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Assessment of the Welfare of Communities Managing the Mount Hamiding protected forest on Halmahera Island North Maluku, Indonesia

Jacob Kailola [1] dan Cornelia Dolfina Maatoke [2]✉

[1] *Program Studi Kehutanan Fakultas Ilmu Alam dan Teknologi Rekayasa Universitas Halmahera, Tobelo, Indonesia*
[2] *Program Studi Agroteknologi Fakultas Ilmu Alam dan Teknologi Rekayasa Universitas Halmahera, Tobelo, Indonesia*

Email: jacobkailola@yahoo.co.id, onnanona81@gmail.com

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✉ **Corresponding Author :**
Cornelia Dolfina Maatoke
Universitas Halmahera
Tobelo, Indonesia

Email :
onnanona81@gmail.com

Abstract

The Mount Hamiding protected forest is located in North Halmahera district, North Maluku Province, Indonesia, which has high biodiversity but has not been managed optimally. In general, the study shows that communities around forest areas have low incomes. However, actual data regarding community welfare at the location level is unavailable. This research aims to assess the level of community welfare and income distribution in protected forest management. The methods used in this research are descriptive qualitative, quantitative. Data collection was carried out through observation, interviews, and literature study. Analysis of the level of community welfare refers to Sayogjo and inequality is measured using the Lorenz curve. The welfare level variable is determined using non-parametric chi-square statistical analysis. The research results show that people still live below the poverty line, and the average per capita income is IDR 3,913,255/year, the Gini Ratio is 0.3 in the low category. Community characteristics: education, number of dependents, distance from house to forest, income, and length of residence have a significant effect on welfare. Meanwhile, age, occupation, and land area do not have a significant effect. To improve community welfare, multi-party collaboration is needed for training and community empowerment activities.

I. INTRODUCTION

Protected forests are renewable natural resources (Sari & Akkaya, 2016), and provide benefits to living things (Brèteau-amores et al., 2019; Wan et al., 2019; Kailola et al., 2021). The direct benefits include the production of firewood, logs, carpentry wood, honey, and essential oils (Mardiatmoko et al., 2020; Kailola et al., 2023). Meanwhile, the indirect benefits include water management regulation, carbon sequestration, and others. Forests also play a role in producing products and driving ecosystems (Luo et al., 2019; Zhang et al., 2019; Wan et al., 2019; Huang, 2019; Riccioli et al., 2019). They contribute to economic growth, but according to some studies, people who live in and around forests are still poor (Maryudi, 2017; Pujo et al., 2018) with high dependence (Dako et al., 2019). The causes of poverty include the increase in population and its uneven distribution, hence people are given less space to manage forests. Furthermore, the resources are managed without considering the principle of sustainability (Aurel, 2015; Xiaoli et al., 2009; Brozovic et al., 2018). Expropriation of land without compensation or reasonable options for resettlement ultimately results in the displacement of poor and low-income people from their homes (Uwayezu et al., 2019; Lengoiboni et al., 2019)

Due to various problems and forest destruction, in 1987 a conference was held in Yogyakarta with the theme "Forest for people." A forest management concept was created known as

"Social forestry." As a result, forests are no longer seen as a stand-alone sector but are part of regional development, and the community has a role to play in managing sustainability to alleviate poverty (Muttaqin et al., 2019; Wang, 2019; Sahide et al., 2020). This is a positive sign for the community because it provides space for forest management as well as solutions for sustainability. (Arts & de Koning, 2017). The application of social forestry is unique and interesting because the management model is adapted to the characteristics of the islands and local sociocultural conditions to improve community welfare (Putraditama et al., 2019, Baynes et al., 2015, Poudyal et al., 2018). Social forestry is expected to bring changes to manage forests sustainably while considering social conditions and regional characteristics. This is in line with (Fisher et al., 2018), where forest management needs to pay attention to biogeophysical conditions and socio-cultural influences on the landscape as well as consider the effects and interactions in management.

North Halmahera, one of the regencies in North Maluku Province, is located in the Wallace region. The total area is 3,892 km2, consisting of production, protected, conversion production, and limited production forests at 22,259.40 ha, 84,460.79 ha, 80,677.64 ha, and 71,232.19 ha, as well as other areas at 92,261.81 ha (Central Statistics Agency of North Halmahera, 2022). However, the availability of resource potential has not been managed optimally. According to some previous research (Kastanya, 2006; Watimena, 2011; Kailola, 2017), this area has forest potential with a high biodiversity value characterized by the endemic and economic value of flora and fauna, unfortunately, forest management in North Halmahera is still traditionally operated (Kastanya, 2019) and less beneficiary for the community (Moreda, 2018). The report of the Central Statistics Agency of North Halmahera 2022 shows that the percentage of community poverty is 4.45%. The community welfare level in North Halmahera, especially for the village around the MPHF, is not yet available. This research aims to determine the level of welfare and income inequality in the community around the Mount Hamiding Protected Forest area.

