The Development of Community-Based Forest Management in Indonesia and Its Contribution to Community Welfare and Forest Condition

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Abstract. The development of community-based forest management (CBFM) in Indonesia has gained its momentum particularly in the last five years. It is undeniable that CBFM has become a key approach for maintaining and improving forest condition and community welfare, all at once. This paper illustrated the contributions of village forest and community forest development in Indonesia to community welfare and forest condition, which were the main purposes of CBFM program. We applied meta-analysis technique to identify the impacts of CBFM development to community welfare and conducted spatial analysis to analyze the impact of CBFM to forest condition. In the period of 2007-2018, there were at least 583 permits of village forest and 745 permits of community forest that have been granted, with the total area of 1,056,752 hectares and 590,363 hectares respectively. Our findings showed that in general village forest and community forest has positive impacts on community welfare through its contribution to community income, however the amount varied within and between regions ranging from 4% to 92%. Village forest and community forest designation also have positive impacts in improving forest condition and land use optimization. Nationally, village forest and community forest have been able to restrain the rate of deforestation, utilize unproductive land and increase primary forest cover in the last four years in particular. These findings revealed that CBFM is a proven approach that provides positive impacts on both the community and forest condition.

1. Background
The development of community-based forest management (CBFM) in Indonesia has gained its momentum particularly in the last five years, driven by government's commitment to allocate 12.7 million hectares of forest land to local communities through various scheme of CBFM or called Social Forestry (SF) program. Furthermore, changes in the roles and interactions between government and civil society organizations that are more inclusive and collaborative have improved the mechanism of CBFM development [1]. Five schemes of CBFM or SF policy arrangements are stipulated in the Ministerial Regulation Number: P.83/MENLHK/SETJEN/KUM.I/10/2016 concerning Social Forestry: 1) Village Forest (Hutan Desa/HD); 2) Community Forest (Hutan Kemasyarakatan/HKm); 3) Community Plantation Forest (Hutan Tanaman Rakyat/HTR); 4) Customary Forest (Hutan Adat/HA); and 5) Partnership (Kemitraan). Each scheme has different main subjects, objects, and objectives.

Until early 2019, the total forest area managed by the local community through SF scheme was 2,724,213 hectares or increase by more than 2,2 million hectares from 2014, involving more than 586,793 households. Based on the scheme, it consists of HD covering 1,361,076 hectares, HKm
covering 667.195 hectares, HTR covering 338.060 hectares, HA covering 31.234 hectares and Partnership covering 326.648 hectares. Significant increase mainly occurred in HD and HKm schemes. The area of HD increased by more than 1.280.000 hectares, while HKm increased more than 513.000 hectares from 2014 [2].

The success of the CBFM cannot only be seen from the extent of forest area granted to the community, but also from the ability of CBFM to achieve the expected goals. CBFM must achieve at least three objectives i.e. poverty alleviations, community empowerment, and improvement of forest conditions [3]. Experiences from various cases show the variety of contributions of CBFM to forest conditions and community welfare.

With the rapid growth of forest area managed by the community through five social forestry schemes, it is necessary to poster the extent to which CBFM is contributing to community welfare and forest condition improvement. Therefore, this study aims to provide an illustration of two largest social forestry schemes (HD and HKm) contribution to community welfare and forest conditions. For that objective, this study applies two different approaches. The first approach is meta-analysis, to analyze the impact of HD and HKm on community welfare by analyzing published articles, research reports, or others relevant documents. Secondly is spatial analysis to explore the forest conditions dynamics of 583 HD and 745 of HKm permits that have been granted before 2019, corresponding to sufficient land cover data. Before the two analyses are carried out, an overview of the development of CBFM in Indonesia will be narrated.

2. Methods
2.1. Meta-Analysis
This study used meta-analysis approach in which articles, research reports, books or other research documents (hereinafter referred to as articles) concerning village forest and community forest were reviewed to summarize HD and HKm contributions to community welfare specifically perceived from the impacts on community income generation/share, and analyze the factors that influence those contributions. The analysis was limited to cover only HD and HKm as the two largest schemes of CBFM in Indonesia. Several procedures in this analysis followed the steps taken by Pagdee [4].

