Resource Potential Analysis Of Honey Bee Feed Apis Dorsata In Mountain Tinanggo Kolaka

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Abstract: Honey Bees feed in the form of nectar, pollen and water, the bees used to build nests, and establish colonies. A hexagonal honeycomb as a store of honey, pollen and seedlings. If feed honey bees (flower plants) are abundantly available continuously, then the always active bees build nests, and fill each cell nest of honey, pollen, eggs, and other products. The purpose of research is to determine the types of flowering plants as a potential feed honey bees (nectar and pollen). The experiment was conducted at Mount Tinanggo Kolaka Southeast Sulawesi Province which lasted from March 2013 until March 2014. Determined by purposive sample observations based on the location of the nearest and farthest honey, using the method of terraced paths. Samples were placed systematically with the withdrawal of the central point on the tree path beehive, a radius of 700 meters from the center of the North, East, South, and West. Data type of plant, plant density and stem diameter were analyzed to determine the importance value index and diversity index type at the tree level, trees, saplings, and seedlings. Based on the results of the enumeration on the collected research sites by 591 plant specimens were clustered on the tree level 152, level 102 poles, 178 degree and 159 degree stake seedlings. Levels of tree species diversity and relatively abundant mast high, and the level of saplings and seedlings are relatively abundant. The dominant species on the tree level Meranti (Shorea sp) and rambutan (Nephelium lappaceum), levels Holea pole (Cleistantus laevis Hook f) and Kuma (Palaquium obovatum Engl), the level of saplings and seedlings levels Holea (Cleistantus laevis Hook f) and rambutan (Nephelium lappaceum). There are 237 types of flowering plants, averaging 19.75 per month flowering plants and flowering peak was in September.

Keywords: Honeybees; flowering plants; diversity; important value types.

1. INTRODUCTION

Production in the form of honey bees, pollen (bee bread), beeswax, propolis, royal jelly, bee puppies, bee venom, provides many benefits to humans, especially from the aspect of health. Forests in Indonesia with an area of 129.43 million hectares, providing a place for honey bees to thrive because of the availability of plants with various types of flower nectar and pollen as a provider, as well as providing clean water. The existence of different types of flowering plants in the forest to feed the potential for bees which then contributes to the economy of forest communities. Tinanggo mountain is part of the Natural Park area Mekongga in Kolaka, has rich forest resources will be diversity species, both flora and fauna. The presence of different types of flowering plants into the ideal place for the life of the honey bee, because it can provide a food source in the form of nectar and pollen from flowers of plants. Communities living around Mount Tinanggo make this area as a place to hunt for honey bees that have been implemented over the years.

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Not surprisingly, since time immemorial Mount Tinanggo known as a producer of honey known as honey Kolaka. Although it has long been known as a producer of Mount Tinanggo honey, but until now it has not been proven through research. It is necessary for research on honey bees feed the resource potential in Mount Tinanggo. This data can be used in the planning of resource development for the welfare of honeybees mankind, especially for people who live around the forest, as mandated by the Act No. 41 of 1999 on forestry.

Role of Honey Bees in forest ecosystems

The presence of honey bees in the ecosystem has a role in responding to two things at once ie as pollinators (pollinating agent) for forest plants flowers, and honey producers to increase public revenue. Honey bee products have a high value so as to provide employment opportunities and increase income, particularly for forest communities. Further impact of forest conservation is the maintenance of hydrological functions (regulator of the water cycle).

Availability interest as Honey Bee Feed

The composition of plant species in the forest landscape grows naturally, resulting in flowering time is also different. There are certain times where very little available flowers and even there, there is a time in which certain types of the number of individuals that much, flowering simultaneously and provided so much interest. Research results [1] explains that, the production of coffee per tree flowers peaked in June, July, August, and December, which is between 850 to 1,300 flower buds. Meanwhile, in January, February, May and November only about 370 to 480 florets flowers. Months no interest Coffee March, April, September and October. At the time of the abundant flowers at the same time with an active bee collecting pollen and nectar found in flowers, these materials are stored in the nest shaped hexagonal cells (hexagons), to be used in establishing the colony. Research results [2]), that the activity of honey bees looking for pollen in mountain Geulis Sumedang in October lower than the activity of searching

for pollen in March. This is due to variations in October pollen less and limited than in March.