II. MATERIAL AND METHOD

2.1. Research Location

This research was conducted in several villages in North Halmahera Regency, North Maluku Province. The regency is located between $1^{0}57'$ North Latitude - $3^{0}00'$ South Latitude and $127^{0}17'$ East Longitude - $129^{0}08'$ East Longitude, covering an area of 3,892 km² with a distance of 120.29 km to Sofifi City as the capital of North Maluku Province (Central Statistics Agency of North Halmahera, 2022). Entisol soil includes Hapludants and Dystrudepts with climate type B of 7-9 wet and 1-3 dry months (Watimena, 2011). The research was conducted in Roko, Soakonora, Togawa, Mamuya, Efi-Efi, and Wangongira Villages in the Mount Hamiding protected forest area. The locations were selected because they represent villages in the protected forest area. Fig 1 shows the locations of the research projects.

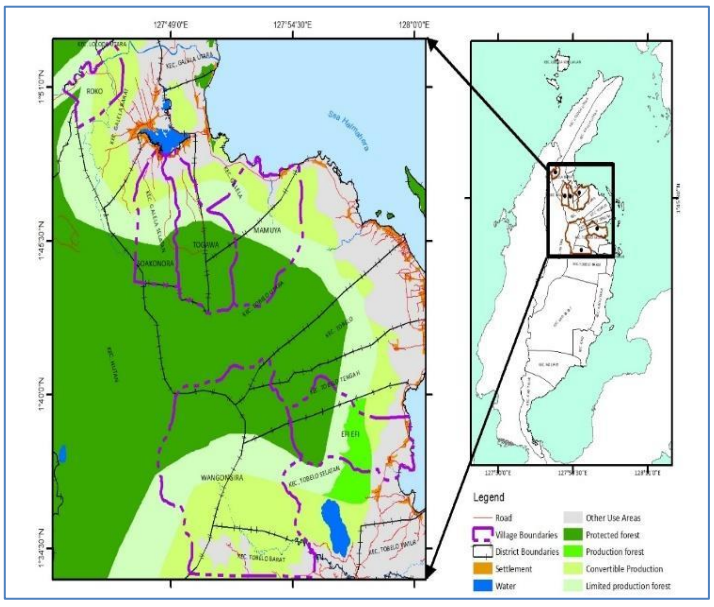

Figure 1. Research Locations for the Mount Hamiding Protected Forest Area

2.2. Collection Data

The research method used was a survey with quantitative descriptive analysis, and the data were collected using a structured questionnaire. Furthermore, the villages were assessed by purposive sampling, while the respondents were determined based on the formula (Sevilla et al., 1993) as follows:

$$n = 1 + \frac{N}{N + e^2}$$

Where: n = number of samples, N = population, e = error limit tolerance (5%)

Primary data were obtained directly through observation activities with questionnaires including respondent's name, age, education, occupation, the number of family members, land ownership area, the pattern of ownership, distance from the house, total income, and expenses. Secondary data were already in existence, and they complement primary data. These include the general condition of the research location such as position and area, physical conditions of topography, climate, rainfall, soil, land use, and community conditions such as population growth.

2.3. Data Analysis

2.3.1. Income analysis

Primary and secondary data obtained from the field were analyzed descriptively with qualitative and quantitative approaches. An indicator of annual family income determined the community welfare level. This includes recording the income received by the family head in the last year from the agricultural and other sectors. The income level is measured by adding up the product of prices and the results of activities with the following formula:

$$\mathbf{Yr} = \sum_{n=1}^{j} (Hi\ x\ pi)$$

Where: Yr = Respondent's income, Hi = Price of commodity I, Pi = Result of production i

The income per capita for each selected village is calculated by dividing the total income by the number of residents using the formula: Pi = Pd/jp. Where: Pi = Income per capita, Pd = Total income of the selected village (determined), and Jp = number of residents in the selected village (Tjoa, 2005)

2.3.2. Analysis of the community welfare level

2.3.2.1. Community income

The income per capita measures the community welfare level, and the benchmark uses the average annual need for rice. According to (Sayogjo, 1977; Kailola, 2012), the criteria are categorized as Not Poor when the per capita income per year is > 320 kg of rice, Poor when it is equal to 240-320 kg, Very Poor when it is equal to 180 - 240 kg, and Most Poor when it is equal to less than 180 kg.