2.2. Spatial Analysis
Spatial analysis used land cover map ranging from 1990 to 2018, forest area (forest function) map and HD and HKm permits that were granted between the periods of 2007-2018. These three thematic maps were obtained from the Directorate General of Forestry Planning and Environmental Governance, Ministry of Environment and Forestry (MoEF). The spatial analysis procedure is illustrated in Figure 1.

![Figure 1. Procedure for spatial analysis](image)

The number of HD and HKm permits that were used in this analysis consisted of 583 HD and 745 HKm permits, with a total area of 1.056.752 hectares and 590.363 hectares, respectively. It should be
noted that based on spatial data availability, it was possible that there were several HD and HKm units between the years 2007-2018 that were not included in the analysis. However, this did not significantly influence the results since the missing spatial data were less than 5%. In order to simplify the analysis without affecting the goals to be achieved, 23 land cover classes on land cover map, were reclassified into 8 land cover classes, taking into account the biophysical and land cover type proximity (Table 1).

**Table 1. Land cover reclassification**

| No | Land cover code | Land Cover Classification | Land Cover Reclassification |
|----|----------------|---------------------------|-----------------------------|
| 1  | 2001           | Primary dryland forest    | Primary forest              |
| 2  | 2002           | Secondary dryland forest  | Secondary forest            |
| 3  | 2004           | Primary mangrove forest   | Primary forest              |
| 4  | 2005           | Primary swamp forest      | Primary forest              |
| 5  | 20041          | Secondary mangrove forest | Secondary forest            |
| 6  | 20051          | Secondary swamp forest    | Secondary forest            |
| 7  | 2006           | Plantation forest         | Plantation forest           |
| 8  | 2007           | Shrubs                     | Shrubs and bare land        |
| 9  | 2010           | Estate Crops Plantation   | Estate crops                |
| 10 | 2012           | Settlement                | Settlement/built up         |
| 11 | 2014           | Bare land                 | Shrubs and bare land        |
| 12 | 2500           | Cloud/no data             | No data                     |
| 13 | 3000           | Savanna/grass land        | Shrubs and bare land        |
| 14 | 5001           | Water body                | Water body                  |
| 15 | 20071          | Swamp shrubs              | Shrubs and bare land        |
| 16 | 20091          | Dryland agriculture       | Agriculture                 |
| 17 | 20092          | Mix dryland agriculture and shrubs | Agriculture |
| 18 | 20093          | Paddy field               | Agriculture                 |
| 19 | 20094          | Fishpond                  | Agriculture                 |
| 20 | 20121          | Airport                    | Settlement/built up         |
| 21 | 20122          | Transmigration            | Settlement/built up         |
| 22 | 20141          | Mining                    | Shrubs and bare land        |
| 23 | 50011          | Swamp                     | Shrubs and bare land        |

3. CBFM Development in Indonesia

In Indonesia, community involvements in forest management began around 1873 by mobilizing communities around the forest area to plant and protect trees on state forests by providing them the opportunity to use the forest land for crops cultivation under the condition that they do not damage the trees as the main crop (*tumpang sari* by Perhutani) [5].

Since the beginning of forest exploitation era in the early 1970s through natural forest concessions system (*Hak Pengusahaan Hutan*/HPH) and development of industrial plantations forest (*Hutan Tanaman Industri*/HTI) in 1990, though it has provided very significant economic impacts, however it was not balanced with the efforts to enhance the ecological and social conditions. In Java, efforts to reduce land tenure conflicts were carried out by *Perhutani*, with various community empowerment programs since 1972 such as Community Development of Forest Villages (*Pembangunan Masyarakat Desa Hutan*/PMDH) and since the 2000s, became Community Forest Management (*Pengelolaan Hutan Bersama Masyarakat*/PHBM) which is the basis framework and principles of SF [6].

