



## Ethno-ecology of Komplangan Field of the Bromo, Tengger, and Semeru Area in East Java: A Qualitative Approach

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### Abstract

This research supports the sustainable environmental development, especially at Perhutani area. The objective of this ethno-ecological study was to know relationship between daily life of local people related to their agroforestry practices in edge of the forest belong to Perhutani at the landscape of Bromo Tengger Semeru-East Java. The Non-Timber Forest Products (NTFPs) showed the importance of the forest for the local people. This study covered the perception and conception traditional management system of environment by the local society and also impact of their activities. Data were collected by applying ethno-ecology research methods. Quality of data were measured by means of participatory ethno-botanical appraisal (PEA) and some research methods included semi-structural and open discussion, in-deep interview, direct observation and plants identification. The results showed that development and management of the natural resources, in Komplangan agroforestry, were highly related to the plant conservation policy. The land use system was adapted from indigenous knowledge which consisted of holly sites (Pedanyangan), worship sites (Sanggar Pamujan), cemetery area and terrace. The conservation model and traditional knowledge in agricultural practices could be used as a model of komplangan area which should be taken into account as the key of biodiversity conservation. Traditional knowledge from these integrative studies will support the sustainable development of NTFPs.

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## INTRODUCTION

Indonesia is a country that has a mega biodiversity, cultural diversity, and resources that are unique, attractive and high potential but have not widely known yet. They also have not been used to support community life. In addition, the local wisdom shall be considered to develop policies in terms of society welfare. Purwanto and Waluyo (2011) stated that one of the potential resources was Non-Timber Forest Products (NTFPs) which had the relationship among the biological, socio-economical, culture aspects in the real life of local people. They also explained the importance of the interdisciplinary and holistic study as well as its analysis of the above-mentioned phenomenon due to their alternative strategic management for the forest resources.

The definition of NTFPs is the biological material except wood from forests that can be used as food, vegetables, fruits, medicinal materials, poisons useful, crafts, and some of the materials for religious rituals in the local community. This product can be utilized directly by local people in their daily lives. It is urgently needed developing the management such as the understanding how to exploit the NTFPs. Moreover, there must be conducted a cooperative discussion among institutions related to NTFPs which involves the local communities, the forestry, and the local authorities. The discussion shall be addressed to the responsibility of the sustainability of NTFPs by balancing aspects as follows: aspects of the ecosystem, cooperation, institutions, and technology.

In addition, it is well known that in the edge of the forest is inhabited by the people from Java, Tengger, and little bit population of Madura. The Tengger people was the ancient of Java people that preferred to live in the rather isolated areas in Bromo, Tengger and Semeru mountain areas especially on the edge of the forest (Batoro, 2013). They had their own traditions, culture, religion, art, dialect, informal organizations, and institutions. Most of them were traditional farmers, and only a small percentage of those working in the fields of trade, tourism etc. For their life survival, the Tengger people developed several adaptation strategies for using the biodiversity resources by domestication (related to their habitat). Javanese people who lived together with them had adapted to the people Tengger's lifestyle there (in Malang, Lumajang, Pasuruan and Probolinggo districts) (Batoro et al., 2013).

However, Maduranese only lived in Probolinggo and Lumajang districts. Local people's li-

ves depend on biodiversity around them. The way to exploit and manage biodiversity was related to the way of thinking, culture, and traditional knowledge (Rambo, 1983; Taylor, 1990; Ellen, 1993; Zahorka, 2007). The local people were known to have a lot of traditional knowledge related to the management of their resource sustainability. This could be supported by the Ethno-ecology which provided the fundamental connection between culture and the environment (Toledo, 1992; Cotton, 1996, Sheil, 2004). Additionally, Sheil (2004) and Waluyo (2008) stated that the ecological factors influencing cultural patterns and social organizations in the community. As a social creature, people were always in need of the corporation among social groups for their survival.

Bromo Tengger and Semeru National Park (BTSNP) and Perhutani had the responsibility to protect forest functions such as a hydrological regulator. In this case, the vegetation had a vital role maintaining the normality of water drainage function. Various used land (yard, agroforestry, forest production, natural forest etc.) in these areas affected the variety of climates and micro-climates.

