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SCREENING OF POTENTIAL WEEDS GROWN IN OIL-PALM PLANTATION FOR ANIMAL FEEDS AT JAMBI PROVINCE

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ABSTRACT

Vegetation that grows naturally in certain areas is a reflection of the interaction of various environmental factors and may change at any time. Under oil palm trees, there are several types of vegetation that have the potential to be used as animal feed, but it has not been identified yet. This study aimed to examine the types of vegetation that grows under the oil palm trees, and could potentially be used for animal feed. Observations were conducted on 3 groups of oil palm plantations aged above 10 years which belong to: *i.e.* smallholder oil palm, private estates, and state estates company. In each group, it was taken 8 plots so there were 24 plots in total. Parameters observed were the types of plants (*i.e.* grass, legume, and weed), plant nutrient content (determined by using proximate analysis), microclimate and soil organic matter content (C and N), and soil pH. Collected data were analyzed descriptively, and were followed by a t test. Results showed that herbages grow in palm-oil plantation in the Ness village are more various than that of in the Arang-arang village. *Ottocloa nodosa* and *Eulisine indica* are two grasses species that might be potential in the Arang-arang village which has a pity soil type, while *Leersia hexandra*, *Paspalum* sp., and *Ottocloa nodosa* are species of grasses which grow in the Ness village which has a yellow-red podsolic soil type. The existence of *Melastoma malabathricum* in the Arang-arang village should be considered as this species contains poisonous substances. *Calopogonium* sp. and *Mimosa* sp. are spesies of legumes that could be developed in palm-oil pasture to improve N content of herbages. Nitrogen or mineral fertilization might be needed to improve soil fertility of different soil types.

Key words: *oil palm, vegetation, weeds, animal feed, soil*

ABSTRAK

Tumbuhan yang tumbuh alami pada area tertentu merupakan refleksi interaksi berbagai faktor lingkungan, dan bisa berubah setiap saat. Di bawah pohon kelapa sawit, beberapa tipe tumbuhan yang berpotensi sebagai hijauan pakan tumbuh tetapi tumbuhan tersebut belum teridentifikasi. Penelitian ini bertujuan untuk mengevaluasi jenis tumbuhan yang tumbuh di bawah tegakan kelapa sawit, dan kemungkinan potensinya sebagai hijauan pakan. Observasi dilakukan pada tiga perkebunan kelapa sawit berumur di atas 10 tahun, milik: petani-kecil, perkebunan swasta, dan perkebunan pemerintah. Sebanyak 8 petak sampel pengamatan diambil untuk setiap kelompok sehingga berjumlah total 24 petak. Parameter yang diukur adalah jenis tumbuhan, kadar nutrien tumbuhan, mikroklimat dan kadar bahan organik tanah, serta pH tanah. Data terkumpul dianalisis secara deskriptif, dan dilanjutkan dengan uji t. Hasil menunjukkan bahwa hijauan tumbuh di perkebunan kelapa sawit di Desa Ness lebih bervariasi dibanding di Desa Arang-arang. *Ottocloa nodosa* dan *Eulisine indica* merupakan dua spesies rumput berpotensi di Desa Arang-arang, sementara *Leersia hexandra*, *Paspalum* sp., dan *Ottocloa nodosa* merupakan species rumput yang tumbuh Desa Ness. Kehadiran *Melastoma malabathricum* di Desa Arang-arang perlu mendapat perhatian karena species tersebut mengandung zat racun. *Calopogonium* sp. and *Mimosa* sp. merupakan tanaman legume yang dapat dikembangkan di perkebunan kelapa sawit untuk meningkatkan kandungan N hijauan. Pemupukan Nitrogen atau mineral mungkin dibutuhkan untuk meningkatkan kesuburan tanah.

