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# The Effectiveness Of Giving Organic Matter To The Productivity Of Tomato Plants

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**Abstract.** The assessment of the productivity of a land is not only based on natural fertility, but also the response of the soil and plants to the application of applied land management technology. Basic fertilizer is given at the time of planting by sprinkling it around the plant. The organic fertilizer used in this study is organic fertilizer from cow dung that has been completely decomposed. The dose of organic fertilizer and NPK according to the treatment is A = Control, B = NPK 180 Kg/ha, C = 100% NPK, D = Organic Manure 4 tons/ha + NPK 100%, E = Organic Manure 4 tons /ha + NPK 75%, F = Organic Manure 6 tons/ha + NPK 100%, G = Organic Manure 6 tons/ha + NPK 75%, H = Organic Manure 8 tons/ha + NPK 100%, I = Organic Manure 8 tons/ha + 75% NPK. With treatment (i) with the type of organic fertilizer and the dose of NPK gave the highest value in the vegetative and generative phases, for the generative phase (growth) plant height (93 cm), number of leaves (73 strands), stem diameter (0.88 cm), flowering age (26 days after planting), number of flowers per plant (66). While in the generative phase (production) the number of fruits per plant (55 pieces), fruit diameter (4.4 cm), fruit weight per fruit (82.4 grams) and fruit weight per treatment was 631.3 kg and fruit weight per hectare reached 28471 Kg. Organic Manure 8 tons/ha (288.3 grams/plant) + 75% NPK (40.1 grams/plant) (I) of 58.1 tons/ha, is a very appropriate dose for nutrient absorption to produce fruit high production. The use of a combination of organic and inorganic fertilizers can increase the amount of organic matter in the soil and can provide the best nutrients for tomato plant growth so that it affects production.

## INTRODUCTION

Tomato (*Lycopersicon esculentum mill.*) is a vegetable plant that has been cultivated for hundreds of years, but it is not known with certainty when it first spread. However, along with the development of time, tomatoes began to be planted, both in the field and in the yard of the house, as a cultivated plant or a consumed plant [1].

One of the problems often faced by farmers in developing their farms, among others, is the decline in land productivity, symptoms of a decrease in land productivity can be seen from crop yields, especially seasonal crops - food which tends to decrease from time to time, without any input of organic matter either derived from crop residues. straw, soybean stover) or manure, the yield will decrease. The results of the East Java AIAT study (2000) in 20 district locations in East Java showed that these locations had low organic C content (1-2%). In such conditions, the need for inorganic fertilizers, especially N, is relatively high (over 500 kg Urea/ha). with yield rates of 5.0 to 5.5 t/ha of dry milled grain. Therefore, to achieve optimal productivity of land productivity, it is necessary to develop farming technology that is given in the provision of inorganic fertilizers and organic fertilizers in a balanced way.

The causes of the decline in productivity and efficiency of farming of food and horticultural commodities as well as plantations in East Java include: (a) most farmers use low quality seeds and excessive quantities; (b) the seeds planted are relatively old; (c) intensive planting followed by irrational use of fertilizers resulted in decreased soil fertility; (d) the development of plant pest organisms (OPT), and (e) land tenure is getting narrower [2]

Some farmers have realized that the use of chemicals, both fertilizers and pesticides in an effort to increase agricultural production, can damage the ecosystem. Organic matter is produced by plants through the process of photosynthesis, element C is the main constituent of organic matter in the form of polysaccharide compounds. The addition of organic matter into the soil will improve the physical properties of the soil, including the consistency of the soil becoming crumbly; increase porosity and infiltration rate so that runoff and erosion can be minimized. Organic matter also functions as a source of macro and micro nutrients [3]

## MATERIALS AND METHODS

Action Research Soil Improvement In the Applied Study of the Implementation of the Agricultural Area Masterplan in the Zone of the Ijen Area with Tomatoes (*horticulture*). The time for the research is in accordance with the cooperation contract, which is 6 months, starting from January 2021. The activity of the applied study of increasing organic matter in Sumberjambe sub-district, Jember Regency. The dose of organic fertilizer and NPK according to the treatment is A = Control, B = NPK 180 Kg/ha, C = 100% NPK, D = Organic Manure 4 tons/ha + NPK 100%, E = Organic Manure 4 tons /ha + NPK 75%, F = Organic Manure 6 tons/ha + NPK 100%, G = Organic Manure 6 tons/ha + NPK 75%, H = Organic Manure 8 tons/ha + NPK 100%, I = Organic Manure 8 tons/ha + 75% NPK. The tools and materials used are organic fertilizer, NPK fertilizer, ruler, meter, hoe, mulch, stationery, bucket, tomato seeds.

