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## **EFFECTIVE COMBINATION OF PALM OIL PLANT WASTE AND ANIMAL WASTE WITH BIO-ACTIVATOR EM4 PRODUCES ORGANIC FERTILIZER**

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**Abstract:** In this paper, we produce a study with organic fertilizers from a combination of palm oil mill waste (POMW) and Cattle Waste (CW) in 3 schemes. More instance, first: K1 50% Palm Oil Mill Solid Waste (POMSW) + 50% Cow Cattle Solid Waste (CCSW), K2 50% Palm Oil Mill Solid Waste (POMSW) + 50% Cattle Liquid Waste (CLW) and K3 50% Palm Oil Mill Liquid Waste (POMLSW) + 50% Cow Cattle Solid Waste (CCSW) fermented with EM4 bio-activator and tested against sweet corn plants. Meanwhile, the fertilizer doses tested for use are without fertilizer (Do), 10 tonnes/ha (D1), 20tonnes/ha (D2) and 30 tonnes/ha (D3) and the altitude of planting sites is lowland (T1), medium land (T2), and highlands (T3). This research was conducted in Sei Mencirim Village, Suggal District, Sambahe Village, Sibolangit District, Deli Serdang Regency and Simpang Empat District, Karo Regency, respectively in North Sumatra Province. We run the statistical analysis by using a factorial randomized block design with three factors at once. In a nutshell. The simulation by K2 following 50% POMSW + 50% CLW is the recommended combination. At the same time, the dose of combination fertilizer is 20 tonnes / ha is the recommended dose and the plateau (T3) is a suitable place for planting corn.

**Keywords:** doses; growth; production; plants; design experiment.

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## 1. INTRODUCTION

During last decade, North Sumatra is one of the largest oil palm producing areas in Sumatera [1] with a total area of 405,799.34 ha with a production of 5,428,535.14 tons of Fresh Fruit Bunches. In line with this bring a good impact and positive for the welfare of the people, especially in the Province of North Sumatra and nationally provide additional for the State Foreign Exchange[2]. Oil palm production goes to palm oil processing factories which are spread over several plantation areas, both government and private. Meanwhile, oil palm waste types are provide many negative impacts on society in the form of waste. The development of beef cattle farms in North Sumatra Province during last five years has increased the population quite rapidly with an average annual population increase of 10.37%. The total population of beef cattle in 2011 was 541,698 heads. Meanwhile, the production of manure from an adult cow is 4,000 kg and urine 1000 lt / year, this sapi livestock waste has the potential to be used as a basic material for making organic fertilizer [3]

In this study, we are use the bio-activator EM4. More instance, EM4 is a decomposer consisting of *Lactobacillus sp*, *Saccaromyce ssp*, *Actinomyces* and fungi that break down cellulose [4]. These microorganisms function in maintaining the balance of Carbon and Nitrogen which is a critical success factor in accelerating the maturity of organic fertilizer production[5]. EM4 also plays a role in suppressing the growth of soil pathogens, apart from accelerating the fermentation of waste and organic waste, increasing the availability of nutrients and organic compounds for plants [6]. The combination of palm oil mill waste and cow livestock waste has the potential as organic fertilizer with high organic matter content [7] and this has been carried out by previous research in several combinations to produce potential combinations in producing organic fertilizers VVU [8]. The use of organic fertilizers in plants is influenced by the amount of organic fertilizers and the availability of nutrients in the soil, therefore the dosage is a determining factor for the success of farming