2.3.2.2. Income inequality analysis (gini ratio)

Income inequality analysis uses a Gini ratio coefficient of 0 – 1. The categories are divided into < 0.4, 0.4 – 0.5, and > 0.5 for low, moderate, and high inequality using the Lorenz curve (Firdaus & Witomo, 2014, Houghton & Khanker, 2009)

2.3.2.3. Analysis of the factors that affect the community welfare level

To determine the factors that significantly correlate to the community welfare level per capita income, statistical data analysis is conducted using chi-square analysis with IBM SPSS 26 software. The results obtained are significant when the chi-square test value is <0.05. Meanwhile, the closeness of the relationship is measured by referring to (Sugiyono, 2013), as shown in Table 1.

Table 1. Contingency coefficient interval value

No	Coefficient interval	Relationship level
1	0.00-0.199	Very low
2	0.20-0.399	Low
3	0.40-0.599	Moderate
4	0.60-0.799	Strong
5	0.80-1.000	Very strong

Source: (Sugiyono, 2013)

III. RESULTS AND DISCUS

3.1. Data retrieval process

The research location was determined by purposive sampling, while data collection used the Slovin method. The number of family heads was 2,540 households with 346 respondents, as shown in Table 2. Each respondent was interviewed in a structured and in-depth manner using a questionnaire. The characteristics include education, occupation, age, number of family members, distance from house, income, expenses, length of stay, and land area.

3.2. Welfare level

An indicator of annual family income assessed the community welfare level. The capita per income for each selected village was calculated from the respondent's income by dividing the total income by the number of residents. It is used to measure the community welfare level, whether poor or not.

3.2.1. Income analysis results

Table 2. The number of respondents in the research villages

No	Village Name	Number of Residents	Number of Family Heads	Number of samples
1	Roko	1,020	313	43
2	Soakonora	3,007	865	117
3	Togawa	1,358	360	49
4	Mamuya	2,528	520	71
5	Efi-Efi	1,229	343	47
6	Wangongira	525	139	19
Total		9,667	2,540	346

Table 3. Community income in research villages

No	Village Name	Income/month (IDR)	Description
1	Roko	1,515,813.953	Moderate
2	Soakonora	1,288,461.538	Low
3	Togawa	739,591.8367	Low
4	Mamuya	1,629,225.352	Moderate
5	Efi-efi	2,112,127.66	Moderate
6	Wangongira	1,123,684.211	Low
Average		1,401,484	Low

Table 4. The community welfare level in the research village

No	Village name	Per capita income (IDR/year)	Welfare level			
			NP	P	VP	MP
1	Roko	4,090,403.50	-	√	-	-
2	Soakonora	3,873,661.67	-	√	-	-
3	Togawa	3,436,253.64	-	√	-	-
4	Mamuya	3,522,543.21	-	√	-	-
5	Efi-efi	5,655,313.07	√	-	-	-
6	Wangongira	2,901,353.38	-	-	√	-
Average		3,913,254.746	-	√	-	-

Information; *NP: Not Poor, P: Poor, VP: Very Poor, MP: Most Poor.*

Table 5. The distribution of respondents' income (gini ratio) in the research villages

No	Village Name	Gini Ratio	Category
1	Roko	0.4	Moderate
2	Soakonora	0.3	Low
3	Togawa	0.3	Low
4	Mamuya	0.3	Low
5	Efi – Efi	0.3	Low
6	Wangongira	0.3	Low
	Rata - rata	0.3	Low

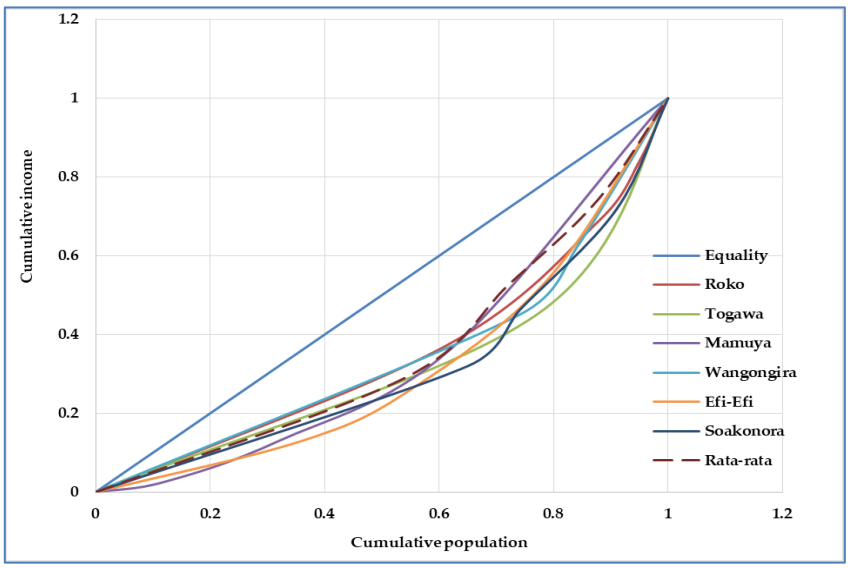

Figure 2. Lorenz curve of community income in research villages

3.2.2. *Analysis of household characteristics on the welfare level.*

The analysis results of household characteristics on the welfare level using chi-square analysis is a non-parametric statistical analysis. This analysis is carried out to determine the relationship between the welfare level and the household characteristics, as shown in Table 6.

