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IMPROVING QUALITY OF KENAF FIBERS (HIBISCUS CANNABINUS L.) ON THE POSTED COAL MINING POINT USING BIOCHAR AND PLANTING MUCUNA)

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ABSTRACT: *Mining techniques carried out in Kalimantan generally use the open mining technique (open mining method) with the refill method (back patching method), discuss critical ways of covering vegetation, cover the speed of presentation of force on rainwater that hits directly soil surface, erosion, direct exposure to sunlight and soil compaction that results in the use of heavy equipment.This research aims to obtain ex-coal mining land that can be used for agricultural land and plantation land by reclaiming ex-coal mining land by providing biochar and planting mucuna type LCC plants, so that the land contains nutrients and good soil texture. so the kenaf plant growth process can grow well.The research was carried out for one year, in the former coal mining area of PT. Puspa Juwita, Muara Badak, Kutai Kartanegara as a place for planting kenaf plants using biochar and mucuna planting is expected to be an alternative choice because it is easy, cheap and effective. The design used in this study is a Completely Randomized Design in Factorial form where the first factor is biochar and the second factor is planting mucuna.The results showed that kenaf plants can grow well on post-mining coal land that has been given biochar and mukuna planting first. From the growth of stem diameter and height of kenaf plants the highest data was seen in the B5 (Biochar 100kg) treatment and the lowest in the B1 treatment (without treatment).*

KEYWORDS: ex-coal mining land, biochar, mucuna, kenaf

INTRODUCTION

One of the critical lands that has the potential to be converted into agricultural land is ex-coal mining land. Ex-coal mining land usually has a high level of density and is less fertile due to the presence of pile material originating from the underground layer, both horizon C and soil parent material (Hermawan, 2002). In such conditions, most food crops are unable to grow well due to limited penetration of roots into the soil to get water and nutrients. Plant seed germination also becomes inhibited in soils on ex-mining land due to crust formation and increased soil strength when the soil becomes dry (Whitemore etal., 2011).Reclamation activities are the end of mining activities which are expected to return the land to its original state. Reclamation activities include restoration of ex-mining land to improve ecological disturbed land and prepare ex-mining land that has been repaired ecology for further use (Murjanto, 2011).

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Biochar is a solid material that is formed through the process of combustion of materials without oxygen (pyrolysis) at temperatures of 250-500 ° C, survive in the soil for up to> 1000 years and is able to sequester carbon in the soil (Lehmann, 2007), can increase soil fertility and be able to restore quality degraded soil (Atkinson et al. 2010; Glaser et al. 2002).Efforts to speed up the recovery of land quality from open mining can be done by planting ground cover plants. In the initial stages it can be developed for the planting of legume cover crops of fast growing (fast growing species) such as: Calopogonium sp., Pueraria sp. (korobenguk), Centrosema sp. and others (Ardika, 2013). Giving biochar and planting mucuna type LCC can increase soil fertility and is one of the ways of reclamation so that ex-coal mining land can be functioned.To reduce these impacts, a study was conducted on the use of ex-coal mining land by using biochar and planting mucuna legume species on kenaf plant growth. If this can be done and is successful, then in addition to being able to overcome the problem of used can also support the growth of kenaf plants and the growth of other plantation crops.

RESEARCH METHODS

Time and Place

This research was conducted during 1 year 2017 and the place of research in the area of the former coal mining area of PT. Puspa Juwita Tanah Datar Village, Muara Badak Subdistrict, Kutai Kartanegara, covers land management activities, biochar application and mucuna planting and planting kenaf plants (Soil and Water Laboratory of the State Agricultural Polytechnic of Samarinda).

Tools and Materials

The tools used in this study include: hoes, machetes, foils, torches, water pumps, microcalipers, meters, soil drills, water hoses, scales and writing instruments, materials used in clean water, Biochar, raffia, plants LCC species of mucuna and kenaf plant seeds.

Research Design

The design used in this study is the RAL Factorial Design where the first factor is biochar and the second factor is mucuna. The first factor is as follows:
B1 = without biochar / control
B2 = Biochar 25 kg / bed
B3 = Biochar 50 kg / bed
B4 = Biochar 75 kg / bed
B5 = Biochar 100 kg / bed
And the second factor is as follows:
M1 = Mucuna planting spacing of 30 cm x 30 cm
M2 = Mucuna planting spacing of 40 cm x 40 cm

Research Procedure

1. Land preparation

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The land that is used is land that was formerly coal mining. First we measure the soil, after that cleaning is carried out, then measuring beds measuring an area of 2 m x 3 m, as many as 10 beds. Then the soil is processed and given manure to improve soil physical properties and the addition of nutrients to the soil.

