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CONSERVATION OF BIODIVERSITY AND OIL PALM BIODIVERSITY IN INDONESIA

By

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RESUME

The expansion of plantations through monoculture cultivation is used as an argument that condemns oil palm as biodiversity loss. In fact, in the development of oil palm plantations, the Indonesian government has already designated areas for oil palm cultivation that are separated from protected and conservation areas, which serve as habitats for biodiversity. Furthermore, oil palm plantations also have five functions/mechanisms for biodiversity conservation, namely the conservation and development of oil palm plant varieties, the development of HCV and HCS, biodiversity regrowth, cover-crop development and biomass recycling, and the development of food crop-livestock-oil palm integration.

INTRODUCTION

The relatively rapid expansion of oil palm plantations in the last 20 years has often been accused of threatening biodiversity loss (Fitzherbert et al., 2008; Koh and Wilcove, 2008; Foster et al., 2011; Savilaakso et al., 2014; Vijay et al., 2016; Austin et al., 2019; Qaim et al., 2020). The association of oil palm plantations with biodiversity loss has also made palm oil and its derivative products classified as high-risk commodities in the European Union.

The development of oil palm plantations is considered a cause of wildlife habitat endangerment. Both local and transnational NGOs often report on wildlife, especially protected species (such as Orang Utans, *Mawas*, Sumatran Tigers, Sumatran Elephants) being threatened with extinction due to the development of oil palm plantations in Indonesia. In addition, oil palm plantations are also accused of being monoculture and lacking biodiversity.

These NGO's accusations may be influenced by the history of development in mainland Europe and North America, where early development involved the total deforestation of their natural forests, leaving no virgin forests as the "home" of biodiversity.

However, in contrast to the history of Europe and North America, Indonesia has since the beginning of its development established regulations regarding which forests must be preserved/protected as the "home" of biodiversity and which forests can be converted for economic development activities and human settlements. NGOs also appear to have limited understanding of the systems and characteristics of oil palm plantations, which are fundamentally different from monoculture crops, including other vegetable oil crops.

This article discusses how Indonesia conserves its biodiversity, allowing its natural biodiversity to remain relatively sustainable today. It then continues to discuss how oil palm plantations also play a role in biodiversity conservation and possess their own biodiversity.

THREE BIODIVERSITY CONSERVATION SYSTEMS

Indonesia adheres to the paradigm of ecosystem harmony, where biodiversity, humans, and settlements along with their economic activities coexist within their respective spaces. This paradigm is reflected in Indonesia's regulations which stipulate that a minimum of 30 percent of the land is maintained as natural forest, including protected and conservation forests that serve as the "home" of biodiversity. Beyond the designated biodiversity "home" areas, other spaces/lands are used for settlements, agriculture/plantations, and other development sector activities.

Such regulations were originally stipulated through the Forest Land Use Agreement (*Tata Guna Hutan Kesepakatan*/TGHK), which were subsequently incorporated into Law No. 41 of 1999 on Forestry, Law No. 5 of 1990 on the Conservation of Natural Resources and Ecosystems, Law No. 26 of 2007 on Spatial Planning, and Law No. 11 of 2020 on Job Creation.

In general, the biodiversity conservation systems in Indonesia consist of the In-Situ system, the Ex-Situ system and the cultivation system. The two biodiversity conservation systems, In-Situ and Ex-Situ, are located within protected areas, while biodiversity conservation carried out through cultivation is situated in cultivation areas.

First, the In-Situ biodiversity conservation system involves conserving biodiversity by maintaining its natural habitats, which include protected forests/natural resource conservation (Nature Conservation Area). Some of them are Strict Nature Reserves, Wildlife Sanctuaries, National Parks, Nature Tourism Parks, Grand Forest Parks, and Hunting Parks.

Protected forests and conservation forests function to protect and become the "home" of wildlife (such as Orang Utans, *Mawas*, Sumatran Tigers, Elephants, Horned Rhinos, Komodo Dragons, and others) as well as other biodiversity spreading across various locations in Indonesia. Apart from being the "home" of biodiversity, protected and conservation forests also function to protect nature and preserve High Carbon Stocks (HCS).

Second, the Ex-Situ biodiversity conservation system involves maintaining (through human intervention) artificial habitats (similar to natural habitats) outside of their natural habitats as the "home" of biodiversity. Some of examples of this are Zoological Parks and Botanical Gardens, which are found in almost every province in Indonesia. In addition to serving as biodiversity conservation efforts, Ex-Situ biodiversity conservation also functions as source of recreation, education, and research.