Based on the above ideas, it is important to have an ethnoecological data relating to local communities in the criss-cross model of forest utilization (Komplangan) from various aspects such as their traditional organization, the perception of NTFPs and their environment (Stockdale, 2005). Data analysis and its applications will be implemented in the management of NTFPs including economic, social and cultural as well as innovation in conservation for sustainable development. Ethnoecological studies of local communities determine the relationship of local knowledge in the daily life of local communities related to their agroforestry on Perhutani forest at the edge of landscape Bromo Tengger Semeru, East Java. The results of this study are important to be used as basic information of NTFPs. Traditional knowledge from these integrative studies (including the indigenous concept and perception of the correlated environment with Komplangan Perhutani management system and the impact of their activities) will support the sustainable development of NTFPs.

## METHODS

The research was conducted in Komplangan Perhutani that covered interviewing of local people, such Javanese (Java people), Maduranese (Madura people) and Tengerese (Tengger people) in a few districts (Malang, Lumajang, Proboling-

go and Pasuruan). The two steps of the research activities as follows:

Detail of ecosystem in the area was described, including type of vegetation, soil structure and fertility, fauna, topography of the area and its climate.

Exploring the local people perception about their way of thinking to the environmental and biological resource management. For these purposes, the standard anthropological methods as direct survey, and being involved in the daily people activities were conducted. Open-ended and in-deep interview and also semi-structured interview were implemented for gaining important information from the leader of the local people, leader of local religion (dukun pandhita), and some special people who were expert for this information (Cotton, 1996; Hoffman & Gallaher, 2007; Batoro, 2015).

Moreover, the study was continued to analyze the local people activities related with their productivity by asking description about their management for the biological resources (Backer & Bakhuizen Van DenBrink, 1968), and its technology, products, and also the impact to the environment.

## RESULTS AND DISCUSSION

### The environment and landscape descriptions of Komplangan Perhutani.

Perhutani located on the outer side BTSNP bordered several cities, namely Malang, Probolinggo, Pasuruan, and Lumajang. The Perhutani forest consisted of protected and production forest. The forests were signed with specially marked boards. Protected forest was actually derived from primary forest, while the production forest made by Perhutani for supplying woods and latex to industries. These supplied woods included several species such as Mahogany, Teac, Wadang, Suren, Jabon, Pine, and, Poo (Eucalyptus).

The protected forests were made to conserve the land and its watershed. In recent years, Perhutani also had developed NTFPs as the object for tourism. There was plenty of Teac wood (*Tectona grandis* L.) grown in Lumajang district because the soil conditions and their latitude were suitable for the plants. In some of this area were also cultivated industrial plants. In addition, there were wild grasses grow such as *Kerinyu*, *Menjari*, *Paitan*, *Telekan*, and several species of ferns (Pteridophyta). Some of the edible wild plants such as vegetable fern, *Pokak*, *Ranti*, *Piji* and bamboo had been found. Some plants were able to be used as firewood (*Paitan* and *Kerinyu*) and as animal feed

(grass).

The landscape has developed as an adaptation of the local community as a result of their culture in response to their environment (physical, social and natural). Sheil et al., (2004) stated that used land is the concept of space management in general and holistic patterns and covers an area of terrain, soil, ground cover and the utilization of the territory. The landscape could be seen as a cultural frame. The cultural life philosophy could be realized as a regulatory and social values or rules (in institutions) which define the relationship between humans and their environment where they live in, among people and between people and their God. This regulation was committed by people as holly concept for their basic law of their life. Here, the regulations were implemented for the landscape for their settlement, the settlement itself, and the house, yard, garden, the Komplangan and sanctuaries.

Tengger village usually located on the hill, the plain or in an area that lies between the hills. All of them are not too far away from water sources. There is also the possibility to form a terrace so that it can build a patch in many directions. The important thing is that they are protected from the blowing wind. The settlements are aggregated. This is very different to the settlement of the Javanese which are accompanied by their farms and animal housing. The settlements in Tengger village do not have big trees but some ornamental plants, and ritual plants are available.

During the research carried out, the settlements have been changing significantly from the original type. They are mounted with electricity, cement and fitted with tiled floors but they always conserve their kitchen. In the kitchen, they always place the middle long bank in front of the shelter of both the left and right sides. Exactly in the central, in front of the shelter, there are a very short table, and a hanged chain for the hot water pan. There is also a hanging plate, located directly on the upper side of the shelter for food storage function. In the kitchen, there are some tools such as *tampah*, *lesung*, *alu* and fire woods.