Table 6. Analysis results of household characteristics on the community welfare level

No	Variable	Chi-square test			
		Value	Significance	Contingency Coefficient	
			Welfare level	Value	Closeness of relationship
1	Education	0.012	Sig*	0.262	Low
2	occupation	0.795	-	0.124	Very low
3	Age	0.127	-	0.127	Very low
4	Number of family members	0	Sig*	0.454	Moderate
5	Distance from house	0.003	Sig*	0.25	Low
6	Income	0.001	Sig*	0.275	Low
7	Expenses	0.001	Sig*	0.275	Low
8	Length of stay	0.003	Sig*	0.259	Low
9	Land area	0.198	-	0.171	Low

Description; *The Chi-Square Value is Significant, if it is < 0.05If the Contingency Coefficient value is > 0.5, the relationship is strong, while if the value is < 0.5, the relationship is weak.*

3.3. Community Income and Welfare Level

Based on the purposive sampling method, the villages determined to be the research locations in the Mount Hamiding protected forest area were Roko, Soakonora, Togawa, Mamuya, Efi-Efi, and Wangongira. The number of respondents was 346 people according to the Slovin data collection method, as shown in Table 2. The number of respondents in each village was 43 in Roko, 117 in Soakonora, 49 in Togawa, 71 in Mamuya, 47 in Efi-Efi, and 19 in Wangongira. Furthermore, the community's income can be seen in Table 3. The results show that the income in the moderate category is in the Roko, Mamuya, and Efi-Efi villages. In contrast, the income in the low category is in the Soakonora, Togawa, and Wangongira villages.

The analysis results of welfare levels using the approach (Sayogjo, 1997) are shown in Table 4. Based on the results, the community's per capita income in Roko, Soakonora, Togawa, and Mamuya is categorized as poor, Efi-Efi is not poor, and Wangongira Village is very poor. Overall, the capita per income for the six villages in the research location is IDR 2,901,353.38/year. Based on the analysis results, the community has a welfare level with the poor category. The income distribution (gini ratio) is shown in Table 5 and

the Lorens curve in Figure 2. Roko village is in the moderate category, while Soakonora, Togawa, Mamuya, Efi–Efi, and Wangongira show that the income gap between one and another is low. Therefore, the overall average is low since the community still lives below the poverty line and depends on forests. This is in line with (Pour et al., 2017), who stated that people living below the poverty line are very dependent on forests.

3.4. Variables Affecting Welfare Level

Statistical analysis uses the chi-square test with SPSS 26 software to determine the relationship of respondent characteristics such as education, age, family members, distance from house to the forest, land area, income, and occupation with the community welfare level. This analysis determines the variables that significantly affect the welfare level. Capita per income is the dependent variable, while the respondent's characteristics of age, education, occupation, number of family members, distance from the house, length of stay, and land area are independent. Based on Table 6, the variables that significantly affect welfare are education, number of family members, distance from house, income, expenses, and length of stay. Meanwhile, occupation, age, and land area do not significantly affect the welfare level.

The relationship between the last formal education with the welfare level is significant. Respondents' education in the 6 villages includes 0.6%, 35.8%, 26.9%, 31.5%, and 5.2% for no school, junior high school, senior high school and undergraduate. These results illustrate that the education level affects the community welfare. People with formal education will gain knowledge and insights shaping their mindset to manage areas more productively, increasing productivity. This is evidenced by the chi-square value of 0.012 < 0.05, which results significantly. Therefore, education has a relationship with welfare at a significant level of 5%. It can impact the lives of farmers in the management of protected forest areas. This is in line with previous research where the education and welfare levels of the community are directly proportional. The insight and knowledge will increase forest management and yield productivity (Aini et al., 2018; Parhusip et al., 2019; Desmiwati et al., 2021)

The relationship between the welfare level and occupation through the statistical test shows the uniformity of results without a significant difference. Occupation as farmers (98.6%), traders (0.6%), entrepreneurs (0.6%), and private employees (0.3%) do not affect the community welfare level at the research locations. This is because most people work as coconut farmers and are still focused on only one area of livelihood. Therefore, they have not been able to increase income for family welfare.

