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KNOWLEDGE AND CULTIVATION OF NON TIMBER FOREST PRODUCT (NTFPs) FOR LOCAL COMMUNITIES AT PESANGGEM PERHUTANI, BROMOTENGGER SEMERU, BIOSPHERE RESERVE, EAST JAVA INDONESIA

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ABSTRACT

This study aims to reveal the indigenous botanical knowledge system of the local community about the diversity of beneficial plants, how to use and manage them in Komplangan Perhutani, Magersari or Komplangan is part of the administrative area of the Kalurahan, a village in a sub-district in Indonesia. Study on Non Timber Forest (NTFPs) was conducted in Magersari area Bromo Tengger Semeru village. The Bromo Tengger Semeru Biosphere Reserve is unique in East Java, Indonesia. Traditional ecological knowledge for environmental conservation with isolated farming systems. The purpose of this research is to reveal species of biodiversity and ethnobotany aspects. The research was conducted using open ended interview, indeps interview, structural, and direct observation an index of cultural significance (ICS). The result of this study used more than 184 species of plants from the local community. Local people use plants in various uses, including food (57 species), medicine and poison (40 species), Perhutani industrial wood (23 species), building materials, firewood and local technology (21 species), conservation (21 species), forages (30 species), fruits (15 species) and rituals (20 species). Furthermore, after calculating the cultural significance index (ICS) it showed that maize (*Zea mays*) had the highest value and eight species had the highest value in local culture. The results of this study are very important to be used as basic information and evaluation studies of non-timber forest products (NTFPs). Management of biodiversity and indigenous knowledge is very important for further development.

Keywords: Knowledge of plants, local society, Perhutani

Introduction

Non-forest timber forest products (NTFPs) are all biological materials other than wooden building materials and are taken from natural forests for human consumption, for example vegetables, fruits, medicines and poisons, crafts and other benefits. The views of the NTFPs community as the main livelihood are rattan, jernang, resin gum, lawet, swallow nest forest honey, incense sap, and other groups, but with results. Purwanto and Waluyo (2011) stated that the handling of NTFPs more generally on forest products is not only forest extracted from plant diversity, but also fish, game animals, fungi, and other elements contained in a forest ecosystem that cannot be separated. A timber or forest is not intended for forest products (NTFPs) seen from several different interpretations between those that are suspended from personal interests and their goals. According to Sheil *et al.* (2004) and Purwanto (2011) there are some opinions that oriented is a heavily on development or more in on the conservation. A timber or non-forest product (NTFPs) can be seen from several different interpretations, depending on personal interests and goals.

The assumption that is oriented towards development (construction) considers NTFPs as an important economic resource that must be utilized optimally and possibly without

destroying nature. However, NTFPs that are economically oriented do not think it is too important to ignore the existence and the fact that land can be converted into more and more useful. The general public understands that NTFPs are only a by-product of the forest, but can also be in the form of sap, because the main products are lawet, bird's nest, rattan and others. Meanwhile, the prospect for NTFPs, construction materials for loggers, is neglected and is a by-product. The NTFPs that have been selected for management may have more than one use, for example, commercial uses (Stockdale, 2005; Purwanto, 2011).

People live from generation to generation from their ancestors, they depend on forest resources for their lives to meet their needs with biological resources with the guideline that forests are a gift from Sang Hyang Widhi for such a prosperous life (Batoro, 2017; Batoro *et al.*, 2017). Ethnobotany inter disiplinier pertaining to the study of human cultural and plants (Cotton, 1996; Purwanto *et al.*, 2004). Human beings would always concerned with the environment in which they live. This happens in the Tengger, Java, Madura and most of them live in the agricultural sector and have implemented strategies, technical adaptation, agricultural techniques, production techniques, traditional medicine techniques, on management, conservation of plant

biodiversity in accordance with environmental conditions that very interesting to evaluate. The local people have a lot of knowledge about land development, biological resources which are not only influenced by historical customs, but also available natural resources, soil fertility, fields and straight jobs. Human dependence on biodiversity and procedures for their diversity of the cultural, concerned therefore the importance of what has been reviewed the draft and comprehension and control the processing of biological resources (Taylor, 1990).

The knowledge of local people actually provides a valuable opportunity to understand the benefits of biodiversity, the ecological landscape around them. The agricultural system, the biodiversity that they have done to the environment where's the information will assist in understanding history landscape, the patterns of vegetation landscape the past, present and future. The ecosystem Bromo Tengger Semeru ecological that are an important source water sources; (hydrological), genetic, biodiversity conservation but is vulnerable to damage the habitat, soil erosion and can cause (Sheil *et al.*, 2004).