The need Nectar For Honey Bees

Build a nest, and build a colony of bees, takes nectar, pollen and water. Source of nectar for feeding bees can be obtained from a variety of flowers, where nectar is a sweet liquid obtained from female flowers. Nektar also found in parts of plants other than interest, which is called ekstrafloral. For example, the rubber plant (Ficus elastica) and plant Acacia (Acacia spp), is not derived from the nectar of flowers, but derived from young leaf buds and leaf base. Nektar also can be obtained from Honeydew, namely sugar liquid secreted through the intermediary of a kind of plant lice (Plant Sucking Insects). Each plant species differ in the amount of nectar produced by flowers. [1] states, to 2000 trees Coffee (Coffea sp) can produce nectar 36.29 liters per hectare per day. It can meet the needs of nectar for honey bees stup 250. According to [3]), plant Kaliandra (Caliandra calothyrsus) in one hectare, is able to produce nectar as much as 119 liters per day, or 42 ml of nectar per tree per day. Jonah, et al (2005) stated that the interest Kapok (Ceiba petandra) resulted in 1.08 ml of nectar per flower, 14.58 liters per tree, and 1822.5 liters per hectare. SIH (2005), states that one worker bees can collect 45 grams of honey during his life (about 6 weeks). Honey bee nectar needs every day for every 145 ml bee stup [3].

Requirements For Honey Bee Pollen

Pollen or pollen from the male flowers are used bees as a source of protein, carbohydrates and vitamins. Some types of plants as sources of pollen include corn, palm, coconut, Rice, Leucaena, Klengkeng, Sengon, Kapok, and others. Cultivation of pollen in honey bees require quality and adequate quantity and continuously throughout the year. While pollen in nature is not always available because it depends on the season. [4]) explains, that during the year the need pollen honey bee colonies as much as 30 kg in earning his living. Research results [5], explains that, in the village Harjobinangun potential pollen in honey bees brought to the nest for 4 weeks in October namely; Corn 56.67%, Acacia auriculiformis (Acacia) 13.22%, Peanut 1.04%, Family Papilonaceae 6.05%, Coconut 1.32%, Guava 0.13%, Mango 0.20%, Daughter shy 0.66%, Family Solanaceae 13.5%, Bananas 0.89%, Tamarind (0.66%), and Noni (0.18%). Results [6] explains that the pollen stored in the honeycomb on rubber plantations and cottonwoods, mainly derived from plants wedusan (37.84%), corn (16.09%), serunen (9.87%), and Acacia sp (8.23%). Further explained that the activity of bee pollen carrier allegedly influenced by the presence of: differences in air temperature, air humidity, distance feed resources, and environmental conditions. To the extent strokes hive, pollen and honey, bees collect more pollen when it is in the area of cottonwoods of the rubber in the area, allegedly due cottonwoods distance closer than the rubber.

Bees Migration

Several things can cause bee colonies to leave the nest, which is due to the honeycomb gets insect human disturbance or other, and also because of lack of food sources (nectar and pollen) in the habitat. [7] explains that when there is a disruption in the hive bee colonies, causing vibration, the vibration simultaneously bees responded by rolling waveforms collectively and patterned on each individual in the colony. [8], explains that the Apis dorsata and Apis laboriosa to migrate at least twice a year. He also explained also that the poor environmental conditions, colonies of bees and the queen escape and create an alternative nest and establish a new colony not far from where it was originally. [9] explains that, the ability of bees Apis dorsata can migrate a distance of up to 200 km. Phase migrating bees are critical and vulnerable stage in his life to be able to survive.