The relationship between the welfare level and age through a statistical test with chi-square analysis shows uniform results. Productive age 15 – 46 (45 people, 13%) and unproductive age 46 and over (341 people, 87%) do not impact the welfare level in forest management. This is because the difference between unproductive and productive age affects yield productivity. According to (Suandi. et al., 2014), productive age also affects income because they physically have higher performance than unproductive age, which impacts yield productivity.

The number of family members has a significant effect on the welfare level. This is because the motivation to provide for family members causes efforts to work harder and increase income (Rahman et al., 2017, Hanum., 2018)

The distance from the house has a significant effect on the welfare level. An increase in income and well-being is linked to a decrease in the distance between home and a designated forest preserve. Forest managers are more productive when the distance between their work location and destination is small. The distance from the house to the research locations of respondents is 6-10 km, with an average of 6.8 km. The statistical test with chi-square analysis shows that the welfare level has a significant relationship with the distance from the house to the forest. This is evidenced by the chi-square value of 0.003, smaller than 0.05. Forest management area accessibility affects how long a community has to get to a plantation or land location. Therefore, they can manage time effectively for management in the forest area, which will increase yield productivity. This is in line with (Ridha, 2017), where the closer the distance from the house to the work location, the higher the yield productivity because much time will be used to conduct activities.

The relationship between income and welfare level is significant. The welfare level rises in conjunction with an increase in income, and vice versa. On a daily basis, copra, a type of smoked coconut meat, is sold as the primary source of income in the research location. Based on the results of interviews, the number of coconut trees

planted will increase, and the yield of copra obtained will be greater when the land area is larger (8 x 8 m). The price of copra in its current condition is IDR 10,000/kg, and the production process can be seen in Figure 5 below.

Figure 5. The process of making copra by the community in the protected forest area

Copra production is conducted individually, in families, or groups. Cooperation within the group is known as Babari in Galelaand Hirono in Tobelo Sub-districts. The results show that 98.6% of community livelihoods are coconut/copra farmers. The statistical test shows that the chi-square value is 0.001, smaller than 0.05. Therefore, income has a significant relationship with the welfare level at the research locations. The average capita per income in the research locations is in the poor category. According to (Jaya R, Rijal AS, 2020), community income is categorized into 4 groups of low (< IDR 1500,000), moderate (> IDR 1,500,000 – 2,500,000), high (> 2,500,000 - 3,500,000), and very high (> IDR 3,500,000), with 221 (63.9%), 60 (17.3%), 43 (12.4%), and 22 (6.4 %) respondents, respectively. The overall average income at the six research locations is IDR 1,366,661.85 in the low-income category. Meanwhile, income per capita/year is IDR 3,913,254.746 in the category of poor farmers. According to (Putri & Noor, 2013, Sukardi, 2017, and Pour et al., 2017), residents' lives are very dependent on forests when the community welfare level is still in the poor category.

The relationship between the length of stay and the welfare level is significant. This implies that the longer a person stays, the higher the welfare level, and vice versa. They will also have experience managing land to increase production, positively impacting income. The chi-square test shows that the length of stay has a significant relationship with the welfare level, evidenced by the value of 0.003, smaller than 0.05. This indicates that the longer the people stay, the higher their welfare level.

Based on the chi-square test results, the land area does not significantly affect the welfare level, as shown in Table 8. This shows that production has not given maximum results on land managed by the community. According to Bahrin et al. (2015), the land owned by a person does not automatically provide a high level of income. However, farmers who own and manage large land areas will have higher incomes than those with narrow lands. Sayogjo (1977) and Bahrin et al. (2015) stated that land ownership and control area are the main factors affecting farmers' income levels. As a result of this study, farmers are still classified in the low-income family category, even though they own and control huge land areas. This is because the land has not been processed and utilized optimally (intensively), hence the productivity level is low. Several agricultural businesses at the research locations, such as planting rice, cassava, and sweet potatoes, are still subsistence and innovation adoption is low. The work and business follow a hereditary pattern where the commodities planted are not based on market demand but on habits.

IV. CONCLUSION

The community residing around the Mount Hamiding protected forest area is below the poverty line with low distribution inequality. They have prioritized the source of income from the sale of "copra," while other products in horticultural crops and tubers are only for subsistence needs. Household characteristics that impact the community welfare level are education, number of family members, distance from house, income, and length of stay. Meanwhile, occupation, age, and land area do not significantly affect them. This research provides several recommendations as follows;

1. Developing a collaboration on environmental services and non-timber forest products between the community and HMPF management.
2. Involving stakeholders such as the government, universities, and NGOs in increasing knowledge and technology through training and empowerment activities.
3. Disseminating information about livelihood diversification to overcome poverty and improve community welfare.
4. Providing access to services through credit assistance, technology, and production equipment facilities.