Kata kunci: *kelapa sawit, vegetasi, gulma, pakan, tanah*

INTRODUCTION

An ecosystem consists of two main components i.e. biotic (living) and abiotic (non-living) components. Plant is one of the biotic components that occupies a particular habitat, such as under oil palm plantations. The structure and composition of vegetation in an area are affected by other ecosystem components which interact with each other, so that the vegetation that grows naturally in certain areas is a reflection of the interaction of various environmental factors and may change in a few time (Setiadi, 1984).

The presence of vegetation in an area will have a positive impact for the balance of the ecosystem in a broader scale. In general, the role of vegetation in an ecosystem is for setting the balance of carbon dioxide and oxygen in the air, improved physical properties, chemical and biological soil, ground water regulation and others. Although in general the presence of vegetation in an area have a positive impact, but the effect varies depending on the structure and composition of vegetation. For example, vegetation in general will reduce the rate of soil erosion, but the amount depends on the structure and composition of vegetation formations that make up the area (Syarifuddin, 2011).

The area of oil palm farm in Indonesia is 9.1 million ha (Forqan and Ratih, 2011) and 489,384 ha is in Jambi, with the distribution based on the owner systems are 320,554 ha of smallholder farm, 150,223 ha of private estates farm, and 18,607 ha of state estate farm (Ditjen Perkebunan, 2011). This potential area can be optimalized by diversify its business through the integration of animal with oil palm plantations. Many people believed that the need for the development in animal forage to be available for animal feed (quality and quantity) is very urgent. It is, however, still a major problem because people are reluctant to plant forage in monoculture. This problem can be anticipated through the integration of mixed cropping of forage crops with productive crops such as oil palm. Plants that are under oil palm has a corresponding diversity of different types of physical and chemical conditions of soil, microclimate and biophysical environmental factors (Syarifuddin, 2010).

This study aimed to: (1) identify herbages growing under oil palm plantation with different soil types, (2) analyze nutrient content of herbages growing under oil palm plantation with different soil types, and (3) study the micro-climate and biophysical soil conditions to support growth of potential plants as animal feeds.

MATERIALS AND METHODS

The study was conducted in the area of oil palm plantations located in two districts of Jambi province (*i.e.*: Arang-Arang village - Kumpeh Ulu - Muara Jambi at altitude of 11 meter above sea level and latitude of 1□41.012'S and 103□49.103'E; and Ness village - Jambi Luar Kota – Batanghari at altitude of 75 meter above sea level and latitude of 1□42.931'S and 103□24.146'E). The two study sites represented two different soil types (*i.e.,* peaty soil type and yellow-red podsolic soil type). The selection of the study sites was deliberately determined on the basis that the two different soil types are common in the Jambi province and have potential for application of an *integrated farming system* (IFS), that is the integration between oil palm vegetations, forages and livestock (Jambi in Figures, 2008).

The materials used in this study were lower vegetations grow under oil palm plantation (i.e. legumes, grasses, and weeds), and soil samples from each study site that had been determined in the plantation area. Several equipments such as a location map, GPS, quadrants, plant identification books/books monographs of plants, pH meter, thermohigrometer, compass, weighing scale, camera, machetes, knives, rope, calculators, computers, boots, scissors, raincoats, sample envelopes, sample bags, observation sheets, notebooks, pencils or pens, and other equipments in the laboratory.

Sampling in the field, a four hundred meter square of plot was chosen purposively in each study site. A one-meter square quadrant was put purposively in the ground, and then the herbages were observed, identified and

ranked. Other parameters such temperature and humidity were also recorded. Herbage samples were collected by cutting all of aerial parts of plants in the quadrant. The herbages were then directly put into sample bags and weighed. These herbage samples were brought to analytical laboratory to be oven-dried at 650C and used for further nutrient content analysis using the method of proximate analysis (AOAC, 1980). About 200g of soil samples were also collected from each quadrant. They were then composited becoming three soil samples for every study sites so that there were six soil samples are ready to be analyzed for N, P, C content, soil pH, and soil texture. All of these activities were repeated as many as 8 times. Data were analyzed using a descriptive method and followed by a t test to see the difference between areas (Steel and Torrie, 1991).

