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Submission date: 05-Oct-2022 09:23AM (UTC+0700)
Submission ID: 1916963433
File name: article_07.pdf (222.3K)
Word count: 3028
Character count: 16239

UDC 332; DOI 10.18551/rjoas.2022-10.07

STUDY OF ECOLOGICAL FACTORS OF PEATLAND AGROFORESTRIC PATTERNS IN SUNGAI PANTAI VILLAGE OF BARITO KUALA REGENCY, INDONESIA

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ABSTRACT
Sungai Pantai Village is a village that has peat land conditions. In an effort to cultivate land, the village community uses an agroforestry system. The applied agroforestry system can provide benefits for farmers, both socio-economic and ecological benefits, to know the ecology based on the analysis of species composition, horizontal structure and vertical structure. The method used in this research is purposive sampling method. The people of Sungai Pantai Village work as farmers. The potential plants planted are for rambutan (Nephelium lappaceum), pineapple (Ananas comosus) and purun (Eucharlis dulcis), while for the evaluation of forestry plants, namely sengon (Paraserianthes falcataria).

KEY WORDS
Agroforestry Systems, Peatlands, Land Management.

Indonesia is the fourth country that has the largest peatland in the world after Canada, the Soviet Union and the United States. The area of peatland in Indonesia is around 17 million ha and is the second largest type of soil after podzolic soil (Bastoni and Sianturi 2000). In Kalimantan, it has an area of 764,305 km2 which has 4,403,000 ha of peat land or 9% of Kalimantan's area. From this area, it is estimated that more than one million ha or 23% have been damaged and the damage continues (Dirjen RLPS, 2000). This results in a very large loss of economic and non-economic value so that it can reduce people's welfare. Therefore, the damage to the degraded peat swamp forest and land needs to be reduced and immediately rehabilitated. One approach that can be taken in the effort to rehabilitate degraded peat swamp land and forests is to develop agroforestry models. Given the very complex and varied characteristics of peat, the development of agroforestry models that will be carried out must be local and even specific growing places, taking into account the physical characteristics of the environment, socio-cultural and economic aspects of local communities as well as ecological aspects.

The area of South Kalimantan has not much raised the values of traditional community wisdom in the use of peat swamp land and forests. The agroforestry system used as a form of land use and peat swamp forest by the community is still a routine activity in the community and has not been used as a support force in making forestry development policies in the region.

According to Marsono (1999), which was emphasized by Lahjie (2001), agroforestry was very beneficial. These benefits are environmental (including reducing pressure on forests, improving soil structure through the addition of organic matter on a regular basis from decomposed litter), economic (in the form of increasing the balance of food products, firewood, animal feed, fertilizers and carpentry wood and increasing the amount of agricultural incomes due to increased productivity and sustainable production) and social (i.e. improved living standards in rural areas through the provision of sustainable employment and higher incomes and improved nutrition and health due to increased quality and diversity of food products).

According to Soeseno and Idris (1974), peat forests have a layer of organic matter that is approximately one meter thick. The height of the trees here can reach a height of 30 m, especially at the edge of the forest, because the more central the habitat characteristics are, the more extreme the trees there are. Whereas in swamp forest the layer of organic matter is very thin, which is about 0.5 m. The area between the two forests is called the peat area and

is a transitional area where elements of swamp forest are found in it but are narrower because it can allow for the formation of peat forests more specifically.

Marsono (1977) said that vegetation is a collection of plants usually consisting of several types and live together in one place. Vegetation analysis is a way to study the composition (species composition) and form of vegetation or plant communities (Soerianegara and Indrawan, 1988). The method used in studying the composition of vegetation or plant communities is by sampling. Sampling of the units that have been studied was carried out in various ways, single plots, double plots and quadrant methods. According to Soerianegara and Indrawan (1988), mentioning the sampling technique above, the species composition of a stand can be known by calculating the density, relative density, frequency, relative frequency, dominance, relative dominance and the Important Value Index (IVI) of the species being sampled.

METHODS OF RESEARCH

This research was conducted in Sei Pantai Village, Rantau Badauh District, Barito Kuala (Batola) Regency, South Kalimantan Province. The study was carried out for ± 3 months. The tools and materials used are in the form of location maps, measuring tools (such as measuring tape, hagameter, calculator), stationery and photo camera.

