Community involvement in KPH Yogyakarta (Yogyakarta Forest Management Unit) land management: a case study of RPH Mangunan

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Abstract. The management of protection forests in KPH Yogyakarta has involved the surrounding community. Community involvement is expected to keep forest sustainability and contribute to the surrounding community’s income. Community engagement activities in the protection forest at RPH Mangunan have been developed long time before the KPH Yogyakarta was formed. Several social forestry activities was designed by utilizing forest land to involve the community in protection forests, especially in RPH Mangunan. Activities with the community on KPH land are permitted as long as the crops and trees are not disturbed. This paper aims to identify community involvement in RPH Mangunan and calculate the economic contribution of each land area used by the community. The research was conducted in July-August 2018. The collection of socio-economic data are obtained through household surveys of KPH land users, in-depth interviews with key stakeholders and Focus Group Discussion (FGD) of parties involved in KPH land management. The income from managing the KPH land is still below the needs of one household based on Yogyakarta provincial minimum wage. Apart from carrying out agricultural activities, some community members have other sources of livelihood. To increase the community's income and support forest sustainability, some strategies need to be implemented.

1. Introduction

Yogyakarta Forest Management Unit (Kesatuan Pengelolaan Hutan Yogyakarta/KPH Yogyakarta) consists of production forest and protection forest with the proportion of 85 percent and 15 percent respectively [1]. Activities allowed on production forests and protection forests are different as production forests have the main function of production, while protection forests is intended for the function of protecting water systems, erosion, and soil fertility [2]. Both in the production forests and protection forests in KPH Yogyakarta, teak, mixed wood species, and eucalypt are planted. Based on protected area management plan, there has been a policy starting in the year of 2013 that eucalypt plantation in the protection forests of KPH Yogyakarta are gradually replaced with mixed wood species with the consideration that mixed wood species will play optimal roles in the protection function [1].

In contrast to production forest, which is logged for timber stands or pruning of eucalypt stands, protection forests, according to their designation, can only be utilized for environmental services and collection of non-timber forest products [2]. Land utilization in protection forest is very limited where
soil and landscape tillage is kept to a minimum. Management of protection forest in KPH Yogyakarta involves local communities with closed links with forest areas where they carry out non-timber forest product collection, intercropping and KPH land area utilization. Local people have been collecting non-timber forest products and using forest land for intercropping, long before the gazetment of KPH Yogyakarta.

Community involvement is expected to increase forest sustainability because it increases community awareness of the importance of forests [3]. One of efforts to involve community in protection forest management is carried out by developing several social forestry schemes. Activities which involve the community on KPH land area are allowed as long as the communities do not interfere the main crops. Community involvement is needed so that the existence of KPH makes a real contribution to the surrounding community, both from the economic, social, and environmental perspectives. Fisher (2017) states that KPHs have important roles in addressing local problems by acting as facilitative mediators [4]. To ensure that the strategic act is in accordance with the applicable policy and regulation, this can only be implemented with the support from government and other stakeholders [4]. Ota (2015) suggests that initiatives should be through a deliberation process and not through a top-down policy.

Community involvement activities in the protection forest of RPH Mangunan have been developed since 1970 long before KPH Yogyakarta was formed. Unlike the KPH condition in other places, especially outside the island of Java where there still exist different perceptions between the community and the KPH management [6]; the social community around KPH Yogyakarta understands and realize the boundaries between the private land and the KPH area. The community at KPH Yogyakarta realizes which areas are included as protection forests. However, due to the limited land that the community has, the community still manage KPH land but with full of responsibility applied the rules of KPH area management. A study by Santoso, Nurrochmat, Nugroho, & Santoso (2019) identify that the level of participation of forest farmer groups in KPH Yogyakarta, bases on Arnstein’s participation level, was in the highest category, i.e. citizen power [7]. This paper aims to identify community involvement activities in protection forests at RPH Mangunan, calculate each land use contribution, and formulate strategies for the purposes of increasing farmers’ household income.

2. Research method
2.1. Location
The research was carried out at the Forest Management Resort of Mangunan (RPH Mangunan) under the management of Yogyakarta Forest Management (KPH Yogyakarta) in July to August 2018. All forests which are managed by RPH Mangunan is located on protection forest. RPH Mangunan is chosen as the research site because there are several forms of land utilization activities in the protection forest area.
2.2. Data collection method

Socio-economic data are obtained through household (HH) surveys, in-depth interview with key stakeholders and Focus Group Discussion (FGD) with stakeholders who are involved in KPH land area management. In this study, the number of respondents are 33 people who are the representatives of four forest farmer groups who operate in RPH Mangunan area. Some questions that are delivered to the respondents include involvement in KPH land area management, activities carried out by farmer groups/farmers on KPH land area, income generated from each activity, and the perceptions on forest and environment. FGD are conducted twice. The first FGD is attended by forest farmer group who use KPH area. The first FGD is to confirm what have been found from the interview. The second FGD is attended by all stakeholders who are involved in KPH land area management which include government representatives, private sectors, and cooperative and representatives of forest farmer groups. Support from each stakeholders for the development of community involvement in KPH land management are identified during the second FGD. Questionnaires are utilized as a guide in collecting data through the survey.