2. MATERIALS AND METHODS

The experiment was conducted at Mount Tinanggo Kolaka Southeast Sulawesi Province from March 2013 until March 2014, which includes the activities of measurement and observation, as well as data analysis. Determining the location of the observations selected intentionally (purposive sampling) based on the location of honey bees collecting forest by forest communities 1 point in the farthest and one point at a nearby location. Inventory of plants is done in a circular plot area of 0.1 ha. The plot is built systematically in two straight lines intersecting at right angles to form four directions North, East, South, West. Samples were placed using terraced lines each line length of 700 meters, with 4 plots (distance between plots 175 meters) of each line. Thus the number of plots in each observation point consists of 16 plots. Total plot altogether 32 plots. Each plot consists of the size of 0.1 ha (circular shape) to observe the level of the tree, 10m x 10m (a grid) to observe the level of the pole, 5m x 5m (a grid) to observe the saplings, and 1m x 1m (a grid) to observe the seedling stage. The point of intersection of the center line of the North, East, South and West are on the nest tree (trees found honeycomb on twigs or branches). Observations aimed at the number of species and number of individuals of flowering plants, the number of species and number of individual plants honeycomb, flowering time, plant stem diameter, height and location of the beehive in a tree. Data were analyzed to determine the importance value index, and the index type diversity at the level of the tree, trees, saplings, and seedlings, and create a timetable (calendar) flowering. Importance Value Index (IVI) is used to establish the dominance of a particular type to the other types in other words the position of ecological significance describe a type of community. Important Value Index is calculated based on the sum Kerapan Relative Value (KR), Relative Frequency (FR), and relative dominance (DR) using [10]. Biodiversity is a very useful parameter to describe or to study the effect of biotic disturbance, succession levels or stability of a community in an ecosystem. Species diversity (H ') is determined by using the formula of Shannon-Wiener Diversity Index (in [11]. Value H '> 3 indicates that the high abundance of species diversity, the value of H' = 2-3 shows abundant species diversity are, and H '<2 shows the low abundant species diversity.

3. RESULTS AND DISCUSSION

Overview Location Research

Tinanggo mountain is part of the conservation forest area TWA Mangolo which has an area of 3933.3 hectares, included in the administrative area Kolaka Southeast

Sulawesi Province. Conditions hilly and mountainous topography, altitude ranges from 97 meters above sea level up to 765 meters above sea level. Has climate types according to Smith and Ferguson were on type B. Mount Tinanggo the Rain Forest located at the upstream watershed Konaweha-Lahumbuti which is also a big and important hydrological system for Southeast Sulawesi province, especially in Kolaka, Kolaka East, North Kolaka, and Konawe. There is a district in Kolaka directly adjacent to the forest area in the sub-district of Mount Tinanggo Latambaga. There are 5 villages and one village in the district namely Mangolo village, Kolaka Asi village, Sea village, Latambaga the village, Sakuli village, and Ulunggolaka village. Bee hunter community forest on Mount Tinonggo derived from Mangolo village, village and village Sakuli Ulunggolaka. The livelihoods of forest communities in Mount Tinanggo is more than 70% as farmers and hunters honeybees, the rest as miners, fishermen, trade, service providers, and others [12].

Summary of Number of Species and Individuals in the structure of stands

Based on the results of the enumeration in the study site, the collected as many as 591 specimens, with the largest number of species of trees and the lowest levels in the seedling stage, as shown in Table 1 below.

Table 1. Summary of specimen plants in the stand structure in Mount Tinanggo

Structure Stands	The Amount Individual	The Amount Type
Tree	152	44
Pole	102	35
Stake	178	27
Seedling	159	24

Source: Primary Data After Processed, 2013.

The data in Table 1 above illustrates the stand structure constituent Tinanggo Mountain forest formations, different number of species and individuals at every stage of growth.