## 2. MATERIALS AND METHODS

### *Making fermentation combination of palm oil manufacturer waste and animal cow waste*

The materials used in this paper are form of palm oil mill waste both of solid and liquid which is taken from the waste products of palm oil factories at the last disposal which are no longer dangerous from heat and chemicals involved in the oil processing process. Cattle waste including of feces and urine is taken from cattle breeders. Cow feces are taken from a pen that has not been mixed with soil but has rotted with a color close to the color of the soil and is not hot, while the urine that falls on the cement floor is tilted and flows into the shelter. Mixing a combination of solid and liquid palm oil mill waste (POMW) with solid and liquid cattle waste (CW) with a combination of K1 is 50% Palm Oil Mill Solid Waste (POMSW = Mud) + 50% Cow Cattle Solid Waste (CCSW = Feces), K2 is 50% Palm Oil Mill Solid Waste (POMSW = Mud) + 50% Cow Cattle Liquid Waste (CLW = Urine) and K3 is 50% Palm Oil Liquid Waste (POMLSW = Liquid) + 50% Cow Cattle Solid Waste (CCSW = Feces). The next process is to combine POMW with CW in combination form (solid - solid, solid - liquid and liquid - solid) with a percentage of the combined combination between POMW and CW, each of 50%: 50%, using 0.25% EM4 bioactivator. However, from the mixture of ingredients and molasses as much as 1.25% of the mixture of ingredients. Furthermore, stored in a tightly closed barrel for 3 weeks. Each mixture was sampled and a proximate analysis was carried out at the BPTP laboratory of North Sumatra Province to determine the content of organic C, N-total, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O and pH using the titrimetric method for the percentage of N-total, Spectrophotometer for P<sub>2</sub>O<sub>5</sub> and AAS for K<sub>2</sub>O.

### *Field Testing of Sweet Corn*

This research was conducted for three years, for the first year and the second year it was conducted in village Sei Mencirim, district of Sunggal Kab. Deli Serdang. The first year analyzes the nutrient content, vegetative growth and production of combined sweet corn. As follows: (solid-solid, solid - liquid, liquid - solid, liquid - liquid) and the percentage of the combination (100%: 0%), (70%: 30%), (50%: 50%), (30%: 70%), (0%: 100%). From the research results in the first year, it was obtained the combination that has the best potential for the growth and production of sweet corn.

The best potency combination was then tested for use in the field using the dose in the second year. Then in the third year testing the best results obtained in the second year, namely the combination (solid-solid, solid-liquid and liquid-solid) with the percentage of each combination (50%; 50%) with the use of various doses (0, 10, 20, 30 ton/ha) and the altitude of the planting site (low, medium and high land). The third year research was conducted from July to December 2020. The materials used were sweet corn, palm oil mill solid waste (POMW), cow manure (CM) and EM4 bio-activator. The experimental design used in the study was a factorial randomized block design with 36 combination treatments and 2 replications [9]. The parameters observed in this study were plant height (cm), stem diameter (cm), leaf area (cm<sup>2</sup>), number of corncob per plot (corncob), corn cob diameter (cm), sample production (grams) and production (kg / plot and tonnes / ha). The research model used was a randomized block design. The research data were analyzed statistically [10] and continued with the mean difference [11] test using the Duncan Multiple Range Test [12].

### 3. RESULTS

#### *Effect of organic fertilizer combinations*

The results of field observations and statistical analysis showed that the results of the research were to measure the growth of plant height, stem diameter and leaf area at 6 weeks after planting as shown in Table 1 below.

Table 1: Effect of organic fertilizer

Combination Treatment	Plant height (cm)	Rod diameter (cm)	leaf area (Cm <sup>2</sup> )
K1 = (50% POMSW + 50% CCSW)	131,34a	1,49a	293,55a
K2 = (50% POMSW + 50% CLW)	141,17a	1,59a	311,95a
K3 = (50% POMLSW + 50% CCSW)	136,56a	1,53a	311,38a

**Note: The same letter notation in the same treatment column is not significantly different at the  $\alpha = 5\%$**

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Table 1 shows the effect of combined organic fertilizer from palm oil mill waste (POMW) and cow livestock waste (CW) at 6 mst results from statistical analysis for plant height, stem diameter and leaf area between treatments K1, K2 and K3 shows no significant differences. ( $p > 0.05$ ), with K2 (a combination of 50% POMSW + 50% CLW) produced the highest plant height with an average of 141.17 cm, stem diameter of 1.59 cm and leaf area of 311.95 cm<sup>2</sup>, whereas K1 (50%POMSW+50%CCSW) with the smallest measurement results with an average plant height of 131.34 cm, stem diameter 1.49 cm and leaf area 293.55 cm<sup>2</sup> (K1 <K3 <K2). From these results it is concluded that the K2 combination is the recommended combination for vegetative growth.

***Effect of dosage of organic fertilizer combinations***

The use of a combination dose of organic fertilizers on plant growth with the results of statistical analysis can be seen in Table 2.