### Implementation Method

**Plant Height**, Measurement of tomato plant height was carried out from the base of the stem to the growing point using a measuring device and observation of tomato plant height was carried out when the plant was 7, 14, 21, 28, 36, 43 days after planting. **Number of Leaves**, Observation of the number of leaves was carried out since the plant was a week old up to 4 weeks after planting, by counting all or total leaves present in every plant. Leaves are one of the plant organs that grows on the branches, serves as a catcher of energy from sunlight to photosynthesis. Leaf organs are organs that it is very important in plant growth and development. The more leaves, the more the process of photosynthesis and the more the food produced. **Stem Diameter**, Stem diameter measurements were carried out using a caliper, observations were made when the plants were 21, 28, 36, 43 the day after planting. **Age of Flower Appearing**, the age of appearance of the first flower is calculated by adding up the days starting from the time of planting until the flowers appear. **Number of Planted Flowers**, Determination of the number of flowers is done by counting all the flowers that are formed and bloom every day. Interest that has been calculated is marked with a marker so that there is no double calculation. **Harvesting Age**, and harvesting age were carried out by counting the number of days starting from the time of planting to harvesting the first fruit that met the harvest criteria at a ripening level of 90% when the fruit was bright. **The number of planted fruit**, the calculation of the number of fruit is done by counting the tomatoes planted. **Weight of Fruit/Fruit**, Weighing of fruit per fruit is done at the time of harvest. **Weight of Planted Fruit**, Weighing of the weight of the fruit of this crop is done at harvest. Weighing is done using an analytical balance. **Fruit Diameter**, Fruit diameter measured using a caliper. Measurement of fruit diameter was carried out at harvest. **Plant Fresh Weight**, plant fresh weight is carried out by weighing all parts of the plant using a digital scale, this observation was made at the end of the study.

## RESULT AND DISCUSSIONS

### General Condition of Experiment Site

The experiment was carried out on the land of Rowosari Village, Sumberjambe District, Jember Regency. The experiment was carried out from February 2021 to June 2021. Tomato seedlings were planted using a distance between holes of 60 x 80 cm with 1 seed in the prepared planting hole. Planting holes are made using a 2-3 cm deep tugal. The application of organic fertilizers is carried out at the respective levels of organic fertilizers, namely 4 tons/ha, 6 tons/ha and 8 tons/ha. Meanwhile, the application of NPK fertilizer with a percentage dose of 75% and

100% NPK is carried out by giving a single NPK fertilizer. In general, the condition of tomato plants is relatively good (figure 1), although there are pest attacks during the vegetative and generative periods.



**Figure 1.** Condition of Plants in the Vegetative Phase (A) and Conditions for Tomato Plants in the Generative Phase Entering the Harvest Period (B)

Harvesting is done when the tomatoes are physiologically ripe. Tomato fruit can be harvested after the age of 62 days after planting to 67 days after planting which is marked by red tomatoes, an interval of 2 to 3 weeks. After harvesting, the fruit is then weighed to determine the production of each treatment.

## Experimental Results

Based on the results of the DMRT test, it showed that the average number of each treatment was 95% significantly different and significantly different at the 99% significance level in the organic fertilizer treatment. The relationship between tomato plants and treatment with organic fertilizer gave a very significant effect on the parameters of flowering age (29 days after planting), fresh plant weight (280 grams) and number of leaves (82 leaves). While giving a very significant effect on 6 parameters, namely the number flowers per plant (53 flowers), harvest age (65 days after planting), the number of fruits per plant (55 pieces), fruit diameter (4.4 cm<sup>2</sup>), fruit weight per fruit (82 grams). ), and fruit weight per plant (4.526 grams).

Crop yields are influenced by genetic factors and also determined by environmental factors. Good plant properties will obtain high crop yields if it is supported by the availability of nutrients and environmental suitability. The results of these observations indicate that organic fertilizer applied to the land greatly affects the growth of tomato plant stem height. This is because the nutrient content contained in each treatment affects the growth of tomato plants. This shows that each plant has a diversity of growth, which is expressed in various plant traits that include the form and function of the plant, as stated by [4] that differences in fertilization applications are one of the factors causing the diversity of plant appearances. Different genetic factors can be expressed in various plant traits that include plant form and function which results in plant growth diversity.

### Fruit Weight per Fruit (grams) and Fruit Weight per Plant (grams)

Observation data on fruit weight per fruit and fruit weight per plant with various types of organic fertilizers and several doses of NPK can be seen in the graph in Figure 2. The results of statistical analysis of DMRT and ANOVA tests show that the application of treatment with various types of organic fertilizers and several doses of NPK has a very significant effect. to fruit weight per plant and fruit weight per plant.

