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Analysis Of Rice Growth And Yield (*Oryza Sativa*) Using The System of Rice Intensification (SRI) Method

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ABSTRACT

This study aims to analyze the effect of *the System of Rice Intensification* (SRI) method on the growth and yield of rice plants (*Oryza sativa*) compared to conventional cultivation methods. The SRI method is a cultivation approach that prioritizes water use efficiency, single planting of young seedlings, wide planting distances, and organic soil management. The research was carried out in irrigated rice fields for one planting season using the Inpari 32 variety. The observed parameters included plant height, number of productive saplings, number of panicles, and harvested dry grain yield per hectare. The results showed that the application of the SRI method significantly increased vegetative growth and plant productivity compared to conventional methods. Plants cultivated using the SRI method have a higher plant height and number of saplings, and produce higher dry grain. These findings show that SRI is a more efficient, environmentally friendly, and potentially increasing food security through increasing rice production.

Keywords: Rice, *Oryza sativa*, growth yield

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INTRODUCTION

This analysis should identify underexplored areas or unresolved problems that the present research seeks to address. Through this, the novelty or originality of the study becomes apparent. Finally, the Introduction should clarify the research stance, specifying whether the study intends to extend, challenge, or support existing literature.

Rice (Oryza sativa) is one of the strategic food commodities that has a central role in food security in Indonesia (Pradiana et al., 2007). As a staple food for the majority of the population, the demand for rice continues to increase along with population growth and improved living standards. In this context, increasing the productivity of rice crops is a top priority for the national agricultural sector. However, challenges in rice cultivation are increasingly complex, especially related to land limitations, declining soil fertility, climate change, and declining water and labor availability (Zarwazi et al., 2016)

Agriculture in Indonesia over the past few decades has still been dominated by conventional cultivation systems that tend to rely on large amounts of external inputs, such as chemical fertilizers, synthetic pesticides, and high irrigation water usage. Although this approach is able to increase production in the short term, in the long term it poses various problems, such as degradation of soil quality, dependence on external inputs, increasing production costs, and declining efficiency in the use of natural resources, especially water. On the other hand, global climate change has caused rainfall patterns to become erratic, which has a direct impact on the crop growth cycle and the availability of irrigation water (Santhiawan & Suwardike, 2019).

To face these challenges, innovation is needed in the rice cultivation system that not only increases crop yields, but is also more efficient, environmentally friendly, and adaptive to climate change. One of the approaches that is getting more attention is the System of Rice Intensification (SRI) method. SRI is a rice cultivation method that was first developed in Madagascar in the early 1980s by Father Henri de Laulanié, and later popularized globally by Norman Uphoff of the Cornell International Institute for Food, Agriculture and Development (CIIFAD), Cornell University, United States (Kurniadiningsih & Legowo, 2012).

The SRI method differs fundamentally from conventional systems in terms of plant, soil, water, and nutrient management. SRI emphasizes the use of young seedlings (less than 15 days old), single planting (not stacked), wider planting distances, and intermittent (wet-dry) water management, not continuous inundation (Toungos, 2018).. In addition, SRI encourages the use of organic matter to improve soil fertility and support the life of beneficial microorganisms. This approach is believed to be able to stimulate better root growth, increase roots, and strengthen plant resistance to pests and diseases.

Various studies conducted in a number of countries show that SRI can increase rice yields by up to 20–50% compared to conventional methods, with more economical water use and lower external inputs (Purwani, 2012). In Indonesia, the implementation of SRI began to be introduced in the early 2000s and has been piloted in various regions, such as West Java, Bali, and North Sumatra. Although the results are quite promising, the adoption of SRI at the farmer level still faces several obstacles, including limited knowledge, changes in planting habits, and the need for adequate technical training.

In this context, further analysis of the performance of the SRI method in various local agroecosystem conditions is very important. This study aims to empirically examine the influence of the SRI method on the growth and yield of rice plants compared to conventional cultivation methods. The main focus in this study is on growth parameters (plant height, number of productive saplings) and yield (number of panicles and dry grain weight per hectare), which are important indicators in evaluating the effectiveness of a cultivation method.