In the tradition of Tengger, it is not allowed to sit on the coffee table in front of the shelter and it is also forbidden to jump in the wood fire that is still burning. There are also special rooms for food storage which is named as *Pedaringan* or *Petaringan*. There are certain other rooms to sleep and it is called as *Peturon*, *Sedongan* or *Kamar*. Each house of Tengerese has no fence. However, it has a special place to hang and to store of their harvested maize (*Zea mays* L.)

The house is a place for the people to pro-

protect themselves from heat, cold, wind, rain and the disturbance of wild animals. People build their houses with a long process, especially for people who live on the edge of the forest; their house is built like a modern house in the city. Many of them leave their traditional form of the house due to the better economic levels.

The people, who came from Tengger, Jawa, and Madura, are common to have Gubuk. The Gubuk is a small house in the garden. Gubuk has multi-function i.e., supporting their economic activities, as supporting their agricultural activities, placing their cultivated animal and for their trade activities. That the reasons for them are why having Gubuk is very important. For the Tengger people, Gubuk or Pondokan has completed with the shelter, sleeping bed, but it is also functioned for grain storage, keeping their cattle, storing their seed and keeping their agricultural tools such as hoe, crowbar, cetok, strings, load stick, het and pontang. It is important for the Tengger people because their gardens are far approximately 0.5-10 km away from their house. They use their Gubuk also for their discussion place among them to plan the agricultural activities and also as the trading site for their harvested crop.

Every house of the Tengger people, who follows Hindu as their religion, always put Padmasari in front of terrace and in front of their guest room. They also have the bedroom, bathroom, and the multi-function kitchen (as the place of refuge). The typical Tengger village always has Punden or Danyang or Sanggar Pamujan or Pure for their worship and cemetery. But in recent fact, recently, they also have the mosque, the church as well as school and medical clinic (Puskesmas) and village clinic (Pukesdes). There is a special location in the edge of the forest that belongs to Perhutani that is called as Magersari which is functioned as Komplangan. Perhutani offers that location for the people by allowing them to cultivate the crop between the standing big trees for their life needs.

There is a word "Danyangan" which means "a statement about it is not allowed to leave good habit", because the people are given the responsibilities to keep the standing trees belong to Perhutani. In the Magersari area, the people are also allowed to build houses. Usually, the form of the houses was similar each other. They built their semi-permanent houses by using bamboo and woods available there. The layout of the houses consists of the terrace, guest room, sleeping room, kitchen, bathroom and also a special room for their cattle. They build their houses in Magersari uniformly. In addition, the society structure

in Magersari is similar to the other villages in Java. Some houses in the certain area establish Rukun Tetangga (RT). Magersari in Duwet Kedampul village has two RT, Patok Picis village has two RT, in dusun (a part of village) Karanganyar Senduro has five RT which are consisted of 170 houses.

Unfortunately, the Magersari has no their own school and cemetery. The only one cemetery is located in Perhutani area. There is shelter houses in the plantation (Persil) in Kecamatan (district) Senduro (Figure 1B). According to the informant (Mr. Ngatim) formerly, they were also included in Magersari area but the people was transmigrated to the outside Java, therefore the houses did not have resident anymore. Recently, there are 5 families who live in these houses. These families livelihoods just similar to the other people in the Magersari. They cultivated corn, taro (Talas), chili, cabbage, potatoes, onion, carrot and Damar tree. But the Damar tree is not well-developed.

There are other forms of Magersari/Komplangan but the work regulation is more official. That is the Pesanggem. Pesanggem is a special location in the edge of the forest which is belongs to Perhutani (for example Duwet Kedampul) (Figure 1A). Perhutani also offers the location for the people to support them by allowing the people to cultivate the crop between the standing big trees for their life needs. The people are given the responsibilities to keep the standing trees belong to Perhutani.

In the Pesanggem area, the people are also allowed to build the houses. Usually, the form of the houses are similar each other. They build their semi-permanent houses by using bamboo and woods that are available there too. The design of the houses consists of the terrace, guest room, bedroom, kitchen, bathroom and also a special room for their cattle. They build their houses in Pesanggem not uniformly like in Magersari.