Important Value Index of Plants

Importance Value Index (IVI) can be used for the delineation of the type of plant or plants of the most dominating in the region or to establish a dominance kind against other types. The higher the value of certain types IVI the higher mastery and role in the ecosystem is [13]. Plant species found in as many as 55 kinds of mountain Tinanggo. The most dominating type at the tree level is Shorea sp (Meranti) with 38.62% and Nephelium lappaceum (Rambutan) IVI with 32.72%. Plant a tree with IVI levels of more than 10 can be seen in the table below.

Table 2. Plant IVI tree level in Mount Tinanggo

Depth Trees	INP
Meranti (*Shorea sp*)	38.62
Rambutan (*Nephelium lappaceum*)	32.72
Kolaka (*Parinaria corymbosum*)	17.78
Holea (*Cleistantus laevis Hook f*)	16.09
Risi (*Evodia celebica Hats*)	14.20
Polio (*Cinnamomum parthenoxylon Meissn*)	13.91
Eha (*Castanopsis buruana*)	13.72
Kuma (*Palaquium obovatum Engl*)	13.28
Pondo Benu (*Cinnamomum subavenium*)	10.07

Primary data after being processed, 2014

[14] stated that the presence of Shorea sp (Meranti) of dipterocarp family is an indicator of the condition of a stable ecosystem (climax) because of the types of Shorea sp always be on the same conditions as the primary forest (succession climax). Type Shorea sp. and Nephelium lappaceum both need help pollinating insects such as honeybees. The plants and bees mutually beneficial association, which the bees need flowers for nectar and pollen obtain, and the plant species that require bee pollination (the union of the pistil and pollen) take place. It was alleged that the existence of a mutually beneficial association between these two types of plants in the presence of forest bees, causing the kind capable of dominating in forest ecosystems at Mount Tinanggo, especially at the level of the tree.

Tabel 3. IVI Plant trees in Mount Tinanggo

Pole levels (local name and latin)	INP (%)
Holea(*Cleistantus laevis Hook f*)	34.49
Kuma (*Palaquium obovatum Engl*)	29.23
Rambutan (*Nephelium lappaceum*)	25.28
Kolaka (*Parinaria corymbosum*)	19.49
Eha (*Castanopsis buruana*)	16.68
Satu Lambu (*Sandoricum kuecapi*)	16.27
Warau (*Eugenia sp*)	11.27
Puloli (*Quercus celebica Miq*)	10.31

Data Primer setelah diolah, 2014

Type Shorea sp at the level of the pole is no longer the dominant species are not even in the IVI group> 10, but was replaced by the type Holea and Kuma, and the type of Rambutan become the third. This is possible because Shorea including the types of recalcitrant seeds are not drought resistant, and will soon germinate when it fell to the ground. Any flowering period but will not bloom every year 3 or 4 years. It is suspected as the cause of why Shorea species does not appear on any level or in the forest stand structure. While these types of Holea and Kuma thought to be tolerant types, which only grow well if there is shade. The types that dominate the stake levels are Holea (Cleistantus laevis Hook f) IVI with 45.56% and Rambutan (Nephelium lappaceum) IVI with 44.30%.

Table 4. IVI Plant saplings in Mount Tinanggo

Depth Stake (local name and latin)	INP (%)
Holea(*Cleistantus laevis Hook f*)	45.56
Rambutan (*Nephelium lappaceum*)	44.30
Eha (*Castanopsis buruana*)	18.69
Kuma (*Palaquium obovatum Engl*)	16.58
Puloli (*Quercus celebia*)	16.13
Kolaka (*Parinaria corymbosum*),	15.57
Meranti (*Shorea sp*)	15.56
Wia (*Baeckea frutescens*)	11.61
Pondo (*Lithocarpus glutinosus*)	11.58
Satu Lambu (*Sandoricum kuecapi*)	10.51

Primary data after being processed, 2014

The dominant species in the seedling stage is Holea (Cleistantus laevis Hook f) IVI with 36.69% and types Rambutan (Nephelium lappaceum) IVI with 34.57%.