Currently, a lot of traditional knowledge about plants and their various kinds that have been lost can mean the loss of these traditional plants or many plants that have not been known or reviewed for information are experiencing erosion due to the rapidly changing environment. A system of local knowledge derived from the accumulated in their interact with the environment having generally pranata, customary norms that are the fundamentals of the socio-culture a group of people (Cotton, 1996; Purwanto *et al.*, 2004). Sheil *et al.* (2004) reported a number of very different conceptual approaches have been employed in human ecology. The aims of this research is to determine the biodiversity of the people of Tengger, Java and Madura as village forests and to study the role of biodiversity resources on the local community.

Materials and Methods

This research was conducted in April 2014 until November 2017. It was conducted in Komplangan, pesanggem or Magersari Perhutani area that covered sampling of local people both Javanese people, Madura people, and Tengger people in a few districts (Malang, Lumajang, Probolinggo and Pasuruan) (Figure 1). Ethnobotanical data works by direct observation on site and surveys. This in-

depth interview method uses respondents and daily activities that involve the local community. The use of free interviews (open ended interview) are to takes knowledge (perception, conception) and management of the types of work. The respondents consist of a society that has a good knowledge of plants including the society and local experts. An index of cultural significance, ICS from (Cotton, 1996; Hoffman & Gallaher, 2007), it has the purpose and function for measuring the interests of the public's life. To calculate the index of cultural significance in the equation is as follows:

$$ICS = \sum_{i=1}^n (q \times i \times e)_{ni}$$

$$i = 1$$

For the plant which has several uses, and equally be as follows:

$$ICS = \sum_{i=1}^n (q_1 \times i_1 \times e_1)_{n1} + (q_2 \times i_2 \times e_2)_{n2} + \dots + (q_n \times i_n \times e_n)_{nn}$$

$$i = 1$$

Captions:

ICS = Index of Cultural Significance, was almost from scratch using a type of n, as of 1 where is it in the th (n); I am the first to that country, and so on. While the value of the parameters of a type of was as follows: q = value (value); the quality of providing with a score or rating on the quality of a species of plants, for instance, five = a staple food; the four primary, secondary and supplementary material three = of foodstuffs, other material of a secondary; two = rituals, greek mythology, recreation and others; i = mere recognition. i = the intensity (intensity value); to portray the use of the plant are useful to put a value on for example: The value of the crossing drainage; very high five = 4 in moderate high-intensity use; usage; while the three = 2 lower intensity of their use; usage of 1 and value of being rare. e = value eksklusivitas (exclusivity values) for example, two = most favored, constituting a principal and two option; i = there is some type that it might be an option, and 0.5 being or constituting a secondary source a secondary nature. Identification of using the Flora of Java and Backer & Bakhuizen van den Brink.



Fig. 1 : Situation of the Perhutani boarding house area in the Bromo Tengger Semeru Biosphere Reserve environment

Result and Discussion

Knowledge society buffer biodiversity of plants

The local resident are supports Perhutani and the characters of plants, naming local, identification and classification based on the value of the benefits. Characterization of pertaining to the disclosure of the plant are practicals and used by the Javanese, Tenggerese and Maduranese. Identification is a vital part in the introduction, with regards to the use of the plant communication management which is beginning the research ethnobotany. The local residents have long been the principal characters in identifying by used the existing criteria includes the morphology, sensorial, ecology, mechanical and mythology.

Criteria morphology is used to identifying shapes and textures either roots the trunk, leaves, flower, fruit and seeds. The morphological used with regard to their activities for example, a ritual of customary planting potatoes. The potato (*Solanum tuberosum*), the seeds extracted as egg, the ritualistic character of a flower tanalayu, edelweiss (*Anaphalis javanica*, *Anaphalis longifolia*), ringin (*Ficus benyamina*), tlotok (*Curculigo capitulata*), putihan, senikir (*Tagetes erecta*) and various cultivars of the banana (*Musa paradisiaca*) having a special character. Criteria involved: the color, the shapes the measure as another feature exhibiting characters can be used to compare to the others for example, lombok-eggplant pungent taste red and blue color, like that of a ring a man (young); bamboo are distinguished between bambu betung (*Dendrocalamus asper*) and bambu jajang (*Gigantochloa apus*), putihan (*Buddleja indica*) where a lower part has creamy white color.

The typical of medical plants consists of sempretan, sere (*Agropogon citartus*), jambuwer, peach (*Prunus persica*), dringu (*Calamus acorus*), poo (*Melaleuca leucadendron*), a white wood and the surface of the peculiar. Mechanical criteria used among the strength and durability of some plants, like a cemara gunung (*Casuarina junghuhniana*) building and firewood for better than the other types. By the number of the knowledges of biodiversity and plants fruit are known by locals outlined in table 1.