RESULTS AND DISCUSSIONS

Plants Identification

Results of plant identification from two different soil types as study sites are shown on Table 1.

In Arang-arang village Muaro Jambi region (a peaty soil type),13 species were found growing under oil palm plantations (Figure 1), while in Ness village, Batang Hari region (a yellow-red podsolic soil type) there were 16 species growing oil palm plantations, Detail herbages that grow in each soil types are illustrated on Table 1. The number of vegetations or herbages grow under oil palm plantation with soil type of yellow-red podsolic in Ness village is greater than in Arang-arang village which has a peaty soil type. This indicates that soil type can influence the number of variety of herbages that can grow.

Table 1. Species of plants found under oil palm plantations in two different soil types

No.	Arang-arang village, Kumpeh Ulu-Muaro Jambi (a peaty soil type)	Ness village, Jambi Luar Kota-Batang Hari (a yellow-red podsolic soil type)
1	*Borreria latifolia*	Lumut / Tundra
2	*Colocasia sp.*	*Ageratum conyzoides* Linn.
3	*Cyperus rotundus*	*Amaranthus spinosus* Linn.
4	*Eulisine indica*	Anak Sawit *(seedling)*
5	*Fassiflora foetida*	*Calopogonium sp.*
6	*Fimbristylis globulosa*	*Cerastium sp.*
7	*Ischaemum timorense* Kunth.	*Cyperus rotundus*
8	*Ludwigia adcendens*	*Euphorbia hirta* Linn.
9	*Melastoma malabathricum*	Lawatan
10	*Mikania cordata*	*Leersia hexandra*
11	*Nephrolepis biserrata*	*Ludwigia adcendens*
12	*Ottocloa nodosa*	*Mimosa sp.*
13	*Stenoclaena palustris*	*Ottocloa nodosa*
14		*Paspalum sp.*
15		*Sparganophorus vaillantii* Gaertner.
16		*Vetiveria zizanoides*(L) Nash

Figure 1. Plant identification in the plot (inside the kuadrant) in Arang-Arang Village

Figure 2. A dominan species of legumes and its potensial for feeds (*Amaranthus* sp., INP=23.44%)

Figure 3. A dominan species of grass and its potensial for feeds (*Cyperus rotundus*)

Herbage found growing in the two sites basically can be divided into three categories, i.e. grasses, leguminosae, and weed. Grasses and leguminosae are forages, while weed is usually as unwilling species in agriculture and forestry so they have to be eradicated. However, theoretically all non-poisonous plant species might be considered to be forages. Several grasses such as *Eulisine indica, Ischaemum timorense* Kunth, *Ottocloa nodosa, Paspalum* sp. and leguminosae family such as *Calopogonium* sp. are forages. *Fimbristylis* sp. *Leersia hexandra* and *Cyperus* sp. are two species found growing under palm-oil plantation. These species are considered as minor forage species because they have minor importance (‘t Mannetje and Jones, 1992); and have noted as primarily being used as forages by the major historical handbooks on economically useful plants of South-East Asia. *Sparganophorus vaillantii* Gaertner, *Vetiveria*

zizanoides (L) Nash, *Cyperus rotundus* are example of plant species that have other primary use so they are considered having a secondary use as forage. *Sparganophorus vaillantii* Gaertner is considered as an auxiliary plant in agriculture and forestry, *Vetiveria zizanoides* (L) Nash as an essential-oil plant, and *Cyperus rotundus* as a plant mainly producing carbohydrates (‘t nManetje and Jones, 1992). *Melastoma malabathricum* is a medicinal and poisonous plant so it should be taken into account when the species exists in the pasture.

Based on Importance Value Index (INP) which is an index that describes the dominance of a plant species, several species for the Arang-Arang village and the Ness village were shown on Table 2.