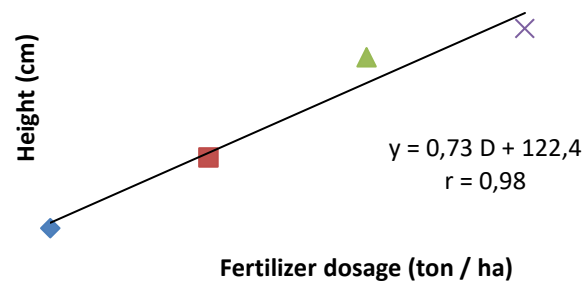
Table 2: Effect of Combined Dose of Palm Oil Mill Waste (POMW) with Cattle Livestock Waste) at 6 Weeks After Planting

Dose Combinations	Plant height (cm)	Rod diameter (cm)	leaf area (cm <sup>2</sup> )
Do = Control	121,87c	1,32c	264,74c
D <sub>1</sub> = 10 ton/ha	129,25bc	1,45b	283,83bc
D <sub>2</sub> = 20 ton/ha	139,70ab	1,61ab	313,94ab
D <sub>3</sub> = 30 ton/ha	142,72a	1,62a	332,31a

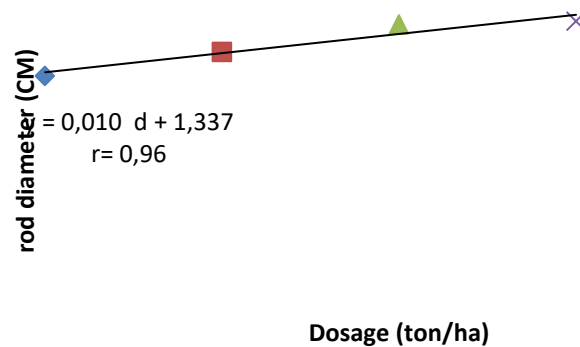
**Note: The same letter notation in the same treatment column is not significantly different  $\alpha = 5\%$**

From table 2 above, it can be seen that the vegetative growth of sweet corn at 6 mst shows a significant difference ( $p < 0.05$ ). The use of a dose of 30 tonnes / ha (D3) is the highest growth with an average of 142.72 cm (plant height), 1.62 cm (stem dimension) and 332.31 cm<sup>2</sup> (leaf area) sweet corn plants, but they are not different. significant ( $p > 0.05$ ) on the use of a dose of 20 tonnes / ha (D2). Compared with Do (control) is the lowest yield with an average of 121.87 cm (plant height), 1.32 cm (stem diameter) and 264.74 cm<sup>2</sup> (leaf area) with no significant difference with

D1 (10 ton / ha ) but the stem diameter is significantly different. The use of a dose of 20 to / ha (D2) is not significantly different from the use of a dose of 30 tonnes / ha (D3), so for planting sweet corn the recommended dose is to use 20 tonnes / ha (D2). The use of a combination dose of organic fertilizers means that the higher the dose used, the higher the plant, the results of regression analysis obtained a positive correlation with  $Y = 0.73 D + 122.4$  with  $r = 0.98$  which is depicted in Figure 1.



**Figure.1.** The relationship between the use of fertilizer doses on the height of sweet corn plants Based on the use of dose to stem diameter, a positive correlation was obtained with  $Y = 0.01 D + 1.337$  with  $r = 0.96$  which is depicted in Figure 2.



**Figure.2.** Effect of dose combination of organic fertilizers on rod diameter

***Effect of Plant Height***

The altitude of sweet corn planting (*T*) consists of lowland (*T1*), medium land (*T2*) and upland (*T3*). From the measurement results of the average plant height, stem diameter and leaf area as well as the results of statistical analysis at 6 weeks after planting showed a significant difference ( $p < 0.05$ ) as shown in Table 3.

Tabel 3: Height of Planting Place

Category	Plant height (cm)	Rod diameter (cm)	leaf area (Cm <sup>2</sup> )
T <sub>1</sub> = Lowland	144,67b	1,37b	293,28b
T <sub>2</sub> = Medium land	169,21a	1,59a	394,76a
T <sub>3</sub> = Highlands	86,27c	1,54a	208,08c

**Note: The same letter notation in the same treatment column is not significantly different  $\alpha = 5\%$**

The planting site on medium land (*T2*) showed the highest yield on plant height (169.21 cm), stem diameter (1.59 cm) and leaf area (394.76 cm<sup>2</sup>), while the smallest plant height was obtained at *T3* (86.27 cm), the stem diameter in the lowlands is *T1* (1.37 cm) while the leaf area in the highlands is *T3* (208.08). The highest plant height obtained at *T2* was significantly different from *T1* and *T3*, when the lowest leaf area obtained at planting in the highlands (*T3*) was significantly different from *T1* and *T3*.