Outside Java, the government’s attention to the community around the forest was initiated by carrying out the obligation of environmental impact analysis (AMDAL) for each natural forest concession holder (HPH). According to the Ministerial Decree Number 500/Kpts-II/1989 concerning the obligation of each HPH holder to implement AMDAL. Furthermore, the government issued Ministerial Decree Number 691/Kpts-II/1991 concerning the role of HPH on village development (HPH *Bina Desa*) program which was replaced by Ministerial Decree Number 69/Kpts-II/1995 concerning Forest Village Community Empowerment (PMDH) program carried out by HPH.
Community involvement in the forest management context also took place in forest areas outside Perhutani and HPH/HTI areas. In 1995, the term community forest has emerged, which was translated into English with the term of social forestry (Ministerial Decree Number: 622/Kpts-II/1995 concerning Guidance on Community Forestry). The term social forestry was officially launched in 2004, when Ministerial Regulation Number P.01/Menhut-II/2004 was issued, concerning Empowerment of Local Communities Within and or Around Forests in the Context of Social Forestry. In this regulation, the term social forestry was a system of managing forest resources in state forest areas and/or private forests, which gives opportunities to local communities as the main actors and/or partners in order to improve their welfare and attain forest sustainability. At least 9 models of community-based forest management have been started since 1999 [5], i.e. customary forests, forest areas with special purpose, village forests, community forests (new legislation on social forest), social forestry, community plantations forest, company-community partnerships in forest management, collaborative management of conservation areas, and community-owned forests.

The new terms appeared with the issuance of Government Regulation No. 6 of 2007 concerning Forest Area Arrangement, Forest Management Plans Development, and Forest Utilization. The regulation stated that community empowerment activities were carried out through three schemes: village forests, community forests and partnerships, with the exclusion of community plantation forest (Hutan Tanaman Rakyat/HTR).

Community-based forest management practices in Indonesia continue to grow, along with the emergence of various policies and regulations that govern them. The issuance of Ministerial Regulation Number: P.83/MENLHK/SETJEN/KUM.1/10/2016 concerning Social Forestry, unifies all the regulations and becomes main umbrella for the implementation of community-based forest management carried out through five main schemes i.e. village forests, community forests, community plantations forest, forestry partnerships, and customary forests.

From the above description, it can be assumed that community involvement in Indonesia forest management has evolved from looking at the community as a problem particularly in driving deforestation to community as the solution in forest management, and from just merely “involving” them to fully devolving forest management to local communities [7]. Social forestry according to the definition on the Ministerial Regulation Number: P.83/MENLHK/SETJEN/KUM.1/10/2016, places local communities and/or customary communities as the main actors of forest management for the purpose of their welfare and environmental sustainability, through five schemes including HD and HKm. This program is believed as the way for distributing benefits equitably and improving community welfare within and surrounds the forest area, which in turn has implications to the forest sustainability. Based on the spatial data that were used in the analysis, there were about 583 of HD and 745 of HKm permits that granted in the period of 2007-2018. Spatial distribution of these two SF schemes can be seen in Figure 2, while distribution based on forest function can be seen in Figure 3.
More than 70% of HD and HKm as shown in Figure 2, were located in Kalimantan and Sumatera. As stated by Porter-Bolland [8], CBFM is still perceived as a tool to solve conflict over forest tenure and legalize forest occupations by communities whereas the tenure conflicts in Sumatera and Kalimantan were very high. Based on forest function, about 60% of HD and HKm located in production forest and 40% located in production forest (Figure 3a and 3b).

Figures 4 shows that the area of both HD (Figure 4a) and HKm (Figure 4b) have increased rapidly in the last five years and almost doubled in 2017 and 2018. These rapid increments were mostly driven by changes in government policies and approaches. More inclusive and collaborative interaction between government and non-government actors involved in CBFM development was the main factor for the increasing rate of social forestry designations, as well as the associated increase in the number of groups, overall territorial expansion areas, and types of services (including trainings and small business investments) [1]. Furthermore, highlight that the “jemput bola” approach in which the government is actively engaging with communities speed up the development process of CBFM. All these approaches and processes are guided by an indicative social forestry map that is regularly updated every six months as an initial indication of the area that will be designated for CBFM. Figure 4c shows distribution of HD and HKm based on five major islands in Indonesia. It can be seen that apart from Java, Bali and Nusa Tenggara, HD areas were larger than HKm, even in Kalimantan it was almost 4 times larger, and in Maluku and Papua, more than 6 times larger than the HKm area.
4. Contribution to Community Welfare Improvement

In order to study the CBFM contributions to community welfare, 14 articles from various sources are selected and reviewed. Of the fourteen articles, 4 were related only to HD, 8 related only to HKm and 2 articles related to both HD and HKm. Contributions to community welfare were analyzed mainly from HD and HKm influences on the communities’ incomes (Table 2 and Table 3).

