Organic Fertilizers Improves Trembesi (*Samanea Saman*) Seedling Growth, A Case Study Of The Implementation Of Post-Mining Land Reclamation And Revegetation Within The Forest Cultivation Zone

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Abstract: This study aimed to (1) determine the effect of each organic fertilizer dosage (a) the growth variables of Trembesi seedlings and (b) the quality of planting media after 120 days planted Trembesi Seedlings. This study also aimed to (2) obtain the optimum dose of organic fertilizer to be applied to the implementation of post-mining land reclamation and revegetation within the Forest Cultivation Zone. This research used various manure: Control without fertilizer; NPK synthetic fertilizer control; chicken manure, cow manure, and organic litter compost. Each of the organic fertilizer was given at doses of 125, 250, and 375 g/polybag. The test plants used were Trembesi seedlings (Samanea saman) at 4 months of age.The experimental design was prepared using Randomized Block Design (RAK) with 5 replications in each test plant group. Data analysis was completed with Fisher LSD Test and Duncan Multiple Range Test (DMRT) as well as regression analysis.The treatment of organic fertilizer dosage showed significant in all variables of growth of trembesi seedlings, except on average of Trembesi seedlings height at 90 days after planting (DAP) and on average stem diameter of Trembesi seed of 30, 60, 90, 120 DAP. Effect of organic fertilizer dosage to planting medium after 120 days planted Trembesi seedling. All variations of fertilization dose increase the pH value, organic C, N-total, C/N ratio, available P, available K, Ca++, Mg++, Na+, K and cation exchange rate (CEC). Treatment dose of 375g/polybag of chicken manure was the best treatment dose with the highest number of twigs on Trembesi seedlings at the age of 30 DAP (21.00 twigs), 60 DAP (36.40 twigs), 90 DAP (63.60 twigs), 120 DAP (106.60 twigs), The Longest length of twig was found on Trembesi seedlings with age of 30 DAP (17.95 cm), 60 DAP(21.61 cm), 90 DAP (28.49 cm), 120 DAP (32.11 cm), longest root length and heaviest biomass weight of Trembesi seedling wasfor the age of 120 DAP, which were 58.80 cm and 487.22 g, respectively.

Keywords: Forestry Cultivation Areas, productivity, post-mining land, organic materials, nutrients

