The Influence of Some Type of Manure on The Growth and Production of Elephant Grass (*Pennisetum purpureum*) CV. Taiwan in Acid Soil

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Abstract. This study aims to determine the effect of some types of manure on growth and production of elephant grass (*Pennisetum purpureum*) cv. Taiwan. The expected results of this research can determine which is the type of manure suitable for the area of the former coal mines that have acid soils (marginal lands). This research using Complete Random Design with four treatments and six replications. The treatment is different source of manure which is control, cow manure, goat manure, and chicken manure. The parameters observed were plant growth including plant height, leaf width, leaf length, fresh weight production, and dry weight production. This study uses the acid soils of the former coal mine with a pH of 4.2 which is input into the polybags, seedlings of elephant grass (*Pennisetum purpureum*) cv. Taiwan in the form of cuttings, Cow, goat and chicken dung are used as a source of manure. This research was conducted in the greenhouse for 60 days. The results of the research obtained the data for plant height (cm) the highest Goat Manure (P2) 229.85; leaf length (cm) the highest Goat Manure (P2) 113.10; Leaf width (cm) the highest Goat Manure (P2) 5.50; Production of Fresh Weight (gr/polybag) the highest Goat Manure (P2) 1361.67; the Production of Dry Weight (gr/polybag) the highest Goat Manure (P2) 214.28. The conclude that the manure suitable for the area of the former coal mines that have acid soils (critical area) is the manure from goat because it produces the highest growth and production than others.

1. Introduction
High livestock production needs to be supported by the availability of sufficient and continuous forage. The main source of forage feed is derived from grass. One of the potential grasses and often given to ruminant animals is elephant grass (*Pennisetum purpureum*) cv. Taiwanese. The productivity of elephant grass is influenced by nutrients, especially macro nutrients, where nitrogen is one of the elements that are often lacking in soil. To overcome this deficiency, fertilization is necessary. Nitrogen is needed by plants to increase production and quality, and is very important in the process of photosynthesis, for growth, especially vegetative parts such as leaves, stems and roots.

To be able to meet the need for forage, it is necessary to plant forage on fertile land. Planting forage on fertile land will produce better forage productivity for livestock compared to critical or less fertile land. During this time, the obstacle for farmers is the reduction of fertile land for growing forage because of land conversion, housing, industry, rice fields, plantations and so on. So that the alternative land for growing fodder is infertile land with low nutrient content and high acidity [1]. One of the land that can be used is ex-
coal mining land. Land use in coal mining areas has considerable obstacles, both physically, chemically and biologically. In addition nutrients in the area are very lacking so it is difficult for plants to grow.

To overcome this, one way to repair the physical damage to the soil is by providing manure. Manure is an organic fertilizer option that can be used. The nutrient content in manure depends on each type of livestock. Fertilization is also an act of providing nutrients to plants, both at the site of growth or on plant parts with a view to getting optimal and fertile growth so as to provide good growth and be able to produce well. [2] High production of certain land units with low production costs is the goal of a business. Manure is very influential on plant response. Therefore, by providing manure (manure) cow, goat and chicken regularly on elephant grass (Pennisetum purpureum) cv. Taiwan as cut grass and grazing can increase its productivity. This study aimed to determine the effect of giving several types of fertilizers sometimes on the growth and production of cv. Elephant grass (Pennisetum purpureum). Taiwan on acid soil from the former coal mines.

2. Materials and Method

2.1 Research Material

The main ingredients used in this study are: Elephant grass cv. Taiwan as many as 24 cuttings, Manure from cow manure as much as 10 kg, Manure from goat manure as much as 10 kg, Manure from broiler manure as much as 10 Kg, Soil acid (pH 4 - 4.5) from ex-coal mining land as many as 204 Kg. The tools used in this study are: Green house with a size of 10 x 3 m, polybags of 10 Kg as many as 24 pieces, Machetes, Knives, Measuring Tools: Caliper and Measuring Tape, Scales, Carts, Sieves of land

2.2 Research methods

The method used in this study is an experimental method using a Completely Randomized Design (CRD) with 4 kinds of treatments and 6 replications. The treatment consists of [3]:

