

**STUDY OF HIGH NATURE VALUE FARMLAND (HNVf) IN REHABILITATION AREA,
BLOCK DONGLO, MERU BETIRI NATIONAL PARK**

**STUDI KAWASAN PERTANIAN BERNILAI ALAM TINGGI (HNVf) DI AREA
REHABILITASI, BLOK DONGLO, TAMAN NASIONAL MERU BETIRI**

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ABSTRACT

*This study aim to study the characteristics of the HNVf in the Donglo rehabilitation based on vegetation, bird, and mammal diversity. Research was held in Donglo rehabilitation area, Wonoasri Resort, Meru Betiri National Park (-8.41158, 113.67849). Vegetation analysis was carried out by using three plots of circle method with a radius of 17.1 meters to cover trees and poles and each circle contains 5 square with a size of 1x1 meter for seedling. Diurnal birds are studied by the point count method (r=20) which uses the center point of the circle method in vegetation analysis. Diurnal mammal observations are made visually at randomly determined points. A total of 6 points were observed, where each point covered 500 m². Semi-natural agriculture, applied at low intensity, and having different types of mosaic landscape habitats are character that compatible with Donglo rehabilitation area. There is a combination between trees and commodities (cover ground) that managed by the community. The observations showed that Jackfruit (*Artocarpus heterophyllus*) (highest IVI = 81.46) provided perch for insectivorous birds: Sooty-headed Bulbul, Black-winged Flycatcher-shrike, and Collared Kingfisher. The average circumference of trees reaches 73 cm and height reaches 8.4 m. Peje *Pueraria javanica* is a ground cover plant that dominates among other commodities in the Donglo (IVI=58.73). Wild boar *Sus scrofa* and long-tailed monkeys *Macaca fascicularis* appear in groups (5-20 individuals) as pests. Six of the 9 bird species identified as insectivores. White-bellied Sea-eagle has a role as carnivore. Only a species has granivore roles.*

Keywords: bird, diversity, mammal, vegetation

ABSTRAK

*Penelitian ini bertujuan untuk mempelajari karakteristik HNVf dalam rehabilitasi Donglo berdasarkan keanekaragaman vegetasi, burung, dan mamalia. Penelitian dilakukan di daerah rehabilitasi Donglo, Resort Wonoasri, Taman Nasional Meru Betiri (-8.41158, 113.67849). Analisis vegetasi dilakukan dengan menggunakan tiga plot metode lingkaran dengan radius 17,1 meter untuk menutupi pohon dan tiang dan masing-masing lingkaran berisi 5 persegi dengan ukuran 1x1 meter untuk pembibitan. Burung diurnal dipelajari dengan metode penghitungan titik (r = 20) yang menggunakan metode titik tengah lingkaran dalam analisis vegetasi. Pengamatan mamalia diurnal dilakukan secara visual pada titik yang ditentukan secara acak. Total enam titik diamati, di mana masing-masing titik mencakup 500 m². Pertanian semi-alam, diterapkan pada intensitas rendah, dan memiliki berbagai jenis habitat lanskap mosaik adalah karakter yang sesuai dengan area rehabilitasi Donglo. Terdapat kombinasi antara pohon dan komoditas (tutupan lahan) yang dikelola oleh masyarakat. Hasil pengamatan menunjukkan bahwa Nangka (INP tertinggi=81.46) menyediakan tenggeran bagi burung-burung insektivora: Cuca Kutilang, Jingjing Batu, dan Cekakak Sungai. Lingkaran pohon rata-rata mencapai 73 cm dan tinggi mencapai 8.4 m. Peje (*Pueraria javanica*) adalah*

tanaman tingkat bawah yang mendominasi diantara komoditi bawah lainnya di Blok Donglo (INP=58.73). Babi Hutan Sus scrofa dan Monyet Ekor-panjang (Macaca fascicularis) muncul secara berkelompok (5-20 ekor) sebagai hama. Enam dari sembilan jenis burung yang ditemukan teridentifikasi sebagai insektivora. White-bellied Sea-eagle berperan sebagai karnivora. Hanya satu jenis burung yang berperan sebagai granivore.