The diversity of plant used for food

The use of a variety of local foods of foodstuffs, food supplement, vegetables, fruits, a condiment, and in a relatively high covering consists of cultivating plants 57 species. Cultivated as a major food producer carbohydrates are jagung, corn (*Zea mays*), kentang, potato (*Solanum tuberosum*), ganyong, arrowroot (*Canna edulis*), mbote (*Calocasia esculenta*), bentul (*Xanthosoma violacium*), pohong (*Monihot utilisima*) and tela (*Ipomoea batatas*). Vegetables types that dominate economic terms and wider land moor includes bawang prei (*Allium fistulosum*), kobis (*Brassica oleracea*), potato (*Solanum tuberosum*), tomat, tomato (*Lycopersicon esculentum*) ercis (*Pisum sativum*), mustard (*Brassica oleracea*), tumber (*Coriandrum sativum*), benguk (*Mucuna pruriens*), mushrooms grigit (*Schizophyllum commune*) etc. The kind of domestic includes papaya (*Carica papaya*), srikaya (*Caricapubescent*) to custard apple, jambuwer (*Prunus persica*) any of various cultivars of the banana (15 cultivars), terong belanda (*Cyphomandra betacea*), ciplukan (*Physalis angulata*). While largely a fruit derived from Tengger. Kind of spices are bawang putih (*Allium sativum*), brambang (*Allium*

cepa), kunir (*Curcuma domestica*), *Coriandrum sativum*, salam (*Eugenia polyantha*), padi, rice (*Oryza sativa*), klop, coconut (*Cocos nucifera*) which supported from outside the country (Batoro et al., 2017; Batoro, 2018; Santoso et al., 2019).

Diversity of building materials, firewood and local technology

Plant diversity that aimed for building material firewood and local technological includes 21 types. The best wood material to build houses is cemaragunung (*Casuarina junghuhniana*) and the other wood is tewel (*Artocarpus heterophylla*), firework (*Michelia champaca*), dadap (*Erythrina variegata*), damar (*Agathis alba*), bamboo: jajang (*Gigantochloa apus*), betung (*Dendrocalamus asper*); mindi (*Melia azedarach*) and pinus (*Pinus merkusii*). Tengger and local society's technology includes various species of farming utilities, household appliances for hunting, a war on catch fish transport, a garment, fiber and assorted, art (jaran kepeng, bantengan) and traditional musical instruments. And in the materials used in the local covering of bamboo plants comprising bamboo betung (*Dendrocalamus asper*) for roofing bamboo jajang (*Gigantochloa apus*) used for building material household appliances, firewood, traditional art, customs, rites jambu wer (*Prunus persica*), cemara gunung (*Casuarina junghuhniana*), tewel, jackfruit (*Artocarpus heterophylla*), etc. Pertaining to the art of using the dried tanalayu flower (*Anaphalis longifolia*), paitan (*Tithonia diversifolia*), distilled from the bamboo jajang and children playground, a penjalin (*Calamus* sp.). The harness jajang Tengger bamboo are used to dancing, ujung-ujungan for the Sodoran and Karo show, while bamboo and sudang to make jaranan. Beside it fagots has a very important role in supporting residents living conditions which environmentally cold. However, the need for drastic decrease that caused by gas stove is very beneficial for both sides and biodiversity conservation society Perhutani.

The diversity of plant and poisonous and drug

The locals use traditional medicine and poison about 40 types of flower plants, most of which are plants; grass herbs. Asteraceae and trees, mostly small lichens and fungi use to deal with all kinds of disease. They said that there's a pain is good for physical and spiritual. They don't use traditional medicine and get rid of this sort of magical, where knowledge are might from experiences. According to exchange experiences and their own culture, it relates with us. Healing the wounds which the sap for the pisang, banana (*Musa paradisiaca*), alang-alang (*Imperata cylindrica*), ciplukan (*Physalis angulata*, *Physalis pruviana*), etc. Nosebleed use of drugs: the leave sirih, piper (*Piper betle*), leaf ganjan (Asteraceae). Pain and fever in the summer and *Acorus*, prenjalin (*Calamus* sp.), bawang prei, garlic (*Allium sativum*), adas (*Foeniculum vulgare*), dadap leaf (*Erythrina variegata*). The leaves or young, use of jambuwer (*Prunus persica*), umbutpiji or young of stem (*Pinanga coronata*), the eyes of the younger flower cubung (*Brugmasia suaveolens*). Toxic plants includes bedor, amethyst; trabasan, kemaduh, klateng, tubo, ganjan, dancukan (*Gardenia palmata*) and etc. To increase the vitality and appetite includes: ranti (*Solanum nigrum*), Lombok, chili (*Capsicum* sp.), klandingan (*Albizia lophanta*), jae wono (*Zingiber officinale*). The use of biological diversity of drugs by the spread chewed, boiled, polished drunk and it also

called suwuk. The drugs has the impact was that modern youth change the view that less practicable in folk medicine are unrealistic and mystical (Batoro and Ekowati, 2017). Traditional medicine is an ancestral heritage and is an economic driver for people (Kristianto *et al.*, 2020).