Soil Analysis

Before the treatment of soil media is analyzed to determine the nutrient components in the soil against the chemical properties of the soil. Soil analysis was carried out at the Samarinda State Polytechnic's Soil and Water Laboratory.

Provision of Biochar and Mucuna planting

Giving biochar and planting mucuna done one month before planting kenaf plants by means of biochar scattered in existing beds, and mucuna planted on 5 (five) beds with a distance of 30 x 30 cm and 5 (five) beds 40 x 40 cm with a view to Add nutrients and improve soil physical properties

Seed Viability Test

Before the seeds are planted in the field, the growth rate is first tested to determine how much the growth rate of the seed.

Planting

Kenaf seed planting is carried out by using as many as 3 seeds per hole with a spacing of 35 cm x 35 cm.

Spacing

Thinning is done to leave 1 (one) plant per planting hole, carried out on plants aged 10 days after planting.

Maintenance

Maintenance includes watering, weeding, and controlling pests and diseases. Watering is done every day in the afternoon if there is no rain, watering is done until the soil is in the field of field capacity or plant water needs are met, weeding is done depends on how little weeds. To prevent pests and diseases spraying with pesticides.

Data Analysis Method

1. Soil analysis before treatment
2. Soil analysis after treatment
3. Increased stem diameter.

Measurements were made 30 45, 60, 75 and 90 days after planting, measured at the base of the stem (ground level).

4. Increased plant height.

Plant height measurements at the age of 30 45, 60, 75 and 90 days, measured from the base of the stem (ground level) to the point of growth

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Data Analysis

Based on the research data obtained, to determine the effect of the treatment on the observed variables, a variety analysis (F test) was carried out at 5% significance level. If the F test shows a significant effect then further tests are performed.

RESULTS AND DISCUSSION

Research Results

1. Analysis of the Former Coal Mine Land Early Research

The results of the analysis of the land use of the former coal mine PT. Puspa Juwita Tanah Datar Village, Muara Badak District can be seen in table 1

Table 1. Results of analysis of PT. Puspa Juwita Tanah Datar Village, Muara Badak District

No.	Parameters	Unit	Value
1	P Total	%	0,0056
2	K Total	%	0,66997
3	N Total	%	0,0524
4	C.Organik	%	0,0026
5	Mg Total	%	0,4597
6	Fe Total	Ppm	2780,00
7	Al Total	Ppm	17826,0
8	KTK	Me/100g	6,50
9	pH	-	6

Rod Diameter

Average Growth of Kenaf Stems Diameter at 30, 45, 60.75 and 90 Days After Planting for 0.25.50,75,100 kg Biochar Treatment and Mucuna Planting with a Spacing of 30x30 cm can be seen in table 2.

Table 2. Data Measurement of Kenaf Plant Diameter at 30, 45, 60, 75, 90 Days After Planting for 0.25,50,75,100 kg Biochar Treatment and Mucuna Planting with a Spacing of 30x30 cm

	Diameter With a Spacing of 30x30 cm				
treatment	30 days	45 days	60 days	75 days	90 days
B1	0.644	0.762	0.915	1.334	1.511
B2	0.651	0.766	0.933	1.288	1.442
B3	0.697	0.828	1.008	1.417	1.588
B4	0.717	0.851	1.071	1.456	1.666
B5	0.748	0.906	1.168	1.655	1.888

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Average Growth of Kenaf Stems Diameter at 30, 45, 60.75 and 90 Days After Planting for 0.25,50.75,100 kg Biochar Treatment and Mucuna Planting with 40x40 cm Spacing can be seen in Table 3.

Table 3. Data on Kenaf Plant Diameter Measurement at 30, 45, 60, 75, 90 Days After Planting for 0.25,50,75,100 kg Biochar Treatment and Mucuna Planting with Spacing 40x40 cm

	Diameter With a Spacing of 40x40 cm				
treatment	30 days	45 days	60 days	75 days	90 days
B1	0.622	0.737	0.9	1.168	1.315
B2	0.624	0.74	0.913	1.222	1.346
B3	0.677	0.8	0.984	1.26	1.42
B4	0.722	0.844	1.071	1.362	1.555
B5	0.711	0.846	1.075	1.377	1.608

Tabel 4. Anova. Dependent Variable : Diameter

Source	Type III Sur of Squares	Df	Mean Square	F	Sig
Corrected Model	11.582[a]	9	1.287	40.464	.000
Intercept	1059.534	1	1059.534	33314.443	.000
Biochar	7.833	4	1.958	61.571	.000
Mukuna	3.260	1	3.260	102.495	.000
Biochar * Mukuna	.490	4	.122	3.849	.004
Error	13.994	440	.032		
Total	1085.110	450			
Corrected Total	25.576	449			

Duncan[a,b]

Biochar	Subet			
	N	1	2	3
2.00	90	1.3944		
1.00	90	1.4133		
3.00	90		1.5044	
4.00	90			1.6111
5.00	90			
Sig.		.478	1.000	1.000

Plant Height

The Growth Height of Kenaf Plants at 30, 45, 60.75 and 90 Days after Planting for Biochar Treatment of 0.25.50.75,100 kg and Mucuna Planting with a Spacing of 30x30 cm can be seen in table 4.