Figure 2 shows the weight of fruit per plant with various types of organic fertilizers giving the highest value in the first treatment of Organic Manure 8 tons/ha (288.3 grams/plant) + 75% NPK (40.1 grams/plant) (2.263 g) and the lowest in treatment A (1.936 g). This is possibility because the organic nutrient content in organic fertilizer was

sufficient for the growth of tomato plants so that it was able to provide the highest yields of crops than the treatment without fertilizer application (control). According to [5], organic fertilizer is an important source of nutrients because it has a higher nitrogen and phosphate content.

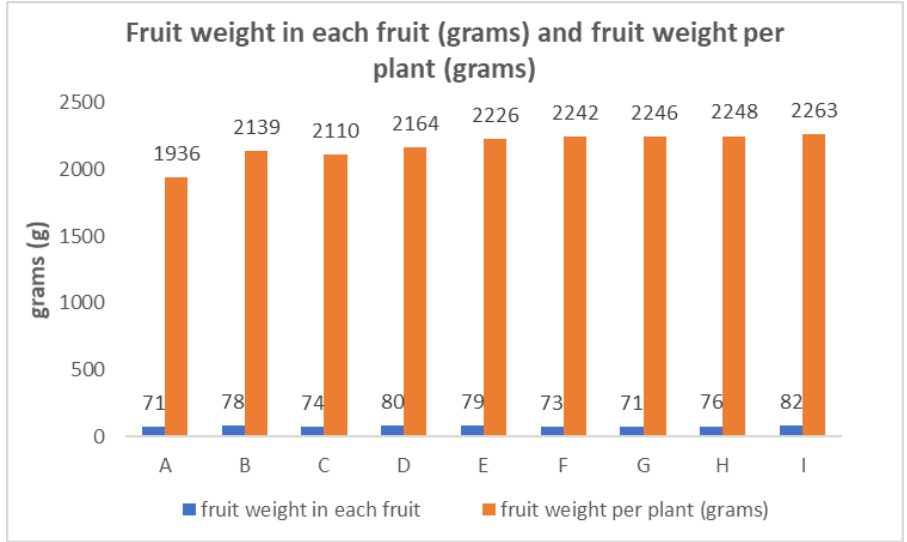


Figure 2. Graph of Fruit Weight per Fruit (grams) and Fruit Weight per Plant (grams)

Fruit weight per fruit showed fruit weight per fruit with several doses of organic fertilizer and NPK giving the highest value in treatment I Organic Manure 8 tons/ha (288.3 grams/plant) + 75% NPK (40.1 grams/plant) of [82.4 g] per fruit and the lowest was in treatment A (71.4 g) (figure 2). This is presumably due to different plant genetic factors, each plant having different genetic factors requires a different environmental situation in its growth in order to be able to grow and develop properly. According to [6] stated that the ability of tomatoes to produce fruit is highly dependent on the need for available nutrients and environmental conditions.

### Fruit Weight per Treatment (Kg)

Observation data on fruit weight per treatment with various types of organic fertilizers and several doses of NPK can be seen in Figure 3 The results of ANOVA analysis and DMRT test showed that the application of Organic Manure treatment was 8 tons/ha (288.3 grams/plant) + NPK 75% ( 40.1 gram/plant) had no significant effect on fruit weight per treatment, while the interaction between the two treatments had no significant effect.

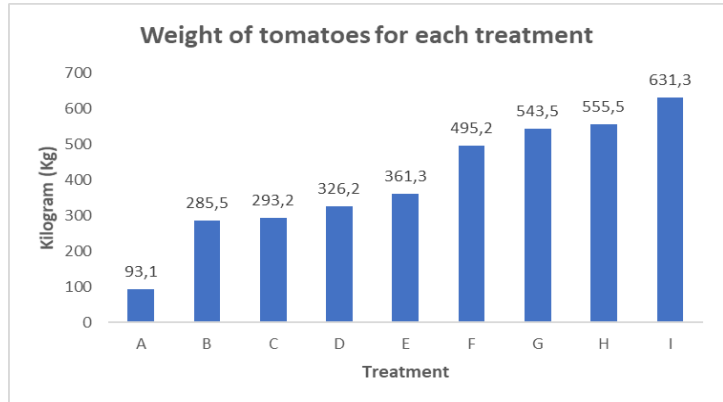


Figure 3. Graph of Tomato Fruit Weight per Treatment (Kg)