***Effect of organic fertilizer combinations***

Maize production on corn cob diameter (cm), sample weight (grams), production (kg / plot and ton / ha) from the effect of combination of organic fertilizers (Table 4), the use of a combination dose of organic fertilizers (Table 5) and the influence of planting site height (Table 6). The results of calculations and statistical analysis of the effect of the combination of organic fertilizer from Palm Oil Mill Waste (POMW) and Cattle Livestock Waste (CW) on sweet corn production are shown in Table 4 below.

Table 4: Effect of Combination of Organic Fertilizer from Palm Oil Mill Waste (POMW) with Cattle Livestock Waste (CW) during harvest

Combination treatment	Cob Diameter (Cm)	Sample weight (gram)	Produksi (kg/plot)	Produksi (ton/ha)
K <sub>1</sub> = 50% POMSW + 50% CCSW	4,72ab	229,72a	3,97a	12,61a
K <sub>2</sub> = 50% POMSW + 50% CLW	4,86a	254,66a	4,00a	12,69a
K <sub>3</sub> = 50% POMLSW+ 50% CCSW	4,45b	235,85a	3,93a	12,49a

**Note: The same letter notation in the same treatment column is not significantly different  $\alpha = 5\%$ .**

From Table 4 above, it can be seen that the effect of the combination of organic fertilizer from palm oil mill waste (POMW) and cow livestock waste (CW) at harvest with the results of statistical analysis on corn cob diameter is significantly different ( $p > 0.05$ ), sample weight, and production. not significantly different ( $p > 0.05$ ), but the three combinations of organic fertilizers (K<sub>2</sub> > K<sub>1</sub> > K<sub>3</sub>) gave the highest value with the use of 50% POMSW with 50% CLW (K<sub>2</sub>) with an average of 4.86 cm (diameter cob), 254.66 g (sample weight) and production (4.00 kg / plot or 12.69 tonnes / ha), while the lowest values were obtained for corn cob diameter and production at K<sub>3</sub>. The result of using a combination of organic fertilizers is recommended in terms of its superiority (K<sub>2</sub> > K<sub>1</sub> > K<sub>3</sub>) for planting sweet corn in the field.

#### *Effect of organic fertilizer combination dosage*

The results of calculations and statistical analysis of the effect of the dose of organic fertilizer Combination of Palm Oil Mill Waste (POMW) with Cattle Livestock Waste (CW) on sweet corn production are as shown in Table 5 below.

Table 5: Effect of Combination Dose Testing of Organic Fertilizers at harvest.

Dose Treatment	Cob Diameter (Cm)	Sample weight (gram)	Production (kg/Plot)	Production (ton/ha)
D <sub>0</sub> control	4,41b	185,07c	3,00c	9,53c
D <sub>1</sub> = 10 ton/ha	4,62ab	219,88b	3,86b	12,25b
D <sub>2</sub> =20 ton/ha	4,68ab	253,35ab	4,30ab	13,66ab
D <sub>3</sub> =30 ton/ha	4,87a	278,76a	4,58a	14,53a

**Note: The same letter notation in the same treatment column is not significantly different  $\alpha = 5\%$ .**



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From the research results, it can be seen that the effect of combination fertilizer doses on the production of sweet corn plants, so that from the four doses tested on corn cob diameter, sample weight and production, the results of the analysis showed significant differences ( $p < 0.05$ ). The use of a dose of 30 tonnes / ha (D3) gave the highest value to the thickness of the cob (4.87 cm), sample weight (278.76 grams) and production (4.58 grams / plot or 14.53 tons / ha), but it was different. Meanwhile, the significant to the use of a dose of 20 tonnes / ha. Compared to Do (without organic fertilizer) is the lowest value with average corn cob diameter (4.41 cm), sample weight (185.07 grams) and production (3.00 kg / plot or 9.53 tons / ha). Because D3 is not significantly different from D2, the recommended dosage for using a combination of organic fertilizers is to use D2 (20 tonnes / ha). The use of higher doses of organic fertilizers results in higher production. Based on the regression analysis, it produces a correlation with  $\hat{Y} = 0.051 D + 3.160$  and  $r = 0.938$  as seen in Figure 3 below.