REFERENCES

Aini, E. N., Isnaini, I., Sukamti, S., & Amalia, L. N. (2018). Pengaruh Tingkat Pendidikan Terhadap Tingkat Kesejahteraan Masyarakat di Kelurahan Kesatrian Kota Malang. Technomedia Journal, 3(1), 58–72. https://doi.org/10.33050/tmj.v3i1.333

Amores, S., Brunette, M., & Davi, H. (2019). An Economic Comparison of Adaptation Strategies Towards a Drought- induced Risk of Forest Decline. Ecological Economics, 164(April), 106294. https://doi.org/10.1016/j.ecolecon.2019.04.006

Arts, B., & de Koning, J. (2017). Community Forest Management: An Assessment and Explanation of its Performance Through QCA. World Development, 96, 315–325. https://doi.org/10.1016/j.worlddev.2017.03.014

Aurel, M. (2015). Good governance and fore est exploitation in Romania . A compara ative analysis. 32(15), 795–800. https://doi.org/10.1016/S2212-5671(15)01464-1

Bahrin, B., Sugihen, B. G., Susanto, D., & Asngari, P. S. (2015). Luas Lahan dan Pemenuhan Kebutuhan Dasar (Kasus Rumah Tangga Petani Miskin di Daerah Dataran Rendah Kabupaten Seluma). Jurnal Penyuluhan, 6(1). https://doi.org/10.25015/penyuluhan.v6i1.10666

Baynes, J., Herbohn, J., Smith, C., Fisher, R., & Bray, D. (2015). Key factors which in fl uence the success of community forestry in developing countries. Global Environmental Change, 35, 226–238. https://doi.org/10.1016/j.gloenvcha.2015.09.011

Brozovic, R., Abrams, J. F., Mohamed, A., Wong, S. T., Niedballa, J., Bhagwat, T., Sollmann, R., Mannan, S., & Kissing, J. (2018). Effects of forest degradation on the moonrat Echinosorex gymnura in Sabah , Malaysian Borneo. Mammalian Biology, 93, 135–143. https://doi.org/10.1016/j.mambio.2018.10.003

Central Statistics Agency of North Halmahera. (2022). North Halmahera in numbers. https://halutkab.bps.go.id/

Dako, F. X., Purwanto, R. I. S. H., & Faida, L. R. W. (2019). Community ' s social capital in the management of Mutis Timau Protected Forest in Timor Island , Indonesia. 20(8), 2177–2186. https://doi.org/10.13057/biodiv/d200811

Desmiwati, D., Veriasa, T. O., Aminah, A., Safitri, A. D., Hendarto, K. A., Wisudayati, T. A., Royani, H., Dewi, K. H., Raharjo, S. N. I., & Sari, D. R. (2021). Contribution of agroforestry systems to farmer income in state forest areas: A case study of Parungpanjang, Indonesia. Forest and Society, 5(1), 109–119. https://doi.org/10.24259/fs.v5i1.11223

Firdaus, M., & Witomo, C. M. (2014). Analysis of welfare and household income inequality of large pelagic fishers in Sendang Biru, Malang District, East Java. Jurnal Sosek KP, 9(2), 155–168.

Fisher, M. R., Moeliono, M., Mulyana, A., Yuliani, E. L., Adriadi, A., Kamaluddin, Judda, J., & Sahide, M. A. K. (2018). Assessing the New Social Forestry Project in Indonesia: Recognition, Livelihood and Conservation? International Forestry Review, 20(3), 346–361. https://doi.org/10.1505/146554818824063014

Hanum, N. (2018). Pengaruh Pendapatan , Jumlah Tanggungan Keluarga Dan Pendidikan Terhadap Pola Konsumsi Rumah Tangga Nelayan Di Desa Seuneubok Rambong Aceh Timur. Jurnal Samudra Ekonomika, 2(1), 75–84.

Houghton, J. and K. S. R. (2009). Handbook on Poverty and Inequality. In Handbook on Poverty and Inequality (Issue February). https://doi.org/10.1596/978-0-8213-7613-3

Huang, W. (2019). Forest condition change, tenure reform, and government-funded eco-environmental programs in Northeast China. Forest Policy and Economics, 98(September), 67–74. https://doi.org/10.1016/j.forpol.2018.09.003

Jaya R, Rijal AS, M. I. (2020). Karakteristik Sosial Ekonomi Masyarakat Sub DAS Alo Terhadap Perilaku Pemanfaatan Fisik Lahan. Journal of Humanity & Social Justice, 2(1), 56.

Kailola, J. (2012). Strategi Social Forestry Dalam Pengelolaan Hutan Kemasyarakatan (HKm) Di Kabupaten Halmahera Utara. Jurnal Agroforestri, 1, 73–79.