P0 = 100% acid soil (without the provision of manure / control)
P1 = 80% acid soil + 20% manure from cow dung
P2 = 80% acid soil + 20% manure from goat manure
P3 = 80% acid soil + 20% manure from chicken manure

2.3 Procedures

The land used is acid soil from the former coal mining land with a pH ranging from 4 to 4.5 taken in Sawahlunto City. Where before it is used, the pH is measured using a digital pH meter. After the soil is removed, it is cleansed of the remaining roots and weeds, then crushed and sieved to homogenize the size of soil particles. Where each polybag contains 8 kg. The size of the polybags used with a diameter of 26 cm and a height of 39 cm (10 kg capacity),

Manure that will be used for treatment comes from cow dung, goat dung and chicken manure. Where the manure has undergone a process of cooking / weathering for 7-10 days marked that there is no more heat from fermentation when touched. Then it is dried with marked if squeezed it does not release water and sifted with a soil sieving device which aims to homogenize the particle size and discard the remnants of feed carried with manure. Giving fertilizer is done 3 days before planting, by mixing the soil with manure before put into a polybag, then put into each polybag and arranged in a green house.

The plant material used is cuttings (cut stems). Good cuttings are obtained from healthy, 2-month-old stems obtained from Padang Mengatas BPITU-HPT. Each cuttings are 25 cm long, weighing 62-78 grams and contain at least 2 books. In each polybag used in planting 1 stem cuttings. Planting is carried out 3 days after incubation, cuttings are planted on sloping 1 cuttings / polybag. After the cuttings are planted the soil is pressed tightly on the cuttings so that they do not easily fall and do not dry out so that the prospective the rood also can easily contact the soil. The grass is watered every day if there is no rain. At
10 and 30 HST weeding is done by weeding and removing weeds. Grass is guarded against pest attacks. At 60 HST, height, leaf length and leaf width of the elephant grass were measured. Harvesting is carried out 60 days after planting (HST) by cutting grass as high as 5 cm from the soil surface.

3. Results and Discussion

From Table 1. above it can be seen that the treatment has a very significant effect (P <0.01) on the height of the elephant grass (*Pennisetum purpureum*) cv Taiwan at the first cut, this is due to the soil used in this study is acid soil with (pH) 4- 4.5 which belongs to the ultisol soil group which is poor in nutrient content while those who are added with manure can add nutrients into the soil. [4]. Ultisol-poor soils, especially P nutrients and cations can be exchanged such as Ca, Mg, and Na erosion is easy. Added [5] cow manure contains N 2.10%; P$_2$O$_5$0.61%; K$_2$O 1.58%, goat manure contains N 2.33%; P$_2$O$_5$ 0.66%; K$_2$O is 1.97%, and sometimes chicken [6] fertilizer contains N 3.21%; P$_2$O$_5$ 3.21%; K$_2$O 1.27% which can help improve soil nutrients.

Table 1. Average Growth and Production of Elephant Grass in the Former Form of Coal Mining

| Treatment          | Average Treatment of Plant Height (cm) | Leaf Width (cm) | The number of sapling/polybag | The production of wet material (g/polybag) | The production of dry material (g/polybag) |
|--------------------|----------------------------------------|----------------|------------------------------|------------------------------------------|------------------------------------------|
| P0 (control)       | 162.48ᵇ                               | 4.00ᵇ          | 2.17ᵇ                       | 242.65ᶜ                                   | 29.80ᶜ                                   |
| P1 (cow manure)    | 224.85ᵃ                               | 5.20ᵃ          | 5.33ᵃ                       | 911.83ᵇ                                   | 142.51ᵇ                                   |
| P2 (goad manure)   | 229.85ᵃ                               | 5.50ᵃ          | 5.83ᵃ                       | 1361.67ᵃ                                  | 214.28ᵃ                                   |
| P3(chicken manure) | 228.43ᵃ                               | 5.43ᵃ          | 5.67ᵃ                       | 1299.78ᵃ                                  | 207.79ᵃ                                   |

Note: Different superscripts show very different effect (P <0.01)

On the leaf width it can be seen that the treatment has a very significant effect (P <0.01) on the leaf width of the elephant grass (*Pennisetum purpureum*) cv Taiwan, this is because the land used is soil that has a low fertility rate and the degree of acidity, so that the availability soil nutrients are greatly reduced, whereas in treatments given the addition of manure there is an increase in pH close to neutral and the addition of nutrients needed by plants. Ref. [7] said that factors that affect the continuity of green food supply are soil fertility that can be fertilized with fertilization. Plants that lack N elements will experience slow growth, stunted, green leaves turn yellowish, narrow leaves, old leaves will turn yellow and die quickly [8].

