Income adaptation of farmers as long covid-19 pandemy on sustainable ub forest management: a case from Indonesia

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Abstract. This study has analysed farmers' income on their adaptation as long Covid-19 pandemic in University of Brawijaya (UB) Forest. UB Forest got a management right of State Forest Management (Ministry of Forestry and Live Environment/MLEF Indonesia). Preliminary, this forest was managed by State Company Forest, namely Perum Perhutani. But, in 2015 it was transferred to the University by MLEF Indonesia for Education and Training Centre. The agricultural plantation has conducted by 824 farmers who were involved in UB Forest management. There are 16 fields of farmers' land use in 514 ha area. After the forest transfer to the UB Forest, there was no clear how farmers right adjusted the vision and mission of UB. This research wants to analyse how the income adaptation farmer as long Covid 19, right and obligation as a shape of participation, and UB Forest management with qualitative approach. Selected respondents were in-depth interviewed. The analysis method used Institutional Analysis Design/IAD (Ostrom, 1999) and Bundles of Right (Ostrom, 1990). Farmers adaptation as long Covid-19 on forest management at UB Forest based on bundles of rights as a Claimant. It means that farmers had two right as below: 1) access and withdrawal right (enter the land, cultivate agriculture land, land conservation, harvest the agricultural yield, watch the forest fire along with UB Forest Team, implementation innovation of UB civitas academic, maintain the tree in UB Forest area, including in education and research of UB) and 2) management right on an agricultural plantation under the tree (a decision the species of agricultural plant, manage the plant, and arrange the cycle of the plantation itself). The income of farmers as long as Covid-19 was declined 39 % from the normal condition.

1. Introduction

The University of Brawijaya is a university located in Malang East Java Province. In 2015 this university was given forest by the Ministry of Live Environment and Forestry (MLEF) of Indonesia. The wide was 514 hectares and located on Karangploso District Malang Regency East Java Province. The altimeter was 700-1200 sea above level. This forest was a tropical rain forest that consisted of a production forest and protected forest. Before it transferred to the University of Brawijaya, it was managed by Company State of Forest, namely Perum Perhutani. The process was done in 2015 by Decision Letter of MLEF with number: 676/MenLHK-Setjen/2015 about Establishment Forest Area as Specific Purpose on Protected (42.72 ha) and Production (471.28 ha) Forest in Karangploso District, Malang Regency, East Java Province widely 514 hectares as an Education and Training
Forest [3-4]. Furthermore, this forest has managed as a Tridharma of the university, i.e., as an education, research, and community service development.

The University of Brawijaya managed the forest, namely UB Forest. The vision and mission of UB Forest were different from Perum Perhutani. Perum Perhutani worked the forest as a profit-oriented company while UB Forest was an education and training forest. The Strategies of UB Forest management were: 1) optimising the authority and bargaining position of UB Forest in forest and environmental management, 2) human resources of UB Forest should focus on strengthening national and international cooperation targeting education, research, and community development (i.e. Tridharma of University), besides developing the industry of forest yields and environment, 3) increased support from regional and central government, and from other stakeholders for fundraising and sustainable management, 4) enhancing the technology and information, 5) management planning on forest area by exploring the role of community in forest management, and 6) developing entrepreneurship in forest and environment management by a) minimising the monopoly of forest yields and coffee marketing, b) enhancing the sustainability of forest ecotourism, wood and non wood productions, c) local community recruitment as a forest guider, and d) regularity of community services in forest institution management, and law enforcement to maintain the forest regulation [4].

According to the fifth strategy, UB Forest management included community roles in and around the forest. It was named a farmer. The number of a farmer who worked in UB Forest land was 824 farmers. Their activities as long as working in the forest were different between State Forest Company/SFC (Perum Perhutani) and UB Forest time [6]. In the Perum Perhutani period, farmers who were involved in the forest worked on the forest land. They must maintain the primary plantation, e.g., Forest’s standing stock (mahoni and pine trees). They also must give the 3 kilograms of pine latex dairy to the Perum Perhutani, besides space utility of land among the trees. The transfer of ownership between Perum Perhutani and UB Forest implied the difference of vision and mission. But, the farmers’ involvement was still going as UB Forest as a new manager. As long as the covid-19 pandemic, it influenced agricultural activities. There is no data about how it affected the income of farmers. This research was essential to analyse how the farmers’ income was affected by this condition.

