding forest conservation impacts on the rural communities. Results for each statement as below:

- Forest conservation causes communities to lack land for agriculture (mean=1.71). The results show 97.1% of respondents disagrees with the statement. This is probably because they already had allocated land or permitted reserve areas for their agricultural activities. This is very important because it does contribute to the food security of these communities.
- Forest conservation causes communities to be barred from finding forest products (mean=1.70). The results show 97.3% of respondents disagrees with this statement. That means rural communities especially indigenous people were not barred from harvesting forest resources only for their use and ensure their sustainable livelihood. However, other rural community may also be
allowed to harvest forest resources but with permit by the forestry department. This result shows positive linkage and relationship between the accessibility of these communities towards forest resources.

3.3 The forests contribution

The contribution of forests to food security and rural poverty can be seen through the household’s monthly income of rural communities. Through sources of monthly income, the relationship can be identified, in which household’s income was divided into a few main categories and one of the categories is forests and agriculture. Other than that, the impact of forest resources on rural poverty and livelihood can be determined through the poverty incidence of these communities.

3.3.1 Household’s income

Households’ monthly income reflects the socioeconomic status of rural communities in the study areas. Result found that the average monthly household’s income was RM3,035, where indigenous people was around RM1,942 per month and the local community was RM3,410 per month (Table 4). The average income is quite closed to the average household monthly income for Rural Malaysia (RM3,080) and Malaysia (RM6,141).

There are two types of income namely cash income and in-kind income. Cash income refers to income gain from employment, businesses and other income that received in cash including forest-related such as the sales or business related to forestry and ecotourism. Meanwhile, in-kind income refers to income other than money income like property and also forest resources consumed such as food sources and water by households. The result shows indigenous people had higher in-kind income compared to local communities. While in term of cash income, local communities had higher income compared to indigenous people.

Table 4. Household’s monthly income.

| Source of income | All (RM) | Indigenous people (RM) | Local communities (RM) |
|------------------|---------|------------------------|------------------------|
| Cash (RM)        | 2,749.69 | 1,780.67               | 3,081.78               |
| In-kind (RM)     | 286.06   | 161.98                 | 328.58                 |
| Total income (RM)| 3,035.74 | 1,942.65               | 3,410.36               |

3.3.2 Source of household’s income

Forests contribute to food security in many ways. One of the ways is through communities’ income generated from forests and its related resources either directly or indirectly. Direct sources of forest products obtained by the community were forest food and fruits such as petai, jering, honey, bamboo shoot and also variety of tuber, ferns and wild mushrooms. However, beware that only Indigenous People are allowed to harvest those food and fruits only for their own daily food consumption, while local community required permit to enter and harvest the forest products. Other direct sources of forest products obtained by the community were wild roots and also aromatic plants such as Tongkat ali, Kacip fatimah, Ubi jaga and also rhizomes like wild gingers. Rural communities consumed it as food seasoning and also traditional medication based on their traditional knowledge. Other than that, river fisherman also is one of the direct sources of income generated from forest. Good forest provides healthy ecosystem for riverine. These communities catch fish for subsistence and some of them sell it to earn an income to support their families. Forests also provide services as an ecotourism site. The spill over of ecotourism came from income generated through food stall, homestay and also chalets/resort workers.

Other than direct sources, forests also serve such an important indirect benefit to rural communities. Agricultural activities are one of the indirect benefits of forests, where forest support sustainable agriculture and increase its productivity by stabilizing soil and climates [1]. Thus, forests and agriculture incomes were categorized as one. Therefore, mentioned direct use of forest showed how these communities depend on forests not only for their food security but also to sustain their
livelihood. Table 5 shows the contribution of forestry and its related activities towards the monthly household’s income.

Overall results show forests and agricultural income contributes 21.5% of cash income source and only 0.6% for an in-kind income source. However, the results also show indigenous people has a higher dependency on forests and agriculture compared to local communities either cash or in-kind income, with percentages of 40% and 19% respectively. The result of indigenous people is in line with study by Kardooni et. al [12] where, 50% of the indigenous people depend on the forestry and agricultural sectors as sources of their income. The results proved that forests and its related activities contribute significantly to the monthly household’s income.

Table 5. Sources of household’s income.

| Type of income | Source of income         | Percentage (%) |
|---------------|--------------------------|----------------|
|               | All                      | Indigenous people | Local communities |
| Cash          | Employed                 | 43.4            | 28.7            | 46.3 |
|               | Self-employed            | 11.2            | 4.6             | 12.5 |
|               | Forestry & agriculture   | 21.5            | 37.0            | 18.5 |
|               | Other                    | 14.5            | 21.4            | 13.2 |
| In-kind       | Forest related           | 0.6             | 2.7             | 0.3  |
|               | Other                    | 8.8             | 5.7             | 9.4  |
| Total households income (RM) | 100.0                  | 100.0           | 100.0           |

3.3.3 Impact of forests on rural communities’ poverty

Forests provide food security to the poor and reduce vulnerability [13]. Poverty incidence in Malaysia calculated based on Poverty Line Income published by DoSM in 2019, where for the state of Johor the Poverty Line Income was RM2,505 per household while RM2,208 per household for Malaysia. From the analysis, this study found poverty incidence for sampled rural communities in Johor was 51%. The poverty incidence for these communities higher compared to the poverty incidence for Johor (15.3%), rural Malaysia (12.4%) and Malaysia (5.6%).

Access by the rural communities especially forest-dependent households to forest and its resources is essential for sustainable poverty reduction and have great influenced to their livelihood as they have difficulty especially in obtaining food and generate income from other forest resources [14]. Mohamed Mirghani ES [15] stated removal of these resources has led to a significant increase of expenditure to meet their basic needs. An increase in expenditure may cause an increase in the poverty incidence of these rural communities. Therefore, the impact of forests on rural communities’ poverty can be seen by excluding the income generated from forests and its related activities both directly or indirectly.

The result found if there is no income generated from forestry the poverty incidence of these communities can be increased up to 64.7% compared current status (51%). Although forests contribution to the incidence of poverty is not much (13.7%) but, this study proves that forests and its resources may have impacted these rural communities significantly.

3.3.4 Forest conservation strategy

The results proof there is a community’s dependency on the forests and forest linkages on the food security and rural poverty in study site. However, if the forests are not being manage, conserve and use in a sustainable way, it may cause overexploitation and cause damage to forest ecosystem. Therefore, there is a need to balance between sustaining the forest and ensuring the food security of these rural communities. One of the rising strategies to encounter these issues is through co-forest management. The co-forest management is giving the management rights of the forest to selected communities for them to manage the forest together with the forest manager. This strategy has potential to help improve access to forest benefits and greater recognition of the forest value itself. There are few models in co-forest management, where these models will offer new or alternative use of forest to generate more sustainable income for these communities. The examples of co-forest management models are ecotourism, forest conservation and also agroforestry. This strategy will offer a new
perspective on the contribution of forestry to food security of rural communities. Sustainable utilisation of forest goods and services not only provide a direct contribution to food security (forest as a supplementary food provider), but it also will provide indirect benefits by offering new sources of income through forest ecosystem services.

4. Conclusion
The world’s population is increasing and meeting the needs of everyone can be a challenge, so thus Malaysia. This is due to the different interest of different parties either government, private sectors, non-governmental organisation and also communities itself. This study proved there is a significant contribution of forestry to food security and rural poverty where rural communities depend on forests goods and services for their livelihood. However, if it is not well managed and sustained, it may cause overexploitation, hence may impact the forest ecosystem services.

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