Kata Kunci: burung, diversitas, mamalia, vegetasi

INTRODUCTION

The rehabilitation area has a long history that began with the transform of political policy in Indonesia. Countries that before controlled forest resources were considered to have acted repressive in controlling forest conservation. On the other hand, people need limited land to meet their food needs. Therefore, a shift in authority that has become more democratic after the new order has been interpreted by the community as opening up community forest management, including illegal logging [1, 2]. Deforestation is increasingly widespread, and shifts to the opening of farmlands [3, 4]. However, over time, forest re-control by the government began reforestation activities, so that the term rehabilitation appears. On the other hand, the community is now managing it intensively, so that rehabilitation areas still exist in several locations in the Meru Betiri National Park (MBNP). Land use that leads to the rehabilitation area problem also occurs in two other national parks on Java: Mount Halimun Salak and Mount Gede Pangrango. Historical problems and different perceptions also occur in these areas, leading to the emergence of agricultural areas. During this time, the community has a perception that the rehabilitation area is supporting their economy and can not be separated from people's lives [5,6].

The character of the rehabilitation area of MBNP is agroforestry and with low intensity farming practices, able to give a buffering effect that balances the role of conservation and economy [7]. Mammals and protected birds which are also found in them are indicators of high-value agricultural models (HNV farmland). The concept of HNVf emerged in Europe as a form of anxiety towards the decline of biodiversity in the agroecosystems. Low-intensity farming

approaches have a positive effect on conserving biodiversity [8]. Biodiversity is very important as an environmental indicator and able to maintain ecological balance in the agroecosystems [9]. Europe and has a varied understanding of its application. HNVf can be indicated as a semi-natural managed agriculture area, applied at low intensity farming practices, and having different types of mosaic landscape habitats. For successful implementation, the identification of HNVf must accurately reflect variations in biodiversity with various agricultural landscapes [8, 10]. This study aims to study the characteristics of the HNVf in the Donglo rehabilitation based on vegetation, bird, and mammal diversity.

METHODS

Study area and vegetation analysis.

Research was carried out in the agricultural area in the rehabilitation area, Donglo block, Wonoasri Resort, MBNP (-8.41158, 113.67849, see Figure 1). Based on observations, the lowest temperature was 30.37°C and the highest reached 34.37°C in average. The results of analysis on soil show 35.5-58.4 gr.cm⁻³ of granular structures [11] with the composition of Entisol (86.2%), Inseptisol (11.4%), and Spodosol (2.45%). MBNP rehabilitation areas have been looted and converted during the reform era (1998-1999). This degraded forest has been converted into agricultural land which is then managed by the local community [12]. This area then becomes a rehabilitation area, where the goal is to restore the ecosystem as well as providing benefits to the people. Therefore, land management is carried out while maintaining the preservation of trees and wild animals..

Agroforestry is a management practice applied in a rehabilitation area, where the main

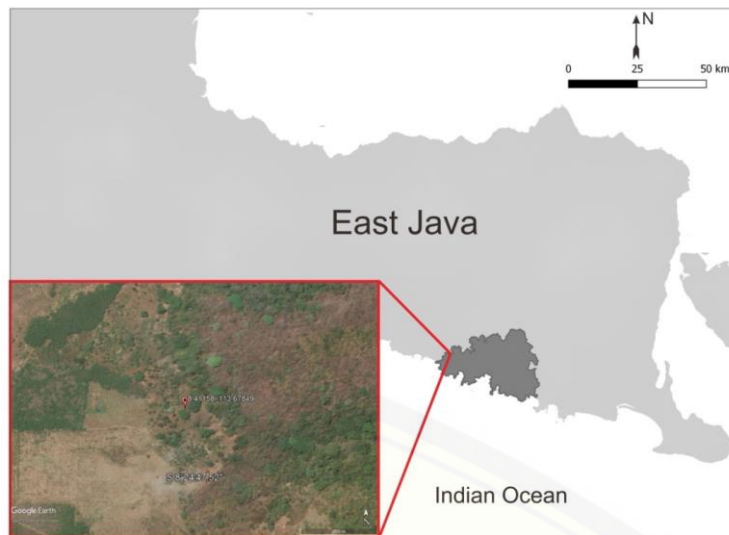


Figure 1. Research map. Keys: Light gray (Java Island and parts of Bali), Dark Gray (Meru Betiri National Park Area), Colored (vegetation condition of the research area)

commodity will be planted among trees (15-25 m²). A total of 248.37 Ha of agricultural land was cultivated in the rehabilitation area at Wonoasri Resort [12] managed by 76.47% of respondents whose profession was in agriculture. Each person has 0.25-05 Ha of arable land per person [13].