Third, a biodiversity conservation system through cultivation (agriculture). Cultivation systems (agriculture, plantations, animal husbandry, fisheries, plantation forests) of a variety of plants and animals/livestock are a part of the mechanism for conserving biodiversity across generations (UN, 2008). Various types of plants and animals that provide food, shelter, and clothing for the global population today are the result of biodiversity conservation through cultivating plants/animals from one generation to the next.

With these three biodiversity conservation systems in Indonesia, it is very clear that development in Indonesia incorporates mechanisms for tropical biodiversity conservation. In 2020, the total forest area designated for biodiversity conservation through In-Situ, Ex-Situ, and cultivation was still approximately 47 percent of Indonesia's land area.

With this biodiversity conservation mechanisms, both In-Situ and Ex-Situ, the original tropical biodiversity is still preserved to this day. Is the original subtropical biodiversity still sustainable today in Europe and North America?

OIL PALM PLANTATION BIODIVERSITY

The oil palm plantations developed in cultivation areas are also accused of being monocultures, leading to biodiversity loss. This accusation is actually inaccurate and not in line with the existing facts. Although their primary purpose is not the conservation of biodiversity, oil palm plantations, in practice, also serve a biodiversity conservation function (PASPI, 2023) with a relatively limited nature, namely only through the cultivation of oil palm plants.

First, the oil palm plantations themselves can be viewed as a mechanism for preserving and harvesting the biodiversity of oil palm plants from generation to generation. Historical records show that oil palm plantations initially originated from only four varieties of oil palm plants planted in the Bogor Botanical Gardens in 1848, then through the cultivation process from generation to generation have now evolved into more than 70 varieties of oil palm plants. It is conceivable that without the cultivation process, it would be certain that the oil palm germplasm would have long been extinct. This means that the biodiversity conservation mechanism through cultivation not only preserves biodiversity but also effectively increases the biodiversity of the plants concerned.

Second, in general, the government grants Land Use Permits (*Hak Guna Usaha*/HGU) to corporations, and only about 60-70 percent of it is used for oil palm plantations. The remaining 30-40 percent is allocated for High Conservation Value (HCV)/High Carbon Stock (HCS) areas, employee settlement, offices, as well as public and social facilities. The HCV and HCS areas are intended for the conservation of biodiversity and natural resources within plantation cultivation areas.

Third, oil palm plants cultivated with minimum tillage, minimum weeding, and no ratoons will grow into trees with a relatively large diameter and height and have canopy cover approaching 100 percent at mature age. Oil palm trees grow and produce during one cycle (life span), which is 25-30 years. This allows biodiversity regrowth in the plantation areas (excluding large mammals) as the oil palm trees age (PASPI Monitor, 2020).

Table 1. Comparison of the Number of Biodiversity Species in Oil Palm Plantations, Ecosystem Benchmarks, and HCV

Taxonomy / Ecosystem	North Sumatra	Riau	South Sumatra	West Kalimantan	Central Kalimantan	West Sulawesi
MAMMALS						
Benchmark*	2-4	0-7	3	0-4	0-3	0-2
Oil palm plantation	3-5	0-5	4	3-4	1-4	1
HCV	2-4	2-6	4	3-7	3-6	3
BIRDS						
Benchmark*	12-21	9-32	35	7-26	13-30	12-36
Oil palm plantation	17	14-21	26	11-19	9-22	17-33
HCV	10-24	9-27	33	14-23	17-33	20-22
HERPETOFAUNA						
Benchmark*	7-9	3-13	11	2-13	4-12	4-5
Oil palm plantation	9-14	6-16	18	7-12	9-13	3-11
HCV	6-7	2-11	6	4-11	9-15	6
BUTTERFLIES						
Benchmark*	17-22	11-29	14	3-21	5-19	10-23
Oil palm plantation	13-23	12-31	30	11-20	14-28	10-19
HCV	10-19	9-22	12	6-26	15-37	12
PLANTS						
Benchmark*	51-66	25-120	8	31-71	5-22	25-53
Oil palm plantation	61-75	55-59	n.a	16-61	n.a	31-39
HCV	73-85	8-129	15	34-99	6-51	45-50

Source: Erniwati *et al.* (2017), Santosa *et al.* (2017), Santosa and Purnamasari (2017), Suharto *et al.* (2019)

During land clearing or initial planting, some fauna biodiversity may temporarily migrate to nearby locations, but after some time, they tend to return to the oil palm plantations. Various empirical studies (Erniwati et al., 2017; Santosa et al., 2017; Santosa and Purnamasari, 2017; Suharto et al., 2019) have revealed that the number of biodiversity species in mature oil palm plantations is

not always lower than the biodiversity present in the land before it became oil palm plantations (Ecosystem Benchmark) and biodiversity in forested areas (High Conservation Value) in the surrounding areas. (Table 1).

