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Sustainable Forest Management contribution to food security: A stakeholders' perspectives in Sabah, Malaysia

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Abstract. Implementing Sustainable Forest Management (SFM) policy has contributed to conserving and protecting the forests to remain relevant for future generations. This study determines stakeholders' viewpoint on the relationship between the implementation of SFM and food security in Sabah. The study was conducted by distributing online questionnaires through the SurveyMonkey platform using convenience sampling methods. Most of the respondents agreed that the forestry sector is still relevant to the development and generation of the economy and revenue to the state of Sabah. Apart from nature-based tourism, wood-based manufacturing, furniture industry, and agroforestry practices, other potential economic-generation segments are indigenous forest food productions, such as wild honey, fruits, vegetables, and game animals. The forestry sector could contribute to food security for Sabah by advancing the current practices and the use of local resources of forest foods. Other prospects are integrating natural and plantation forest management programs with the generation of forest food resources. Factors that could foster the forestry sector's contribution to food security, among others, are research and innovation, education, involvement of local communities, and the role of government policy on forestry and food security in Sabah.

Keywords: Indigenous forest food; food security; Sustainable Forest Management.

1. Introduction

The main objectives under the SFM concept are related to the forest's role on the three pillars of social, economic, and environmental function. Accordingly, many criteria and indicators were introduced and established to develop the best approaches to achieve the stipulated goals and objectives. The SFM concept has developed to a broader operation and services in the forestry industry due to the continuous development of new products such as bioenergy and modern technology to keep business on the market [1]. The diversity of operation and services in forestry has opened up more opportunities for jobs, and people can secure alternate activities for income generation. The sustainability of the forestry sector was perceived as vital, for instance, as it had contributed to the rural economic development through the employment of people mainly from the rural area where job opportunities are low [2]. The employment opportunities in rural areas ensure income generation for every work done; therefore, it improves people's purchasing power and eventually leads to food security [3]. Food security is defined by the Food and Agriculture Organisation of the United Nations (FAO) as “.. a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” [4]. The management of forest resources according to the principle of SFM will ensure sustainability, perceiving its significance



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to the socio-economic development of human societies, including the ability to sustain food security. Forest could contribute directly and indirectly to the people's food security by securing them with food, ecosystem services to intensify agriculture production, bushmeat and fuelwood for income generation and food processing [5]. Furthermore, trees can save the most vulnerable people in time of shocks. For instance, forest products become an alternative for poorer people during crop failure to feed their families while women's roles in food processing and preserving become significant [6].

Some elements of SFM implementation that impacted people's livelihood, especially the local communities in rural areas, are the social forestry program [7]. It aims to improve the condition of the natural resources, alleviate poverty among forest users, and empower direct forest users, whilst the core objective is to promote the engagement of communities in forest management [8]. Apart from social forestry, some other SFM related components have also been listed and identified to contribute to poverty alleviation and mitigation. These include eco-tourism, protected areas, agroforestry, payment of ecosystem services, forest producer organisation, tenure and property right reform, forest management, the role of small and medium forest enterprises (SMEs), as well as any forest-related management [9]. All these have summarised that poverty and food security issues can be lifted by improving occupation, generating revenue, securing land tenure, cooperative and interactive partnership with various stakeholders, and effective restoration and management of forest, which provide added value to the communities' livelihood.

This study aims to determine stakeholders' viewpoints on the relationship between the implementation of SFM and its contribution to Sabah's food security. The stakeholders are thus who are associated with the forestry-related organisation that includes the government and private sector, including the forest management unit (FMU) workers, Non-governmental organisations (NGOs), forestry consultants and government-linked companies.

2. Method and data analysis

This study distributed questionnaire surveys through the SurveyMonkey platform using purposive and convenience sampling methods, whereas based on the selected respondents' willingness to participate in the study. Those respondents were selected on the basis of their background and knowledge on topics related to forestry sector and food productions. The questions were designed in open-ended, and close-ended based on the Likert Scale which responders specify their level of agreement to a statement in five points (1-Highly agree, 2- Agree, 3- Moderate, 4- Not agree and 5-Hghly not agree). Data were analysed using Microsoft Excel and Statistical Package for the Social Sciences (SPSS). One hundred six respondents had participated, with 70% of them directly involved in the forestry-related organisation, 53% were from the government sector, 30% from the private sector, including the forest management unit (FMU) workers, and 17% are NGOs, forestry consultant and government-linked company. Most of the respondents, which is 49%, are involved in forestry-related work followed by those involved in agriculture, which is 28%, tourism and research 25% respectively, and the rest are from the businessman, education, social welfare, fisheries and husbandry backgrounds.

3. Results

3.1 Contemporary potential contribution of the forestry sector in Sabah

Overall, most of the respondents highly agree and agree that the forestry sector contributes to the food security in Sabah. Only about 11% are not agreed or strongly do not agree, while another 10% are neither agreed nor disagreed. Most of the respondents agree that the forestry sector contributes to the state economic generation with the highest potential based on weighted average (1- Highly agree, 2- Agree, 3- Moderate, 4- Not agree and 5- Highly not agree) is nature and forest-based tourism industry (1.92). These are followed by timber-based manufacturing and downstream wood processing industry (2.10), integrated industry of forests, agriculture and husbandry (2.14), furniture industry (2.17), forest-based food resource industry that involving indigenous food like wild honey, fruits and vegetables and game animals (2.20). The next potential is logging operation or timber harvesting with a weighted average of (2.29), which was supposed to be the main business in the forestry sector in the past. Other potentials

are identified under the Payment for Ecosystem Services (PES) (2.45), Non-timber Forest Products (NTFPs) (2.49) and the filming and publication industry (3.30).