2. Methods

This research was conducted in June-July 2020. The location was in Dusun Sunbersari Tawangargo Village, Dusun Sumberwangi Donowarih Village, and Dusun Buntoro Ngenep Village. The type of research was qualitative. Data used primary and secondary data. The primer data were collected by field observations, in-depth interviews with farmers, and government selected by snowball sampling. Respondent of farmers selected by snowball sampling based on age class standing stock in UB Forest.

There were four age classes (3, 5, 6, and 7) of standing stock in UB Forest. In series of age class classification were: 1) Third (3) was the standing stock with 15 years old; 2) Fifth (5) was 25 years old; 3) Sixth (6) was 30 years old, and 4) Seventh (7) was 35 years old. Then the existing farmers for each class of age were selected by snowball sampling. Analysis data used descriptive analysis of farmers’ roles based on their right stratum as property rights bundles (Ostrom, 1999).

3. Results and discussion

Since 2015, UB Forest’s management has had bundles of rights as followed: 1) access and withdrawal rights, 2) management rights; 3) exclude non-right people; and 4) without tradable rights. Access and withdrawal rights mean that UB Forest can do all activities into the forest and take advantage of its yields. It was like a non-wood product, limited wood yields suitable with the regulation, services of forest, ecotourism, education and training, research, and community services.

The topography of UB Forest area varied as followed: (a) Slope of 0-8% was (40.97 ha); (b) > slope of 8-15% was (484.89 ha); and (c) slope > 15% was (23.81 ha). The average rainfall per years was 250 mm, and an average temperate was 27°C. The accessibility comes into the forest was become three gates (Table 1). Gate A is located in Zona 1 through wonokoyo area, gate B located in
Zona 2 through sumberwangi, gate C located in Zona 2 turn right before wonokoyo, and gate D in Zona 3 through Bocek [10].

**Table 1. Area of each category of slope gradient**

| Slope (degree) | Area (Ha) | Proportion (%) |
|----------------|-----------|----------------|
| 0-8%           | 40.97     | 7.45           |
| 8-15%          | 484.89    | 88.21          |
| >15%           | 23.81     | 4.33           |
| **TOTAL**      | **549.67**| **100**        |

The vegetation in forest protected area of UB Forest consisted as trees and shrub, as followed: 1) trees group gintungan [(Bischoffia javanica), dadap (Erythrina lithosperma), anggrung (Trema orientalis), ringin (Ficus benjamina), kesek (Muntingia calabura), gondang (Ficus variegata), tepus (Etlingera solaris), puspa (Schima wallicii), eukaliptus (Eucalyptus spp), durian (Durio zibethinus), avocado (Perse Americana), breadfruit (Artocarpus altilis); and shrup group 2) bamboo (Bambusa spp.), fern (Cycas spp.), and kaliandra (Calliandra calothyrsus). Hereafter the protected forest, the production forest had a different formation of vegetation. In this area consisted of the industrial woody and agricultural plantation. Management of two kinds of plantation-based on the regulation of MLEF that woody was managed by UB Forest and agricultural plantation was managed by farmers (Table 2).

**Table 2. Potential of Woody and Agricultural Plantation in UB Forest**

| No. | Species | Age Class (AC) of Standing Stock | Agricultural Plants |
|-----|---------|----------------------------------|---------------------|
| 1.  | Pine (Pinus merkusii) AC 2-7    | Talas (Colocasea esculenta), coffee (C. robusta & Arabica), carrot (Daucus carota), and chilli. |
| 2.  | Mahoni (Swietenia mahagoni) 1977, 1979, 1982 | Talas (Colocasea esculenta), curcuma (Curcuma longa), cassava (Manihot esculenta), coffee (C. robusta & Arabica), and chilli. |
| 3.  | Suren (Toona surena) 2007       | Talas (Colocasea esculenta), cassava (Manihot esculenta) |

The space among the pines plantation in the field was 3 x 3 meters. At the area, farmers utilised by growing agriculture plants as following: coffee, carrot, ginger, curcuma, chilli, etc. The species of agriculture plant was defined by the farmers. They had an obligation to manage the land and maintain the standing stock of trees. It had been held since the 1980s when State Forest Company/SFC (Perum Perhutani).