The sampling technique in this study is purposive sampling with the KPH Yogyakarta land users as the respondents. According to D. P. Turner (2019), purposive sampling is a non-probability sampling technique that is used when the researchers expect to target specific individuals with interesting characteristics in the research [7]. According to Sugiyono (2010), purposive sampling is a technique to determine the research sample with certain considerations that are aimed at making the data obtained more representative[9]. Furthermore, Tongco (2007) states that purposive sampling can also be used with qualitative and quantitative techniques [10]. The inherent bias of this method contributes to the efficiency, and it remains robust even when it is tested against random chance sampling techniques.

2.3. Analysis

Data analysis that is applied is descriptive analysis and financial analysis for the socio-economic data of KPH land users. According to Loeb et al. (2017), descriptive analysis is an analysis that describes a phenomenon by identifying the pattern of the data obtained [11]. Meanwhile, according to Winartha (2006), descriptive analysis is a tool to analyze, describe, and summarize various conditions and situations from data that have been collected in the interviews or observations about the problem studied in the field [12]. In other words, descriptive analysis is a type of data analysis that helps describing, showing, or summarizing data in a constructive way so the data patterns that may appear can be identified. In this study, financial analysis is used to see the profitability of the use of KPH land.
3. Result and discussion

3.1. The utilisation of KPH Yogyakarta Area by the surrounding community

The main livelihood of the community around RPH Mangunan is farming. KPH land use activities by the community are managed through forest farmer groups (KTH) under the guidance of KPH. This community involvement activity aims to increase the people awareness on the importance of forests, to create jobs, and to increase the surrounding community's income [1]. Around 73% of the respondents state that only people originally from villages surrounding the KPH area are able to involve in KPH land management, and 23 percent perceive that both of the people inside and migrants are allowed to manage KPH land as long as they are residents of the villages (Figure 2a.). The community utilizes the KPH area by planting *empon-empon* (spice and medicinal plants), crops, peanuts, bananas, and grasses for cattle. The community is obliged to maintain KPH stands around the intercrops. This is in line with the respondents’ opinion on the requirement for obtaining land use rights in the KPH area. According to the respondents, in addition to the requirements that must be fulfilled, such as obtaining KPH permit, completing administrative requirements, becoming a member of a forest farmer group, they also have to protect the forest and maintain the standing trees which belong to the KPH (Figure 2b.). With the growing sense of community ownership of the KPH existence, the community will participate in maintaining and preserving the KPH area.

![Farmers' perception in managing KPH area](image1)

**Figure 2.** Farmers’ perception of KPH land use requirements

The low level of community participation in KPH can be affected by the low level capability, farmers’ motivation, and opportunities that can be accessed by the community [13]. KPH Yogyakarta tries to involve the surrounding community in many KPH activities by giving capacity-building efforts through training and regular meetings. KPH facilitation also provides information, knowledge, and skills; this gives positive impacts on community participation in activities organized by KPH [14]. Besides, Puspita, Qurniaty, & Febryanto (2020) state that social capital contributes positively to community involvement in managing KPH areas.

3.2. Land use pattern at RPH Mangunan

The community around RPH Mangunan has been using the KPH land area for years to meet their daily needs. Initially, the community used KPH land for intercropping for crops, spices, and medicinal plants (*empon-empon*). However, with the increasing need for higher income, the community around the KPH began to improvise in carrying out income-generating activities. Currently, the involvement of community in the protection forests at RPH Mangunan is not only limited to crops intercropping, but also they also grow mulberry for silkworm feed, honey beekeeping, and ecotourism.

3.2.1. The pattern of intercropping with pine, eucalyptus, and candlenut as the main trees; spices as the intercropping. This pattern is mostly applied by farmers before other patterns was developed. Plants
that are commonly cultivated as the intercropping are corn, peanut and spices (Figure 3). Spices can be cultivated for a longer period of time; the spices can still grow well even though the pine/candlenut trees have grown densely. Galangal is one of spices that is widely planted by the community. The local community initially tapped the pine trees for the sap. However, considering the age of trees of more than 30 year-old, since the year of 2013, the pine resin tapping has been forbidden for the sake of safety. Then in order to replace the income from tapping the pine sap the candlenut trees are chosen by the KPH management because these trees produce fruit which its seeds can be harvested by farmers.