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Table 5. Data Measurement of Kenaf Plant Height at 30, 45, 60, 75, 90 Days After Planting for Biochar Treatment 0,25,50,75,100 kg and Mucuna Planting with a Spacing of 30x30 cm

	Plant Height With Spacing of 30x30 cm				
treatment	30 days	45 days	60 days	75 days	90 days
B1	27.4	79.088	142.755	167.688	175.533
B2	28.933	79.488	148.555	171.178	178.378
B3	28.488	80.688	152.133	175	183.557
B4	30.955	84	158.133	181.888	190.578
B5	31.466	84.8	167.956	188.6	202.133

The Growth Height of Kenaf Plants at 30, 45, 60.75 and 90 Days after Planting for Biochar Treatment 0.25.50.75,100 kg and Mucuna Planting with a Spacing of 40x40 cm can be seen in Table 5.

Table 6. Data Measurement of Kenaf Plant Height at 30, 45, 60, 75, 90 Days After Planting for 0.25,50,75,100 kg Biochar Treatment and Mucuna Planting with Spacing 40x40 cm

	Plant Height With Spacing of 40x40 cm				
Treatment	30 days	45 days	60 days	75 days	90 days
B1	28.977	79.4	145.066	170.177	177.622
B2	28.466	80.977	151.311	174.6	181.888
B3	29.622	81.088	154.8	177.222	188.066
B4	31.133	84.846	161.667	189.911	199.689
B5	31.688	88.688	168	195.488	207.489

Tabel 7. Anova. Dependent Variable : Diameter

Source	Type III Sur of Squaes	Df	Mean Square	F	Sig
Corrected Model	50994.702[a]	9	5666.078	48.871	.000
Intercept	15988381.520	1	15988381.520	137901.723	.000
Biochar	47648.147	4	11912.037	102.743	.000
Mukuna	2718.302	1	2718.302	23.446	.000
Biochar * Mukuna	628.253	4	157.063	1.355	.249
Error	51013.778	440	115.940		
Total	16090390.000	450			
Corrected Total	102008.480	449			

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Duncan[a,b]

Biochar	Subet					
	N	1	2	3	4	5
1.00	90	176.5778				
2.00	90		180.1333			
3.00	90			185.8111		
4.00	90				195.1333	
5.00	90					204.8111
Sig.		1.000	1.000	1.000	1.000	1.000

Final Analysis of the Former Coal Mine Research

The results of the analysis of the land of the former coal mine PT. Puspa Juwita Tanah Datar Village, Muara Badak District, the end of the study can be seen in table 8

Table 8. Results of analysis of the land of the former coal mine PT. Puspa Juwita Tanah Datar Village District of Muara Badak End of Research

No	Sample code	P Total	K Total	KTK	N Total
		%	%	mmol/100 g	%
1	1	0.1110	0.69110	7.20	0.230
2	2	0.0981	067685	6.80	0.210
3	3	0.2560	0.73151	12.30	0.289
4	4	0.1031	0.68987	10.60	0.220

DISCUSSION

The results of the initial soil analyst study showed that macro nutrients N, P, K, Mg have low values. Likewise, a low level of organic C may cause the soil CEC value is not too large. The Al element also has the role of reducing CEC when it is in large amounts of land. The Fe element is included in the micro nutrients needed by plants in very small amounts, but if it exceeds the needs of the plant it will be toxic or interfere with plant growth. A low CEC is generally also directly proportional to a low pH (acidic state).

The former coal mining land has a high density and is less fertile due to the presence of pile material originating from the underground layer, and heavy equipment traffic during the mining process. Conventional open-pit mining has greatly altered landforms and the balance of land

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surface ecosystems, reducing soil productivity and environmental quality. Coal mining causes great damage to flora, fauna, hydrology, physical, chemical and biological soil properties (Kumar and Pandey, 2013).

In the second soil analysis results appear higher than the results of the initial analysis of the elements N, P, K, C, CEC value and pH, because the former coal mining land was given biochar and planted with mukuna, it can grow well in less fertile soil conditions with very fast growth. Biochar also improves the quality and quantity of water by increasing the retention of soil nutrients and agricultural chemicals for the utilization of plant growth, while mukuna plants have abundant biomass, stems and leaves are easily weathered so that it is a source of organic material that can add nutrients and fertilize the soil in plants, able to fix nitrogen from the soil and prevent erosion because the leaves are able to cover the soil perfectly (Suwardjo, et al, 1989).

