研究報告

印度尼西亞不同類型社區居民對社區森林重要性之比較

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【摘要】森林生態系可提供不同類型的生態服務，在印度尼西亞所推行不同類型的社區林業計畫對森林所提供生態服務的期待也可能有所不同。本研究的目的旨在 (1) 建立印度尼西亞社區林業的基本資料，(2) 瞭解社區居民對社區森林重要性的看法，及 (3) 比較不同類型社區居民對森林重要性的看法。本研究採用問卷調查方式，訪問位於印度尼西亞北蘇門答臘省，執行社區林業計畫的四個不同類型社區，調查期間為2019年7月9日至8月24日，共獲186家庭成員的問卷。本研究採用14項森林價值的重要性提供社區居民填答，採用變方分析 (analyses of variance) 和最小顯著差異 (least significant difference) 法檢測各項森林價值在社區間的差異性。所得之結果顯示計有11項森林價值在社區間具有顯著性差異，3項森林價值不具顯著性差異。不具顯著性差異的森林價值包括：“社區森林可以提供手工藝品材料來源”、“社區森林可以提供文化服務”、“我可以到森林從事遊憩和放鬆”。四種社區類型中，Persamot Community Group和Mandiri Community Enterprise Cooperative的居民對於森林提供木材、食物、肉類、飼料原料，具較高的分數，而Jangga Dolok Community和Mekar Community的居民於森林提供水資源、旅遊、防止洪水和乾旱、邊坡防護、生物多樣性保護、減緩氣候變遷，具較高的分數。本研究所得之結果將可提供社區林業重要的資訊。

【關鍵字】社區類型、社區森林、森林價值。

Research paper

Comparison of residents' perspective toward the importance of community forest among different community types in Indonesia

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【Abstract】Forest ecosystem provides multiple ecological services that their importance might be perceived differently to the various community types implementing Community Forest (CF) program in

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Indonesia. The purpose of the study was to (1) establish a foundational information for CF in Indonesia; (2) understand residents' perspective toward the importance of community forest; and (3) compare residents' perspective among different community types. This study was conducted from 12th July 2019 to 24th August 2019 through questionnaire survey administered to 186 family members of four communities implemented CF program in North Sumatra Province, Indonesia. The importance of 14 forest values for different community types were examined through analyses of variance (ANOVA) and least significant difference (LSD) method, respectively. These results showed that 11 forest values were significantly different while 3 forest values were not significantly different among the different communities. The insignificant items included "Community forest provides handicraft materials", "Community forest provides materials for cultural services", and "I go to forests to do recreation/relaxation activities". Persamot Community Group and Mandiri Community Enterprise Cooperative perceived highly the importance of timber, food, meat, and fodder material from forest, while Jangga Dolok Community and Mekar Community valued highly the importance of water resources, tourism value, flood and drought prevention, landslide prevention, biodiversity protection, and climate change mitigation of forest value to the local people on their villages.

【Key words】community types; community forest; forest values.

1. Introduction

Forest ecosystem provides multiple ecological services for human including in ecological, economic, and social aspects (Chuang & Yen 2017; Yen et al. 2020; Liu & Yen 2021). People could obtain raw materials for food, fuel and shelter from forests (Krieger 2001). Meanwhile, forests could be utilized for recreation, tourism and cultural activities (Millennium Ecosystem Assessment, MEA 2005). In recent years, numerous researches pointed out forests sequestrated a large amount of carbon from atmosphere that significantly helps reduce the global warming (Yen & Lee 2011; Yen & Wang 2013; Yen et al. 2010; 2020; Liu & Yen 2021). Since forest resource possesses multiple benefits for human, how to sustainably manage forest is an important issue worldwide.

Community Forestry (CF) plays an important role management in current forest management because CF-based forest management is regarded as one of the sustainable forest managements which involves local people to obtain benefits from forest and community participation to achieve the health of forest ecosystem and community well-being (Gray et al. 2001; Gilmour 2016). In various countries, the community-based forest management is known in different program names. For example, in Taiwan community forestry is known as Community Forestry Project (Taiwan Forestry Bureau, TBF 2018). However, Social Forestry (SF) program is employed in Indonesia (Ministry of Environmental and Forestry of Republic of Indonesia, MOEFRI 2016), Community Forestry Program in Nepal, India and Cameroon (Acharya 2002; Minang et al. 2019), and many other names that could be employed in different countries. Even though these

programs are labelled with different names and with different situations, community-based forest management has similar principles and purposes, such as decentralized forest management to local people or communities in order to achieve forest protection and conservation, improving economic income through utilizing forest resources, and providing social benefits to communities (Charnley & Poe 2007).