The research was conducted using primary data and secondary data. Primary data obtained from the results of measurements in the field. While secondary data comes from relevant agencies related to supporting data in research. The data taken is the ecological aspect of agroforestry. In the ecological aspect, purposive sampling was taken with the aim of knowing the composition and growth rate of plants, which was carried out by measuring the horizontal structure and vertical structure. Where in Sei Pantai Village there are 4 agroforestry management techniques, namely Alley cropping (alley/lane plants) with the mound technique, Alley cropping with the mound and galengan technique, Alley cropping with the surjan technique (mounds and tabukan) and Plantation crop combinations (mixed crops) with the mound technique.

RESULTS AND DISCUSSION

The composition of plant species in Sungai Pantai Village consists of agricultural and forestry crops.

Species density means the number of individuals of a species per unit area of observation, which is generally expressed in hectares. Mastery of species is not only determined by frequency, but also by density value (Sutisna, 1985). In general, species that have a wide distribution will be followed by a high density value per unit area.

Table 1 – Composition of Plant Types in Sungai Pantai Village

No	Plant Type	Scientific Name
1.	Rambutan	*Nephelium lappaceum*
2.	Nanas	*Ananas comosus*
3.	Padi	*Oryza sativa*
4.	Sengon	*Paraserianthes falcataria*
5.	Purun	*Eucharlis dulcis*

Source: Primary data processing, 2022.

The distribution/number of trees per hectare for each land management technique can be seen in Figure 1. From the figure, it can be seen that for the mound technique the number of tree levels is 475 trees/ha, for the mound and galengan techniques the number of tree levels is 571 trees/ha, for For the surjan technique, the number of tree levels is 188 trees/ha, and for the guludan technique the number of tree levels is 267 trees/ha.

From the information above, it can be seen that there is a tendency for the mound and galengan techniques to have the highest number of trees/ha, this is because in this

technique the distance between plants and the width of the mound is smaller than the mound technique, and in the mound technique there are also rambutan plants. This is also because people want more income from farming so that more land for planting perennials is only made as necessary.

Table 2 – Tree density for each land management technique

No.	Land Management Techniques	Plant Type	Density (tree)	Relative Density (%)
1.	Gundukan (Mound)	Sengon Rambutan	325 150	68 32
2.	Gundukan and Galengan (Mounds and Gallans)	Sengon	571	100
3.	Surjan	Rambutan	188	100
4.	Guludan (Mound)	Sengon Rambutan	167 100	63 37

Source: Primary data processing, 2022.

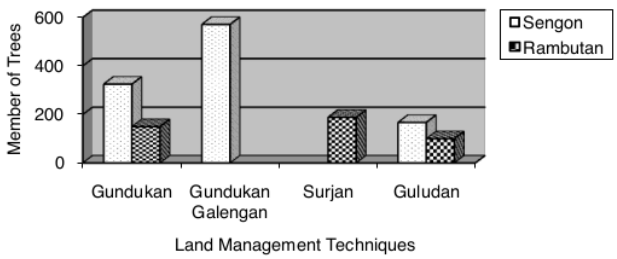

Figure 1 – Diagram of distribution/number of trees per hectare for each land management technique

As for the mound technique, it is because the mound area is only slightly compared to the area for agricultural areas, which is only one mound, or it can be said as a single ridge in a land ownership, the width of the mound can reach 7 meters. It was once again emphasized that the width or size of the mounds, galengan and mounds was based on the wishes of the farmers in considering the yields of the harvest, and was limited by the existing constraints, both socio-economic and ecological conditions. For the surjan technique, only rambutan trees are planted, where this tree has a wide canopy and requires a wider room so that the spacing is wide.

The comparison of the relative density value of one plant species with the relative density value of other plant species can be seen in Figure 2. From the figure it can be seen that the highest relative density value is in the mound and galengan technique, this is because in this technique only sengon (Paraserianthes falcataria) is planted with smaller spacing and mound size. Meanwhile, the lowest relative density is found in the surjan technique with rambutan plants (Nephelium lappaceum), this is because this species requires a wide growing space.

Frequency can be used as a measure to determine the distribution of the species concerned in an area and to other types of species, it can be seen from the relative frequency value. In this study, each land management technique only planted one or two types of plants so that the frequency was balanced. And in the observation, only one plot was made for each observation.

A complete comparison diagram of the relative frequency value of one type of plant to the frequency value of other plants can be seen in Figure 3. The highest relative plant frequency is sengon (Paraserianthes falcataria) for mound and galengan techniques and rambutan (Nephelium lappaceum) plants. because in this technique only pure plants are planted. While in the mound technique and the mound technique there is a mixture of plants, namely sengon (Paraserianthes falcataria) and rambutan (Nephelium lappaceum).

