The effect of a combination of organic fertilizer on the production of Inpari 32 varietas

A Prasetia¹, R Kusumah¹, M L Resubun¹ and R Amin²

¹Department of Agrotechnology, Faculty of Agriculture, Musamus University, Merauke, Indonesia
²Department of Agro-technology, Faculty of Agriculture, Universitas Hasanuddin, Makassar, Indonesia

E-mail: andriprasetia@unmus.ac.id

Abstract. Merauke Regency is one of the regencies located in Papua Province, which has potential land for the development of the agricultural sector, especially food crops. The potential land for rice development in Merauke Regency reaches 1.9 million hectares. Organic farming, in its implementation, focuses on the use of organic materials that can increase crop production. The purpose of this study was to examine the effect of organic fertilizer combination (cow manure and liquid organic fertilizer) on the production of Inpari 32 types. The method was a Randomized Block Design (RBD) consisting of 4 treatments and was repeated three times so that 12 plots were obtained the trial. The results show that the application of organic fertilizer has a significant effect on the weight of 1000 grains, weight of rice grains per experimental plot, and weight of rice grains per hectare. The highest rice grain at 14% water is P1Z2 treatment, which yields 2.28 tons/hectare.

1. Introduction

Merauke is a regency located in Papua Province, covering an area of 4,469,841 hectares. Having a high land for development in agriculture, specifically food crops. Potential land for food crop development, specific rice in Merauke reaches 1.9 million hectares. Rice production, according to data from the Central Statistics Agency of Merauke in 2014, reached 204,687.17 tons [1].

The development and application of organic agriculture continue to increase with increasing awareness of the population about the dangers of using chemicals that harm health. Organic farming is a method in the production process that improve the quality of soil ecosystems in order to increase crop production. It emphasizes the use of natural materials to rehabilitate or even improve soil quality. The aim of organic farming systems maintains harmony with natural systems, and it takes full advantage of farming management by utilizing and developing.

Efforts to increase rice production in Merauke can be made by fertilizing plants during growth and development. Since the farmers who have been using inorganic fertilizers continuously cause the productivity of agricultural land declines.

The use of inorganic fertilizers continuously becomes inefficient and impair the balance of soil, chemical, and biological properties to decline land productivity, affect production, and also produce residues that damage the environment. Therefore, It is recommended that the application of inorganic
fertilizers should be balanced with the use of organic fertilizers in the current agricultural business [2].

One alternative fertilization that is readily obtained is manure. Manure, which consists of macro-elements (nitrogen, phosphorus, potassium, calcium, and sulfur) and micro (iron, zinc, boron, and cobalt) has natural properties and be secure for the soil. Besides, manure increases water holding capacity, soil microbiological activity, cation exchange capacity, and improves soil structure [3]. Cow manure has advantages over other manure, which has high fiber such as cellulose. It provides macro and micronutrients for plants and improves water absorption in the soil [4].

Liquid organic fertilizer (POC) is organic fertilizer with specific nutrients that have beneficial for plant growth. The use of liquid fertilizer can be flushed or sprayed on the plant. The raw material for liquid fertilizer can come from the availability of a variety of organic materials around. Several studies show that the application of liquid organic fertilizer to plants can increase crop production through the activation of microorganisms contained therein and those in the environment.

Growth Regulator Substance (gibberellic) plays a role in stimulating the extension of the stem segment, involve in the initiation of fruit growth after pollination (especially if auxin does not play an optimal role), gibberellin also increases the number of leaves in some plant species. The response to gibberellins increases cell division and cell enlargement. The administration of 250 ppm of gibberellin gives the best growth and yields on the cultivar dewata wheat because it showed the highest seed weight per panicle and per plant [5].

2. Research method
The study was conducted from January to May 2018 in Kuprik Village, Semangga District, Merauke Regency, Papua.

The materials are Inpari 32 rice seed varieties, manure (cow dung), POC Jago Tani Ratu Biogen fertilizer (POC products from Jimmy & Co.), pesticides, ropes, plywood, paints, nails, stakes, sacks, gasoline and solar. Then, the tools are hand tractor, Alkon machine, tarpaulin, hoe, shovel, scythe, hand sprayer, scales, meter, hammer, saw, machete, ruler, calipers, camera, and stationery.

The research used a randomized block design (RBD) consisting of 4 treatments and repeated three times to obtain 12 experimental plots and 1200 plants. Fertilization treatments are:

- P0 = 0 ton manure + 0 ml POC /ha
- P1 = 15 ton manure + 112 ml POC /liter
- P2 = 15 ton manure + 224 ml POC /liter
- P3 = 15 ton manure + 336 ml POC /liter

The study was conducted by dividing paddy fields into 12 plots, with a size of 2 m x 2 m. The distance of rice plants in 1 experimental plot is 20 cm x 20 cm.

Observation of yield components is carried out at harvest at 120 days with a moisture content of 14%, including the weight of 1000 grains of the dried rice grain, the weight of rice grain/plot and rice grain/hectare.