1 INTRODUCTION

According to The Ministry of Forestry of the Republic of Indonesia, forest is an ecosystem consisting of a landscape of biological natural resources, dominated by trees in natural unity with its environment, where one can not be separated (Permenhut RI number P.16/Menhut-II/2014).Vickery (1984) mentions the specific feature of tropical forests that other forests do not have, namely the very high recycling rate, so that all components of forest vegetation will not lack nutrients. Forest nutrient cycle begins with the fall of organic material from forest flora and fauna to the forest floor. The quantity of organic material falling according to Hausenbuiller (1978) is between 10 and 20 tons per ha / yr. In natural forest (species *Buchanania lanzan*), the magnitude of the fall of organic matter is 8.3 ton / ha (Singh, 1984). Yamani (1996) stated that the amount of organic material in natural forest is 7.7 tons / ha / year. The quantity of organic material falling is 7.3 tons / ha / year in logged-over forests and 11.5 tons / ha / year in natural forest (Hairiah, 2004). According to Indriyanto (2006), forest land is the main form of topsoil and storage of mineral elements needed by plants. The forest soil will affect the composition and structure of the forest vegetation that is formed. Coal mining in forest areas can have a positive impact on social economy in the short term. However, coal mining has a long-term negative impact on vegetation and the dynamics of forest land related to chemical, physical and biological. According to the Environmental Agency of East Kalimantan Province (2013) there are land use permits in Forest Areas for coal mining businesses covering an area of approximately 14,424.95 ha. According to the Directorate General of General Mining (1993), mining will change the physical, chemical and biological environments such as landform and soil conditions, water quality and flow, dust, vibration, and vegetation patterns and fauna habitats. Gardner (2004) states that open mining sites will cause drastic ecosystem changes. McGeehan (2011) In many cases, mine spoil represents a completely destroyed soil-plant ecosystem. Hamidah (2011) states that coal mining activities have a negative impact on some chemical and physical properties of the soil. Mhlongo et al (2013) states that post-mining neglect conditions will increase environmental damage. This opinion is corroborated by the results of the Ramayana study (2015) which states that post-mining soil fertility status is low to very low. Implementation of reclamation and revegetation of former coal mine in East Kalimantan is weak (Distamben Province Kaltim, 2015). The results of the Research Research Center of Mulawarman University (2007), indicate that the reclamation and revegetation of ex-mining land on coal mining business is categorized as less successful. The results of a study by East Kalimantan Province's Research Team of Research and Development Agency (2009) indicate that revegetation for one year has a positive effect on the chemical and physical properties of the soil, but has not provided significant improvements to post-mining environmental conditions. According to Harjuni (2012), on reclamation and post-mining land revegetation, every 10 ha of reclaimed land can only reduce surface runoff by 10.68%, and decrease soil erosion rate of 51.15%. Land degradation and water balance in coal mining areas continue to occur, unless the implementation of reclamation and revegetation activities is intensified on the post-mining land of the coal. According Munawwar (2012) the implementation of revegetation for 11 activities analyzed in the area of Forest Cultivation (KBK) reached only 70.11%, meaning less in accordance with Minister of Forestry Regulation (number P.60/Menhut-II/2009). Coal mining activities that do not carry out post-mining reclamation and revegetation properly will potentially lead to the emergence of critical land in the area of KBK. There is no change in the status of post mining land using a borrowing pattern in the KBK. Gardner (2004) states that revegetation on post mining land must be productive and sustainable. If post-mining land is planted with productive crops, then the productivity of the land should be able to compete with productivity on appropriate soil environmental conditions. When the original crop is returned, the level of land productivity should be sufficient to ensure the achievement of sustainable land ecosystems. Slater (2017) states that post mining rehabilitation can take a long time and is expensive. However, serious land rehabilitation will support the restoration of soil nutrition. In this case the post-mining land revegetation is approached by planting Trembesi crops with organic fertilizer using several types of manure with various doses. This study aims to (1) determine the effect of fertilizer dosage from each organic fertilizer (a) to the growth variables of Setaria seedlings and (b) to the quality of planting media after planting Trembesi Seeds for 120 days. This study also aims to (2) obtain the optimum dose of organic fertilizer to be applied to the implementation of post-mining land reclamation and revegetation within the KBK.

2 MATERIALS AND METHODS

2.1. Study area

This research was conducted in field laboratory of Agroecothecnology, Faculty of Agriculture Mulawarman University. The demonstration plot is 55 Trembesi plants planted in polybags. This research took place in June 2016 - December 2017.

2.2 Procedures

1. Media

Samples of soil, as much as 20 kg each polybag, were taken from the post-mining area within the forest area of PT Jembayan Muara Bara. Organic fertilizer materials, in the form of chicken manure, cow manure, and litter compost, are collected from farmers in Samarinda and Kutai Kartanegara areas. Trembesi tree seedlings were selected with the criteria of age 4 months, the same relative height, the appearance of normal growth. Chemical and physical analysis of soil were conducted at Soil Science Laboratory, Faculty of Agriculture, Mulawarman University.

2. Research Design

This research used various manure: (P1) Control without fertilizer; (P2) NPK synthetic fertilizer control; chicken manure (P3, P4 and P5), cow manure (P6, P7, P8), and litter compost (P9, P10, P11). Each of the manure fertilizer was given at doses of 125, 250, and 375 g/polybag. These figures were conversion of ±12 tons/ha of nutrient cycle in the post-mining area. The experimental design was prepared using Randomized Block Design (RAK) with 5 replications in each test plant group.

3. Observed Parameters

Observation variables included two aspects: (1) growth variable of trembesi seedlings and (2) variable of nutrient concentration change. For seed growth variables, observations were made on: (a) average height of trembesi seedlings, (b) average of trembesi seed stem diameter, (c) average number of twigs, (d) average length of twigs . All of these parameters were observed at 30, 60, 90 and 120 DAP, (e) average root length of trembesi seedlings and (f) average weight of trembesi seed biomass measured at 120 DAP. For variable changes of nutrient concentration was observed on planting medium at age 120 DAP. The observed nutrient concentrations included pH, organic C, N Total, P available, K available, Ca^{++}, Mg^{++}, Na^{+}, K^{+} and cation exchange capacity (CEC).