Kailola, J. (2017). Jurnal Ilmu-Ilmu Pertanian ISSN 1693-1491. Cannarium, 15(2), 54–65.

Kailola, J., Mardiatmoko, G., Simanjuntak, R., & Kastanya, A. (2021). Moisture Content and Absorption Levels of Carbon Dioxide in Binuang Bini (Octomeles sumatrana Miq) Trees For Climate Change Management. Jurnal Manajemen Hutan Tropika, 27(3), 143.

Kailola, J., Purwanto, R. H., Sumardi, & Faida, L. R. W. (2023). Assessing social capital in community forest management in the Mount Hamiding Protection Forest, North Halmahera District, North Maluku, Indonesia. Biodiversitas Journal of Biological Diversity, 24(1).

Kastanya. (2006). Pengelolaan Hutan Alam Produksi Lestari Sesuai Dengan Gugus Pulau Di Maluku. Jurnal Agroforestry, I(1).

Kastanya, A. (2019). Multi-landscape forest management of small islands in the Moluccas based on green economy Multi-landscape forest management of small islands in the Moluccas based on green economy. https://doi.org/10.1088/1755-1315/285/1/012011

Lengoiboni, M., Richter, C., & Zevenbergen, J. (2019). Land Use Policy Cross-cutting challenges to innovation in land tenure documentation. Land Use Policy, 85(March), 21–32. https://doi.org/10.1016/j.landusepol.2019.03.023

Luo, S., Wang, C., Xi, X., Nie, S., Fan, X., Chen, H., Ma, D., Liu, J., Zou, J., Lin, Y., & Zhou, G. (2019). Estimating forest aboveground biomass using small-footprint full-waveform airborne LiDAR data. International Journal of Applied Earth Observation and Geoinformation, 83(July), 101922. https://doi.org/10.1016/j.jag.2019.101922

Mardiatmoko, G., Kailola, J., Simanjuntak, R., & Kastanya, A. (2020). The rate of absorption of carbon dioxide and moisture content in Linggua (Pterocarpus indicus willd.) for climate change management. Ecol Environ Conserv, 26(2009), S415–S422.

Maryudi, A. (2017). The contesting aspirations in the forests. In The contesting aspirations in the forests. https://doi.org/10.17875/gup2011-282

Moreda, T. (2018). Land Use Policy Contesting conventional wisdom on the links between land tenure security and land degradation : Evidence from Ethiopia ☆. Land Use Policy, 77(January), 75–83. https://doi.org/10.1016/j.landusepol.2018.04.058

Muttaqin, M. Z., Alviya, I., Lugina, M., Hamdani, F. A. U., & Indartik. (2019). Developing community-based forest ecosystem service management to reduce emissions from deforestation and forest degradation. Forest Policy and Economics, 108(September 2018), 101938. https://doi.org/10.1016/j.forpol.2019.05.024

Parhusip, S., Suharti, S., Sukandi, T., Amano, M., & Matsumura, N. (2019). Economic Analysis of Local People's Involvement in Community-based Forest Management (CBFM) in Desa Ciomas, Indonesia. Journal of Forest Planning, 25(1), 1–14. https://doi.org/10.20659/jfp.2019.002

Poudyal, N. C., Butler, B. J., & Hodges, D. G. (2018). Landscape and Urban Planning Spatial analysis of family forest landownership in the southern United States. Landscape and Urban Planning, October, 1–8. https://doi.org/10.1016/j.landurbplan.2018.10.018

Pour MD, M., Motiee, N., Barati, A. A., Taheri, F., Azadi, H., Gebrehiwot, K., Lebailly, P., Van Passel, S., & Witlox, F. (2017). Impacts of the Hara Biosphere Reserve on Livelihood and Welfare in Persian Gulf. Ecological Economics, 141, 76–86. https://doi.org/10.1016/j.ecolecon.2017.05.023

Pujo, Sofhani, T. F., Gunawan, B., & Syamsudin, T. S. (2018). Community capacity building in social forestry development: A review. Journal of Regional and City Planning, 29(2), 113–126. https://doi.org/10.5614/jrcp.2018.29.2.3

Putraditama, A., Kim, Y. S., & Sánchez Meador, A. J. (2019). Community forest management and forest cover change in Lampung, Indonesia. Forest Policy and Economics, 106(July), 101976. https://doi.org/10.1016/j.forpol.2019.101976

Putri, C., & Noor, T. (2013). Analisis Pendapatan Dan Tingkat Kesejahteraan Rumah Tangga Petani Padi Sawah Berdasarkan Luas Lahan Di Desa Sindangsari, Kecamatan Banjarsari, Kabupaten Ciamis, Provinsi Jawa Barat. Jurnal Ilmiah Mahasiswa Agroinfo Galuh, 53(9), 1689–1699.