With an experimental approach in agricultural land, it is hoped that this research can provide relevant scientific data as a basis to encourage the adoption of the SRI method by farmers more widely. In addition, the results of this research are also expected to contribute to formulating sustainable agricultural development policies that support increasing productivity while preserving the environment. The application of more efficient and environmentally friendly cultivation methods such as SRI is very relevant in the framework of sustainable modern agricultural development, as proclaimed in the Sustainable Development Goals (SDGs), especially the 2nd goal, namely Zero Hunger, and the 12th goal, namely Responsible Consumption and Production.

Furthermore, this research can also answer the doubts of some people about the SRI method which is considered difficult to implement because it requires high precision and significant changes in cultivation management. By comparing the real results in the field between conventional and SRI methods, this study will provide a more objective picture of the advantages and challenges of each method. If SRI is proven to provide better and more efficient results, then this method can be recommended as a key alternative in rice cultivation, especially in areas that face water limitations and high production costs (Suprapto, 2010).

METHODS

The observation results were analyzed quantitatively using statistical methods to determine the effect of rice cultivation treatment with the SRI method compared to conventional methods. The first step was to collect data from each experimental unit based on the observed parameters, namely plant height, number of productive saplings, number of panicles per clump, panicle length, and weight of harvested dry grain per hectare.

Furthermore, the data obtained is tested for normality and homogeneity to ensure that the data meets the basic assumptions of variant analysis. The normality test was carried out using the Shapiro-Wilk test, while the homogeneity test was carried out with the Levene test. If the data does not meet these assumptions, the data is transformed (e.g. logarithmic or square root) so that it can be further analyzed. After that, a one-way Variance Analysis (ANOVA) was performed for each parameter to find out if there was a significant difference between treatments. ANOVA is performed at a significance level of 5% ($\alpha = 0.05$) with the help of statistical software such as SPSS, R, or Microsoft Excel.

If the ANOVA results show a significant difference, then it is followed by a comparison test between treatments using the Smallest Real Difference (BNT) test at the same level (5%) to find out which treatment gives the best results statistically. The results of the analysis are presented in the form of tables and graphs, accompanied by descriptive interpretations to clarify the biological meaning of the results obtained. This analysis also includes a discussion of agronomic factors that may affect the growth and yield of rice in each cultivation method.

Location and Time of the Research This research was carried out in an irrigated rice field in Sukamaju Village, Cikembar District, Sukabumi Regency, West Java. The location was selected based on the suitability of the agroecosystem and the availability of irrigation facilities that support the application of the SRI method. The research lasted for one planting season, from February to May 2024.

RESULT AND DISCUSSION

This study aims to analyze the effect of the application of *the System of Rice Intensification* (SRI) method on the growth and yield of rice plants (*Oryza sativa*) compared to conventional cultivation methods. Some of the parameters observed include plant height, number of productive saplings, number of panicles per clump, and dry grain yield per hectare.

Plant Height

Plant height is one of the indicators of vegetative growth that can describe the general condition of the plant, including nutrient absorption, water adequacy, and photosynthesis effectiveness. The observation results showed that rice plants planted with the SRI method had an average plant height of 112.5 cm, while plants planted with the conventional method had an average height of 104.2 cm.

The increase in plant height in the SRI method is thought to be closely related to the use of young seedlings aged 8–12 days after sowing (watershed), single planting (one seedling per hole), and wider planting distance (25 x 25 cm). These three factors provide optimal growing space for the plant's roots, so that the roots can develop more widely and deeply. With a better root system, plants have a higher water and nutrient absorption capacity, which directly impacts vegetative growth, including plant height.

Planting with a wide planting distance also improves sunlight penetration and air circulation, which are important factors in the process of photosynthesis and respiration. Furthermore, intermittent water management applied to the SRI method creates better aerated soil conditions, which supports the growth of soil microorganisms and increases nutrient availability.