This research was conducted in 2-9 November 2019. We conducted a vegetation analysis to understand the low-intensity farmland in the rehabilitation area of Block Donglo. Vegetation analysis was carried out by using three plots of circle method with a radius of 17.1 meters to cover trees and poles and each circle contains five squares with a size of 1x1 meter for seedling (Figure 2).

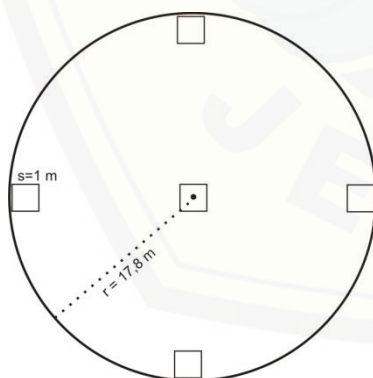


Figure 2. Vegetation analysis plan

The farmer knowledge of land cycles was studied by semi-open interviews to complement this research which could not cover the rainy season. A total of 12 respondents gave a qualitative description of the of commodities and pests.

Birds survey. Diurnal birds are studied by the point count method ($r=20$) which uses the center point of the circle method in vegetation analysis. The survey was carried out on a week for 15 minutes between 06.00-09.00 am, which is the best active time for most diurnal birds. All bird species that interact directly, as well as flying through research were recorded along with their numbers. Most of the behaviors observed were recorded to illustrate the intensity and role of birds in agricultural areas.

Mammals survey. Diurnal observations are performed visually at randomly determined points. A total of six points were observed, where each point covered 500 m². Visual findings on species, numbers, and behaviors are recorded. Foraging behavior is recorded as a priority observation: type of food, plants eaten, parts, distribution of food scraps (pellets) and feces. Observations were not made visually but were observed through secondary data findings such as identification and documentation of hair, scratches, and impurities. The type and estimated amount were recorded along with the observed behavior.

Data is tabulated with Microsoft Excel to calculate the Important Value Index (IVI). Data on the species and numbers in plots are recorded to obtain the total findings (K), frequency (F) for animal, and dominance (D) for plants. The IVI value then described to understand the role of plants / animals in the rehabilitation area. Interview data were analyzed qualitatively to complete information

on land management and commodity cycles that occurred outside of the study period.

RESULTS AND DISCUSSION

The concept of HNVf developed in the Europe and has a varied understanding of its application. HNVf can be indicated as a semi-natural managed agriculture area, applied at low intensity, and having different types of mosaic landscape habitats. For successful implementation, the identification of HNVf must accurately reflect variations in biodiversity with various agricultural landscapes [8, 10]. This character is very compatible with Block Donglo. Agricultural management occurs in a low intensity agroforestry system. There is a combination of crops is applied between trees planted by MBNP and commodities (cover ground) managed by the community (Figure 3). The variations in the landscape support the diversity of plant habitats to attract the presence of birds and mammals.

Jackfruit (*Artocarpus heterophyllus*) became the species with the highest Important Value Index (IVI, 81.46, Figure 4). This plant is one of the main commodities planted by the MBNP for reforestation project. The average circumference of trees reaches 73 cm and height reaches 8.4 m. MBNP collaborates with community to grow shade plants. Fruit plants are chosen to increase the willingness of

the community to conserve. On the other hand, people can freely harvest the fruit. Kenitu (*Chrysophyllum cainito*) has the second-largest IVI (65.82, Figure 4). The average tree circumference reached 95 cm and height 12 m. It has lush leaves and closes most of the crown in a rounded shape. Observation results indicate that Kenitu is not preferred for bird activities. However, Plantain Squirrel (*Callosciurus notatus*) and Long-Tailed Monkey (*Macaca fascicularis*) are attracted to its sweet fruit. Even before people can harvest it, the monkey has eaten most of the ripe fruit and spread the remains.