Fruit weight per treatment with various types of organic fertilizers and doses of NPK gave the highest value in the first treatment of Organic Manure 8 tons/ha (288.3 grams/plant) + 75% NPK (40.1 grams/plant) of 631.3 Kg



fruit per treatment and the lowest was in treatment A (93.1 Kg). This is related to the nutrient content in organic fertilizers that are able to provide the best nutrients for tomato plant growth so that it affects production

According to [7] stated that organic fertilizer is a good source of macro and micro nutrients that can increase soil fertility and become a substrate for soil microorganisms and increase microbial activity, so that it decomposes more quickly and releases nutrients. The application of organic fertilizers is also believed to improve soil physical properties and increase nutrient cycles such as exerting direct enzymatic or organic effects on plant roots thereby promoting plant growth.

### Fruit Weight per hectare (Kg)

The average production per hectare due to mulch treatment and dose of organic fertilizer after being tested with DMRT can be seen in showing that the highest tomato production was found in the treatment of Organic Manure 8 tons/ha (288.3 grams/plant) + NPK 75% ( 40.1 grams/plant) (I) was 28.4 tons/ha and the lowest in tomato fruit production per hectare in the control treatment was 4.2 tons/ha. This is presumably because the application of Organic Manure 8 tons/ha (288.3 grams/plant) + 75% NPK (40.1 grams/plant) (I) is a very appropriate dose for nutrient absorption so as to produce high-yielding fruit. According to [8] which explains that good plant growth can be achieved if the nutrients needed for plant growth and yield are in available, balanced and in optimum doses.

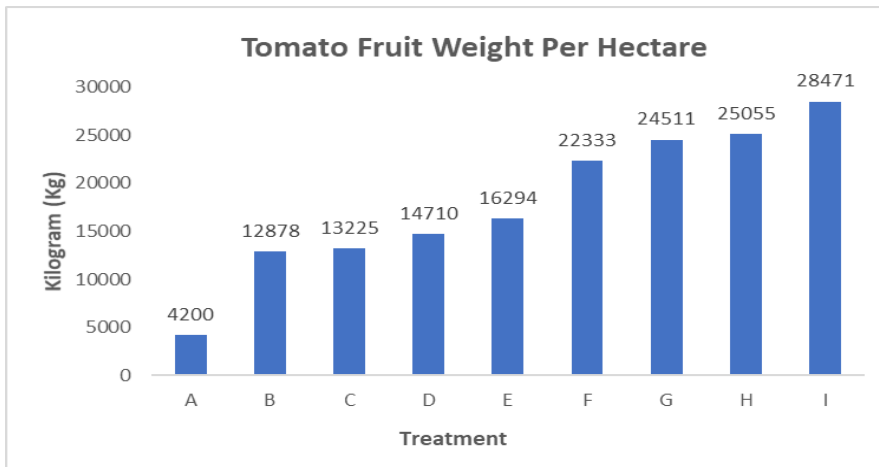


Figure 4. Graph of Tomato Fruit Weight per Hectare (Kg)

Figure 4 shows that treatments A, B and C of 100% NPK (50.9 grams per plant) have not been able to produce maximum. This is related to plant genetic factors on the adjustment of growth in the growing environment so that if the environment is not suitable for the genetic potential for growth, the plant will experience difficulties in developing so that in this condition plant growth will be hampered and not produce optimally. According to [9] stated that genetic variation in the population is indicated by differences in the reactions of individuals to varying environmental conditions.

### CONCLUSION

Based on the results of field tests on tomato plants that the use of a combination of organic and inorganic fertilizers can increase the amount of organic matter in the soil. The results of the dose analysis that have a significant impact is the use of 6-8 tons/ha. Organic Manure 8 tons/ha (177.6 Kg/m<sup>2</sup>) + 75% NPK (32.94 Kg/222 m<sup>2</sup>) (i) which is a very appropriate dose for nutrient absorption so as to produce good tomatoes followed by nutrients required for plant growth and yield are available, balanced and in optimum doses. With treatment (i) with the type of organic fertilizer and the dose of NPK gave the highest value in the vegetative and generative phases, for the generative phase (growth) plant height (93 cm), number of leaves (73 strands), stem diameter (0.88 cm), flowering age (26 days after planting), number of flowers per plant (66). While in the generative phase (production) the number of fruits per plant (55 pieces), fruit diameter (4.4 cm), fruit weight per fruit (82.4 grams) and fruit weight

per treatment was 631.3 kg and fruit weight per hectare reached 28471 Kg. This is related to the nutrient content in organic fertilizers that are able to provide the best nutrients for tomato plant growth so that it affects production.

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