In Pesanggem, the people cultivated the good quality of seed, and they already used the schedule of planting, fertilizer and pesticide in the area without irrigation. They take out the weeds and they follow the planting instruction from government (Perhutani) (Figure 2). The people in Pesanggem got their Pesanggem area from Perhutani and they are regulated by LMDH. They are responsible for keeping the industrial trees such as Pinus, Mahony, Teac, Jabon, Wadang, Suren, Poo, Damar, Pasang, Cemaragunung and Sengon belong to Perhutani. Between these trees, the people who have Pesanggem area are allowed to cultivate cabbages, onion, potatoes, *Astruli*,

*Brokoli*, banana, carrots, *Ercis*, corn, cassava, coffee, *Kerut*, *Talas* etc. Actually, some variety of the banana is not recommended by Perhutani since they can reduce the productivity of latex-producing trees. Another necessity plant is coffee. The coffee is planted under the canopy of the other trees.

The soils in the Pesanggem area are sandy, clay-sandy, and sandy-clay soil. People identify the black or dark brown soil color to define the very fertile soil due to the organic contents. They have the manure fertilizer from their cattle, shave and chicken manure for their un-fertile soil. The people also know the wild plant well because it grows beside the main cultivated crops. The wild plants are Teki (*Cyperus rotundus*), Bandotan (*Ageratum conyzoides*), Teh-tehan (*Eupatorium triplinerve*), Jaringan (*Sonchus* sp.), Kuningan (*Wideliamentana*), Ranti (*Solanum nigrum*), Cimplukan (*Physalis angulata*) etc. In addition, they also exactly know how to treat the soil in the slope area. They are familiar with “belt terrace” if they obtain area in the slope area for the water flow. They know well how to treat the plain area as well as the areas between the hills.

Traditional ecological knowledge faced by the people in the Pesanggem area were formed by the landscape and geographical condition, the altitude, latitude, soil slope, mountain area, climate, air temperature, and the regularly eruption of Bromo mountain. They could influence the way of their life. Unfortunately, nowadays, we have no solution to overcome the sulfur gasses and volcanic dust from mount Bromo eruption to the area of Probolinggo district.

The implementation of the agricultural activities which were done by the people in Komplangan played an important role in the land conservation. Gubug was also important to facilitate people for working. The long distance of Gubug from the settlement is also giving the positive impact for their healthy. Terrace area, that being developed, is very appropriate for the soil conser-

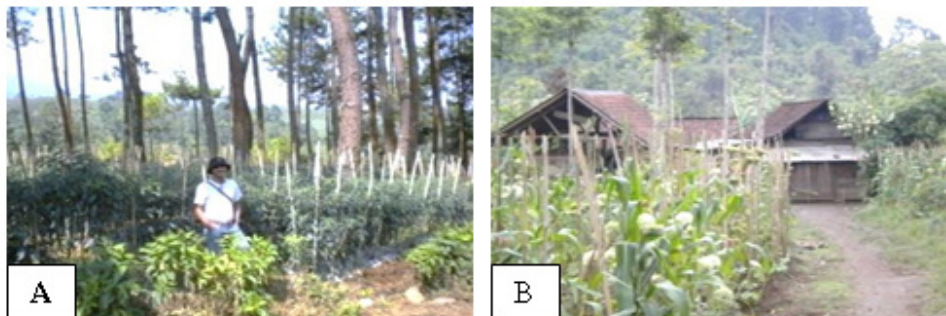
vation. It is very good for the vegetables crop and the other economically competitive crops. Agroforestry is an appropriate agricultural best practice in this case.

The Cemara gunung (*Casuarina junghuhiana* L.) variety is proven to be the best standing trees for protecting from erosion. They have one wise word “cutting one tree, planting 10 trees”. It is very good conservation methods. They have to find the other species of trees rather than those Cemara gunung to be conservation trees. The implemented local law is considered to support the environmental conservation. The existency of Danyangan, Sanggar Pamujan, and cemetery, which are covered by high diversity of trees and shrubs and inhabited by some fauna, is very important to be conserved.

The aggregated settlement is the very good term in supporting the social togetherness among them. In the settlement there are not big trees since they are afraid for the great wind caused fallen trees. Besides of that, the existence of the big tree close to their houses cooler the air temperature. Kitchen concept is a unique because it becomes discussion place of Tengger people. The kitchen is not only for cooking but also for family gathering and for a refuge. Gubug has also functioned not only as storage of their agricultural products but also for their trading activity and for temporary rest site during their agricultural activities.