4. Data Analysis

The data analysis used in this experiment was Fisher Test, followed by Duncan Multiple RangeTest (DMRT) to find the real difference between treatments, so that the best treatment was obtained. Regression analysis was done to find out the closeness of the relationship between dosage of manure treatment to biomass of trembesi seeds

3 RESULT AND DISCUSSION

3.1. Result

1. Chemical parameters of Soil After Mining

Soil post coal mines have decreased chemical characteristics, consisting of pH, organic C concentration, total N, P available, and K available (Table 1). Decreased quality of post-coal mining land was due to the open mining system. Mining this way causes the loss of surface soil through land clearing. According to Gardner (2001), land evictions lead to the loss of soil organic matter, so the soil becomes critical or poor. Poor soil will be less organic material capable of supporting fertilizers and water, because the organic material is a soil colloid that functions in the formation of micro aggregates and colloid complex. Such soil conditions do not support the fairly growth of plants (Cole, 1995).

Tabel 1. The Chemical Caracteristic of the Soil and Organik Fertilizer.

Media	pH	C Organic	N Total	C/N ratio	P available	K available
Soil before mining*	4.64 (acidic)	1.09 (low)	0.10 (low)	11.36 (medium)	4.90 (very low)	63.95 (very high)
Soil after Mining**	4.00 (very acidic)	0.50 (very low)	0.08 (low)	6.0 (low)	4.46 (very low)	54.45 (high)
Chiken manure	9.30 (alkaline)	16.37 (very high)	2.25 (very high)	7.30 (low)	4.35 (very low)	4.66 (very low)
Cow manure	8.35 (alkaline)	15.25 (very high)	1.39 (very high)	1 (medium)	1.49 (very low)	9.54 (very low)
Litter compost	9.54 (alkaline)	17.78 (very high)	1.43 (very high)	12.40 (medium)	3.35 (very low)	3.68 (very low)

* Obtained from Environmental Impact Assesment Analysis Documen of PT. Jembayan Muara Bara
** Laboratory analysis

Decreased quality of post-coal mining land was due to the open mining system. Mining this way causes the loss of surface soil through land clearing. According to Gardner (2001), land evictions lead to the loss of soil organic matter, so the soil becomes critical or poor. Poor soil will be less organic material capable of supporting fertilizers and water, because the organic material is a soil colloid that functions in the formation of micro aggregates and colloid complex. Such soil conditions do not support the fairly growth of plants (Cole, 1995). To improve the soil as above can be done with the addition of organic fertilizer. Sheoran et al (2010) states soil productivity of a particular land can be enhanced by adding various natural amendments such as saw dust, wood residues, sewage sludge, and animal manure.These amendments stimulate the microbial activity wich provide the nutrients (N, P) and organic carbon to the soil. Wijesekarata, et all (2016), states that large quantities of biowaste, such as manure compost, biosolids, and municipal solid waste (MSW) can be used to rehabilitate post-mining soil. These biowastes provide a source of nutrients and improve the fertility of the soil.

2. Biological parameters of Trembesi planting

Availability of nutrient media substances corrected positively by the addition of organic matter. According to Ingestad and Lund (1988) and Ericson and Ingestad (1986), nutrient deficiencies, especially elements of phosphorus, affect the development and health of plants, especially nitrogen elements. Ingestad and Agren (1988) states that carbon nutrients, nitrogen and other nutrients are used by plants for growth components. The treatment of organic fertilizer dosage showed significant in Plant High {Table 2, row 1 (ANOVA), Pigure 1a, 1b, 1c, 1d (Regression analysis for Alpha 5%)}; Number of Twig (Tabel 2, row 3; Pigure 3i, 3j, 3k, 3l); Length of Twig (Tabel 2, row 4; Pigure 4m, 4n, 4o, 4p); Length of root for 120 DAP (Tabel 2, row 5; Pigure 5q); Weigth of Biomass for 120 DAP (Tabel 2, row 6; Pigur3 6r); of trembesi seedlings, except on average of Trembesi seedlings height at 90 DAP and on average stem diameter of Trembesi seedlings of 30, 60, 90, 120 DAP.