The diversity of plant in traditional rituals

The local residents putt the various custom types in connecting with the rituals. The ritual of customary society Tengger divided into ritual of customary pertaining to the common people, a life cycle pertaining to a farm build houses and symptoms of nature. Similarly, the Java is still using the event began, from birth marriage, death until thousandday (nyewu). Diversity of plant used for ritual purposes custom is adhesive a local society which covers 20 species. A kind of ritualistic society Tengger in canning gedang ayu, in the form of jambe, kembangboreh, petra, tetamping, tuwuhan and ongkek. Ongkek includes various species of which have the plants sprouted or branched like a lot, fragrant (*Pandanus amaryllifolius*), pisang, banana (*Musa paradisiaca*), piji (*Pinanga oronata*), jagung, corn (*Zea mays*), alang-alang (*Imperata cylindrica*), pari, rice (*Oryza sativa*), klop, coconut (*Cocos nucifera*) of interest, a youthful and market foods. Petra was puppet (man) made from plant material includes: senikir (*Tagetes erecta*), tanalayu, edelweis (*Anaphalis javanica*, *Anaphalis longifolia*), tlotok (*Curculigo capitulata*), pampung (*Unanthe javanica*), bamboo betung (*Dendrocalamus asper*), as bone bambooajang (*Gigantochlea apus*) as a rope. A ritual performed pertaining to death shamans given by Pandhita Tengger (Siswanto and Batoro, 2019; Batoro *et al.*, 2019). The monument and sacred place in Pedanyangan, grave and Sanggar Pamujan covering of chiefly evergreen tree (*Casuarina junghuhniana*), danglu (*Engelhardia spicata*), kipres (*Casuarina* sp.), beringin (*Ficus benyamina*), ilat-ilat (*Ficus callosa*), pampung (*Oranthe javanica*), kebek (*Ficus grassulasioides*), aren (*Arenga pinnata*) and bendo (*Atocarpus elasticus*).

The diversity of plant materials for fodder

The cattle on the run are lots of pork and goats but with the beef. Many people migrating to dairy cattle kraal as in the village of candlenut the poor. Animal is the most developed and the flesh of bulls to pick up the process of fattening it more profitable for profusion of the forage grasses. With varying pet and forage grass of good quality and they also raised beef and the swine besides using as a manure in processing agricultural land. The fodder plant includes 30 species. A major animal feed areas truli (*Pennisetum purpureum*), endro (*Caliandra haematocephala*), tereside (*Gliricidae sepium*) and the wild plants for example: pinjalan (*Capillipedium parviflorus*), grinting (*Cynodon dactylon*), petungan (*Equisetum debile*) and teki (*Cyperus rotundus*).

Table 1 : The amount of the work of local people

No	Categori of the utilization	Number species
1	Groceries	
	Vegetables: a leaf. The trunk, bud, flowers	34
	Sources of carbohydrate, tubers, roots rizoma, seeds	9
	Spices: herbs and roots rizoma, the trunk, of a leaf	23
	Fruit	15
	The drink	2
	Fungi	4

2	Wild plants	84
3	An ornamental	3
4	Plant fiber and a rope	4
5	The musical instruments and play	9
6	An instrument (households, agriculture, weapons)	10
7	Producing latexs and resins	2
8	Firewood, building, was technology local	21
9	Fodder	30
10	The ritual of customary	20
11	Poisonous herbs and medicines	40
12	A hedge plant and conservation	21
13	Others: kinang materials, cigarettes	3

The diversity of plant and conservation

The knowledge of a hedge plant and biodiversity conservation from the local resident is maintaining the land, komplangan, and the environment. The main plant that can be used as a hedge plant is endro, cemara, trabasan, delekan, telekan, kerinyu, kipres as a good crop faced collapse, restrain the water sulphur vapors and more. Tufted herbs are used for hedges and conservation is 21 species is used in addressing the land's slides spruce (*Casuarina junghuhniana*), putihan (*Buddleja asiatica*), astruli (*Pennisetum purpureum*), jarak, castor bean (*Ricinus comunnis*), cubung, angel-tears (*Brugmasiasu aveolens*), mentigi (*Vaccinum variegatum*), jambuwer (*Prunus persica*) and dadap (*Erythrina variegata*). The others are on trial in an area covering Tengger consist of jabon (*Adina cardifolia*), suren (*Toona sinensis*), the drug is to enter the white wood and adas (*Fœniculum vulgare*).