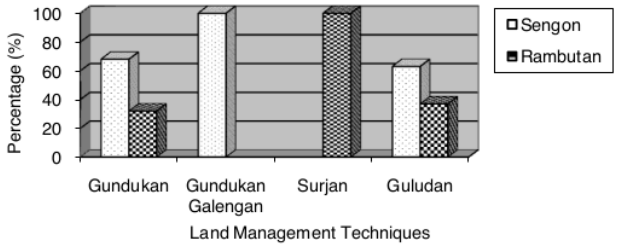

Figure 2 – Comparison diagram of the relative density value of one plant species with the relative density value of other plant species for each land management technique

Table 3 – Tree frequency for each land management technique

No.	Land Management Techniques	Plant Type	Frequency (tree)	Relative Frequency (%)
1.	Gundukan (Mound)	Sengon Rambutan	1 1	50 50
2.	Gundukan and Galengan (Mounds and Gallans)	Sengon	1	100
3.	Surjan	Rambutan	1	100
4.	Guludan (Mound)	Sengon Rambutan	1 1	50 50

Source: Primary data processing, 2022.

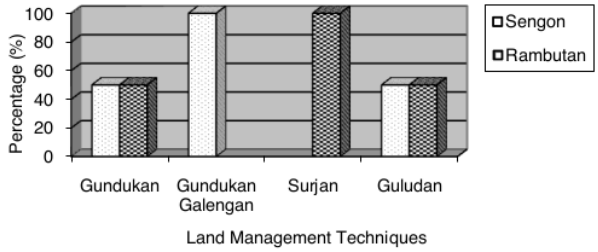

Figure 3 – Comparison of the value of the relative frequency of one species to the value of the relative frequency of other species for each land management technique

Dominance is the basic area of a species contained in a certain area or the proportion between the area covered by a plant type/species and the total habitat. In general, if a species has a large number, then the dominance value is high compared to other types which are few in number, on the contrary, a species which is more numerous than other species does not necessarily have a higher dominance value.

Table 4 – Dominance and Relative Dominance of trees for each land management technique

No.	Land Management Techniques	Plant Type	Domination (tree)	Relative Dominance (%)
1.	Gundukan (Mound)	Sengon Rambutan	42 14	74 26
2.	Gundukan and Galengan (Mounds and Gallans)	Sengon	51	100
3.	Surjan	Rambutan	98	100
4.	Guludan (Mounds)	Sengon Rambutan	23 35	40 60

Source: Primary data processing, 2022.

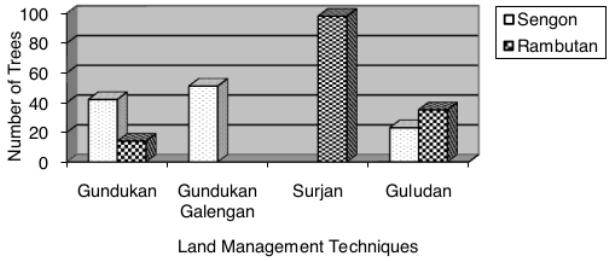

Figure 4 – Diagram of the dominance of one plant species over the dominance of other plants for each land management technique

From the figure, it is known that although the rambutan (Nephelium lappaceum) plants in the surjan technique are fewer in number but their dominance is large, this is because the trees are old and have a larger LBDS. Meanwhile, sengon (Paraserianthes falcataria) has a smaller dominance because the LBDS of the plant is smaller. The results of the calculation of the data for the relative dominance of one type of plant against other types of plants in each land management technique can be seen in Figure 5.

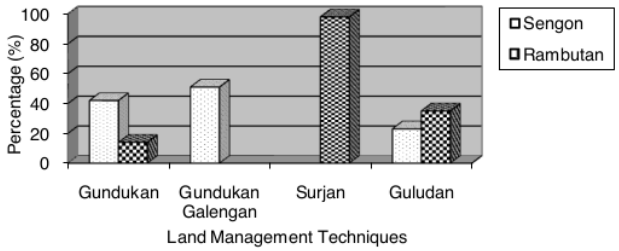

Figure 5 – Diagram of the relative dominance of one type of plant against the dominance of other plants for each land management technique

Important Value Index (IVI) is a form or description that is qualitative in nature for each type of plant that dominates or dominates a certain area. To obtain the Important Value Index (IVI), it is obtained by adding up the Relative Density (KR), Relative Frequency (FR) and Relative Dominance (DR), (Soerianegara and Indrawan, 1980).