CF in Indonesia (SF program) has been implemented since 1980's which has purpose to increase livelihood from forest and to improve forest security. Forest resources are very important for most of the people in Indonesia especially for those who live around forest. Local people depend on various forest resources, e.g. firewood, fodders, materials for agriculture and equipment, and traditional medicine materials which are commonly taken from forest (Gunawan et al. 2004; Situmorang et al. 2015). They also extract other forest resources such as fruits, tubers, palm sap, resin, rattan and many others to fulfill household needs and to increase income (Walujo 2008; Santika et al. 2019). The restriction access to forest of local people and inequality of forest resource management had created conflicts between forest managers and local communities which had ended with forest destruction and illegal occupation which were difficult to be overcame due to the limitation of government or other forest managers (Purnomo & Anand 2014). Hence, community forestry program has been a win-win solution for both local people and government, and Indonesia adopts 'social forestry' to indicate livelihood creation from forest ecosystem rather than community forestry which indicates community participation in forest management. This program aims at producing flow of forest

protection and recreating benefits from forest resources to communities (Westoby 1968; Husain et al. 2018; Erbaugh 2019; Rakatama & Pandit 2020).

Indonesia CF program is a devolution of state forest to local communities for a certain period (commonly 35 years) to improve forest quality and to improve people well-being. It consists of five categories which include Village Forest, Community Forest, Community Plantation, Customary Forest, and Forest Partnerships (MOEFRI 2016; Erbaugh 2019). The CF categories are generally differentiated by the community institutions and the utilization status of the devolved forest. Village forest is a forest managed by a village institution which is implemented in protected and production forests; communties forest is managed by certain community or community group organizations which can be implemented in protected and production forest; community forest plantation is production forests that can be managed by individual, local community organization, and enterprises; customary forest is a forest area managed by an indigenous community that the status of the state forest is released after designation of the customary forest; and community partnership is a joint management between forest's managers and local communities on production, conserved, or protected forests. The management methods of CF area include agroforestry, ecotourism, timber and non-timber are production, as well as carbon and water utilization are implemented on forest land, where they are suited to the forest condition and the availability of forest resources when they are devolved.

Numerous studies have addressed the

CF importance in Indonesia, for an example: the importance of the community forest to conservation and people well-being (Pender et al. 2008; Maryudi & Krott 2012; Szulecka et al 2016; Kuncoro & Cahyani 2018; Santika et al. 2019; Njurumana et al. 2020). However, most of these studies partially discussed the CF types applied in Indonesia, and few studies combined all of the CF types as a whole for analysis. Moreover, the studies focused on comparison of residents' perspective toward the importance of community forest among different community forest types are still rare in Indonesia. Hence, the purpose of this study was to (1) establish a foundational information for CF in Indonesia, (2) understand residents' perspective toward the importance of community forest; and (3) compare residents' perspective among different community types.