Table 2. The Performance of variables that observed on Trembesi seedling

No.	Parameters		DAP	Control		chicken manure			cow manure			litter compost		
				(0)	NPK Fertilizer	125 g/bag	250 g/bag	375 g/bag	125 g/bag	250 g/bag	375 g/bag	125 g/bag	250 g/bag	375 g/bag
1	The average increment of Trembesi seedling	Plant high (cm)	30	$14,40^{f}$	$19,00^{def}$	$26,80^{abcdef}$	$24,50^{bcdef}$	$38,62^{abc}$	$20,63^{cdef}$	$34,60^{abcd}$	$41,00^{abc}$	$17,60^{def}$	$33,80^{abcdef}$	**$44,80^{a\,(1.1)}$**
			60	21.40^{bcd}	23.60^{d}	31.00^{abcd}	32.90^{abcd}	**$46.18^{a\,(3.1)}$**	45.37^{ab}	40.00^{abc}	39.00^{abcd}	38.00^{abcd}	35.40^{abcd}	36.20^{abcd}
			90	20.20^{h}	$33.80^{abcdefgh}$	$33.80^{abcdefgh}$	46.40^{abc}	$38.20^{abcdefg}$	$36.60^{abcdefgh}$	**$50.20^{a\,(1.1)}$**	48.80^{ab}	$44.40^{abcdefg}$	45.60^{abcdef}	45.80^{abcd}
			120	35.00^{f}	50.40^{f}	68.80^{bcdef}	92.80^{abcd}	90.20^{abcde}	58.20^{f}	67.00^{bcdef}	95.20^{ab}	75.00^{abcdef}	93.60^{abc}	**$99.60^{a\,(1.1)}$**
2		Stem diameter (cm)	30	$0,28^{c}$	$0,29^{bc}$	$0,45^{ab}$	$0,36^{ab}$	$0,35^{ab}$	$0,40^{ab}$	$0,40^{ab}$	$0,42^{ab}$	$0,44^{abc}$	$0,40^{ab}$	**$0,47^{a\,(2.2)}$**
			60	0.17^{e}	0.18^{e}	0.26^{abcd}	0.24^{abcde}	0.20^{abcde}	**$0.32^{a\,(1.2)}$**	0.22^{abcde}	0.28^{ab}	0.20^{abcde}	0.24^{abcde}	0.22^{abcde}
			90	$0,13^{c}$	$0,16^{bc}$	$0,20^{abc}$	$0,24^{abc}$	$0,24^{abc}$	$0,22^{abc}$	$0,28^{ab}$	$0,24^{abc}$	$0,22^{abc}$	$0,26^{abc}$	**$0,30^{a\,(1)}$**
			120	$0,46^{a}$	$0,62^{a}$	$0,64^{a}$	$0,72^{a}$	$0,62^{a}$	$0,64^{a}$	$0,72^{a}$	$0,44^{a}$	$0,70^{a}$	**$0,74^{a\,(3.2)}$**	$0,60^{a}$
3	The average of number of twig of Trembesi seddling (cm)		30	12.00^{i}	13.00^{i}	16.00^{cdef}	16.80^{bcd}	**$21.00^{a\,(1.3)}$**	15.20^{defg}	16.80^{bcde}	18.80^{ab}	14.00^{fghi}	15.20^{defgh}	18.00^{bc}
			60	$19,20^{j}$	$21,80^{hij}$	$25,40^{efg}$	$28,60^{bcd}$	**$36,40^{a\,(1.3)}$**	$23,80^{fgh}$	$27,60b^{cde}$	$30,40^{b}$	$23,80^{fghi}$	$26,40^{ef}$	$29,60^{bc}$
			90	38.80^{h}	$42.00g^{h}$	46.60^{defg}	52.40^{bcd}	**$63.60^{a\,(1.3)}$**	45.00^{efgh}	50.20^{bcdef}	55.60^{b}	46.40^{defgh}	50.80^{bcde}	54.60^{bc}
			120	$68,20^{i}$	$72,40^{ghi}$	$80,00^{defg}$	$88,20^{bcd}$	**$106,60^{a\,(1.3)}$**	$79,40^{efgh}$	$86,80^{bcde}$	$95,20^{b}$	$76,00^{fghi}$	$82,60^{def}$	$92,20^{bc}$
4	The average length of twig of Trembesi seedling (cm)		30	$10,81^{i}$	$11,91^{h}$	$14,57^{cde}$	$14,95^{cde}$	**$17,95^{a\,(1.4)}$**	$13,38^{defgh}$	$14,09^{cdefg}$	$17,27^{ab}$	$12,71^{efgh}$	$14,44^{cdef}$	$15,82^{b}$
			60	$14,20^{j}$	$15,23^{hij}$	$17,72^{cdef}$	$18,96^{bcd}$	**$21,61^{a\,(1.4)}$**	$16,12^{efghi}$	$17,86^{bcde}$	$20,00^{ad}$	$17,18^{defgh}$	$17,79^{cdef}$	$19,56^{abc}$
			90	$18,25^{f}$	$20,20^{ef}$	$22,24d^{ef}$	$23,36b^{cd}$	**$28,49^{a\,(1.4)}$**	$21,07^{def}$	$22,67^{cde}$	$25,58^{ab}$	$21,02^{def}$	$21,72^{def}$	$24,99^{bc}$
			120	$19,21^{i}$	$22,11^{h}$	$25,03^{cdefg}$	$26,37^{bcd}$	**$32,11^{a\,(1.4)}$**	$23,73^{defgh}$	$25,37^{cdef}$	$29,08^{ab}$	$24,36^{defgh}$	$25,95^{cde}$	$27,48^{bc}$
5	Length of root (cm)		120	$40,00^{i}$	$40,60^{i}$	$45,60^{defghi}$	$50,20^{bcdef}$	**$58,80^{a\,(1.5)}$**	$49,00^{defg}$	$50,60^{bcde}$	$56,40^{abc}$	$48,20^{defgh}$	$52,40^{abcd}$	$57,40^{ad}$
6	Weight of Biomass (g)		120	$133,98^{i}$	172.40^{efghi}	$233,52^{efghi}$	$305,81^{bcdef}$	**$487,22^{a\,(1.6)}$**	$237,40^{efghi}$	$371,47^{abcd}$	$469,16^{ab}$	$286,57^{cdefg}$	$359,77^{abcde}$	$436,49^{ab}$

