Increased growth and production of irrigated rice by providing cow organic manure and NPK compound fertilizers with planting systems Jajar Legowo 4:1 in the Village of Tanjung Keriahan, Langkat Regency, North Sumatera

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Abstract. Until now the average national rice production that can be achieved is around 4-5 tons/ha. To increase production that can be achieved above the national average, new efforts in agronomic technology are needed to overcome it. One of the efforts that can be done is to examine the utilization of organic cow manure and NPK fertilization with the Jajar Legowo 4:1. The purpose of the study is to obtain the optimum dose of cow manure and NPK compound fertilizer with high rice production achievements. The study was conducted in the Irrigated Rice Region of Tanjung Keriahan Village, Langkat Regency, North Sumatra Province. The study used Randomized Block Design with fertilizer treatment for organic materials in cow 4 levels of dosage: 0, 5, 10, 15 tons / ha and NPK compound fertilizer application with 5 treatment doses: 0, 100, 200, 300, 400 kg / ha. The results showed that the growth and development of rice plants Mekongga variety that were studied were best shown in the giving of 15 tons/ha of cow manure and NPK fertilizer application of 400 kg/ha.

1. Introduction
Rice production at this time is generally not able to achieve maximum production in accordance with the potential yield contained in superior varieties planted in the field which only ranges between 4-5 tons/ha in terms of the potential production contained therein ranges from 8-10 tons/ha. Many efforts have been made in the context of increasing production which can be achieved in the area per hectare such as the use of superior varieties, spacing, perfect tillage, irrigation water irrigation and fertilization. Until now, rice production in Indonesia is still not comparable with the needs of community rice, which encourages the government to always provide and increase rice production in sufficient quantities [1].

In an effort to increase production better, one of the alternatives that can be done is to improve soil conditions by providing organic fertilizer from cow cages that are available around the location where irrigated rice is developed and the addition of plant nutrients by applying NPK compound fertilizer and the varieties used high-yielding varieties that have been adaptive at locations in the irrigated rice fields to be planted.
The good properties of organic fertilizers on increasing soil fertility are mentioned: Improving soil structure, facilitating soil management, increasing soil water retention capacity, increasing CEC (cation exchange capacity) so that the cation's binding capacity is higher, improving life soil biology, containing microbes in sufficient quantities that play role in the process of decomposition of organic matter [2].

It was also explained that organic matter added to the soil will be a source of energy and food for various microorganisms in the soil [3]. Various soil microorganisms become active through the food chain, then undergo a process of decomposition to produce a variety of organic and inorganic compounds that are useful for plants.

NPK fertilizers are macro nutrients needed by rice plants to increase their growth and production. Fertilizer N functions primarily to improve plant vegetative growth and protein formation. N deficiency results in stunted plant growth, limited root growth and yellow leaves. P fertilizer in plants functions in the formation of flowers, fruits and seeds, root development, strengthens the stem does not easily fall, accelerates maturation and functions in plant cell division. P deficiency causes stunted plant growth because cell division is interrupted, leaves turn purple or brown from the leaf tips. Fertilizer K functions mainly to activate enzymes in plants, flour synthesis, stimulate carbohydrate translocation from leaves to plant organs, an important component in the osmotic regulation mechanism in cells and directly influence the level of membrane semipermeability and phosphorylation in chloroplast [4-6].

Superior rice varieties are varieties that generally have high production potential compared to local varieties, have resistance to certain pests and diseases or can grow well on soils that are poisoned by Al and Fe. Mekongga variety is one of the superior varieties that is widely planted in irrigated rice fields in North Sumatra, including in Tanjung Keriahan Village, Langkat Regency with Bekulap River Irrigation Area. This variety has a maximum production potential of 8.5 tons/ha. Judging from the cultivation system of paddy rice cultivation, one of the planting systems that can be done to increase production by increasing the population of plants per hectare is to apply the Jajar Legowo 4: 1 planting system. The 4: 1 Legowo planting system is a cropping pattern by providing additional insertion plants on both sides of the periphery plant. Plant population 192.712 ± 4,260 clumps/ha with a percentage increase of 20.44% compared to tile patterns (25 cm x 25 cm) [7].

The Jajar Legowo planting system is one component of Integrated Crop Management in lowland rice which when compared to other planting systems has advantages [8]. There is a wider open space between the two groups of rows of plants that will increase sunlight into each rice plant family, thereby increasing photosynthetic activity which has an impact on increasing crop productivity.

Based on the description above, it is necessary to conduct research into the provision of organic cow manure and NPK fertilizer with the Jajar Legowo 4: 1 planting system in order to increase the production and quality of lowland rice to be achieved. The research aims to get the best dose of cow manure and NPK compound fertilizer with the highest production.

2. Materials and methods

2.1. Time and place
The study was conducted in the irrigated area of Tanjung Keriahan Village, Serapit District, Langkat Regency, North Sumatra in 2019. The source of rice irrigation water came from the Bekulap River Weir in Tanjung Keriahan Village.