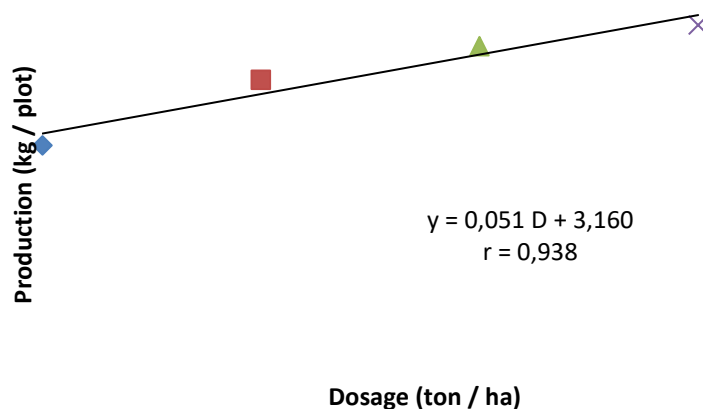


Figure.3. The Effect of using organic fertilizer doses on production (Kg / plot)

***Influence of Planting Place***

The results of calculations and statistical analysis of the effect of the height of the planting place for sweet corn from the use of a combination of organic fertilizer from Palm Oil Mill Waste (POMW) and Cattle Livestock Waste (CW) on sweet corn production are shown in table 6 below.

Table 6: The effect of testing the height of sweet corn planting place during harvest

Category	Cob Diameter (cm)	Sample weight (grams)	Production (kg Plot <sup>-1</sup> )	Production (ton ha <sup>-1</sup> )
T <sub>1</sub> = Lowland	4,30b	173,54b	2,96b	9,40b
T <sub>2</sub> = Medium land	4,51b	228,06a	3,40b	10,78b
T <sub>3</sub> = Highlands	5,12a	301,20a	5,45a	17,29a

**Note: The same letter notation in the same treatment column is not significantly different  $\alpha = 5\%$ .**

The altitude of the place where sweet corn is planted has an effect on growth and production. From the average calculation results and statistical analysis, it can be seen in Table 6 that the effect of the height of the planting place for sweet corn on corn cob diameter, sample weight, and production shows a significantly different effect ( $p < 0.05$ ). Planting in the highlands (T<sub>3</sub>) produced the highest yield compared to planting in the medium and lowlands (T<sub>2</sub> and T<sub>1</sub>). The highest production was obtained at T<sub>3</sub> with an average of 5.12 cm (diameter), 301.20 grams (sample weight) and 5.45 kg / pot or 17.29 tons / ha (production). When compared with the planting site on medium land (T<sub>2</sub>) and T<sub>3</sub>, it was not significantly different ( $p > 0.05$ ) for sample weight, while the corn cob diameter and production showed significant differences ( $p < 0.05$ ). Planting in the lowlands (T<sub>1</sub>) gave the least insignificantly different results compared to planting in the medium land (T<sub>2</sub>) for cob diameter and production (kg/plot or ton / ha) and significantly different from sample weight (grams). The difference in sweet corn production due to the height of the three planting sites is shown in Figure 4.