Note :
(0) : No organic matter and no NPK Fertilizer, DAP : days after planting, The bold showed that the highest, The average number that followed the same alphabet, showed not significant by DMRT test at of alpha 5% , (1.x) : Very stong correlation by Regresion analysis at alpha 5%, (2.x) : Moderate correlation by Regresion analysis at alpha 5%, (3.x) : Weak correlation by Regresion analysis at alpha 5%, (x.1), (x.2),…..,(x.6) : Pigure 1, Pigure 2……Pigure 6

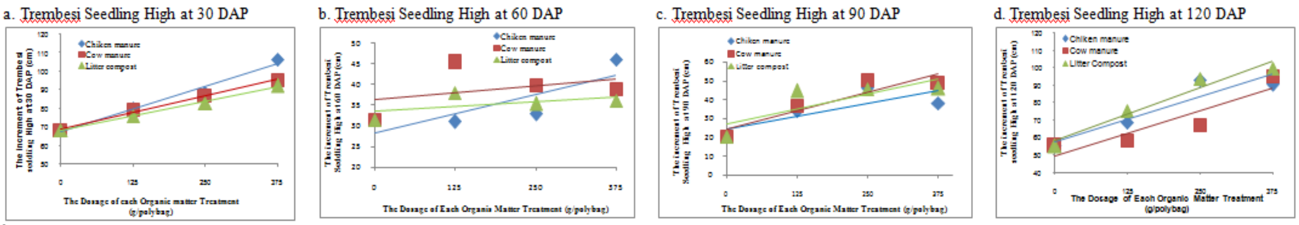

Figure 1. Corelation the dose of organic matter treatment on the average of increment Trembesi seedling high at 30, 60, 90, 120 DAP

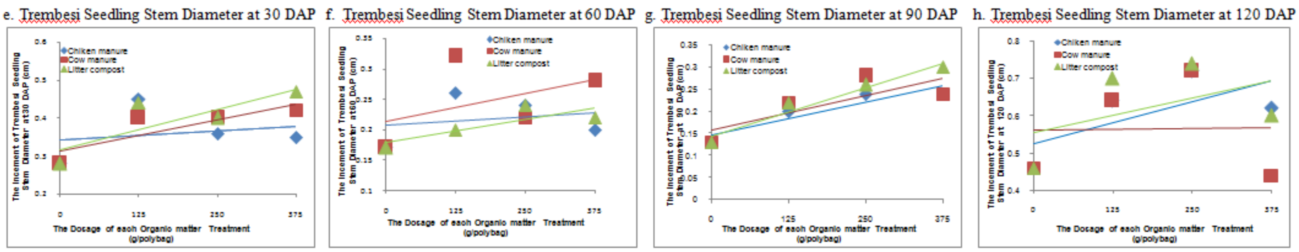

Figure 2. Corelation the dose of organic matter treatment on the average of increment Trembesi seedling steam diameter at 30, 60, 90, 120 DAP