2. Material and Method

(1) Study area

The research was conducted in North Sumatra Province in Indonesia. As above mentioned, CF program consists of five categories in Indonesia (Table 1). We extracted some representative communities as examples to be analyzed. They included four locations implementing different CF types, namely, (1) Jangga Dolok Village (Jangga Dolok Community, JDC); (2) Lubuk Kertang Village (Mekar Community, MC); (3) Perdamean Sibisa Village (Persamot community group, PCG); and (4) Perbangunan Village (Mandiri Community Enterprise Cooperative, MCEC). Hereafter, we used type I to IV to represent the above four communities. The research locations are presented in Figure 1 and the relationship between five categories of CF program and these four communities is shown in Table 1.
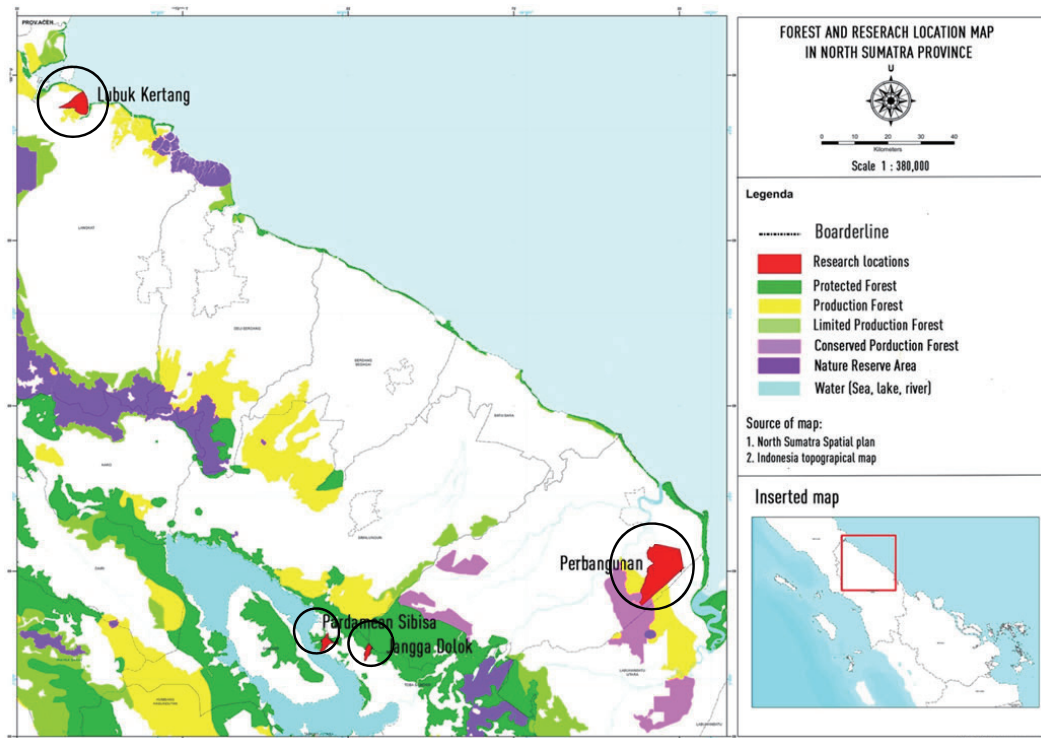

Figure 1. Research locations in North Sumatra Province, Indonesia (Source: Asahan Barumun Watershed Management Institution 2019).

Table 1. The relationship between five categories of CF program and four communities of this study in Indonesia (Source: MOEFRI 2016; Erbaugh 2019).

No.	CF Categories	Location and forest status allowed for CF-license	Community types (applicants)	Example community of this study
1	Village Forest*	Protected forest Production forest	Village cooperative Village business enterprises	Jangga Dolok Community
2	Forest Partnerships*	Protected forest Production forest Conservation forest	Local community organizations Group of community organizations	Mekar Community
3	Community Forest*	Protected forest Production forest	Local community organizations Group of community organizations Community cooperative	Persamot community Group
4	Community Plantation*	Production forest	Individual Local community organization Community cooperative	Mandiri community enterprise cooperative
5	Customary forest	Customary forest (forest owned by indigenous community)	Indigenous people	

Note: The CF categories with * marks were evaluated in this study.

This study did not examine all the five CF categories as the research area for comparison. The customary forest type was not included in the research areas because the status of the forest of customary forest is not a state forest after the release of the area from state forest to indigenous people. The management of the CF program for this category is also rather different from the others because the management of customary forest is handled by indigenous community and village institution, instead of government. Therefore, this CF type was not contained in the present study. While for the four CF categories, the program is under management of the government included in supporting the activities, financial, human and community developments, monitoring, and evaluation.

(2) Respondents, sampling method, and sample size

Respondents in this research were the members the of the four community organizations joining CF Program. The members of the community organization are families, which mean that in this study, only one person was the representative of the family based on the legal document. To determine samples, random sampling technique was employed to the members of the community organizations. This study used on-site survey by questionnaire.

(3) Questionnaires and data collection

Community forestry includes many elements that influence each other such as forest resources, community features, governance, policies, institutional arrangements, financial and human

resource supports, and many others (Pagdee et al. 2006; Duguma et al. 2018). The questionnaire used in this study contained seven aspects, including importance of forest resources, social capital, organization management, cognition to CF, benefits of CF, and community support to CF. This present study was to evaluate the importance of the forest to communities, and the examined questions only consist of community background information and 14 questions relating forest resource values.