In landscape of oil palm plantation ecosystem consists of various habitat types such as immature, young immature, prime, ageing, and old oil palm plants, shrubbery, and HCV areas that remain forested. With its varied landscape, it becomes an area for the development of flora and fauna in the oil palm plantation ecosystem. It has also been found that in oil palm plantation locations, the number of biodiversity species, such as herpetofauna and butterflies, has actually increased compared to the number of biodiversity species in the Ecosystem Benchmark and HCV.

Fourth, in the planting and maintenance phase of Immature Plants, leguminous cover crops such as Calopogonium sp., Pueraria sp., Mucuna sp., Centrosema sp. are also planted between the oil palm trees (Prawirosukarto et al., 2005; Yasin et al., 2006; PASPI Monitor, 2021a). In mature plants, the biomass from pruning, empty fruit bunches, and land application of POME that returns oil palm biomass to the soil also promotes the growth of soil microbial biodiversity. These cover crops and soil microbial biodiversity clearly enhance the richness of biodiversity of oil palm plantations.

Fifth, in oil palm plantations, especially smallholder oil palm plantations, oil palm farmers also develop various integration patterns such as integration of oil palm with food crops (Partohardjono, 2003; Slingerland et al., 2019; Baihaqi et al., 2020; Kusumawati et al., 2021) during the immature phase and oil palm-livestock integration during the mature/prime plant phase (Batubara, 2004; Sinurat et al., 2004; Ilham and Saliem, 2011; Utomo and Widjaja, 2012; Winarso and Basuno, 2013) , thus the biodiversity in oil palm plantations is increasing.

Therefore, it is clear that the biodiversity of oil palm plantations initially decreases during land clearing, but biodiversity increases as the oil palm plantations ages, reaching 25-30 years old. Is biodiversity found in other vegetable oil crops, which are typically annual crops, similar to that in oil palm plantations?

Beyer et al., (2020) and Beyer and Rademacher (2021) conducted comparative studies of global biodiversity loss among vegetable oils by comparing land cover biodiversity before and after conversion to vegetable oil crops. The study used the Species Richness Loss (SRL) footprint indicator per liter of vegetable oil as a measure of biodiversity loss (Figure 1).

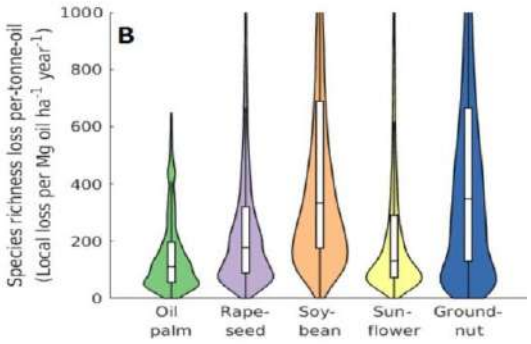

Figure 1. Comparison of Species Richness Loss in Palm Oil Vs Other Vegetable Oils (Source: Beyer *et al.*, 2020; Beyer and Rademacher, 2021)

The results of this study have revealed that biodiversity loss in palm oil is lower compared to other vegetable oils (soybean oil, peanut oil, sunflower oil and rapeseed oil). Relative to the SRL of palm oil as the reference, the SRL index for soybean oil is 284 percent, the SRL index for rapeseed oil is 179 percent, and the SRL index for sunflower oil is 144 percent. This means that when using SRL as an indicator of biodiversity loss, palm oil is the vegetable oil with the lowest biodiversity loss, while the vegetable oil with the greatest biodiversity loss is soybean oil. (PASPI Monitor, 2021b).

CONCLUSION

The three biodiversity conservation systems in Indonesia are the In-Situ biodiversity conservation system, the Ex-Situ biodiversity conservation system, and the biodiversity conservation system through cultivation. In-Situ and Ex-Situ biodiversity conservations take place in protected areas, while conservation through cultivation occurs in cultivated areas.

There are five mechanisms for biodiversity conservation in oil palm plantations in Indonesia, namely the conservation and development of oil palm plant varieties, the development of HCV and HCS, biodiversity regrowth, cover-crop development and biomass recycling, and the development of food crop-livestock-oil palm integration. With these five biodiversity conservation mechanisms, oil palm plantations become a part of biodiversity conservation and are not purely monoculture cultivation which causes biodiversity loss.

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