In Tengger area, there is some conservation area which follows the word: The creator is, who responsible to the nature. Pedanyangan is believed as a place where the soul of our ancient gathering. In this place, the Tengger people give their offer and they pray to get the success in their life and to achieve their needs.

On the other hand, there is Danyangan that is completed the worship, the holy big trees. Those trees are the mark of the site where the Tengger people start their traditional and ritual ceremony (Batoro et al., 2013; Batoro, 2015). These are the species of the very old holly trees



**Figure 1.** Komplangan. (A) Pesanggem in Dusun Magersari Duwet Kedampul with their variety of pinus-chilli. (B) Shelter house in Senduro Lumajang.

**Table 1.** Land use system of Komplangan in Perhutani area

Kind of Landuse	Ownership	Land Function
Settlement area (Magersari village)	Perhutani	Settlement
Conservation area: a.Forbiden forest b.Holly sites c.Protected area, production area d.Cemetery	Perhutani	Conservation
Nature area: a.River b.Protected forest,BTSNP c.Water fall d. Water sources	Perhutani BTSNP	Nature
Agricultural, tourism, education area: a.Komplangan Tourism b.Education (e.g ; c.Ledok Ombo Camp) d.Poncokusumo, for Pramuka activities) c.Sports area	Perhutani	Cultivation, tourism and education

(hundred years) such as Cemara gunung (*Casuarina junghuhmiana*), Danglu (*Engelhardia speciosa*), Beringin (*Ficus elastica*), Pampung (*Uranthe javanica*), Kayu kebek (*Ficus grassulasioides*). Especially, in the villages Wonotoro, Paitan, Lombok udel, Endro and Trabasan, Danyangan are marked and separated with another common area with Bambu Ori.

Usually, Danyang has relationship with the religious leader that called as Dukun Pandit-ha, Wong Sepuh and Legen. Danyang is a site inheritance from their ancients for praying, worship, praying site to get the safety of life. Danyang means also a holy site, which comes from their ancient that cannot be left because they protect the area surrounding them.

Some traditional ritual ceremonies are very common in the culture of Tengger such as Pujan, Barikan, Kasada, Karo, Hajatan and Entas-entas. Sanggar Pamujan is a site for praying and for Unan-unan ceremony that are held every 5 years for 1 year completion in Tengger Calendar. These places are for giving offer for the ancient spirits.

In Unan-unan ceremony, there must be a Buffalo available for being offered with its head and its skin must be placed on the big special place called Ancak (made from Bamboo). This Ancak with its head and skin of Buffalo will be brought by the Tengger people to go around their village. That is why the Sanggar Pamujan is considered to be important.

In addition, there were several potencial places to be developed to support the conservati-on program. These places included cemetery and

tourism area which were described as follows:

**Cemetery**

Cemetery which had to be built as the village was built for the first time. The Tengger people believe that in cemetery there are a lot of the spirits of their ancients since they are as a last rest place for them. In some villages Bambang and Dusun Magersari Karanganyar Desa Burno, the cemetery site is in Perhutani area. Especially in Bambang village, Sub-District Wajak, the cemetery is also in Perhutani, whereas there is Pedanyangan with a lot of variety of trees i.e., Beringin (*Ficus benyamina*) and Krakap (*Ficus* sp.). Similarly, the cemetery of Dusun Magersari of Karanganyar Bruno village in district Senduro, is also located in Perhutani area but with different species of trees such as Damar, Andong (*Cordal-ine fructifosa* (L.) A. Chev., Jati (*Tectona grandis*) and Pinus (*Pinus merkusii*). The people that are in-habited in the edge of forest also have their own cemetery with other varieties of tree species and it depend on the altitude of their area.

**Tourism Area**

There are some potential places for tour-ism in the Komplangan area that have not been developed professionally. Some possibilities tour-ism objects and activities appropriate for the visi-tors are waterfall, little lake (Ranu), Arung Jeram recreation, nature tourism, holy sites, nature pan-orama in agricultural area, natural forest, moun-tain bike riding etc.