Table 2 shows that grass is a minor species found in the Arang-arang village site as well as in the Ness village site. Fimbristylis globulosa (INP=43.91%) might be very potential as source as it is increaser species in the peaty soil. It is, however, predicted that Fimbristylis globulosa has minor importance as forage because it is a tufted plant with stiff flattened stems, flowering with no leaf-blades but leaf-sheaths only; leafy shoots usually on young plants so it should mix with leguminosae species to increase forage utility for livestock. Mimosa sp. (INP=18.91%) might be useful species in palm-oil plantation as it can use N from the air so that it will support the palm-oil plantation. Livestock can graze Mimosa sp. especi. Herbage Production (fresh and dry matter) Results of observation based on herbage production (fresh and dry matter) were shown on Table 3.ally when it is still young.

Herbages growing under palm-oil plantation with a peaty soil type contain 31.28% dry matter, while in a yellow-red podsolic soil type herbages contain 22.66% dry matter. It means that herbages grow in the Arang-arang village was 8.5% higher than that of in the Ness village. The more herbages growing in the Arang-arang village consume the more nutrients could be got by livestock grazing in the pasture compared that of growing in the Ness village.

Table 2. Dominant vegetation types found under oil palm plantations in two different soil types

Research locations	Type of vegetations
Arang-arang village, Kumpeh Ulu-Muaro Jambi (a peaty soil type)	*Fimbristylis globulosa* (INP=43.91%) *Ludwigia adcendens* (INP=40.46%) *Nephrolepis biserrata* (INP=29.85%) *Melastoma malabathricum* (INP=17.78%)
Ness village, Jambi Luar Kota-Batang Hari (a yellow-red podsolic soil type)	Lumut/Tundra (INP=32.18%) *Amaranthus* sp. (INP=23.44%) *Mimosa* sp. (INP=18.91%) *Ludwigia adcendens* (INP=16.40%)

Table 3. Average herbage production in fresh and dry matter for each plot from the two sites (Arang-Arang Village and Ness Village).

No.	Herbage Production	Arang-Arang Village*	Ness Village*
I.	In fresh, g	215.15 200.44	200.44
II.	In dry matter, g 67.3	45.43	45.43

Figure 4. Measurement of dry matter

Figure 5. Weighing of forages samples

Table 4. Average of biophysical soil condition for each plot from the two sites (Arang-Arang Village and Ness Village)

No.	Soil Analysed	Ness Village*	Arang-Arang Village*
1.	N-total, %	0.17	4.52
2.	P (P_2O5) HCl 25%, mg/100g	13.19	0.27
3.	K (K_2O) HCL 25%, mg /100g	16.07	0.23
4.	pH (H_2O)	5.57	4.57
5.	pH (KCL)	4.73	3.87
	Soil Texture:		
	Sand	22.54	-
	Dust	63.75	-
	Clay	13.70	-

*Notes: averages from 8 replicates

Biophysical Soil Condition

Results of biophysical soil condition by measurements of the soil texture and soil nutrient content were shown in Table 4.

Table 4 shows that N content in the Arang-arang village is more than 25 times higher than that of in Ness village but it lacks minereals (P_2O5 and K_2O). Compared with those two minerals content in the Arang-arang village, the Ness village soil under palm-oil plantation contains 48.85 and 69.87 times higher representing the P_2O5 and K_2O contents respectively. Nitrogen fertilization is needed for soil type in the Ness village, while addition of minerals (P_2O5 and K_2O) might be needed for soil type in the Arang-arang village.

CONCLUSION

It was concluded that herbages grow in palm-oil plantation in the Ness village are more various than that of in the Arang-arang village. Ottocloa nodosa and Eulisine indica are two grasses species that might be potential in the Arang-arang village which has a pity soil type, while Leersia hexandra, Paspalum sp., and Ottocloa nodosa are species of grasses which grow in the Ness village which has a yellow-red podsolic soil type. The existence of Melastoma malabathricum in the Arang-arang village should be considered as this species contains poisonous substances. Calopogonium sp. and Mimosa sp. are species of legumes that could be developed in palm-oil pasture to improve N content of herbages. Nitrogen or mineral fertilization might be needed to improve soil fertility of different soil types.

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