3. Result and discussion
The results showed that the weight of 1000 grains of rice showed a significantly different effect by the provision of Organic Fertilizers. The highest effect occurred on P1Z2 treatment. The average yield of 1000 rice grains, the average yield of experimental rice grains, and the yield of rice per hectare are shown in table 1. Table 1. Average yields of 1000 rice grains, grain yield per experimental plot, and Paddy grain yield (tons/ha) with organic fertilizer treatment (rice moisture of 14%).

| Treatment | Average yields of 1000 rice grains (gr) |
|-----------|----------------------------------------|
|           |                                        |
Based on research data, the use of organic materials is needed to improve soil fertility and rice production. The average weight of 1000 rice grains has a significant effect during the treatment of organic fertilizer. The P0Z0 treatment was significantly different from the P1Z1 treatment. The P0Z0 treatment was also significantly different from P1Z3. Then, the P1Z1 treatment was significantly different from the P1Z2 and P1Z3 treatments. While the P1Z1 treatment was not significantly different from the P1Z2 treatment, and the P1Z2 treatment was also not different from the P1Z3 treatment. The highest 1000 grain weight is in P1Z2. It is the result of the organic fertilizer, which improves soil quality and contributes nutrients to nitrogen, phosphorus, and potassium into the soil [6].

The observation of the weight of 1000 seeds and the treatments of organic fertilizer show a significantly different effect. P1Z2 treatment has the highest weight of 1000 seeds (cow manure 15 tons, and 224 ml POC / liter). The components such as weight of 1000 grains and the yield per plot of the experiment by genetic and environmental factors. Sometimes the genetic traits do not arise because environmental factors are not relevant. Therefore, in obtaining the genetic traits as expected, human efforts in utilizing environmental factors are an essential part [7].

**Table 2.** Average rice grain per plot with organic fertilizer treatment (14 % of paddy water).

| Treatment | Average paddy grain results/ experimental plot (gr) |
|-----------|----------------------------------------------------|
| P0Z0      | 775.2 a                                            |
| P1Z1      | 804.2 a                                            |
| P1Z2      | 912.0 b                                            |
| P1Z3      | 844.5 ab                                           |

Table 2 shows that the average weight of rice grains per experiment plot due to organic fertilizer ranged from 775.2 grams to 912.0 gr. The average grain weight per trial plot increased consistently with increasing levels of organic fertilizer applied. The highest grain weight was found in the treatment of P1Z2 (912.0 gr), which was significantly different from each level of other organic fertilizer treatments that were attempted. It is due to the provision of organic fertilizer can supply nutrients needed by plants, so that it affects the increasing yield per plot of the experiment. However, in the treatment of P1Z3, the production tended to decrease, it caused the ability of plants in absorbing nutrients was maximal.

**Table 3.** Rice paddy (ton/ha) with organic fertilizer treatment (14 % of Rice moisture).

| Treatment | Paddy weight (ton/ha) |
|-----------|-----------------------|
| P0Z0      | 1.94                  |
| P1Z1      | 2.01                  |
| P1Z2      | 2.28                  |
| P1Z3      | 2.11                  |
Table 3 shows that crop production per hectare of organic fertilizer treatment gives a real effect between treatments. The highest crop production in the treatment of organic fertilizer P1Z2 (cow manure 15 tons, and 224 ml POC / liter) was 2.28 tons/hectare. The lowest rice production is 1.94 tons/ha, and the highest production is 2.28 tons/ha. Sutedjo (1995) states that organic fertilizers play a role in topping the surface soil (topsoil), increase soil pH or decrease soil acidity, increase microorganism populations, enhance water absorption and storage capacity, and increase soil fertility [8]. According to Lingga (2002), the roles of organic fertilizer, besides add nutrients into the soil, also increase humus levels, improve soil structure and encourage the life of microorganisms [9]. Rusastra, et al (2005) argue that the nutritional efficiency of plants increases when fertilizing the soil using inorganic fertilizers is combined or balanced with organic fertilizers [6]. This organic fertilizer acts as a nutrient enhancer N, P, K for plants from mineralization by microorganisms.

Organic matter contains carbohydrates, proteins, lignin, and cellulose which are dominated by C, H, and O [10]. The average C content in organic matter is approximately 58%, so the provision of organic material increases the C-organic content in the soil. The provision of organic fertilizer as an addition to organic material increases soil C-organic because organic matter is able to influence the improvement of soil physical properties to provide a good environment for roots [11].

4. Conclusion

Based on the results of the study, it can be concluded that the application of a combination of organic fertilizer to rice plants has a significant effect on the weight of 1000 grains of rice (P1Z2: 26.6 gr), on the weight of rice grains per experimental plot (P1Z2: 912.0 gr), and the grain weight rice per hectare. The highest rice grain at 14% water was P1Z2 treatment, which was 2.28 tons/hectare. Ow production in this study caused inappropriate varieties. Inpari 32 types is a variety prepared for high commercial production, so the low nutrient input provided has an impact on low production in this study. Production of a plant is generally determined by the vegetative growth of the plant itself. Haryadi (1990) suggests that the vegetative phase determines the generative phase [12]. If vegetative growth is good, the generative phase will be good too. Increasing the dose of organic fertilizer is inseparable from the decrease in reactivity of organic acids, which are toxic to plants, and increasing the availability of base cations and phosphorus in the soil for plants.

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