Some set of regulations were used as management guide: 1) National Education System Law No. 20 year 2003 (Staatsblad year 2003 number 78, Staatsblad number 2301); 2) National Development Planning System Law No. 25 year 2004 (Staatsblad No. 24 year 2004, Staatsblad number 4421); 3) Indonesia Teachers and Lectures Law No. 14 year 2005 (Staatsblad number 4586); 4) Indonesia National Long-term Development Plan Law 2005-2025 No. 17 year 2007 (Staatsblad number 33 year 2007, Staatsblad number 4700); 5) University Education Law No. 12 year 2012 (Staatsblad No 5336);
6) Government Regulation of National Education Standards No. 19 year 2005 (Staatsblad No. 14 year 2005, Staatsblad No. 5339) as amended for the last time by Government Regulation No 32 year 2013 of Amendment Government Regulation No. 9 year 2005; 7) Lectures Government Regulation No. 37 year 2009 (Staatsblad No. 76 year 2009, Staatsblad No 5007); 8) Government regulation of Fund for Education No. 48 year 2008 (Staatsblad No. 91 year 2008, Staatsblad No. 4864); 9) President Regulation of Indonesian National Qualifications Framework No. 24 year 2012; 10) Ministry of National Education Regulation of Strategic Plan Ministry of National Educational year 2010-2014, as amended for the last time by Ministry of National Education No. 44 year 2010; 11) Ministry of National Education Regulation of Statute University of Brawijaya No. 34 year 2011; 12) Minister of Administrative reform and Bureaucratic Reform of Lecturer Functional Position and Credit Score No. 17 year 2013 as amended for the last time by Minister of Administrative Reform and Bureaucratic Reform No. 46 year 2013 Amendment of Minister of Administrative Reform and Bureaucratic Reform regulation No. 17 year 2013 of Lecturer Functional Position and Credit Score; 13) Indonesia Forestry law No. 41; and 14). The Special Purpose Forest Area rule is explained on P15/MENLHK/SETJEN/KUM.1/5/2018 the year 2018.

UB Forest management's strategy was suitable with its characteristic, the community around the forest, and finally proper with Tridharma of University, e.g. education, research, and community development [3]. Priorities strategy were: 1) optimisation UB Forest management; 2) Human resources development in Tridharma implementation; 3) National and International support for the forest sustainability, and 4) Increasing Information and Technology.

4. Farmers characteristic

UB Forest was surrounded by three villages, e.g. Tawang Argo, Donowarih, and Ngenep. The primary livelihood was a farmer. There was a farmer group, namely Kelompok Tani Sumber Makmur. This group was formed to organise the member. All member planted coffee species in the forest land. The size of the land cultivated under the trees was varied. There was 0.5 ha until 3 ha. That land scattered on different age class of UB Forest. The existing of land and agricultural each farmer laid in different of age class standing stock.

It can found on the land two kinds of farmer types. The wide land of each farmer was varied. It was from 2000 meter per sea till 10.000 m per sea. One was as a Magersaren. It means that the farmer who lived in the forest area as a worker [8] and the have land agricultural in the UB Forest. They didn't have a house. They depended on State Forest Company. Since 1970 State Forest Company had a program to make their worker's housing, namely Magersaren base-camp. The obligation of Magersaren should do anything of forestry work. It was lax tapping, wood harvesting, pruning, skidding, and log transporting to the wood store location.

Magersaren communities are people who do not own their cultivation land so that their lives are highly dependent on the intercropping land granted by Perum Perum Perhutani for reforestation activities. It was as well as relying on Perum Perum Perhutani forestry work, such as sap tapping, logging, thinning, skidding.

The second was a Pesanggem. Pesanggem was a farmer who was not living in the forest, but they have agricultural land in the UB Forest. The number of farmers was more than Magersaren. Sometimes they did the ground by themselves, and sometimes they did not do. They only gave the financial land operation by another farmer. The land of pesanggem was not fixed, often it happened illegal transfer to another person. So the handover of the land, it caused the messed upland cultivation. It was forbidden to an illicit transaction of state forest area. It happened since Perum Perhutani operated to this location. The settlement of Magersaren consisted of huts made of wood branches, roofing with alang-alang grass or dry leaves in the forest area and continue to move around following the work rotation of Perum Perhutani. Magersaren tends to be rated as a poor community. In Pakistan, another occasion based on [1] stated that forest officials provided timber and fuelwood was just 14% and 10%, respectively. The kinds of agricultural plants depended on the family, owners/tenants, and fellow-farmers' opinions. It was likely too with the farmer behavior in UB Forest.
agricultural plants. They decided the kinds of plants based on economic section, environmental benefit, hereditary planting habits, and market demand.