The forest value items referred to previous studies and literatures and suited to the forest value managed in the CF program. The detailed items are shown in Table 2.

Each item of Table 2 contains 5 level-Likert scales for responders where 1 = unimportant; 2 = slightly important; 3 = neutral; 4 = important; and 5 = very important, and it was used to value the importance of forest resource.

The data collection was from 12th July 2019 to 24th August 2019. At the end of the survey, the number of filled questionnaires was 195, and the number of valid questionnaires was 186 questionnaires (95.38%), that was later used as the valid data for further analysis. A total of 186 valid questionnaires were obtained, where the type I to IV shared 47, 26, 64, and 49, respectively.

(4) Statistical data analysis

An analysis of variance (ANOVA) was employed to examine each item. When showed a significant difference at $p = 0.05$ by ANOVA, the least significant difference (LSD) method was adopt to compare the difference among the community types (Yen et al. 2020; Liu & Yen 2021).

Table 2. Items of questions on the importance of forest value of community forest.

Item	Importance of community forest resources	References
1.	Community forest provides timber materials (wood/bamboo/fuelwood)	Brockerhoff et al. (2017); Gentle (2000); Thoms (2008)
2.	Community forest provides food materials (fruits, nuts, tubers, kitchen ingredients, ect.)	Binnqüist et al. (2004); Brockerhoff et al. (2017); TEEB (2009)
3.	Community forest provides natural medicines materials.	Thoms (2008); CICES (2011)
4.	Community forest provides meat products and livestock	Gentle (2000)
5.	Community forest provides fodders materials	Gentle (2000); Thoms (2008)
6.	Community forest provides handicraft materials	Binnqüist et al. (2004)
7.	Forest is a source of water	Brockerhoff et al. (2017); TEEB (2009)
8.	Community forest as tourism area	Jones (2005); Situmorang (2018)
9.	Community forest provides materials for cultural services	Brockerhoff et al. (2017)
10.	I go to forests to do recreation/relaxation activities	CICES (2011)
11.	Community forest secures living things and protects biodiversity	TEEB (2009); CICES (2011)
12.	Community forest plays role to prevent flood and draught disasters	TEEB (2009); CICES (2011)
13.	Community forest plays role to prevent landslide	TEEB (2009); CICES (2011)
14.	Community forest existence is as climate change mitigation (global warming)	TEEB (2009); CICES (2011)

3. Result

(1) Fundamental information of CF categories of the study

The information of the four different communities in this study is presented in Table 3.

Table 3. Detail information of community features of this study.

No.	CF Types in the license	Community name	CF area status	Number of members (families)	Age of the community organization (in 2019)	Residential distance (km)	CF area (ha)	Management model / average land holding (ha/ family)
I	Village Forest	Jangga Dolok Community (JDC)	Protected forest	115	3 years	± 2	350	Collective (group)/ Ecotourism
II	Forest partnerships	Mekar Community (MC)	Protected forest	33	13 years	± 1.5	60	Collective (group)/ Ecotourism
III	Community Forest	Persamot Community Group (PCG)	Protected forest	167	6 years	± 5-10	610	Family (individual)/ Agroforestry/ (± 2-3)
IV	Community Plantation	Mandiri Community Enterprise Cooperative (MCEC)	Production forest	126	7 years	± 10	1,264	Family (individual)/ Agroforestry/ (± 10)

Source: Social Forestry and Partnership Institution for Sumatra Region (2018); research data.

A total of 350 ha Village forest managed by the JDC is a protected forest located in mountainous area managed all together by communities for ecotourism purpose and water utilization. The potency of the forest which has water resource (a small pound) in the forest has made the management type of this CF type is more focused on ecotourism. Moreover, Jangga Dolok Village also has been known as a cultural tourism village which is close to the most visited tourism area in North Sumatra Province, even one of the best in Indonesia. Except the ecotourism activities, the village forest in Jangga Dolok also provides fresh water to communities, and the communities can do alimited extraction of non-timber forest products (NTFPs) from forest such food materials, fodders, firewood, and many others (Social Forestry and Partnership Institution for Sumatra Region, 2018).