Observations show that Jackfruit provides perch for insectivorous birds: Sooty-headed Bulbul, Black-winged Flycatcher-shrike, and Collared Kingfisher. This fact illustrates that perennials have become the main draw for insectivorous birds with a variety of benefits. Vertically, the distribution of insectivorous birds utilizes branches of more than two meters (Table 1). Furthermore, they will snatch the insects that are generally on the surface of the leaves of ground crops commodity. Only one of 10 striking activities observed in insectivorous birds is carried out from ground-to-ground. Perch has provided the right location for birds to observe the prey below them. This helps birds to focus because their eyes are not stereotype [14].



Figure 3. Vegetation in: a) rainy season, and b) dry season in Donglo. Keys: 1. Jackfruit, 2. Rice, 3. Mays, 4. Peje

Peje (*Pueraria javanica*) is a ground cover plant that dominates among other commodities. Peje is very well known by the community because its seeds have a high selling value (IDR 150000-170000/kg). The seeds are harvested and dried in the sun. After being collected, it will be sold to collectors in farmer groups. This commodity is planted in the dry season. However, during the rainy season, other commodities such as corn (*Zea mays*), rice (*Oryza sativa*), sweet potato (*Ipomoea batatas*) are grown in polyculture with multiple cropping techniques.

Based on respondents, mays and rice are the main commodities in the rainy season (Figure 3). Both of these plants require a high water supply, which does not occur during the dry season. Water limitations also occur due to contours of mountainous land and make it difficult to apply irrigation system. However, Peje is also planted as an intercrop, although not as much as in the dry season. This commodity is still planted considering the benefits that can be obtained by farmers, in addition to others that can be utilized on a family scale. Peje has the ability to bind the N and P elements as soil nutrients. This is very important for the sustainability of agriculture in the rehabilitation area. [15].

In general, the community that manages the Donglo block, gives a lot of effort to their responsibility. They did not damage the standing plants that planted by the MBNP. Anyone could take fruit or leaves from these plants for free. However, it is generally taken by land managers themselves, because of their responsibility in maintaining the sustainable farmland.

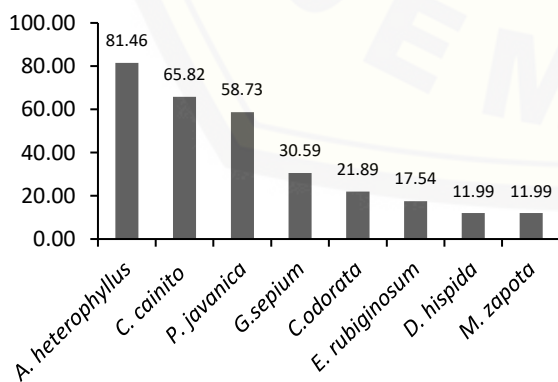


Figure 4. IVI of the main commodity species

One non-commodity plant such as Klayu (*Erioglossum rubiginosim*) is allowed to grow wild. This is quite unique, considering the possibility of lower commodity crops developed so far will not grow optimally with shade. Based on the narrative of the community, the plant grows wild and there is no special effort to control it. The community consciously understands that Klayu will become a tree. The possibility of the transition of commodities to commodities that are more pro-environment supports the community to plant hardwood plants.

During the rainy season, mammal pests increase, such as the wild boar (*Sus scrofa*) and Long-tailed Monkeys (*Macaca fascicularis*) that appear in groups (5-20 ind). Wild boar groups also attack Peje which is planted in the dry season. To dispel these pests, farmers provide a tight plastic fence. Besides, guard dogs are also employed in driving away boars or monkeys. Just before harvest, the intensity of guarding by the community is increasingly tightened. Firecrackers are often used to dispel mammal pests, both during the day and night.

The well-known pest is the Long-tailed Monkey (Table 1). Monkeys are the main pest of all commodity in Donglo, both on the perennial and fruit plants. The land is protected by guard dogs that are well cared for by the owner. However, during the day the land is not found by humans. Landowner will come in the afternoon to monitor and send the dog food. The community said that monkey attacks will be higher during the dry season. It is most likely that mokeys are attacking commodity seasonally, where there is a scarcity of food in the forest.