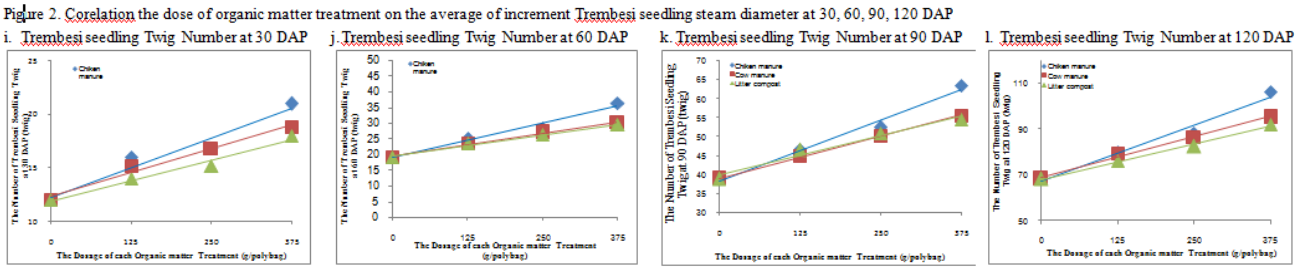

Figure 3. Corelation the dose of organic matter treatment on the average of Trembesi seedling twig number at 30, 60, 90, 120 DAP

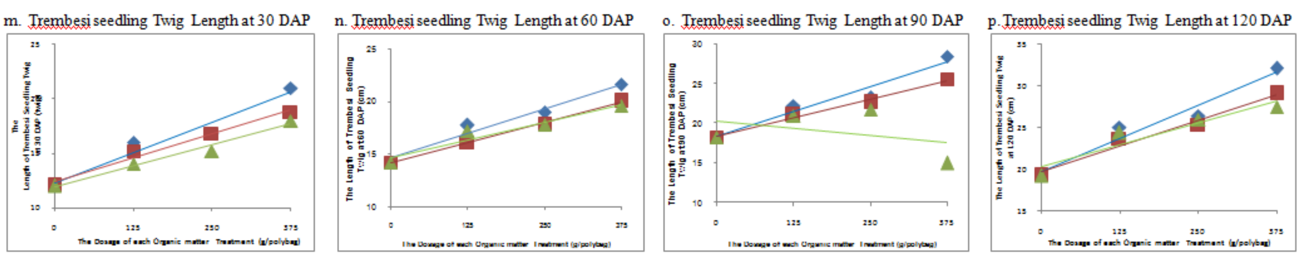

Figure 4. Corelation the dose of organic matter treatment on the average of increment Trembesi seedling twig length at 30, 60, 90, 120 DAP

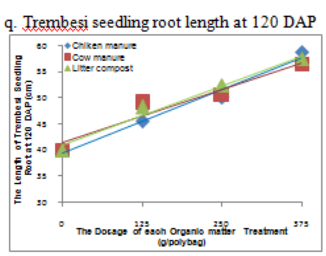

Figure 5. Corelation the dose of organic treatment on Trembesi seedling root length at 120 DAP

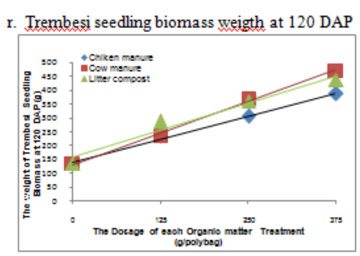

Figure 6. Corelation the dose of organic matter treatment on Trembesi seedling biomass weigth at 120 DAP

2. Chemical parameters of planting media after Trembesi planted for 120 DAP

The treatment of different fertilizer doses from each group of organic fertilizers gave an increase of nutrient concentration on the experimental media after being planted Trembesi for 120 days. In the chicken manure group, the 375 g/polybag treatment dose gave the highest increase in all nutrient concentrations except C/N ratio and K^+. In the cattle manure group, the 375 g/polybag treatment dose gave the highest increase in all nutrient concentrations except C/N ratio, Ca^{++}, Mg^{++}, Na^+, and K^+. In the compost fertilizer group, the dose of 375 g/polybag gave the highest increase in all nutrient concentrations except Mg^{++}, K^+, and Na^+ (Table 3).