Since the 1970s, Perum Perum Perhutani (SFC) started to launch a program to build magersaren settlement units in the forest area with the building of semi-permanent houses. It provided for farmers working on intercropping land called magersaren base-camp. This base camp was not an improvement from the long-standing magersaren community but is a new settlement unit for intercropping farmers and Perum Perhutani supervisors in temporary forest areas. It was occupied temporarily during the planting work contract [8]. In the other farmer context, [9] have categorized the assets of community forest farmers in the following terms: (i) human capital; (ii) physical capital; (iii) natural capital; (iv) social capital; and (v) financial capital. Human capital refers to the number of persons in the community categorized as of productive age: all of the magersaren and pesanggem farmers sampled in this study fell within the productive age group. The activities performed by all farmers comprised both agricultural and non-agricultural endeavors. The community-based forest (HKm) farmers had 14 sources of income, while the farmers of the privately-owned forest had 12.

Magersaren and Pesanggem were different farmers. UB Forest continued SFC pattern with the new management. UB Forest tried to in good arrangement between the right of the land and its capability. Firstly, activity was conducted by mapping the land based on the age of a class of trees and the farmers' rights. It founded that many farmers had many lands in the other area. Contrary to this condition, not all the land was right in good cultivation. Some were left unused. UB Forest tried to manage the disorder of this right by identifying, mapping, and communicating with the farmers to get well administration of the land.

UB Forest should make it well-managed the land and the farmers. They were driven by the effectiveness and efficiency of land use. The purpose was the equity and welfare can increase. In the future, It could not find unused land. The farmers should adapt to the policy of UB Forest management. Magersaren and Pesanggem will manage base on their capability and responsible for land management. Land and farmers were taken as a sample based on stratified sampling and administration region (Table 3).

| No | Dusun | Village      | Swath | Σ Farmers | Plantation            |
|----|-------|--------------|-------|-----------|-----------------------|
| 1. | Sumber | Sumbersari   | Tawang | 85        | 32 Pine, Coffee       |
|    | wang   |              | Tawang | 90        | 6 Pine, Coffee        |
| 2. | Sumber | Sumberwangi  | Donowar | 91       | 30 Pine, Coffee       |
|    | wang   |              | Donowar | 93       | 16 Pine, Coffee       |
|    |        |              |        | 94        | 14 Pine, Coffee, Vegetable |
|    |        |              |        | 97        | 8 Pine, Coffee        |
|    |        |              |        | 100       | 3 Mahogani, Coffee    |
| 3. | Bunto  | Buntoro      | Ngenep | 98        | 40 Mahogani, Coffee, Talas |
|    | ro     |              | Ngenep | 99        | 44 Mahogani, Coffee, Talas |
|    |        |              |        | Total Farmers | 193                   |
The administration region in UB Forest has founded 3 Dusun (Sumbersari, Sumberwangi, and Buntoro) and 3 Villages (Tawangargo, Donowarih, and Ngenep). There were nine swaths (85, 90, 91, 93, 94, 97, 100, 98, and 99). Farmers in the sample were 193. Meanwhile, the plantation in that area was pine, coffee, and talas. Based on data obtained from the interviews, the age of respondents ranging from 32 years to 58 years. The level of education of all informants is only up to elementary school. The income of each informant varies from 1,500,000 to 5,000.00. It is because the area of agricultural land owned by informants also varies. But according to the respondent, the income earned every month as a farmer still lacks to meet daily needs. So some respondents also have other jobs as traders, so they get an extra income.

The existence of COVID-19 affects the habits of farmers in UB Forest. Moreover, at the same time, Covid-19 coincided with the primary harvest season and calls for a government lockdown due to the pandemic causing harvest prices to drop dramatically. One of the changing habits of farmers is in labor, which is usually for harvesting; they employ workers from outside the family, but because of the pandemic and the concurrent harvest, they only use workers from within the family to reduce costs incurred are not too high. They can still set aside for their daily lives. Many of the farmers interviewed did not grow vegetables due to pandemics, and they only depend on the coffee plants even though the production of this year's coffee is not as good as in previous years.

The selected respondents begun with recommendations from predetermined key informants. Researchers took information from key informants aimed at validating the data from interviews with respondents. The head of the farmer group was chosen as the key informant because he coordinated directly with UB Forest and the farmers. Director of UB Forest had an authority to regulate the management and decisions regarding the management of UB Forest.

Respondents selected lived in the state forest area. Formerly, the term used by SFC in people who lived in forest areas is Magersaren. The Magersaren community was a farm employee who worked for Perum Perhutani, or an organization is living in a state-owned forest area. The kinds of work were land clearing, planting, maintaining plants, and protecting the forest.