Rahman, S. A., Sunderland, T., Roshetko, J. M., & Healey, J. R. (2017). Facilitating smallholder tree farming in fragmented tropical landscapes: Challenges and potentials for sustainable land management. Journal of Environmental Management, 198, 110–121. https://doi.org/10.1016/j.jenvman.2017.04.047

Riccioli, F., Fratini, R., Marone, E., Fagarazzi, C., Calderisi, M., & Brunialti, G. (2019). Indicators of sustainable forest management to evaluate the socio-economic functions of coppice in Tuscany, Italy. Socio-Economic Planning Sciences, 100732. https://doi.org/10.1016/j.seps.2019.100732

Ridha, A. (2017). Analisis Faktor-Faktor Yang Mempengaruhi Pendapatan Petani Di Kecamatan Narussalam Aceh Timur. Jurnal Samudra Ekonomika, 1((2)), 165–173.

Sahide, M. A. K., Fisher, M. R., Erbaugh, J. T., Intarini, D., Dharmiasih, W., Makmur, M., Faturachmat, F., Verheijen, B., & Maryudi, A. (2020). The boom of social forestry policy and the bust of social forests in Indonesia: Developing and applying an access-exclusion framework to assess policy outcomes. Forest Policy and Economics, 120(August 2019), 102290. https://doi.org/10.1016/j.forpol.2020.102290

Sari, A., & Akkaya, M. (2016). Contribution of Renewable Energy Potential to Sustainable Employment. Procedia - Social and Behavioral Sciences, 229, 316–325. https://doi.org/10.1016/j.sbspro.2016.07.142

Sayogjo. (1977). Garis Kemiskinan dan Kebutuhan Minimum Pangan. https://repository.ipb.ac.id/handle/123456789/24089

Sevilla, C.G, Tuwu, A., dan Syah, A. (1993). Pengantar Metode Penelitian, Universitas Indonesia Press, Jakarta.

Suandi, Yulidar, Suma S, D. Y. (2014). Hubungan Karakteristik Kependudukan Dengan Kesejahteraan Keluarga Di Provinsi Jambi. Piramida, 10(2), 71–77.

Sugiyono, D. (2013). Metode Penelitian Kuantitatif, Kualitatif, dan Tindakan.

Sukardi. (2017). Analisis Pendapatan Masyarakat Desa untuk Kelestarian Hutan Lindung (Studi Hutan Desa Pattaneteang Kabupaten Bantaeng). Jurnal Hutan Dan Masyarakat, 9(1), 44. https://doi.org/10.24259/jhm.v9i1.2047

Tjoa, M. (2005). Analisis Sumber Daya Hutan Untuk Pembangunan Wilayah Pulau Seram Kabupaten Maluku Tengah. Tesis Pasca Sarjana Universitas Gadjah Mada, Yogyakarta.

Uwayezu, E., Vries, W. T. De, Universität, T., Tum, M., Bau, I., & Umwelt, G. (2019). Scoping land tenure security for the poor and low-income urban dwellers from a spatial justice lens. Habitat International, 91(July), 102016. https://doi.org/10.1016/j.habitatint.2019.102016

Wan, J., Yu, J., Yin, G., & Song, Z. (2019). Effects of soil properties on the spatial distribution of forest vegetation across China. Global Ecology and Conservation, 18, e00635. https://doi.org/10.1016/j.gecco.2019.e00635

Wan, P., Zhang, G., Wang, H., Zhao, Z., Hu, Y., Zhang, G., Hui, G., & Liu, W. (2019). Impacts of different forest management methods on the stand spatial structure of a natural Quercus aliena var. acuteserrata forest in Xiaolongshan, China. Ecological Informatics, 50(November 2018), 86–94. https://doi.org/10.1016/j.ecoinf.2019.01.007

Wang, S. (2019). Forest Policy and Economics Managing forests for the greater good : The role of the social license to. Forest Policy and Economics, 107(March), 101920. https://doi.org/10.1016/j.forpol.2019.05.006

Watimena, G. (2011). Indigenous knowledge. Procceding, Icraf, 343–368. https://doi.org/10.4324/9781315162690-3

Xiaoli, L., Yingyi, C., & Daoliang, L. (2009). A Spatial Decision Support System for Land-use Structure Optimization. WSEAS Transactions on Computers, 8(3), 439–448.

Zhang, H., Deng, Q., Hui, D., Wu, J., Xiong, X., Zhao, J., Zhao, M., Chu, G., Zhou, G., & Zhang, D. (2019). Recovery in soil carbon stock but reduction in carbon stabilization after 56-year forest restoration in degraded tropical lands. Forest Ecology and Management, 441(2019), 1–8. https://doi.org/10.1016/j.foreco.2019.03.037