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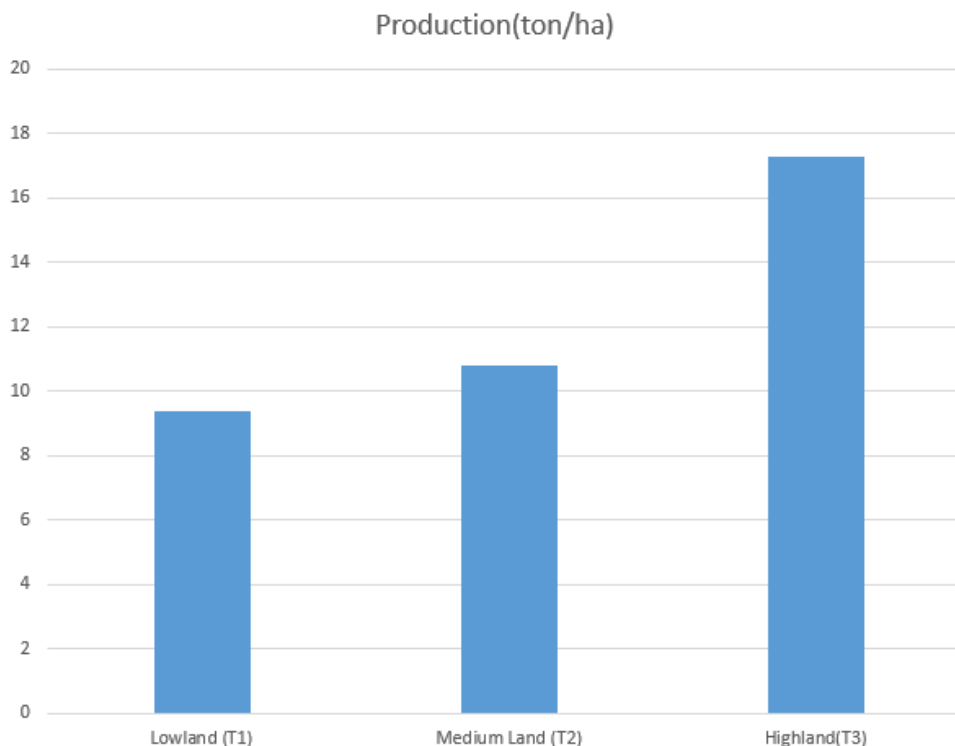


Figure 4. Fig 4. Average production of sweet corn (ton / ha) from the influence of planting height

#### 4. DISCUSSION

##### *Use of Combination of Organic Fertilizer*

The use of a combination of organic fertilizers from Palm Oil Mill Waste (POMW) and Cattle Waste (CW) which was analyzed statistically on the parameters observed in sweet corn plants in the field gave no significant effect ( $p > 0.05$ ). From the research conducted by Gandahi and Hanaf (2014), palm oil mill waste has the potential to become organic fertilizer. The three combinations give the same response to both vegetative and generative development. One reason is that the nutrient content of each is almost the same. This is supported by the results of the proximate analysis in 2018 at BPTP North Sumatra Province that K1 (50% POMSW and 50% CCSW) contains total N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O after fermentation by adding EM4 bioactivator with respective levels (N- total, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O) for K1 (0.64%, 0.4% and 0.41% while the nutrient content for K2 (50% POMW and 50% CLW (0.45%, 0.31 and 0.46) and in a combination of 50% POMLSW and 50% CCSW (K3) with (0.45%, 0.31% and 0.46%). From the praximic analysis data it can be

seen that for  $P_2O_5$  is  $K_1 > K_2 = K_3$  while the content of  $K_2O$  is  $K_2 = K_3 > K_1$ . Apart from the previous test results by [7] that  $K_1$ ,  $K_2$  and  $K_3$  on vegetative and generative growth were not significantly different and the best compared to other combinations. Likewise, the results of the second year test on the best combination was also obtained  $K_1$ ,  $K_2$  and  $K_3$  also the best and not significantly different. For plant growth, apart from nutrients in fertilizer application, it can also be influenced by environmental factors such as climate, sunlight and soil due to the presence of microbes in the soil [13].

The combination of organic fertilizer from palm oil mill waste (POMW) and cow livestock waste (CW) with the content of each waste adds to each other so that it fulfills the nutrient elements in the combination. Cow manure in CW is one of the potential ingredients for making organic fertilizers [14]. The need for organic fertilizers will increase in plants along with the demand for organic products. Meanwhile, the organic fertilizers make a better taste, are healthier and are good for the environment. The increase in nutrients in the combination of organic fertilizers with the addition of bio-activators in the fermentation process has a role in nutrient decomposition during the fermentation process to be used in plant growth, followed by the suitability of the growing environment [15] [16]. In a study using palm oil mill waste combined with cow livestock waste, however, it has long been done in Malaysia to compost from palm oil mill waste from plantations into fertilizer [17].