Table 2. Six articles related to HD’s contribution to community welfare

| Author(s) | Research year | Province | Number of unit analysis | Year of permit granted | Contribution to community |
|-----------|---------------|----------|-------------------------|------------------------|---------------------------|
| [10]      | 2018          | West Papua | 2 HD (HD Sira and HD Manggroholo) | 2016 | HD designation have no significant impact in improving the community's welfare |
| [11]      | 2018          | South Sulawesi | 7 HD (HD Pattaneteang, HD Campaga, HD Marayoka, HD Libureng, HD Paekekke, HD Jangun-Jangun, HD Bae) | 2010-2017 | 5 HD have significant contribution to total farmers' income that varies from 7% to 76%, 2 HD have no contribution on community income |
| [12]      | 2019          | West, Central, South, East and North Kalimantan | 41 HD (Not specified) | 2009-2014 | - 36 HD permits contribute to the improvement of community well-being indicators - 5 HD permits have no significant impact on community well-being indicators |
In general, all articles stated that HD and HKm had contributed to the communities’ welfare by improving their incomes with varying degrees of significance. Of the 51 HD permits, only eight provided quantitative information on income share. Therefore, it was not possible to undertake a full quantitative synthesis but descriptively summarized the reported results within the articles. From 51 HD cases, only 9 HD (18%) stated did not have any significant contributions, while 42 HD (82%) considered to have positive impacts to communities’ incomes and other well-being indicators (among others are living conditions, access to health, school etc.). Moreover, 3 studies [11], [13], [14] which was conducted in the same location (HD Pattanateang in South Sulawesi) but in different year, confirmed the same finding that forest management activities over HD framework, did significantly contributed to the community income.

Table 3. Ten articles related to HKm's contributions to community welfare

| Author(s) | Research year | Province | Number of unit analysis | Year of permit granted | Contribution to community |
|-----------|---------------|----------|-------------------------|------------------------|---------------------------|
| [16]      | 2010          | Lampung  | 3 HKm (HKm Bina Wana Lestari, HKm Mitra Wana Lestari Sjahtera and HKm Setia Wana Bhakti) | 2007                   | - Contributed to 43-56% of community total income. - HKm has been instrumental in the reduction of poverty between 52-89%. |
| [17]      | 2018          | Bangka Belitung Island | 3 HKm (HKm Gempa 1, HKm Gempita and HKm Tunas Harapan) | 2016                   | In HKm Gempa 1, 52% of total community income derived from HKm activities, whereas in HKm Gempita and Tunas Harapan, no significant contributions. - HKm contribution to community income is 5.5%. - HKm not yet effective in reducing poverty |
| [18]      | 2013-2014     | Yogyakarta | HKm Kulon Progo | 2007                   | - Significant decrease of poor households - Improved the financial gain of the farmers as indicated by increases in income, percentage of household with savings as well as the decline in number of loan and households with food shortages |
| [19]      | 2017          | Lampung  | 2 HKm (HKm Jaya Lestari, Makmur and HKm Bina Wana Lestari) | 2001 and 2009          | - Significant decrease of poor households - Improved the financial gain of the farmers as indicated by increases in income, percentage of household with savings as well as the decline in number of loan and households with food shortages |
| Author(s) | Research year | Province | Number of unit analysis | Year of permit granted | Contribution to community |
|----------|---------------|----------|------------------------|------------------------|--------------------------|
| [10]     | 2018          | Maluku and North Maluku | 2 HKm (HKm Lata, HKm Homa Ila Pano) in Maluku Province and 1 HKm (HKm Tunas Muda) in North Maluku Province | 2014 and 2015 | HKm designation has not had a significant impact on improving the community’s welfare. HKm only contribute to subsistence economy. |
| [3]      | 2009          | Yogyakarta | 2 HKm in Banyusoco and Karangasem | Mid of 1990s | HKm contribute to 20-50% of community total income. HKm has not contributed significantly to community income. |
| [20]     | 2011 dan 2014 | Yogyakarta | 2 HKm (HKm Tani Manunggal dan HKm Sedo Lestari) | 2007 | HKm contribute to 20-50% of community total income. |
| [21]     | 2013          | West Nusa Tenggara | 3 HKm units (HKm Sambelia, HKm Sesaot, and HKm Danussadiqien) | 2009 | HKm has not contributed significantly to community income. HKm contribution to total farmers’ income varies between 4% - 92% |
| [11]     | 2018          | South Sulawesi | 22 HKm (HKm Sujun Manai, HKm Kapita, HKm Marayoka, HKm Gunung Silalu, HKm Kunto Tojeng, HKm Cinna Mata, HKm Sukkuru Mappeji, HKm Lagolla, HKm Coppo Coreara, HKm Lestari Alam, HKm Bukit Cinennung HKm Batu Mammanae, HKm Sipakange, HKm Basukan HKm Nanggala, HKm Nama Naggala, HKm Akasia, HKm Coreangung, HKm Sipaito II HKm Mabulosibangat, HKm Buhunglah, HKm Tabuakkang I) | 2010-2017 | HKm contribution to total farmers’ income varies between 4% - 92% |
| [22]     | 2014          | Lampung | 5 HKm (HKm Betung Jaya, HKm Bertingin Jaya, HKm Harapan Sentosa, HKm Mitra Wana Lestari, HKm Hina Wana Lestari) | 2007-2013 | Farmers income from HKm range from 40%-75% to total income |