For the number of tillers from the table it can be seen that the administration of several types of manure is very significant (P <0.01). this is because the soil used has a low fertility rate and acidity, so the availability of soil nutrients is very lacking, while in the treatment given manure occurs the addition of nutrients such as N, P and K and other elements that are needed by growth tillers. The number of tillers is strongly influenced by the ability of plants to absorb nutrients from the soil and the life of plant shoots depends on the adequacy of food, water, and others closely related to soil fertility, cutting and temperature [8]. The addition of manure can increase the growth of tillers and improve the structure of soil to become more crumb in increasing the root growth of the soil pores thus making it easier for new shoots to grow through the soil surface. The balance of nitrogen nutrients in the soil that plants use for the development of roots, stems, leaves and nitrogen is important for plant growth [9].

For fresh weight production, it was found that the application of several types of fertilizers sometimes had a significant effect (P <0.01), this was due to nutrients contained in various kinds of manure also
differed. High nutrient content can be used by plants for growth and plays an important role in increasing crop production. If the plant lacks nutrients, it will interfere with the growth and production of the plant [10]. 

For dry weight production, it was found that the application of several types of fertilizers sometimes had a significant effect (P <0.01), this was due to the nutrients contained in various kinds of manure for plants to be used for growth and the different fertility levels were influenced by the value of minerals in plants . Re. [5] said that cow manure contains 2.10% N; P₂O₅ 0.61%; K₂O 1.58%, goat manure contains N 2.33%; P₂O₅ 0.66%; K₂O 1.97%, chicken manure contains N 3.21%; P₂O₅ 3.21%; K₂O 1.27%, which can help improve soil nutrients.

4. Conclusions
From the results of this study it can be concluded that suitable manure is used for former coal mining areas that have acid soil (critical land) is manure from goat manure because it produces the highest growth and production compared to other types of fertilizers.

References
[1] Englestad., 1985. Problem of improvement siol fertiliti by use of green manuring in the tropical faerming system. In: Organic Material as Fertilizers. FOA of the United Nations, Rome. P. 147-153.
[2] Kusuma, 2002 Produksi Rumput yang Tinggi dari Satuan Luas dengan Biaya Rendah Tujuan Utama Sebuah Usaha. Gramedia. Jogjakarta.
[3] Oyo. 2010. Teknik Pemberian Jenis Pupuk kandang untuk Meningkatkan Hasil Rumput Benggala (Pannicum Maxsimum) CV Purple Gelne, Buletin Teknik Pertanian Vol. 15 No.2 : 66-69.
[4] Prastowo, 1993 cit. Najiyati et al., 2005. Pupuk kandang Sapi, Kambing dan Ayam Mengandung Unsur Hara yang Lengkap (Makro dan Mikro). Skripsi Departemen Budidaya Pertanian Fakultas Pertanian Universitas Sumatera Utara.
[5] Semekto. 2006. Pupuk Kandang. PT. Citra Aji Pratama. Yogyakarta.
[6] Williamsom and Payne (1986). Tanah Didaerah Tropis biasanya Kekurangan N. Jurnal Peternakan Indonesia.
[7] Hardjowogeno.1992. Keragaman Sifat Tanah. Jurnal Ilmu Peternakan. Vol.2 (1). 13-23.
[8] Kasno, A. 2009 Peranan Bahan Organik Terhadap Kesuburan Tanah. [serial online]. www. Pustaka litbang deptan.go.id. Diakses 03 November 2018.
[9] Susetyo, D. I. Kismono dan B. Suwardi. 1977. Hijauan Makanan Ternak. Direktorat Jenderal Peternakan. Departemen Pertanian. Jakarta.
[10] Prawiranata. W., H. Said, T. Pin. 1989. Dasar- Dasar Fisiologi Tumbuhan. Laboratorium Fisiologi Tumbuhan. Institut Pertanian Bogor. Bogor.