Besides Perhutani area and Bromo Teng-



ger Semeru National Park (BTSNP) there are a lot of unique objects that potential for tourism development. The objects are the mountain, little lake (Ranu), sandy area (Lautan Pasir), water fall, flora and fauna, and also the holy sites. But it is necessary to conduct collaboration among the stakeholders related to tourism such as local government, Perhutani, BTSNP and the local people in the edge of the forest. They must sit together to develop anticipation of the impacts.

According to the informant (Mr. Furqon as an official of Perhutani) (Figure 2), Perhutani has developed Ledok Amprong tourism in the special site in Perhutani area (site 52A) with the width of 6.7 ha. This tourism area was established by the head of Poncokusumo in Malang on 31rd May, 2014. The unique of this area was located in the Perhutani but it still was inhabited by the people (called as inclave area). The tourism objects in that area are: Tubing, mini-tract (for mini trail bicycle), camping ground for 500 people, jogging track in the forest, apple picking, and tree home-stay.



**Figure 2.** The officials of Perhutani as the initiator of the local tourism development of Ledok Amprong in site 52 A of Poncokusumo district

### The Collaboration of Local People and BTSNP and Perhutani

The collaborations of local people and Perhutani were implemented as Local People Society of Village-Forest which was called Lembaga Masyarakat Desa-Hutan ((LMDH). They were collaborating forest management (Pesanggem) as well as The Drinking Water Instalation that giving positive results to the people such as for the people in South Ngadas village, so they could get drinking water from the water sources of BTSNP area (ca 6.7 km from Ngadas village) in Ayak-ayak forest.

There is a great waterfall located in BTSNP area. The local people called this waterfall as The Tirta Wening. Then, in BTS area there is a water source that could be utilized by the people in Senduro. In addition, there were other waterfalls

such as The Sumber Pitu waterfall in Perhutani area, and The Coban Pelangi waterfall in Perhutani area.

The conservation forest in BTSNP and Perhutani very important areas that must be strictly conserved since its function as a buffer zone for controlling watershed. The watershed area plays the important role for water sources conservation. These water sources are very important for drinking water in the mountain area. For this reason, it is to plan the conservation activities both short term and long term which will be conducted by the stakeholders.

Those programs can be the guidance about the importance of the forest, water sources and environment. The stakeholder shall understand how to conserve water sources for the drinking water. The water source conservation will consist of Gubuklakah area, Sumber Pitu water source, Greja water source which belongs to Perhutani, Coban Pelangi waterfall, water source in Ngadas, Andeman water source in Wajak, and also water source in Poncokusumo, Pandansari, Tumpang area and in other villages.

For the reasons above, it is an urgent to conserve the forest in relation to the conservation of water sources and waterfall in those areas. For realizing those planning, in Komplangan area it was initiated to establish farmer association to manage, use and conserve the forest wisely. The association has produced a kind of corporation management for forest namely Komplangan Regulation.

In this Komplangan regulation, the people inhabited in Komplangan area were allowed to utilize certain forest areas belong to Perhutani by planting some crop for their life with the responsibilities to keep the industrial trees belong to Perhutani. These species of the industrial trees were Mahagoni, Poo, Suren, Jabon, Pinus, and Coffee. It was possible for the members of the local people association to rent the land of Perhutani. In addition, Perhutani and BTSNP have conducted a partnership in planting Suren and Jabon Trees in sloping lands that need to be conserved.

### CONCLUSIONS

The local people in Komplangan adapted their culture to their environment in planning the land utilization in villages that led them life in harmony with nature. The various utilizations of several parts of Perhutani and BTSNP areas resulted in both positive and negative effects. The positive effect was proven by the positive economic for related people and Perhutani and BTSNP.

The local people could get the crop products that were cultivated in Komplangan area beside that they were allowed to stay in the part of forests which belonged to Perhutani. Moreover, the industrial plants of Perhutani could be kept by the people in Komplangan. The negative effects caused by the Komplangan were the used land change, erosion, reducing of water debit produced by water sources and waterfall, and the suppression on both of flora and fauna species diversity.

Especially for developing the tourism, it is urgently needed to manage the livestock such as goat, pig, chicken, as well as environmental resources which have to be conducted in corporation among the stakeholders (Perhutani, BTSNP and the local government). The dependence of the local people on the fire woods should be taken into account as the primer needs of the people similar to the food. Traditional knowledge from these integrative studies will support the sustainable development of NTFPs.

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