The forest managed by the MC trough partnership scheme is a mangrove forest in a coastal area. MC has implemented a joining management with a district unit of forest management in that area. A total of 60 ha mangrove forest which is known as Lubuk Kertang mangrove forest is managed by the community for ecotourism activities and other derived activities in ecotourism area such as

food vendor and souvenir shop developments, transportation renting, and parking lot services (Social Forestry and Partnership Institution for Sumatra Region, 2018).

PCG members have managed the fragmented-protected forest that happened before their management. At this time, the community implements an agroforestry system practice in the land through combining forest trees with perennial and agricultural crops, e.g. coffee, mango, avocado, banana, and many other crops. For the forestry trees, the family has responsibility to grow them for at least 100 trees per ha (Social Forestry and Partnership Institution for Sumatra Region, 2018).

Community Plantation managed by the MCEC is a production forest that had experienced a degradation in the past. At this time, the community manages the area by combining forestry trees and plantation crops, e.g. oil palm and rubber tree through agroforestry system. Most of the forestry trees growing in the area are the low land species aged at around 1-6 years. Some of the community members also utilize grasses as fodder of livestock production such as cows. The same with community forest type managed by PCG, this community has responsibility to grow forestry trees at least 100 trees per ha (Social Forestry and Partnership Institution for Sumatra Region, 2018).

The fundamental differences of the communities shown in Table 3 include management of the CF area, number of the devolved area, distance of the residence to community forests, and the age of the community organization. JDC and MC manage the devolved forest area in group or collective activities, while PCG and MEC manage the area by individual or family based. For the PCG, each family has

responsibility to sustainably manage the forest land round 2-3 ha, and MCEC is around 10 ha per family. The forest resources managed collectively are managed through ecotourism management, while the forests managed individually are managed through agroforestry system. From this difference, management of the community organization is also different. For example, the JDC and MC should determine all the activities through consensus method to achieve common goal. Conversely, for the family-based management, each family determines the goal and achieves the goal by themselves.

For the total area, the MCEC has the largest area (1,264 ha) while the smallest is MC. The determination of forest area is usually calculated by the number of family members of the community organization by 2 ha up to 3 ha. However, the expectation can be made, for example the forest of MCEC is 1,264 ha which is around 10 ha per family. This forest area is calculated based on the total degraded forest area that need to be reforested.

According to the residence distance to forest, the MC is the nearest to forest area (around 1.5 km), while the farthest is MCEC (around 10 km). The distance to forests can influence the intensity of visits or activities in the forests. It also can determine the level of dependency of communities to the forest resource. The MC which is close to the forest and which implements ecotourism has made this forest as the most intensively utilized forest compared to others. Compared to JDC which also implement ecotourism, the mangrove forest ecotourism has been conducted earlier than village forest by JCD which the number of visitors to MC's mangrove forest is higher than to JDC's village forest.

Based on the age of the community

organization establishment, MC is the oldest community organization that managed the forest area, while the JDC is the youngest. MC is a community that collaborates with a forest management unit in the area since 2006 to recover mangrove forest before the CF program was intensively promoted in Indonesia (known CF acceleration policy) in 2016. While JDC is a community that newly formed in 2017 when the CF program acceleration was intensively promoted.

(2) ANOVA to examine residents' community forest values among community types

To examine the importance of forest ecosystem value, each item was examined by ANOVA and the results are shown in Table 4.

Table 4. ANOVA on importance of forest value among different community types.