In RPH Mangunan and Dlingo, there are candlenut trees covering an area of 25 hectares with a potential for planting of 7,500 trees or with a density of 500 trees/ha planted from 2000 to 2003. [1].

![Figure 3. Main trees: pine, eucalyptus, candlenut; intercroppings: galangal and crops (Photo Credit: Mega Lugina)](image)

3.2.2. The pattern of intercropping with teak, pine, and acacia as the main trees; mulberry as the intercropping. Communities around the forest area of RPH Mangunan have planted mulberry among the plants of teak, pine, and acacia trees which cover the area of 2.5 hectares in Sudimoro II Block (Figure 4). The pattern was started at RPH Mangunan in the year of 2015 by communities at Mangunan and Muntuk villages, Bantul Regency, who are members of Margosutero Forest Farmer Groups. Intercropping activities are carried out without destroying the primary plants (trees), and farmers must replant the KPH empty area and replace the dead trees.

The heads of KPH expect that the development of mulberry plants and the cultivation of silkworm can increase the farmers’ income. Therefore, the KPH facilitates the development of mulberry leaves, training of silkworm breeding, and providing infrastructure. The training materials include mulberry cultivation techniques, silkworm breeding, cocoon spinning into yarn, and technique of silk thread weaving. Mulberry seeds are obtained from a farmer group at BDH Paliyan. The farmers who are the members of mulberry management group agree to gather once a week to work together to do the planting and maintenance of the mulberry plant. The members who cannot attend during the community service, are subject to pay a fine of IDR 15,000. In addition to managing pure plants under stands, the farmers also keep silkworms. The farmers take turns feeding the silkworms with mulberry leaves until the caterpillars produce cocoons. When the caterpillars are still young, the feed is the young mulberry leaves, that are harvested by picking. When the silkworms are 20 days old, the harvesting of mulberry leaves for feeding the silkworms is carried out by pruning.
3.2.3. The use of KPH land for honey beekeeping. The development of beekeeping for honey production started in 2018 through the facilitation from KPH Yogyakarta in the forms of beekeeping training and the provision of infrastructures. Within RPH Mangunan, the beekeeping involves Sekarsari Forest Farmer Group (Kelompok Tani Hutan/KTH) who manage the area of Sudimoro II block. The type of the bee to keep is *Apis cerana*. During the beekeeping training, the farmers receive materials related to bee honey-producing, the procedures for maintaining habitat for honey bee cultivation, the methods of harvesting and keeping, and marketing the honey. The realization of beekeeping activities are still limited to the distribution of wooden boxes (stup) for bee colonies and bees to keep. The maintenance of honey bee is carried out by “herding” the colonies to several locations in RPH Mangunan which are in bloom. Sources of feed for honey bee are nectar and pollens from several plants, include the plants of acacia, mahogany, rubber, mango, petai (*Parkia speciosa*), cashew, *Paraserianthes* sp., calliandra, water guava, and coconut trees.

3.2.4. The use of KPH Land for ecotourism development. The development of ecotourism in RPH Mangunan began in 2014 with the proposal to use the area for environmental services or ecotourism; the use of the area in protection forests for other purposes bases on the Minister of Forestry Regulation P.22/Menhut-II/2012. The regulation allows 10 per cent of the protection forest are to be utilized for ecotourism facility development. In 2015 the formation of Notowono Cooperative was initiated and attained the legal entity in 2016. The cooperative began to work with Yogyakarta Provincial government to manage ecotourism in RPH Mangunan and on January 31 2017 the cooperative gain the permit. The establishment of ecotourism was initially carried out by several forest farmer groups and after some
period of the activities, it was successful and brought income to the community; other farmer groups have also switched to develop ecotourism in protection forest that they managed. The development of ecotourism in the protection forest has changed the culture of some local people from farmworkers (pesanggem) to ecotourism operators/managers. Currently, there are 9 operators who administer ecotourism at RPH Mangunan protection forests and all of them offer scenic beauty as the main attractions.

Figure 6. Ecotourism Development in RPH Mangunan (Photo Credit: Indartik)

3.3. **Financial analysis of each KPH land use pattern**

The land managed by the community around the KPH is a protection forest where the tree stands have been in the area for decades. Most of the tree stands have covered the forest area so that the land that can be used is limited and only certain trees or crops are able to live in these conditions. The area of land and types of crops cultivated determine the income earned by farmers or land users [15].