Table 5. IVI Plant Nursery level at Mount Tinanggo

Seedling Levels (Local Name and Latin)	INP (%)
Holea (*Cleistantus laevis Hook f*)	36.69
Rambutan (*Nephelium lappaceum*)	34.57
Kuma (*Palaquium obovatum Engl*)	13.97
Satu Lambu (*Sandoricum kuecapi*)	12.51
Eha (*Castanopsis buruana*)	11.78
Pondo (*Lithocarpus glutinosus*)	10.32

Primary data after being processed, 2014

The types that are at the level of saplings and seedlings are the type that will replace the tree and pole formation in stand structure in the future. Therefore, the presence of tillers (saplings and seedlings) are very important in describing a type of future sustainability will come. According [13] that the presence of a species in an area showing adaptability to habitats and wide tolerance to environmental conditions. Vegetation structure which shows the types of plants with large IVI, categorized as the main constituent of plant communities in the region. Type Holea and Rambutan is contained in any kind of stand growth in ecosystem structure. Both types are always in the group of the importance of > 10%, even at the level of poles, saplings and seedlings Holea and Rambutan emerge and dominate in mountain ecosystems on Tinanggo. The existence of rambutan types that dominate the ecosystem Mount Tinanggo, starting at nursery level to the level of the tree suggests that the kind of Rambutan (Nephelium lappaceum) is a type that can guarantee the availability of nectar and pollen as forest bees feed on the past, present and future.

Level Diversity of Plants

Diversity becomes greater when where Evenness greater. This means that species diversity have been great if the existing populations of each other evenly in abundance, not some huge population, while other populations are very few. Based on the results of the analysis showed that the level of diversity of vegetation of different types at each stage of growth in stand structure, as shown in the table below.

Table 6. The level of diversity of vegetation types in Mount Tinanggo

The structure of stands	The level of diversity (H ')	Category Abundance
Tree	3,45	Abundant High
Pole	3,19	Abundant High
Stake	2,94	Abundant Medium
Seedling	2,6	Abundant Medium

Primary data after being processed, 2014

[15] stated that the diversity of plant species tend to be higher in older communities and tend to be low in the newly formed community. Stability of habitat is the main factor governing biodiversity. As well as making up in the mountain vegetation Tinanggo illustrate the diversity of trees and poles higher than the saplings and seedlings

Calendar Flowers

Each species has a different flowering time, so that there is no interest at all times forever. Information flowering time is needed to assist in the management of bees feed on a development area. The more the number of flowers it can be said to be more available nectar and pollen for honey bees. Based on observations, indicate that interest is available throughout the year. Peak flowering plant that is in August and September are shown with 26-32 flowering plant species. This can be seen in the table below.

Table 7. *Calendar Flowering Plant Species In Mount Tinanggo*

Local Names	Species	Family	Flowering Period											Nektar / Pollen
			J	F	M	A	M	J	J	A	S	O	N	D	
Loho	Spondias pinnata Kurz	Anacardiaceae							■	■	■				N,P
Kalapi	Kalappia celebica	Caesalpinaceae	■	■									■	■	N,P
Meranti	Shorea sp	Dipterocarpaceae					■	■	■	■	■	■	■		P
Dama-Dama	Vatica verrucosa	Dipterocarpaceae					■	■	■	■	■	■	■		P
Kasumeeto	Diospiros sp.	Ebenaceae				■	■	■							N
Holea	Cleistantus laevis Hook f.	Euphorbiaceae								■	■				N
Risi	Baccaurea sp	Euphorbiaceae								■	■				N
Putemata	Macaranga sp	Euphorbiaceae						■	■	■	■				N
Pilole/Puloli	Quercus celebica Miq	Fabaceae				■	■	■	■	■	■	■			N,P
Eha	Castanopsis buruana	Fabaceae			■	■			■	■	■				N,P
Pondo	Lithocarpus glutinosus	Fabaceae						■	■	■	■	■		■	N,P
Melinjo/Huko	Gnetum gnemon	Gnetaceae	■	■									■	■	N
Bintangor	Calophyllum waworoentii Kds	Guttiferaceae	■	■	■	■	■	■	■	■	■	■	■	■	N
Polio	Cinnamomum parthenoxylon Meissn	Lauraceae		■	■	■	■	■	■	■					N,P
Pondo Benu	Actinodaphne multiflora	Lauraceae						■	■	■	■	■	■	■	N,P
Ponto	Litsea firma Hook f.	Lauraceae						■	■	■	■	■	■	■	N,P
Wewu	Planchonia valida Blume	Lecythaceae	■	■	■									■	N
Wayu	Hibiscus tiliaceus L.	Malvaceae								■	■				N
Satu Lambu	Sandoricum koecape Merr	Meliaceae	■											■	N
Kayu Bassi	Metrocideros petiolata	Myrtaceae						■	■	■					N,P
Lare	Xantostemon confertiflorum	Myrtaceae							■	■	■				N,P