Several factors that caused differences in benefit contribution of HD to community welfare among others are administrative problems, community readiness, restriction/limitation in forest utilization, and type of forest commodity and market access. From 9 HD that claimed have no contribution to community income, 2 of them are caused by unclear license/rights. In 2014 HD Libureng and HD Jangan-Jangan in South Sulawesi received the working area designation from Ministry of Forestry (now called MoEF) as a basis for granting village forest management rights (Hak Pengelolaan Hutan Desa/HPHD) according to Ministerial Regulation Number: P.89/Menhut-II/2014 concerning Village Forest. However, until 2018 they have not obtained yet the rights as a permit for carrying out forest management activities in the field. Later on, the Ministerial Regulation Number: P.89/Menhut-II/2014 replaced by Regulation Number: P.83/MENLHK/SETJEN/KUM.1/10/2016 concerning Social Forestry. According to the new regulation, the process of issuing HPHD should be in accordance to the new regulation means that the HPHD granted by the Minister. These changes can cause delays in the issuance of HPHD.

2 HD in West Papua Province shows something different. They have obtained the HPHD permits, however unable to manage their area optimally due to several things [10]. First, customary peoples who have used the area for generations have claim the forest land as customary rights or certain clan groups, so that the granting of formal access in the form of HPHD does not have a real impact because it’s used only to fulfill subsistence needs. Secondly, although there has been encouragement from the government through facilitation and assistance program on production capital, however limited knowledge on the use of technology became an obstacle in the sustainability of the production of capital utilization, thus
the community would return to the activities that they have carried out beforehand, due to their limited capacity in using and maintaining the capitals. Thirdly, inadequate cooperation and involvement of community groups indicated institutional problems in managing HD. Some limitations or restrictions on forest utilization also have a role in the different contribution of HD. From the study of HD in Kalimantan, [12] points out that constraints on commercial utilization of timber as a result of HD designation have contributed to negative impacts on income, thus reducing financial the well-being of communities.

Types of forest products and market access also determined the success of HD management in terms of its ability to increase people's income. HD in South Sulawesi and Sumatera has succeeded in increasing community income creating products that have good market opportunities such as Coffee, Rubber, Cloves, Honey and other products. In addition to those types of products, the ability to increase the product quality and added value also drives the increase in community income as happened in HD Pattanateang in South Sulawesi. Moreover, village infrastructure improvement, in HD Jorong Simancuang and several HD in South Sulawesi, has increased the opportunity for communities to sell their forest products directly to the market.

Similar to HD, in general HKm provides positive contribution to community welfare. According to the result of 10 studies involving 43 HKm as samples, 77% (33 HKm) considered to have positive contribution to community income share, while 23% (10 HKm) stated have no significant contributions. The amount of contribution of HKm to community income are varies within and between region. Figure 5 presents the varieties of 23 HKm contributions to community income at four different provinces. The contribution ranges from 4% to 92% in South Sulawesi, from 5% to 43% in Yogyakarta, and 40% to 74% in Lampung.

![Figure 5](image-url)  
**Figure 5.** Contribution to total income from 32 HKm in four different provinces.