Contrary to monkeys, wild boar attacks commodity in groups at night. The main target is groundcover plants, such as Peje, Corn, beans, rice, sweet potatoes, even tree bark. Based on observations, it appears that the damage to pests is greater than monkeys. The number of group can reach hundreds of wild boar. Farmers providing plastic fences or nets that are applied right from the ground surface around the land to protect their farmlands. In addition, the guard dogs are also useful for driving away boars. Vertebrate pest attacks in Indonesia affects the loss of yield weight up to 2.25-2.45% for rice, and 2-5% for corn per year. These damages occur during planting, up to storage [16].

Table 1. List of animal names and their roles

Common Name	Scientific Name	IVI	Vertical distribution (m)	Roles
Mammals				
Wild Boar	<i>Sus scrofa</i>	19,96324	1	Diurnal Pest
Long-tailed Monkey	<i>Macaca fascicularis</i>	16,43382	1,2,3,4,5	Nocturnal Pest
Dog	<i>Canis lupus</i>	16,43382	1	Farm Guard
Plantain Squirrel	<i>Callosciurus notatus</i>	4,301471	4,5	Diurnal Pest
Birds				
Sooty-headed Bulbul	<i>Pycnonotus aurigaster</i>	28,19853	1,2,3	Omnivore
Javan Munia	<i>Lonchura leucogastroides</i>	23,49265	1,2,3	Granivore
Black-winged Flycatcher-shrike	<i>Hemipus hirundinaceus</i>	19,96324	4,5	Insectivore
Small Minivet	<i>Pericrocotus cinnamomeus</i>	16,83824	5	Insectivore
Common Tailorbird	<i>Orthotomus sutorius</i>	16,43382	3,4	Insectivore
Olive-backed Tailorbird	<i>Orthotomus sepium</i>	11,72794	3,4	Insectivore
Black-banded Barbet	<i>Megalaima javensis</i>	10,95588	5	Frugivore
Plaintive Cuckoo	<i>Cacomantis merulinus</i>	5,477941	5	Insectivore
Collared Kingfisher	<i>Todiramphus chloris</i>	5,477941	4,5	Insectivore
White-bellied Sea-eagle	<i>Haliaeetus leucogaster</i>	4,301471	Flying through	Carnivore

Jackfruit is an important commodity as well as tree plants that grow in the rehabilitation and conservation area. Jackfruit provides perch function for insectivorous birds for hunting behavior. The undergrowth varies during the rainy season: corn, rice, peje, whereas during the dry season it is only managed for Peje.

Six of the nine bird species were identified as insectivores (Table 1). The existence of birds with this role illustrates the condition of a stable agricultural environment [17], where many insect pests will prey on. This role is very important and has an impact on reducing the use of pesticides. One type of frugivorous bird, Black-banded Barbet, feeds on the fruit of the figs and discards its seeds through manure. This fact shows that frugivorous birds play a role in reforesting. In addition, its high tolerance makes it very suitable for living in disturbed areas such as rehabilitation lands [18, 19].

White-bellied Sea-eagle have a role as a carnivore (raptor) observed by flying through. It is very widely suspected that other raptor periodically flies through these farmlands. This fact indicates the presence of top predators as guarantors of ecological balance in the farmland. Only one species, Javan Munia, acts as a granivorous. Although granivorous birds have the potential to be pests, the loss of these birds in the environment will have a major

impact on the explosion of insect pest populations [20].

In an HNVf analysis, there is an interaction between high biodiversity and commodities in an agricultural landscape. The discovery of 14 species of mammals and birds with all their roles is an indication of a sustainable HNVf in Donglo. This HNVf area becomes one of the barriers between a conservation area and a settlement with all its effects. It is very important to preserve it from damage due to human activities. In addition, this area clearly acts as a home range for various animals from the national park.

The challenge in the future is to design a sustainable management of HNVf that is community-friendly, but still oriented to its function as a biodiversity fragment. Social approaches and assistance need to be applied to reduce new land clearing and the application of the latest agroforestry technology to apply the 3 pillars of agricultural sustainability: economic, social and environmental aspects.

CONCLUSION

The rehabilitation area in Block Donglo is indicated as HNVf due to habitat for 14 species of mammals and birds. The main commodity is Peje, which is planted both in the rainy and dry seasons. Jackfruit is a type of tree that is found in large quantities and has an important role,

including as an attractor of birds and mammals. All commodities can attract the presence of animals, either because of predation or as pests.

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