Table 3. Chemical contents of planting medium after 120 DAP

Parameter	Unit	Pre-planting*	Control		Chicken manure			Cow manure			Litter compost		
			(0)	NPK fertilizer	125 g/bag	250 g/bag	375 g/bag	125 g/bag	250 g/bag	375 g/bag	125 g/bag	250 g/bag	375 g/bag
pH H_2O	-	4.0	4.25	4.51	5,03	6,02	**6,63**	5,38	5,39	**5,46**	5,25	6,15	**6,50**
C organic	%	0.50	0.58	0.70	0,57	0,94	**1,36**	0,64	0,66	**0,78**	0,75	0,81	**1,22**
N total	%	0.08	0.06	0.16	0,20	0,24	**0,35**	0,18	0,21	**0,22**	0,17	0,22	**0,53**
C/N Ratio	%	6.00	9.67	4.38	2,85	**3,92**	3,89	**3,56**	3,14	3,55	**4,41**	3,68	2,29
P available	ppm	4.46	7.20	9.45	166,50	301,05	**436,50**	40,05	62,55	**68,40**	81,90	133,65	**143,20**
K available	ppm	54.45	43.51	68.02	53,51	60,18	**186,65**	67,04	88,61	**195,47**	57,24	90,57	**101,16**
Exchangeable cations													
Ca^{++}	meq/100g	Nob	2.83	4.35	3,69	8,11	**8,17**	**9,94**	3,95	5,32	3,28	4,24	**5,30**
Mg^{++}	meq/100g	Nob	1.04	1.52	1,74	2,71	**3,74**	**3,83**	1,29	1,09	1,00	**1,32**	0,76
Na^{+}	meq/100g	Nob	0.43	0.62	0,21	0,80	0,59	**1,41**	0,48	0,61	**0,48**	0,38	0,28
K^{+}	meq/100g	Nob	0.23	0.47	0,54	1,13	0,80	**1,35**	0,65	0,52	0,56	**0,67**	0,32
CEC	meq/100g	Nob	11.87	**20.12**	13,75	17,67	**18,88**	19,25	17,13	**29,87**	13,12	17,75	**19,12**

Note : * : Soil after mining. Nob : no observed. The bold showed that the highest

Poultry manure at the same fertilizer dose (dose 125 g/polybag) gave the highest increase of N Total and P available nutrients compared to other organic fertilizer group influences. Chicken manure, at a dose of 250 g/polybag, gave the highest increase of nutrient concentration in organic C, N Total, C/N ratio, available P, Ca^{++}, Mg^{++}, Na^{+}, K^{+} and CEC, compared with other fertilizer groups. At a dose of 375 g/polybag, chicken manure provided the highest increase of nutrient concentration at pH, organic C, available P, Ca^{++}, Mg^{++} and K^{+}, compared with other fertilizer groups (Table 4).

Tabel 4. Comparison of increased nutrient concentrations in planting media after planted trembesi at the same dose of different organic fertilizer.

Parameters	Units	Pre-planting*	Control		CnM**	CM**	LC**	CnM**	CM**	LC**	CnM**	CM**	LC**
			(0)	NPK fertilizer	125 g/bag	125 g/bag	125 g/bag	250 g/bag	250 g/bag	250 g/bag	375 g/bag	375 g/bag	375 g/bag
pH H_2O	-	4.0	4.25	4.51	5,03	**5,38**	5,25	6,02	5,39	**6,15**	**6,63**	5,46	**6,50**
C organic	%	0.50	0.58	0.70	0,57	0,64	**0,75**	**0,94**	0,66	0,81	**1,36**	0,78	**1,22**
N total	%	0.08	0.06	0.16	0,20	0,18	0,17	**0,24**	0,21	0,22	0,35	0,22	**0,53**
C/N Ratio	%	6.00	9.67	4.38	2,85	3,56	**4,41**	**3,92**	3,14	3,68	**3,89**	3,55	2,29
P available	ppm	4.46	7.20	9.45	166,50	40,05	81,90	301,05	62,55	133,65	**436,50**	68,40	**143,20**
K available	ppm	54.45	43.51	68.02	53,51	**67,04**	57,24	60,18	88,61	**90,57**	186,65	**195,47**	**101,16**
Exchangeable cations													
Ca^{++}	meq/100g	Nob	2.83	4.35	3,69	**9,94**	3,28	**8,11**	3,95	4,24	**8,17**	5,32	**5,30**
Mg^{++}	meq/100g	Nob	1.04	1.52	1,74	**3,83**	1,00	**2,71**	1,29	1,32	**3,74**	1,09	0,76
Na^{+}	meq/100g	Nob	0.43	0.62	0,21	**1,41**	0,48	**0,80**	0,48	0,38	0,59	**0,61**	0,28
K^{+}	meq/100g	Nob	0.23	0.47	0,54	**1,35**	0,56	**1,13**	0,65	0,67	**0,80**	0,52	0,32
KTK	meq/100g	Nob	11.87	**20.12**	13,75	**19,25**	13,12	17,67	17,13	**17,75**	18,88	**29,87**	**19,12**