Further analysis of the study results showed relative similar condition to HD, which have caused differences in the performances of HKms on community income. Community readiness, especially with regard to the institutional arrangements, still posed a challenge in some community forest management cases. This condition was found in two HKms in Bangka Belitung Islands (HKm Gempita and HKm Tunas Harapan), two HKms in Maluku (HKm Latu and HKm Homa Ita Pano) and HKm Tunas Muda in North Maluku. Lack of coordination and communication between the HKm and the local village government has resulted in management conflict between the HKm and local authority particularly in managing area for ecotourism development. Ecotourism management is carried out by the youth organization (Karang Taruna) under the control of the village authority, so that the economic benefits have not been received directly by HKms. While in HKm Gempita, limited capacity and resources, and the absence of government facilitation have caused the ecotourism potentials within HKm area, not yet optimally managed [17]. Constraints related to the relationship between HKm and customary or clan
rules that occurred in Maluku and North Maluku and unjust distribution of government assistance have triggered the communities so that they did no longer wanting to carry out forest management activities [10]. Different conditions occurred in West Nusa Tenggara and Kulon Progo Yogyakarta. The HKm management activities were only limited to meet basic livelihood needs of community. This condition was caused by the biophysical condition that limited the number of plants that were able to be cultivated, and inability of the community to diversified economic activities [3], [21]. Meanwhile, 3 HKm in South Sulawesi with contributions to total income below 10% (HKm Batu Mammanae, HKm Bukit Cinennung and HKm Cinna Mata), were constrained by unclear area boundaries managed by the HKm members. They were waiting for the government facilitation to clarify the management area of each HKm member.

HKms with good performance in increasing income, generally were triggered by the ability to produce products or commodities that were accepted by market and their ability to access the market. For instance, more than 80% of the generated income in four HKms with highest income contributions in Lampung, were derived from coffee production and sales (Figure 6). Their coffee products have successfully penetrated regional markets through cooperation with some exporters [22].

**Figure 6.** HKm contribution to community average annual income in four HKm in Lampung.

Another interesting finding from this study was that HD and HKm contributions to the total incomes were not correlated with the length of permits that have been obtained. Figure 7 showed the correlation between the length of time since permit were granted and contributions to community total income from 5 HD and 32 HKm that have quantitative data. It is clear that the duration of permits has no effect (as shown by low $R^2$ value) on the total income contributions.

**Figure 7.** Correlation between HD and HKm permits duration with contribution to total income.

the area of secondary forest continues to shrink, surprisingly the primary forest cover has increased in both HD and HKm areas (Figure 8).
Another interesting finding from this study was that HD and HKm contributions to the total incomes were not correlated with the length of permits that have been obtained. Figure 7 showed the correlation between the length of time since permit were granted and contributions to community total income from 5 HD and 32 HKm that have quantitative data. It is clear that the duration of permits has no effect (as shown by low R² value) on the total income contributions.

5. Contribution to Forest Conditions

Based on spatial analysis results, we can further analyze the dynamics of land cover changes in 1,056,572 hectares of HD area and 590,362 hectares of HKm area that have been granted until 2018. Forest cover, especially primary forest, decrease significantly within the period of 1990-2009, and resulted by the increase of agricultural land. During this period, forest destruction mainly occurred in 1996-2000 due to severe forest fires in 1997/1998, and change in socio-political conditions that caused many uncertainties in forest management [23], [24]. Between 2009 to 2015 the rate of deforestation relatively declined and at a steady rate. Within the period of 2015-2018, even though the area of secondary forest continues to shrink, surprisingly the primary forest cover has increased in both HD and HKm areas (Figure 8).

Further analysis results revealed that the increase of primary forest area between 2015-2018 was resulted from the quality improvement of secondary forest cover of more than 39,800 hectares in HD and more than 25,055 hectares in HKm area. This also shows that the decline in secondary forest cover during that period did not show a high rate of deforestation because most of it actually turned into primary forest, although there is still land conversion into agriculture and shrubs. The change from secondary forest to non-forest in that period is less than 4% in HD and not exceeding 6% in HKm area. Additionally, the increase on agricultural land in HD and HKm areas around 54% and 71% was generated from shrubs and bare land conversion respectively, which indicated the optimization of unproductive land.