No.	Forest values	ANOVA		Community Types			
		F	p-value	JDC	MC	PCG	MCEC
1.	Timber materials	31.65	.000*	2.87 ± 0.74	2.50 ± 0.76	3.73 ± 0.82	4.02 ± 0.83
2.	Food materials	24.19	.000*	3.66 ± 0.60	3.35 ± 0.63	4.53 ± 0.69	4.20 ± 0.84
3.	Traditional medicine	3.99	.009*	3.72 ± 0.77	3.62 ± 0.64	3.30 ± 0.95	3.78 ± 0.74
4.	Meat	7.92	.000*	2.53 ± 0.91	2.65 ± 0.85	3.05 ± 0.86	3.29 ± 0.71
5.	Fodder	9.86	.000*	2.98 ± 0.92	2.58 ± 0.90	3.02 ± 0.83	3.61 ± 0.76
6.	Handicraft materials	2.47	.063	3.34 ± 0.81	2.96 ± 0.72	3.06 ± 0.77	3.29 ± 0.54
7.	Water supply	28.59	.000*	4.09 ± 0.58	3.73 ± 0.72	3.06 ± 0.73	2.96 ± 0.73
8.	Tourism area	27.74	.000*	4.02 ± 0.74	4.46 ± 0.51	3.00 ± 0.87	3.27 ± 0.93
9.	Cultural materials	0.60	.616	3.28 ± 0.74	3.00 ± 0.80	3.20 ± 0.89	3.22 ± 0.96
10.	Recreation/ relaxation	2.23	.086	3.51 ± 0.78	3.88 ± 0.65	3.56 ± 0.79	3.41 ± 0.79
11.	Biodiversity protection	24.66	.000*	4.23 ± 0.52	4.15 ± 0.54	3.30 ± 0.81	3.35 ± 0.72
12.	Flood and draught protection	13.72	.000*	4.32 ± 0.56	4.04 ± 0.60	3.50 ± 0.82	3.82 ± 0.63
13.	Landslide protection	9.20	.000*	4.00 ± 0.55	4.11 ± 0.52	3.53 ± 0.62	3.82 ± 0.57
14.	Climate change mitigation	3.22	.024*	4.19 ± 0.49	4.35 ± 0.56	3.98 ± 0.55	4.00 ± 0.71

Note: * the statistic is significantly different at $p = 0.05$.
JDC = Jangga Dolok Community; MC= Mekar Community; PCG= Persamot Community Group; MCEC= Mekar Community Enterprise Cooperative.

Table 3 does not only show the results of ANOVA (F value and p-value) but also presents the forest values of each community type. A total of 14 items and only 3 items are not significantly different by ANOVA. These three insignificant forest value items are related to cultural benefits of forest, indicating that cultural value have the same importance to all the communities.

Extraction of raw materials for handicraft and cultural events from forest are usually done by local people for cultural activities, which these activities are occasional needs and the forest has same function to provide these materials. For recreation or relaxation purpose, the communities perceived that those forests have same functions to help people to release or decrease stress.

(3) Comparison of residents' community forest values among community types by the LSD test

A total of 11 items showing the significant different by ANOVA test (Table 4), the LSD test is employed to compare the means among communities which are shown in Figure 2.
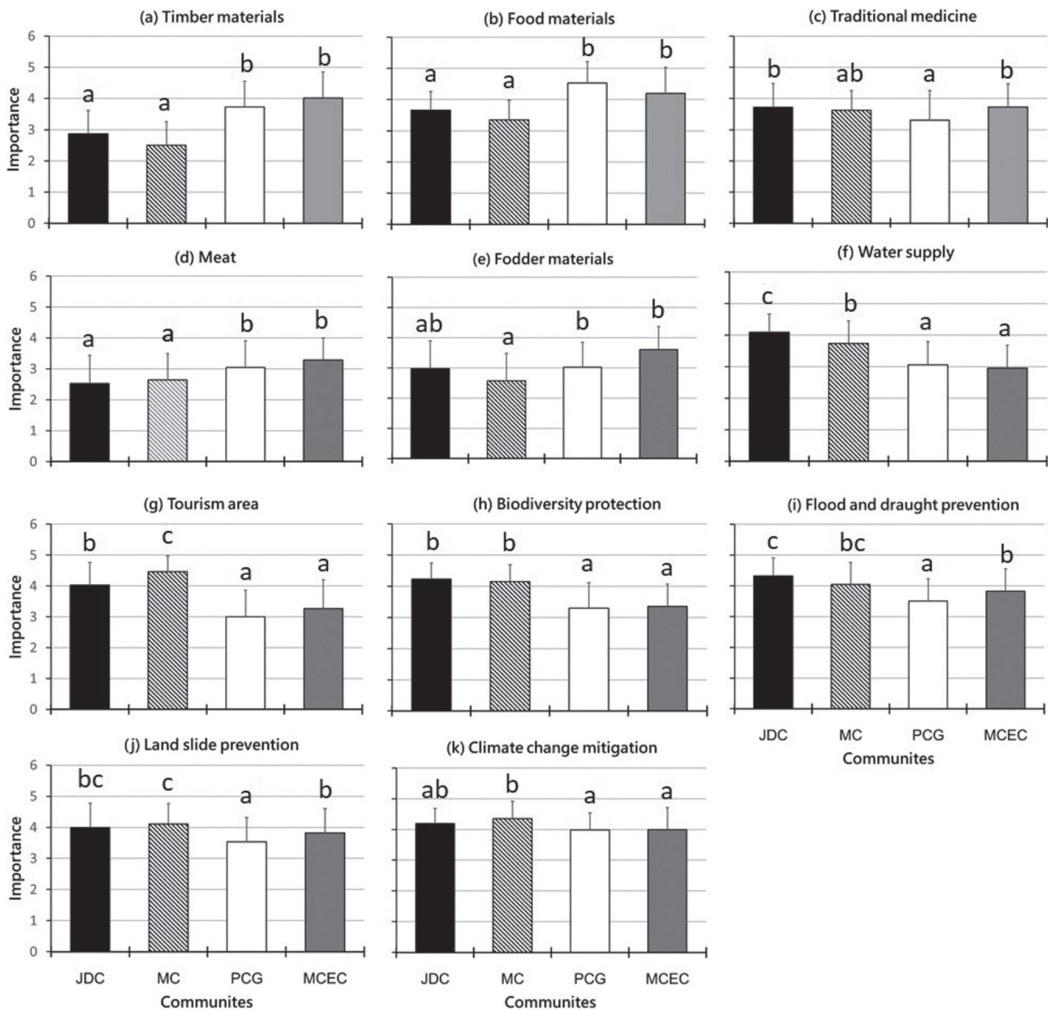