Dara-Dara	Eugenia sp	Myrtaceae			■	■									N,P
Dambu-Dambu	Syzygium sp.	Myrtaceae			■	■	■	■	■	■	■				N,P
Warau	Eugenia sp.	Myrtaceae									■	■			N,P
Wosili	Eugenia sp	Myrtaceae					■	■	■						N,P
Wia	Baeckea frutescens L.	Myrtaceae									■	■	■		N,P
Dambu Hada	Chionanthus corolulatus	Myrtaceae			■	■	■								N,P
Lare	Xantostemon confertiflorum	Myrtaceae							■	■	■				N,P
Kasu Baku	Ficus sp	Moraceae			■	■						■	■	■	N,P
Hunubi	Artocarpus dayphylla Miq	Moraceae								■	■	■			P
Palem Hutan	Pinanga caesia	Palmaceae	■	■	■	■	■	■	■	■	■	■	■	■	P
Welala/Kuku	Pericopsis moniana	Papilionaceae			■	■	■								N,P
Kole	Alphitonia moluccana T.et B.	Rhamnaceae	■										■	■	N
Kolaka	Parinaria corymbosum Miq.	Rosaceae							■	■	■	■			N
Lobani	Neonauclea sp	Rubiaceae			■	■									N
Woro one	Anthocephalus cadamba Miq	Rubiaceae	■	■	■	■									P
Tolihe	Gardenia anisophylla Jack	Rubiaceae					■	■							P
Kolambu	Anthocephalus macrophyllus Hav.	Rubiaceae	■	■	■										N
Lobani	Neonauclea sp	Rubiaceae								■	■	■	■		P
Jambu-Jambu	Gardenia anisophylla	Rubiaceae							■	■	■				N
Pondose	Evodia celebica Hats	Rutaceae			■	■					■	■			N,P
Riri	Evodia celebica Hats	Rutaceae								■	■	■	■		N
Rambutan	Nephelium lappaceum	Sapindaceae								■	■	■	■		N,P
Landolo	Ailanthus malabarica D.C.	Sapindaceae									■	■	■	■	N,P
Kuma	Palaquium obovatum	Sapotaceae	■									■	■	■	N,P
Umera	Palaquium sp	Sapotacea	■	■									■	■	N
Wolondero	Ailanthus malabarica D.C	Simnaceae							■	■	■	■			P
Wuno	Trichospermum sp	Tiliaceae							■	■	■				P
Ngau-Ngau	Geussia sp	Verbenaceae									■	■			P
Kasu Meraha	Geunsia quatemiforlia	Verbenaceae								■	■	■			P
Holimbute	Geunsia cinnamomea	Verbenaceae									■	■			N

Primary data after being processed, in 2014.

4. CONCLUSION

Specimen plants are observed at Mount Tinanggo totaled 591 consisting of 55 species and 25 families. Vegetation analysis results indicate that the vegetation structures that make up Mount Tinanggo at the tree level is dominated by Meranti (Shorea sp) and the type of Rambutan (Nephelium lappaceum), at the level of the pole is dominated types Holea (Cleistantus laevis Hook f), and the type of Kuma (Palaquium obovatum Engl), at the level of saplings and seedlings levels dominated by Holea (Cleistantus laevis Hook f) and Rambutan (Nephelium lappaceum). Species composition of vegetation on Mount Tinanggo among others; to the level of the tree and pole abundant species diversity is high, and the level of saplings and seedlings were abundant species diversity. Calendar of flowers every kind of show that flowers can be available throughout the year, and the peak flowering in August and September.