Table 2 : The utilization of useful and ICS local people

No	Scientific names	A major utility	Other uses	ICS
1	<i>Zea mays</i>	Staple food	1,2,4, 5	66
2	<i>Casuarina junghuhniana</i>	Building material	5,8,11, 15	40
3	<i>Coffea arabica</i>	Spice	5,6,7,8	36
4	<i>Musa paradisiaca</i>	Fruits	5,6,7,12	54
5	<i>Solanum tuberosum</i>	Extra foods	5,6, 7	38
6	<i>Gigantochlea apus</i>	Building material	2,5,6,8,11,14	38
7	<i>Pennisetum purpureum</i>	Fodder	8,14	42
8	<i>Dendrocalamus asper</i>	Local technology	2,5,6,8, 14	38
9	<i>Ficus benyamina</i>	Leaf	5,6,7,12	38

Captions : 1. Staple food, 2. Primary food, An additional (tuber, vegetables, fruit), 3. Building materials, 4. Fodder, 5. Ritual, 6. Myth, 7. The medicine, 8. Conservation, 9. Seasoning, 10. Rope, 11. Equipment, 12. Wrapper, 13. Fertilizer, 14. Firewood.

Index of culture (ICS) useful plants

An index of culture significance (ICS) intended to uncover the extent of the most important and an essential Tengger used for social life. A total of 184 species Tengger recorded in the use of the plant. According to the number of people category ICS Tengger having an abnormally high (65) that is used for wheat is a staple food, rituals, supplement, the medicine, cakes and myths. Tufted herbs having high category (38-65) by 8 additional types, are used as food vegetables, fruits, rituals, a condiment, a stimulant, myths, the rope, firewood, food, fodder, fertilizer, building, conservation and the premises (2) the table. The results shows apparently ICS highest value of jagung, corn (*Zea*

mays) and lofty fir, covering kopi (*Coffea arabica*), kentang, bamboo jajang, bamboo betung, ring in (*Ficus benyamina*) and astruli (*Pennisetum purpureum*). It is important as policy base the government. Value was ICS pohong (*Monihot esculenta*) among other things (ICS 32) sempretan, strawberries (*Fragaria vesta*) and kates, papaya (*Carica papaya* and *Carica pubescent*) (ICS 22), bawang prei, leek (*Allium fistulosum*) (ICS 36), mustard or sawi (*Brassica oleracea*) (ICS 22), ganyong (*Canna edulis*) (ICS 18) can be developed further in the economy. Weakness ICS avoidable with the result of a variety of sources, the calculation is based on the results of the value, the intensity and level of the where value ICS can change in the course of time (Stockdale, 2005; Purwanto, 2011).

Conclusions

The study of the management of forest and non-timber products (NTFPs) by the knowledge of the local community is an introduction to what was once a good potential disclosure that can be put into practice. Magersari village local knowledge can be used as a learning innovation and a unique cultivation model.

The inventory that very useful is about 184 species, it used by locals as food and cultivate (57 species), a type a wild plant (84 species) of drug and poisons (40 species), a type building material firewood, and technology (21 species), a local the forest Perhutani (23 species), a type fodder (30 species), a type a hedge plant and conservation (21 species), the type the ritual of customary (20 species) and fodder (30 species).

The result of reckoning ICS jagung, corn (*Zea mays*), have an abnormally high (66) with eight of the following: ICS tall, cemara gunung (*Casuarina junghuhniana*), pisang, banana (*Musa paradisiaca*), ringin (*Ficus benyamina*), kentang, potato (*Solanum tuberosum*), kopi, coffee (*Coffea arabica*), bambujajang (*Gigantochlea apus*), bambu betung (*Dendrocalamus asper*), Astruli (*Pennisetum purpureum*), jagung, corn (*Zea mays*), *Allium porum* and kentang, potato (*Solanum tuberosum*) the indication it has paid dues in public's life supporting by Perhutani.

Suggestions

The high and lofty ICS should use one of the parameters of neighboring areas to determine the types of economic and the used of a local sustainable management and biodiversity. This information can be used as policy base and evaluation of the potential inkomplangan or pesanggem Perhutani biosfer reserve Bromo Tengger Semeru area.

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