Spices such as galangal does not require the purchase of new seeds because new plants come from the remaining rhizomes. From Table 1, it can be described that intercropping galangal provide net income as much as Rp. 2,3 million/HH/year. The mulberry intercropping still suffers losses. Since the year of 2015, mulberry has been harvested three times but it failed twice and the only harvest only gave IDR. 400,000 for the whole group. The beekeeping has not received any income yet as farmers have just received the wooden boxes for homes of the bees and the bee parents to breed. Based on the activities that have been carried out in RPH Mangunan, ecotourism gives the highest net income of IDR. 9,000,000/HH/year. The amount of income, cost and net income of each pattern is shown in Table 1.

| No. | Pattern                  | Income (IDR/HH/year) | Cost (IDR/HH/year) | Net Income (IDR/HH/year) |
|-----|--------------------------|----------------------|--------------------|-------------------------|
| 1.  | Intercropping Galangal   | 2.610.667            | 275.833            | 2.334.833               |
| 2.  | Intercropping Mullberry  | 20.000               | 75.000             | (55.000)                |
| 3.  | Honey bee keeping        | -                    | -                  | -                       |
| 4.  | Ecotourism               | 9.000.000            | -                  | 9.000.000               |

Result in Table 1 is below the farmers' income from coffee agroforestry in KPHL Batutegi Lampung, where the income from agroforestry activities on KPH land is IDR 14.65 million/HH/year and from non-agroforestry activities (mostly farming on private land) in the amount of IDR 6.32 million/HH/year [16]. The study of Rukminda, Soekmadi, & Adiwibowo (2020) in KPH Rinjani Barat show that the intensity of tenure conflicts between FMUs and residents reduce significantly the forestry partnership program [18]. In addition, with the partnership agreement with the KPH, the community feels that they
have legitimate access to the forest area. In this study at RPH Mangunan, this legitimacy makes the farmers persist in farming even though they have not been able to meet their needs fully from a financial point of view. They think that the legitimacy of this KPH land management can be passed down to their children and grandchildren.

The results of interviews with the respondents indicate that agroforestry activities on KPH land have contributed to meeting the livelihood needs of farmers, especially galangal farmers (Figure 7). Meanwhile, about 50% of the farmers in the honey group state that agroforestry provide contribution; the rest probably has not yet received the same results as in the mulberry farmer group. For tourism groups, and it is about 37% state that they are benefited from this activity.

![Figure 7. Percentage of respondent who consider that agroforestry has contributed to fulfil household needs.](image)

Further information is explored to see the percentage contribution of the utilization of KPH land area, both from agroforestry and tourism activities. According to the farmers of galangal group, the income from galangal agroforestry can reach around 30% of their daily needs. Meanwhile, the members of the tour group state that the use of FMUs for tourism has assisted 70% of their daily needs. In addition to managing the KPH land area, the group members also manage agroforestry on private land. Timber plants on their own land are stored wood that can be harvested at any time when they requires a large amount of money. Types of trees planted include teak, sengon, mahogany, petai, *Gnetum gnemon*, *Dalbergia* sp., and acacia. The average income of agroforestry in the private land is IDR 1,646,495 per HH/year. Supposing the needs of one farmer household bases on Yogyakarta provincial minimum wage of IDR 18 million/HH/year. In that case, the income from managing the KPH land area plus the activities on the land owned is still below the needs of one household. Therefore, apart from carrying out agricultural activities on the same ground with timber plantations, some community members have other sources of livelihood. In addition to farming activities, the livelihoods of the surrounding community are breeders, bamboo craftsmen, food traders at tourist attractions, construction workers, carpenters, entrepreneurs, vegetable traders, wood traders, drivers, private employees, and tailors. As in other places, source of income outside of the activities in the forest are still the mainstay in meeting needs [19].

### 3.4. Strategy to increase community income from KPH land use

The uncertainty income obtained from intercropping which continuously decreases due to the closing of the main tree canopy, and the age of pine trees; has triggered KPH and the local people to propose and conduct other patterns besides intercropping. The existence of ecotourism activities at RPH Mangunan causes changes in community interest in agroforestry activities. The certainty of income obtained from ecotourism activities is the main factor for farmers to switch to ecotourism (20). Apart from that, activities in ecotourism are not too draining if it is compared to farming. This is in line with the results
of studies by Irhamna (2017) and Rosida (2014) which state that the transformation of farming activities into ecotourism development is driven by uncertain results from agriculture income offered from tourism activities [18,19]. Most of the respondents who prefer ecotourism activities come from the young group. The results of Marysya & Amanah (2018) study in tourism development in Situ Gede Bogor also show that the level of community participation in tourism management is significantly influenced by age, length of stay, and potential tourist areas [23].