The existence of the Magersaren community has existed since SFC era. Perum Perhutani (SFC) had permitted them to live in a forest area. The objective was to integrate reforestation with activities to increase the income and welfare of forest village communities. In this context, farmer groups are formed around agroforestry on forest land and activities conducted on farmers' private land, animal

![Figure 1. Number of a farmer of each village and swath category](image-url)
husbandry, small-scale industry, and public character activities such as building facilities for clean water, bridges, and village roads [11]. They could not make a permanent residence. Besides, the Magersaren community was also required to maintain the staple plants owned by SFC. The Magersaren community has a variety of agricultural activities under the main stand of pine trees. They plant crops that are seasonal - chili, corn, cassava, turmeric, and taro. In comparison, the annual plants cultivated by the Magersaren community were coffee plants. Most of them also worked as farms worker whose owners are capital owners and come from outside the village. Every day they were paid Rp. 30,000 for female workers (approximately 8 hours of work/day) and Rp.50,000 for male workers (around 8 hours of work/day)[5].

Table 4. Farmers Income before and during Covid-19

| No | Plants    | Total Cost (Rp) | Revenue (Rp) | Income (Rp) | Plants    | Total Cost (Rp) | Revenue (Rp) | Income (Rp) |
|----|-----------|-----------------|--------------|-------------|-----------|-----------------|--------------|-------------|
| 1  | Corn      | 2,455,000       | 3,450,000    | 995,000     | Chili     | 2,900,000       | 4,800,000    | 1,894,000   |
| 2  | Chili     | 12,530,000      | 24,000,000   | 11,740,000  | Turmeric  | 770,000         | 2,000,000    | 1,230,000   |
| 3  | Turmeric  | 600,000         | 2,200,000    | 1,600,000   | Carrot    | 2,364,747       | 5,500,000    | 3,135,263   |
| 4  | Cassava   | 1,160,000       | 2,800,000    | 1,640,000   |           |                 |              |             |
| 5  | Taro      | 2,730,000       | 4,500,000    | 1,720,000   |           |                 |              |             |
| 6  | Average   | 3,539,000       |              |             | Average   | 2,086,421       |              |             |

Figure 2. Average farmers income (IDR)--before and during COVID-19

Even though food is always needed by the community, due to PSBB (Large-Scale Social Restriction), which is carried out in several areas, UB Forest magersaren farmers experience problems during a pandemic. For example, farmers cannot freely sell their crops. Suddenly the Coronavirus made people's purchasing power decrease, accompanied by a reduction in commodity prices because supply increased, but purchasing power decreased. Some farmers continue to harvest and sell their crops even though lower prices and not a few farmers leave their crops not harvested until they die. To keep earning income during a pandemic, they rely on coffee plants that they have planted for a long time to be harvested. According to the farmers interviewed, the price of coffee is not too affected by this pandemic. The income of farmers as long as Covid-19 was declined 39 % from the normal condition. Before Covid-19, farmers' income was IDR 3,539,000, then after IDR 2,086,421 (Table 4 and Figure 2).

The farmers' existence in this forest area will be optimized according to their abilities and capacities to assist in the planning and management of UB Forest. The community is expected to help the UB Forest carry out supervision in social, economic, and environmental settings. Besides, the
location of Sumbersari Magersaren is usually used by UB Forest to facilitate students to conduct research, practicum, and other activities that support education. The Magersaren community of Sumbersari Magersaren helped to meet the adequacy of facilities provided in the forest area, such as water, tools or working tools, etc.

5. Conclusion
UB Forest management's sustainability depended on knowing the real characteristic itself, how the actors involved, and the regulation implemented. Priorities strategy were: 1) Optimize UB Forest management; 2) Human resources development in Tridharma implementation; 3) National and International support for the forest sustainability, and 4) Increasing Information and Technology. The handover farmers consisted of Magersaren and Pesanggem managed by Tridharma University implementation-education, research, and community service.

Farmers adaption as long Covid-19 on forest management at UB Forest based on bundles of rights as a Claimant. It means that farmers had two right as below: 1) access and withdrawal right (enter the land, cultivate agriculture land, land conservation, harvest the agricultural yield, watch the forest fire along with UB Forest Team, implementation innovation of UB civitas academica, maintain the tree in UB Forest area, including in education and research of UB) and 2) management right on an agricultural plantation under the tree (a decision the species of agricultural plant, manage the plant, and arrange the cycle of the plantation itself). The income of farmers as long as Covid-19 was declined 39% from the normal condition.

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