Figure 2. Comparison of mean of forest values among communities (the length of the trend lines above the bars indicates the standard deviation; bars with the same letters were not significantly different at $p = 0.05$ by the least significant difference test), where JDC is Jangga Dolok Community; MC is Mekar Community; PCG is Persamot Community Group; and MCEC is Mekar Community Enterprise Cooperative.

Figure 2 shows that JDC and MC perceived the lower perception on timber materials and food products, meat product, and fodder materials (Items 1, 2, 4, and 5 in Table 4, and Figure 2a, b, d, and e) compared to PCG and MCEC. For food materials, PCG had the highest value among the others, while for timber, meat and fodder materials, MCEC was the highest among the others.

The importance of forest values was related to ecological service and aesthetic value represented by the items 7, 8, 11, 12, 13, and 14 (Figure 2f, g, h, i, j and k) that were higher for JDC and MC compared to PCG and MCEC. For water supply, biodiversity conservation, and flood and draught prevention, JDC possessed the higher perception on those values; and MC had the highest perception on tourism area, landslide prevention, and climate change mitigation compared to other communities.

The other forest values that did not show the obvious difference to the two similar group (JDC-MC or PCG-MCEC) was the importance of traditional medicine material from forest to communities. For this category, MCEC and JCC were higher compared to MC and PCG. The highest importance of traditional medicine material from forest was given by MCEC.

4. Discussion

PCG and MCEC perceived the higher importance of values that are related to direct values of forests on provisioning services (Figure 2). Because agroforestry management model implemented by PCG and MCEC is a combination of agricultural or perennial crops, or livestock with forestry trees, it possibly causes a higher importance of food, meat, and fodder material from forest lands. Previous researches on CF in

Indonesia have mentioned that agroforestry system allowing combination of non-forestry plants affects the high community perception to this CF model management (Arifin et al. 2009; Maryudi & Krott 2012; Mulyadin et al. 2016). Novayanty et al. (2017) and Njurumana et al. (2020) also pointed out that combination of non-forestry plants, such as perennial crops (fruits plants), horticulture products, and plantation plants up to 40% provides multiple benefits to communities including in food material production. Related to timber materials, PCG and MCEC also perceived the higher perception because PCG that implements agroforestry can extract bamboo, poles, and fuelwoods material in cultivation areas (Pender et al. 2008; Thoms 2008; Arifin et al. 2009; Njurumana et al. 2020), while MCEC that implements plantation community forest can harvest wood products. The CF plantation type implemented in production forest encourages communities to develop plantation forest through practicing silviculture, harvesting, and institutional and marketing management of timber products (Hakim 2009; Szulecka et al. 2016).