Note : * : Soil after mining. Nob : no observed. **: CnM (Chicken Manure), CM (Cow Manure), LC (Litter Compost). The bold showed that the highest

3.2. Discussion

1. Biological parameters of Trembesi planting

The vegetative phase requires a lot of nitrogen for chlorophyll synthesis, because nitrogen is part of the chlorophyll A and chlorophyll B molecules that play a role in photosynthesis (Black, 1973). This is in line with the opinion of Sutejo (1994), nitrogen phosphorus and potassium are macro nutrients. Nitrogen is required for the formation of plant vegetative components, ie leaves, stems and roots. This causes the spread of Trembesi root can not spread as in normal soil The number and length of the twigs are part of the vegetative growth. Both of these parameters are strongly influenced by the assimilate produced by the photosynthesis process. Abundance of nutrients on planting medium, as a result of the treatment of organic materials such as nitrogen elements, allegedly able to sustain the need of increasing the number of twigs and long twigs. This is in line with Sutejo (1994), nitrogen is the main nutrient for plant growth, which is generally required for the formation or growth of vegetative parts, such as leaves, stems and roots. Setyamidjaya (1986) states when there is a lack of nitrogen elements in the media then the plant will show slow growth and dwarf. Treatment of chicken manure (375 g/polybag) produced the longest root, 58.80 cm (147% of control) and the heaviest biomass, ie

487.22 g. This positive result is thought to be due to the giving of organic matter to decrease soil density. Roots and other vegetative parts are easy to grow growing enlarged and elongated with the support of an abundance of nitrogen elements. Sutejo (1987) states that one of the important roles of the nitrogen element is to increase plant growth.

2. Chemical parameters of planting media after Trembesi planted for 120 DAP

Improved nutrient content occurred in the experimental media, after planting with Trembesi for 120 DAP with the treatment of organic fertilizer dose 125, 250 and 375 g/polybag in all fertilizer groups. This improves the conclusion of research results Suhari (2009), which states that, the treatment of chicken manure up to 22.0 tons/ha has not been able to improve soil chemical properties such as CEC, pH, C-Organic, N and Ca, but can improve pH, nutrient status P, K and Mg. In addition, the improvement of nutrient content on the post-mining land of coal, by the treatment of organic fertilizer with a dose of 375 g/polybag in all groups of fertilizers were in line with the conclusions of other studies. Khalidin et al (2012), stated that, the provision of manure adds to the availability of nutrients, because manure contains various nutrients such as N, P and K that are needed by plants. Ramirez et al (2012), states that a combination of inorganic and organic materials would produce the highest ratio of biological activity. Budianta, et al (2013), stated that composting treatment on post sand mining land can improve pH, CEC, organic C and nutrients. In other experiments on coal post-mining areas, Deni (2013), stated that, mixed treatment of oil palm liquid waste and MOL (local microorganisms) are able to increase and stabilize the physical and chemical properties of post-coal mining such as; PH (H2O), DHL, basic saturation, base cations (Ca^{++}, Na^{+}, Mg^{++}, K^{+}), total N, C / N ratio, as well as macro and micro elements, such as; P, K, Fe and Mn. Berliana (2014), stated that cow manure can improve C-Organic, N, P and K, microbial quantities and microbial diversity in post-coal mining land; Rodrigues and Rodrigues (2014), states that the addition of farm yard manure (FYM) and vermicompost (VC) altered thechemical properties of spoil, increased pH and macro - and micro- nutrient levels and enhanced plant growth; De coninck and Karam (2014), stated that application of compost and chelators had a positive effect on top of biomass production of maize; Wijesekara et al (2016), large quantities of biomass such as manure compost, biosolids, and municipal solid waste (MSW) that are low contaminants can be used to rehabilitate mine spoil. These biowastes provide a source of nutrients and improve the fertility of spoils.

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