2.2. Materials and tools
The materials used consist of Mekongga variety of rice seeds, cow manure organic fertilizer, Phonska NPK fertilizer, insecticide and fungicide, stationery, bamboo, zinc plate, white paint, zinc signpost, raffia rope. Tools used hoes, machetes tripe, machetes, plastic buckets, digital cameras.
2.3. Research methods
The research used factorial randomized block design consisting of 2 treatment factors that were repeated 3 times. These factors are as follows: Factor 1 is a fertilizing factor for cattle cage organic materials consisting of 4 treatment dose levels: B₀ = 0 tons/ha, B₁ = 5 tons/ha, B₂ = 10 tons/ha, B₃ = 15 tons/ha. Factor 2 is NPK fertilization factor consisting of 5 levels of treatment dosage: M₀ = 0 kg/ha, M₁ = 100 kg/ha, M₂ = 200 kg/ha, M₃ = 300 kg/ha, M₄ = 400 kg/ha. The research data were processed using analysis of variance methods and Duncan distance test (DMRT) at test level of 5% [9].

2.4. Research Implementation
In carrying out this research, the activities carried out included: making seedlings of Mekongga variety, clearing land and preparing land for research sites, making 60 plots of experimental plots divided into three plant blocks, fertilizing organic material from cow cages and fertilizing compound fertilizers NPK with the treatment dosage per ha according to the specified research treatment, planting plants in experimental plots with the Jajar Legowo 4 : 1 planting system with a spacing of 25 cm x 25 cm and two seedlings planted per planting hole. Maintenance activities include irrigation water supply, weeding, control of pests and diseases and production harvests. The research parameters observed included plant height, number of tillers, panicle number, grain production per plant and grain production per plot.

3. Results and discussion

3.1. Plant height
In this study it was seen that the parameters of plant height growth were significantly affected by the treatment of cow manure and NPK fertilizer as well as the interaction of cow manure and NPK fertilizer (Table 1).

| Cow Manure | NPK fertilizer | Average |
|------------|----------------|---------|
|            | M₀ = 0 kg NPK/ha |         |
| B₀ = 0 ton/ha | 77.16 f | 90.17 c | 94.87 ab |
| B₁ = 5 ton/ha | 74.20 g | 86.69 d | 96.79 a |
| B₂ = 10 ton/ha | 80.89 e | 88.26 d | 96.77 a |
| B₃ = 15 ton/ha | 77.07 f | 87.38 d | 92.11 bc |
| Average | 77.33 e | 88.13 c | 95.13 a |

Note: Figures followed by the same notation in the same column show no significant difference at the DMRT test level = 5%.

In the treatment of cow manure, the best plant height is found in doses of manure 10 tons/ha and in NPK fertilizer application, the best plant height is found in doses of NPK fertilizer 400 kg/ha. In the interaction condition, it can be seen that in the treatment without NPK fertilizer, the best dosage of cow manure is 10 tons/ha. In conditions of NPK fertilizer = 100 kg/ha, the dosage of cow manure, as well as between without manure with those given manure 5 - 15 tons/ha. In NPK fertilizer application = 200 kg/ha, the best plant height is in the treatment without the use of manure. In the condition of NPK fertilizer = 300 kg/ha, the best dose of manure influence on crop height is at a dose of 10 - 15 tons/ha. In the provision of NPK fertilizer = 400 kg/ha. The best dose of manure is at a dose of 5 - 10 tons/ha. Plant height is an indicator of plant growth.
assessment, where plant height is related to the growth and development of roots in the soil which is influenced by soil fertility conditions both from the physical, chemical and biological activities of the soil. The provision of organic material in the form of cow manure and NPK nutrient fertilization will improve soil fertility which will stimulate the growth of plant roots which will then affect the growth and development of the shoots of the plants including the plant height growth height [3-4,6,10].

3.2. Number of tillers

Growth and development of the number of tillers per plant based on the results of this study was significantly affected both because of the influence of single factor treatment of cow manure and single factor for NPK fertilizer treatment, including because the interaction effect also significantly affected the number of tillers per plant.

| Cow Manure | NPK fertilizer | Average |
|------------|----------------|---------|
| B0 - 0 ton/ha | M0 = 0 kg NPK/ha | 18.39 g  |
| B1 - 5 ton/ha | M1 = 100 kg NPK/ha | 19.89 fg |
| B2 - 10 ton/ha | M2 = 200 kg NPK/ha | 18.50 g  |
| B3 - 15 ton/ha | M3 = 300 kg NPK/ha | 20.17 f  |
| B4 - 20 ton/ha | M4 = 400 kg NPK/ha | 19.24 e  |

The effect of cow manure on the highest number of tillers per plant was found in the dosage of manure 15 tons/ha and on the effect of NPK fertilizer application, the highest number of tillers was 400 kg/ha. The best interaction effect on the number of tillers was in the combination treatment of 15 tons/ha cow manure with all the treatments of NPK compound fertilizer (0 – 400 kg/ha). The highest number of tillers was in the combination of 15 tons/ha cow manure treatment with NPK fertilizer 400 kg/ha. Number of tillers is one of the determining components in achieving rice production in the area of rice plants per hectare [10]. Provision of organic material will improve the physical, chemical and biological characteristics of the soil through its influence on the growth and development of roots in the soil which then affects the growth and development of plants on the surface of the soil including the growth of the number of tillers per plant. Fertilization containing NPK which is a macro element that is needed by plants for plant growth both rooting in the soil and plant parts canopy including for the growth and development of tillers in rice plants [3-4, 10]. So it is clear that the application of cow manure and NPK compound fertilizer increase the number of tillers that develop in the results of this study.

4. Conclusion

From the results of this study it can be concluded that the administration of cow manure and NPK fertilization and its interactions can significantly increase the growth and development of Mekongga rice fields in the research area that is tried, seen from its effect on the growth of plant height and the development of the number of tillers per plant.
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