3.2 SFM contribution to food security

The approaches to how SFM could contribute to food security are most determined by promoting research on forest food resources. It also includes the development of practices and use of forest food resources such as wild fruits, vegetables and mushrooms, the integration of agroforestry program in SFM, the introduction of a specific site for food resource bank in the FMU areas, the establishment of forest plantation with the integration of food resource production (Table 1).

Table 1. SFM approaches in contributing to food security.

Means	Percentage, % (Number of respondents)					Weighted Average (SD)	Rank	Total
	Highly Agree (1)	Agree (2)	Neither Agree or Disagree (3)	Not Agree (4)	Highly not Agree (5)			
Promote research on forest food resources	51.16% (44)	38.37% (33)	6.98% (6)	3.49% (3)	0.00% (0)	1.63 0.76	(1)	86
Development of practices and use of forest food resources (Wild fruits, vegetables, mushrooms etc.)	45.35% (39)	46.51% (40)	8.14% (7)	0.00% (0)	0.00% (0)	1.63 0.63	(1)	86
Integration of agroforestry program in SFM	41.18% (35)	44.71% (38)	11.76% (10)	2.35% (2)	0.00% (0)	1.75 0.75	(3)	85
Introduce specific site for food resource bank in the FMU area	44.19% (38)	38.37% (33)	13.95% (12)	4.65% (4)	0.00% (0)	1.79 0.85	(4)	86
Integrated Forest plantation practices with food resources production	36.05% (31)	46.51% (40)	15.12% (13)	1.16% (1)	1.16% (1)	1.85 0.80	(5)	86

Note: The value shown is based on percentage (%) and the number of respondents in agreement ().

3.3 Enhancing SFM for food security

The most agreed statement by the respondents on how the SFM can further contribute to food security is related to research and innovation programs, followed by education, participation of stakeholders including the local community, the roles of government policies, investment from the industry, level of awareness among the public and financing (Table 2).

Table 2. Factors contributing to SFM as a food security instrument.

Contributing Factors	Percentage, % (Number of respondents)					Weighted Average (SD)	Ranking	Total
	Highly Agree (1)	Agree (2)	Neither Agree or Disagree (3)	Not Agree (4)	Highly not Agree (5)			
Research and innovation.	58.23% (46)	35.44% (28)	5.06% (4)	1.27% (1)	0.00% (0)	1.49 (0.65)	(1)	79
Education	54.43% (43)	29.11% (23)	12.66% (10)	3.80% (3)	0.00% (0)	1.66 (0.84)	(2)	79
Participation of local community.	50.63% (40)	29.11% (23)	18.99% (15)	1.27% (1)	0.00% (0)	1.71 (0.81)	(3)	79
Participation of stakeholders.	42.31% (33)	41.03% (32)	15.38% (12)	1.28% (1)	0.00% (0)	1.76 (0.75)	(4)	79
Government policies	45.57% (36)	35.44% (28)	13.92% (11)	5.06% (4)	0.00% (0)	1.78 (0.87)	(5)	79
Investment among the industries.	37.97% (30)	39.24% (31)	18.99% (15)	3.80% (3)	0.00% (0)	1.89 (0.84)	(6)	79
Level of awareness.	49.37% (39)	20.25% (16)	17.72% (14)	12.66% (10)	0.00% (0)	1.94 (1.08)	(7)	79
Financing	41.77% (33)	31.65% (25)	17.72% (14)	8.86% (7)	0.00% (0)	1.94 (0.97)	(8)	79

Note: The value shown is based on percentage (%) and the number of respondents in agreement ().

4. Discussion and conclusion

The study found that the forest sector is still vital to the state, contributing directly and indirectly to food security, especially forest-dependent people. It could contribute indirectly, such as in the tourism and manufacturing industry, to generate income for those involved. For the local community in Sabah, where most of the population are indigenous, the forest is often associated with cultural, spiritual, and economic purposes [10]. The ethnic groups of Sabah's community, mainly from the ethnic groups of Dusun, Murut, Paitan and Bajau, commonly dwelled in rural areas [11, 12]. Community residing in the proximity of the forested areas tend to be more dependent on the forest than those who are more distant [13]. Although not all indigenous people depend primarily on the forest for livelihood, it was evident that those who reside nearby forest cover collect resources for subsistence and daily consumption [14]. It was stated that the indigenous people utilise nature and forest resources to meet their needs, particularly in rural areas [15]. The forests are deemed to improve livelihood and the people's food security with the inclusion of a tree-based system which is prominent for ecosystem services provision to agriculture [12].

The roles of forest among the forest-dependent people are highly significant to food security because they obtain continuous supply from the ecosystem services. By doing research and development on current practices and use of forest food resources, may enhance the food security function of the forest. The integrations under the multiple-use concept in the agroforestry system for food production and identification of specific sites in the FMU area may also help boost the forestry sector for food security. How to enhance the SFM concept for food security is related to research and innovations, education to the public, and stakeholders' participation that includes the government, corporates, and local communities to come together and collaborate in establishing or developing plans, programs and activities for food security. Others are awareness and financing on the food security in the forestry sector by the government or the private sectors that include the FMU holders.

In conclusion, forest function and roles towards food security are possible under the SFM concept to ensure forest sustainability for current and future generations. The SFM policy could highly support the full contribution of the forest, not only for timber production but also the full range of ecosystem services that include non-timber forest products and food production. The potential of the forest as a

food bank is important to ensure the advancement of food security directly and indirectly, especially for those dependent people, who may be more susceptible to food insecurity during the pandemic COVID-19, for example. Finally, the SFM concept can increase social and environmental benefits and contribute to people livelihoods, employment and income generations.

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