The increase in the content of macro elements is caused by the administration of biochar and mukuna planting before planting kenaf, with this treatment can improve the physical properties of the soil to support plant growth. Based on the results of the analysis that has been done, it can give positive results to the improvement of soil physical properties seen in kenaf plant growth.

The treatment by adding biochar and mukuna plants in the former coal mining area can be made into agricultural and plantation land which will accelerate the process of restoring the former coal mining land. This will cause the land that was originally only planted with a few types of plants will experience an increase in quality so that it can be planted by several types of plants. Kenaf plants can be developed on the land and the micro climatic conditions in the former mining location will be improved by developing agricultural and plantation crops in the location.

The results of the calculation of the average stem diameter and plant height at ages 30,45,60,75 and 90 days with plant spacing 30x30 cm and 40x40 cm, from five treatments B1 (without treatment), B2 (Biochar 25 kg), B3 (Biochar 50 kg), B4 (Biochar 75 kg) and B5 (Biochar 100 kg) with the largest stem diameter are in the B5 treatment and lowest in B1.

The results of analysis of variance showed that the F count <F test table of 5% or 1%, in five treatments had a significant influence on the increase in stem diameter and height of the plant. Giving biochar and planting mukuna on the reclaimed land of the former mining area is able to add nutrients that can restore soil quality at the level of soil damage so that the growth of kenaf plants can grow well.

According to Subowo (2011), that by planting MCC species can change the physical, chemical and biological environment such as soil conditions, water flow quality, vegetation patterns and fauna habitat, and so on. Mucuna plants are able to grow and produce organic material in large quantities, mucuna roots can improve the physical properties of the soil and increase soil fertility. According to Steiner et al (2007), the addition of nutrients needed by plants in sufficient quantities will be good plant growth. As stated by Daniel et al (1987), that the success of growth is determined by internal factors (genetic and hormones) and external factors (climate and quality of the place to

grow). Potential types for reclamation of ex-coal mine land are selected based on their ability to adapt to the condition of the land to be reclaimed, as well as the availability of seedlings (Adinugroho and Sidiyasa, 2009).

From the results of kenaf plant research is a type of plant that grows fast and is relatively more effective in absorbing water, nutrients and solar energy and CO2, because the acceleration of growth is closely related to the process of physiological metabolism, especially the photosynthesis process. Because the condition of the former mine conditions is nutrient poor, it is necessary to consider the selection of non-greedy fast-growing species. Kenaf plants can be seen from the increase in stem diameter and plant height in the treatment of B5 (100 kg Biochar), its growth is good because there are mukuna plants which are very instrumental in accelerating the process of forming the microclimate and improving soil conditions so as to accelerate the process of succession of vegetation because they create conditions that allow for entry and the growth of other types of vegetation.

In treatment B1 (without treatment) the lowest stem growth and plant height were seen, this is due to the physical characteristics of the soil such as texture, consistency, structure, boundaries between soil layers and changes in soil chemical properties such as nutrient content in soil N, P, K , C-organic, soil pH, physical changes that occur morphology and topography of the land, and changes in microclimate caused by changes in wind speed, disturbance of biological habitats in the form of flora and fauna, as well as a decrease in soil productivity resulting in mined land becoming barren and infertile (Personal, 2012).

Nutrient deficiencies in ex-coal mine land can inhibit plant growth, the lack of nutrients results in stunted plant growth and development and directly influences plant productivity (Ardhiansyah. N and Sumarsono P, 2014)

With reclamation as an effort to repair or restore damaged land as a result of mining business activities must be done as early as possible by planting plants to create a stable soil surface, nutrient formation through weathering falling leaf litter, repairing soil as a planting medium for safe conditions and not eroded so young can be reused. There needs to be a plan for developing agricultural, plantation and forest crops (Subowo, 2011)

CONCLUSION

From all research activities carried out up to the stage of making this report, it can be concluded that:
1. It appears that there is an influence on the provision of biochar and mukuna planting on the improvement of the physical properties of the former mining land of PT. Puspa Juwita Tanah Datar Village Muara Badak District Kutai Kartanegara Regency.
2. Looking at the increase in diameter and height of kenaf plants produced up to the age of 90 days after planting, it can be seen that the B5 treatment (100kg / beds) shows that the growth of kenaf plants is better than all treatments and the percentage of kenaf plant life is 100%.

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3. Ex-mining land that has been given biochar and mukuna planting can be used as a land for cultivating fiber plants in this case the Kenaf plant (Hibiscus cannabinus L).

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