Table 5 – Dominance and Relative Dominance of trees for each land management technique

No.	Land Management Techniques	Plant Type	(Important value index)
1.	Gundukan (Mound)	Sengon Rambutan	193 107
2.	Gundukan and Galengan (Mounds and Gallans)	Sengon	300
3.	Surjan	Rambutan	300
4.	Guludan (Mound)	Sengon Rambutan	153 147

Source: Primary data processing, 2022.

The Important Value Index for the mound technique is controlled by sengon (Paraserianthes falcataria) by 193%, in the mound and galengan technique it is controlled by 300% by sengon (Paraserianthes falcataria), and for the surjan technique it is controlled by 300% by rambutan (Nepheliun lappaceum), while the tabukan technique is controlled by the

sengon plant (Paraserianthes falcataria) by 153%. For more details, the comparison of the Important Value Index of one type of plant to the Important Value Index of other plants can be seen in Figure 6.

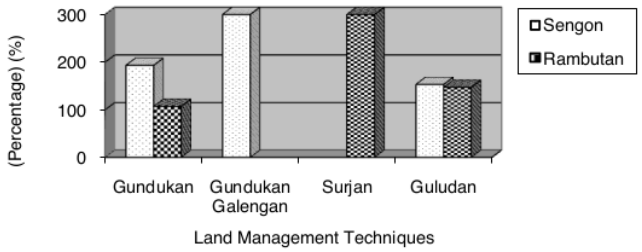

Figure 6 – Diagram of the important value index of one type of plant against the important value index of other plants for each land management technique

To find out the use of space in growing plants, it can be known by using horizontal structure analysis. From the observations, it can be seen that the plants that require the largest growing space. This study shows that in the agroforestry pattern there are 4 strata, where the four strata consist of strata A, namely sengon plants (*Paraserianthes falcataria*), strata B, namely sengon plants (*Paraserianthes falcataria*), strata C, namely rambutan plants (*Nepheliun lappaceum*) and strata E, namely consists of pineapple (*Ananas comosus*) and rice (*Oryza sativa*).

Meanwhile, in the agroforestry profile for the mound and galengan technique, in this technique there are only 2 strata, namely stratum B, namely sengon (*Paraserianthes falcataria*) and stratum E, namely rice (*Oryza sativa*). To describe the vertical structure in the surjan technique, it can be seen here that there are only 2 layers of strata consisting of strata B, namely rambutan plants (*Nepheliun lappaceum*) and strata E which consist of pineapple plants (*Ananas comosus*) and purun plants (*Eucharlis dulcis*). There are 3 levels of stratification using the taboo technique, namely stratum A occupied by sengon plants (*Paraserianthes falcataria*), stratum B occupied by sengon plants (*Paraserianthes falcataria*) and rambutan (*Nepheliun lappaceum*), while for stratum E occupied by rice plants (*Oryza sativa*).

CONCLUSION

Based on the results of the study, it can be concluded that from the ecological aspect it has a large dominance value (horizontal appearance) and Important Value Index (IVI), so the most prominent species is the sengon plant (*Paraserianthes falcataria*). This is because this species is deliberately propagated in its cultivation. When viewed from the profile diagram (vertical view), there are several differences for each land management technique. In the mound technique there are 4 strata, where the four strata consist of strata A, namely sengon plants (*Paraserianthes falcataria*), strata B, namely sengon plants (*Paraserianthes falcataria*), strata C, namely rambutan plants (*Nepheliun lappaceum*) and strata E, consisting of pineapple plants. (*Ananas comosus*) and rice plants (*Oryza sativa*). For the mound and galengan techniques, there are only 2 strata, namely strata B, namely sengon (*Paraserianthes falcataria*) and strata E, namely rice (*Oryza sativa).* To describe the vertical structure of the surjan technique, there are only 2 layers of strata consisting of strata B, namely rambutan plants (*Nepheliun lappaceum*) and strata E consisting of pineapple plants (*Ananas comosus*) and purun plants (*Eucharlis dulcis*). To see the level of stratification for the tabukan technique, there are 3 levels of strata, namely stratum A occupied by sengon plants (*Paraserianthes falcataria*), stratum B occupied by sengon plants (*Paraserianthes falcataria*) and rambutan (*Nepheliun lappaceum*), while for stratum E is occupied by rice plants (*Oryza sativa*).

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