### ***Effect of Using Doses of Organic Fertilizer***

The results of observations and statistical analysis showed that the dose of combination of organic fertilizers (D) had a significant effect ( $p < 0.05$ ) on vegetative growth (plant height, stem diameter, area of land) and generative (number of cobs / plot, corn cob diameter, sample weight, production (kg / plot, ton / ha)). Combination of organic fertilizers is a type of fertilizer that contains complete nutrients needed by plants. In addition to organic fertilizers, there are complete elements that also contain microorganisms which function to describe nutrient availability for plants so that they can increase growth and production. The low use of combined doses of organic fertilizers for maize plants affects the low availability of nutrients in the soil so that it inhibits vegetative and generative

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development of plants which results in decreased production. The addition of organic matter to the soil helps influence soil conditions such as chemical properties and physical and biological properties of the soil [18]. The presence of microorganisms in organic fertilizers will help the breakdown of organic matter in the soil, thereby improving and adding to the biological properties of the soil in increasing fertility from the use of organic fertilizers [19]. The use of organic matter as a substitute for inorganic fertilizers to optimize land for planting and can be an alternative solution to problems faced by farmers. The use of organic materials such as cow dung compost, sheep, paitan grass (*Tithonia diversifolia*) and snails (*Crotalaria juncea*) is useful for repairing damaged soil structure due to excessive use of inorganic fertilizers.

The results of this study using doses gave a significantly different effect and the recommended dose of 20 tonnes / ha (D2) but the development and the highest yields were with the use of 30 tonnes / ha for vegetative and generative growth of maize plants [20] on shallot plants that the application of cow manure 30 tonnes / ha has a significant effect on the growth and yield of shallot tubers per hectare. The availability of nutrients and microorganisms into the soil needed by plants, helps dissolve insoluble nutrients, suppresses the growth of harmful soil organisms (pathogens), helps the soil nitrification process and helps improve circulation of air in the soil [21] [22].

The use of organic fertilizers as an effort to increase crop production has been very cultivated and farmers have considered fertilizers and fertilizers as the main factors in agriculture [23][24]. Organic fertilizers play a role in increasing income in organic farming in the form of sustainable agriculture. Organic fertilizers are multipurpose soil fertilizers that play a role in increasing important nutrients in the soil for plants while also playing a role in increasing soil fertility [25] [26]. Fertilization is basically to increase soil fertility and increase the availability of nutrients to meet plant needs. Fertilization also needs to be done to restore the nutrients transported or lost at harvest. One of the best efforts to overcome the lack of nutrients is the provision of organic fertilizers [27]. The recommended dosage of combination organic fertilizers in this study for the growth of maize plants is to use 20 tonnes / ha (D2), slightly higher than previous studies

in the lowlands using 15 tonnes / ha at different planting times[8].

### ***The influence of the place of planting***

Research with different elevations of sweet corn planting for vegetative and generative growth based on observations and statistical analysis shows significant differences, this is due to the influence of climatic[16], topography, humidity and soil factors [28]. The results of this study found that planting in the highlands (T3) with lower vegetative growth but high generative. Apart from that, the highlands slow down the harvesting time of sweet corn plants, while planting in the lowlands (T1) has higher plant growth while the lowest production. That environmental factors can affect plant productivity growth[17] including air temperature, relative humidity, rainfall, and the number of rainy days which affect plant development until harvest time. This opinion is supported by the fact that environmental elements that affect productivity growth are elevation, air temperature and relative humidity [29]. The difference in altitude in the three locations causes differences in climatic conditions such as temperature and humidity. Different climates greatly affect harvest time and will result in different maize productivity[29]. The higher the planting area, the lower the air temperature, but the humidity increases [30] Rainfall and the number of rainy days are not influenced by altitude. The differences in the conditions in which it is planted can affect plant growth, production and plant quality [31]. The corn cultivation in the lowlands obtains lower production compared to planting in the highlands this is due to higher temperatures in the lowlands which are detrimental to pollen viability [32].

## **5. CONCLUDING REMARKS AND FUTURE RESEARCH**

The combination of the combined organic fertilizers tested gave an insignificant effect, but the combination that had a higher influence on plant height, stem diameter, leaf area, number of cobs and sweet corn production was using K2 (50% POMSW with 50% CLW ). Testing the dose of organic fertilizers tested from several levels gave a significantly different effect on the growth of sweet corn production, using a dose of 20 ton / ha (D2) as a recommendation for plant height, leaf area, ear weight / sample, number of cobs / plot and production / ha. Testing the altitude where

sweet corn is planted has a significant effect on increasing productivity, the highest and best is planting in the highlands (T3). Research is to test the combination of organic fertilizers by using different dosages and altitudes for the growth of sweet corn plants, so that further research is needed on other plants and different planting times.

### CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests.

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