REFERENCES

[1] Saepudin, A.M. Fuah, . Sumantri, T. Abdullah, S. Hadisoesilo. 2010. Peningkatn produktivitas lebah madu melalui penerapan sistim integrasi dengan kebun kopi. Jurnal Ilmu-Ilmu Peternakan 21 (1): 24-30.

[2] Yudi, C.A. 2010. Aktivitas Apis cerana mencari polen, identifikasi pollen dan kompetisi menggunakan sumber pakan dengan Apis mellifera. Tesis Pascasarjana IPB Bogor.

[3] Husaini, E.A. 1986. Potensi Produksi Nektar dari Tegakan Kaliandra Bunga Merah (alliandra calothyrsus Meissn). Prosiding Lokakarya Pembudidayaan Lebah Madu untuk Peningkatan Kesejahteraan Masyarakat. Perum Perhutani. Jakarta.

[4] Sumoprastowo, R.M, dan R.A.Suprapto. 1993. Beternal Lebah Madu Modern. Bhatara. Jakarta.

[5] Andoko, D. 2001. Nilai Penting Jenis-jenis Tumbuhan dan Potensinya Sebagai Penyedia Pollen untuk Pakan Lebah Madu (Apis mellifera Staint) di Desa Harjobinangun Kecamatan Toroh Purwodadi. Skripsi. Jurusan Biologi Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Diponegoro. Semarang.

[6] Minarti. 2007. Evaluasi Produksi dan Perkembangan Koloni Lebah Madu Apis mellifera Linnequs ditinjau dari Aspek Pakan di Perkebunan Randu (Ceiba pentandra L) dan Karet (Hevea brasiliensis Willd). Disertasi. Program Pasca Sarjana Fakultas Pertanian Universitas Brawijaya. Malang.

[7] Karstberger, G., Frank, W., Thomas, H. 2013. Social Waves in Giant Honeybees (Apis dorsata)

Elicit Nest Vibrations. Natur Wissenschaften, 100; 595-609.

[8] Woyke, J., Jerzy Wilde., Maria, Wilde. 2012. Swarming and Migration of Apis dorsata and Apis laborisa Honey Bees in India, Nepal and Bhutan. Journal of Apicultural Science. Volume 56, Issue 1, pages 81-91.

[9] Robinson,W.S. 2012. Migrating Giant Honey Bees (Apis dorsata) Conggregate Annually at Stopover Site in Thailand. Plos ONE 7(9): e44976.

[10] Mueller-Dombois, D., H. Ellenberg. 1974. Aims and Methods of Vegetation Ecology. John Wiley & Sons. New York.

[11] Soegianto, A., 1994. Ekologi Kuantitatif. Metode Analisis Populasi Komunitas. Usaha Nasional. Surabaya.

[12] Naskah Akademik Mekongga, 2012. Usulan Perubahan Fungsi Kawasan Hutan Lindung Kompleks Hutan Mekongga Menjadi

[13] Hamidun, M.S., D. Wahyuni, K. Baderan. 2013. Analisis Vegetasi Hutan Produksi Terbatas Boliyohuto Provinsi Gorontalo. Jurusan Biologi Fakultas Matematika dan Ilmu Pengetahuan Alam. Universitas Negeri Gorontalo. Gorontalo.

[14] Rasnovi, S. 2006. Ekologi Regenerasi Tumbuhan Berkayu Pada Sistem Agrovorest Karet. Sekolah Pasca Sarjana Institut Pertanian Bogor. Bogor.

[15] Odum, E.P. 1971. Fundamentals of Ecology. Toppan Company Ltd. Tokyo