The change of forest cover as shown in Figure 8 was the result of coarse analysis since it involved the whole HD and HKm areas albeit in that year yet obtain permits. In order to avoid this bias and to convince that the presence of HD and HKm have contributed to the improvement of forest conditions, further analysis were carried out by comparing forest cover conditions before and after HD and HKm designation in a certain year without taking into account areas where there were no HD or HKm permits in that year. For this analysis, we excluded the HD and HKm permits that were granted in 2018 since it was not possible to analyze the conditions after the permits were granted due to lack of data on land cover in 2019 or thereafter. Analysis results showed that the presence of HD and HKm were not only
overwhelm the rate of forests conversion to non-forest areas, but also have improved the quality of primary forest cover (Figure 9).

In general, deforestation and forest degradation still occurred prior to HD and HKm designation. Figure 9a shows the average values of the primary forest cover change in both HD and HKm areas before and after HD and HKm designation. Before there were HD and HKm, primary forest cover reduced around 151.6 hectares/year and 4.2 hectares/year in HD and HKm respectively. After HD and HKm designation, the area of primary forest cover increased around 397.3 hectares/years in HD and 106.3 hectares/years in HKm. This confirms that forest conditions improvement as shown in Figure 8, has a correlation with the presence of HD and HKm. If the analysis based on forest function, the increase of primary forest cover mainly occurred in protection forests compared to production forests. Moreover, not only improving the primary forest cover, HD and HKm designation also contribute to the reduction in the rate of conversion of secondary forests to non-forest areas (Figure 9b). The secondary forest conversion rate has decreased from 1.127,6 hectares/year to 454,5 hectares/year in HD and from 268,6 hectares/year to 200,9 hectares/year in HKm, since the area has been managed under the HD and HKm scheme. However, these contributions did not necessarily result from all HDs and HKms which were granted permits between 2007-2017, it varied across spatial and temporal distribution. For example, HD that was granted permit in 2013, showed the opposite condition. There was no difference in forest cover condition before and after HD designation. Instead, the rate of deforestation and forest degradation after HD designation has actually increased. Positive contributions mainly came from HD and HKm which were granted permits between 2014-2017.

Figure 9. Total average change of primary forest (a) and secondary forest (b) condition (ha/year) before and after HD and HKm designation.

Figure 10. Conversion of unproductive lands to agriculture (a) and plantation forest (b) in HD and HKm area within 2009-2018

Additional analysis was also conducted to see the optimization of unproductive land (shrubs and bare land) in the HD and HKm areas from 2009 to 2018. Figure 10 shows the conversion of unproductive land to agriculture and plantation forest in HD and HKm area (Figure 10). More than 17,000 hectares
of unproductive land in HD and more than 36,000 hectares in HKm area have been converted to agriculture within that period. Slight increase of plantation forest (179 hectares in HD and 1,442 hectares in HKm) was also resulted from the unproductive land management.

Eventually, the results of this study are in accordance with the findings from the studies conducted by Santika et al. [25], Putraditama [26]. By analyzing HD permits that were granted between the years 2012-2016 in Sumatera and Kalimantan, found that community forest management under the HD scheme has successfully achieved to avoid the deforestation in overall, although the performance varied in temporal scales. While investigate the performance of HKm that were granted in 2007 in Lampung in maintaining forest cover. They concluded that HKm are more effective in maintaining forest cover than other similar forests without CBFM, albeit less effective than conservation forest management.

6. Conclusion
The development of CBFM in Indonesia has evolved from just merely involving community towards community as the main actor in forest management. CBFM particularly related to HD and HKm, played important roles in improving community welfare through its contribution to community income. However, the contribution has not yet fully occurred in all HD and HKm, and the value of the contributions varied within and between regions ranging from 4% to 92%. HD and HKm have positive impacts in improving forest conditions and land use optimization. Nationally, village forest and community forest were able to restrain the rate of deforestation, utilize unproductive lands and increased primary forest covers in the last four years in particular. This study was solely based on meta-analysis from other study results and spatial analysis with national level scale of accuracy. Therefore, direct field studies and spatial analysis using higher spatial data resolution need to be carried out. Moreover, understanding on how local communities use and manage forest resources and its impact on CBFM performance are very important and require further systematic studies. Nevertheless, this study revealed that CBFM is a proven approach with positive impacts on both community and forests conditions.

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