On the other hand, the agroforestry activities have been considered as having contributed to meet the needs of farmers. Even though there is a shift, there are still some farmers who want this activity to continue. In addition, agroforestry activities also positively impact carbon sequestration activities and the fulfilment of local food demands.

There are several strategies to increase household income from community involvement in managing protection forests at KPH area:

a. The developed pattern must support the function of the protection forests.
All the patterns which involve community must support the function of protection forests. Mulberry cultivation for silkworm feed in fact requires an open growing place to be exposed to sunlight. In addition, the land needed for mulberry cultivation is not small considering that feed for silkworms is needed every day. Therefore, mulberry intercropping does not support the rehabilitation of protection forests.

b. Careful selection of MPTS or crops by considering biophysical characteristics.
So far, the selection of commodities developed is still trial and error activities. The selection of MPTS or crops to be developed need to be carried out through a careful process which consider biophysical characteristics as the location has not too high rainfall, i.e. less than 2500 mm per year, located on high altitude and hilly areas which are composed of rocky ground. Furthermore, regarding the selection of bee species, it should also consider biophysical characteristics. Apis cerana will easily leaves the site if the climate is no longer suitable, especially if it is too hot. In addition, Apis cerana colony will also move away if the nest is visited by pests such as birds, lizards, or large butterflies. Trigona family (known as klanceng) which has properties that are more adaptable to new environments seems to be suitable to breed..

c. Capacity building both for local community and KPH workers.
There is also demanded for capacity building for local communities, especially for other skills out of farming skills. Currently, KPH has been conducting trainings. However, for the development of new activities, such as the cultivation of silkworms, honeybees and ecotourism, intensive assistance is needed [24]. Capacity building is also needed for KPH employees, especially at the resort level, which has an important role in facilitating the community [25].

d. Integration between ecotourism and other activities (e.g. agroforestry, silkworm raising, honeybee raising).
It is inevitable that tourism on KPH area is in great demand. Therefore, it is necessary to integrate ecotourism with other activities that have been carried out by the community such as agroforestry, silkworm development, and honey bee raising. Innovation is needed so that these agroforestry activities have a relatively significant contribution in fulfilling the needs of people's lives. Locations that have developed into tourism objects are an opportunity to integrate these agroforestry activities with tourism activities. The selection of plant types for agroforestry generated by tourism will determine the income from this activity. According to Lugina, Indartik, Pribadi, & Wibowo (2020), in their study on the development of agroforestry integrated with ecotourism in RPH Mangunan show that coffee and guava plants provide a positive NPV value, which means they are feasible to be developed [26]. It is expected that the integration can benefit both for ecotourism development itself and
the income generation of other schemes. The integration also play a role in avoiding farmers leaving farming activities and supporting local food availability.

e. The design of community involvement activities must also calculate the benefit/cost and risk analysis so that losses can be avoided. Detailed planning from each design which include benefit/cost and risk analysis is necessary to avoid failure/loss. This should also be completed by monitor and evaluation to assess whether the design of community involvement has achieved the objectives [27]. With the benefit/cost analysis, local community can consider the benefit/losses they will receive. Economic benefit is one of the factors that is considered by the communities in determining whether or not they will participate in a forest management activity [28,29].

f. Support from other stakeholders to farmer groups to succeed the schemes. There is a need of supports from other stakeholders to farmer groups to conduct community involvement schemes [30]. In this case, KPH play an important role in building and maintaining relationship among the involved stakeholders [31]. Example for this strategy is such that local governments, such as tourism offices, promote ecotourism offered by local communities. To attract visitors to RPH Mangunan, dissemination of promotions through various media is an important marketing strategy to be implemented [32].

4. Conclusion
Community involvement in RPH Mangunan land management has provided certainty of community access in managing KPH land area, has increased public awareness about the importance of protecting forests, and has provided income. There are four patterns of land use in RPH Mangunan involving the community, namely: (1) spices intercropping, (2) mulberry intercropping, (3) honey bee keeping, (4) ecotourism. Of the four patterns, the use of KPH land area for ecotourism provides the highest income for the surrounding community, as much as IDR 9 million/HH/year. The development of mulberry and bee keeping is still not promising because they are still at the initiation stage. The income from the activities of managing the KPH land area is still below the needs of one household based on Yogyakarta provincial minimum wage. Apart from carrying out agricultural activities on their own land, some community members have other sources of livelihood. To increase the community's income and support forest sustainability, there are some strategies need to be taken.

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