In contrast with PCG's and MCEC's forest value importance, JDC and MC perceived the higher values on indirect values of forest ecological services, such as water cycle regulation, soil protection, recreation, climate change mitigation, and biodiversity protection. The differences on topographic and geographic conditions, aesthetic value, and forest covering condition possibly influence the higher perception of JDC and MC members on these values compared to PCG and MCEC. Concerning topographic and geographic factors, JDC members gave the highest perception on water value because JCD's village forest located in mountainous area and a small pound in the forest has function as a

water catchment area to Jangga Dolok and other villages in the lower areas. This finding is similar to the studies conducted by Burton et al. (2007) and Situmorang & Simanjuntak (2015) which mentioned that the perception on water resource is high because the local people are dependent on water resource to support people's life such as for fresh water, household activities, and agriculture. Whereas, MC that managed mangrove forest perceived the importance of mangrove forest to protect water resources in the beach area. Malik et al. (2017) mentioned that mangrove forest has physical function to protect underground water resource from a sea water intrusion that important to villagers living in coastal areas.

Coastal people might perceive highly the importance of mangrove forest ecosystem to protect coastline abrasion from tidal waves and floods that harmful to the coastal village. It is because wetland vegetations decrease the destructive force of waterflow when passing and approaching land (Ewel et al. 1998; Malik et al. 2017; Setiawan et al. 2017; Sulaiman et al. 2019). The same with the forest managed by PCG, the village forest located the higher and mountainous area protects the villages from flood, draught, and landslide. Related distance of community forest, JDC and MC villages are nearer to forest (1.5 - 2 km) compared to PCG and MCEC (5-10 km). Mikusiński & Niedziałkowski (2020) found that local people in the closest zone perceived the higher importance of ecological services of forest. Hence, the local people had high perception on ecological service because forest has a direct influence to the village security (Nurmalia & Handono 2019).

In aesthetic aspect, MC perceived the highest perception on ecotourism value of the forest. Lubuk Kertang Mangrove managed by

MC in the coastline has acompact mangrove tidal ecosystem, and beach panorama which are good for edutainment and recreation. Likewise, JDC's village forest has dense forest, small pound, and beautiful panorama from the mountain to the most popular lake in Indonesia (Lake Toba). The higher perception on tourism value of forest by MC and JDC because of the benefits of ecotourism on environmental protection, income, and job opportunities that can increase trough ecotourism activities. This finding is supported by previous studies which found the high community perception on ecotourism value to support livelihood (Lonn et al. 2018; Situmorang 2018).

Relating the forest covering condition, different density level of trees and vegetation might cause the different perception on biodiversity conservation and disaster protection to the adjacent settlement areas which were perceived highly by JDC and MC compared to PCG and MCEC. The condition of forest covering managed by JDC and MC is denser compared to PCG's and MCEC's community forest because JDC and MC managed a compact forest while PCG and MCEC managed the degraded forests which is now manage through agroforestry. The denser the forest covering, the more biodiversity protection and water cycle regulation service can be provided by forest (Brockerhoff et al. 2017). Nurmalia & Handono (2019) also mentioned that local people had high importance of the high forest vegetation density because it indicates the high biodiversity conservation, ecological service, and livelihood support that are important to local people.

5. Conclusion

The differences of community types significantly influenced community perception

on the importance of forest values on 11 items forest values (timber, food material, traditional medicines, meat, fodders, water supply, tourism area, biodiversity protection, flood and drought protection, landslide protection and climate change mitigation) and insignificantly different for 3 items (handicraft material, cultural/religion material, and recreation /relaxation) of 14 tested forest values. The difference of CF management (agroforestry and ecotourism), topographic and geographical aspects, and forest condition might influence the different perception of the forest values among the different community types. PCG and MCEC that implement agroforestry in the CF area were more inclined to the direct values of forests on provisioning services which include timber, food, meat and fodder materials from forest land due to the CF model that allowed combination of forestry plants and agriculture plants in the CF management applied by PCG and MCEC. In contrast, JDC and MC highly valued the indirect values on ecological services such as water supply, water cycle regulation, soil conservation, biodiversity conservation, and climate change mitigation because the forests located upper and near the villages provide protection services to the villages. Therefore, these communities mostly utilize the aesthetic value of forest through an ecotourism management and water resource utilization to support the people life. The results of this study will provide useful information for Community Forestry program.

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