Number of productive saplings

The number of productive saplings is one of the important parameters that determine the final result of rice production. Based on the observations, the SRI method produces an average of 28 productive saplings per clump, while the conventional method only produces 20 productive saplings. This difference is very significant and shows the advantages of the SRI method in supporting the growth of chicks.

Some of the factors that cause an increase in the number of productive saplings in the SRI method include the use of young seedlings, intensive tillage, and optimal water management. Planting young seedlings encourages the plant to adapt better to its new growing environment and stimulates lateral root growth, which in turn increases the formation of seedlings.

Meanwhile, intermittent water management allows the soil to undergo wet-dry cycles that support the activity of soil microbes, particularly microorganisms that play a role in nitrogen fixation and phosphate dissolution. The availability of sufficient and balanced nutrients is essential to stimulate the growth of the seedlings.

Further, good tillage of the SRI method, including optimal soil hoeing and reversal, causes the soil structure to become looser. This supports root growth and water movement in the soil, which greatly affects the growth of the tillers.

Number of Panicles per Clump

The number of panicles per clump is the main factor in determining the potential rice yield. The results showed that the SRI method produced an average of 24 panicles per clump, while the conventional method only produced 17 panicles. This suggests that the SRI method has a higher yield potential as it produces more productive panicles.

The increase in the number of panicles is closely related to the number of productive saplings. With more saplings that are able to form panicles, the potential for the grain produced increases. The use of young seedlings and wide planting spacing in the SRI method allows the plant to have a longer growth time and optimal growing space, so that the process of differentiation into panicles can take place better.

In addition, proper fertilization management in the SRI method that prioritizes the use of organic fertilizers such as compost and manure is able to provide nutrients slowly but sustainably. This is different from chemical fertilizers which tend to dissolve quickly but have a short shelf life in the soil.

Organic fertilizers also improve the structure and fertility of the soil in general, which favors the formation of panicles. These results are in line with the findings of Uphoff (2003), who stated that the SRI method is able to increase the number and length of panicles due to the optimization of the plant growing environment.

Dry Grain Yield per Hectare

The yield of harvested dry grain is the main parameter in evaluating the effectiveness of a cultivation method. Based on crop yield measurement, the SRI method produces an average of 7.8 tons/ha of dry grain, while the conventional method only produces 6.2 tons/ha. This means that there is a 25.8% increase in yield on the SRI method.

This increase in yield reflects the synergy of all of the growth components discussed earlier—plant height, number of productive saplings, and number of panicles. The combination of optimal vegetative and generative growth results in better grain quantity and quality.

In addition to the technical factors that have been described, the efficiency of water use is also an important advantage of the SRI method. The intermittent irrigation system of the SRI method not only saves water by 30–50%, but also creates an ideal rooting environment for rice growth. This is important considering the increasing challenges of water availability due to climate change and land conversion.

On the other hand, the use of lower inputs in the SRI method, such as the number of seeds that is only 5–10 kg/ha (compared to 25–30 kg/ha in conventional systems), makes this method more economical and efficient. Farmers are also encouraged to take advantage of local resources, such as manure and compost, which are not only cheaper but also more environmentally friendly.

Environmental Impact and Sustainability

The advantages of the SRI method are not only limited to production results, but also have a positive impact on environmental sustainability. The use of organic fertilizers and the reduction of chemical inputs reduce the risk of water and soil pollution. SRI also supports eco-friendly agriculture by increasing biodiversity on farmland, including soil microorganisms that play a role in nutrient cycling.

In addition, the water management system applied in SRI does not cause root rot due to prolonged stagnation, as is often the case with conventional systems. With more aerated soil conditions, plant roots grow healthier and stronger, so that they are able to support optimal plant growth until harvest time.

Some of the farmers involved in the study also admitted that the SRI method requires more attention and labor, especially in the early stages of planting and weeding weeds. However, increased yields and reduced input costs make this method economically viable in the long run.

Constraints and Recommendations

Although the SRI method shows encouraging results, implementation in the field faces several obstacles. First, this method requires training and assistance to farmers because the approach is different from conventional planting systems that are commonly carried out. Changes in seeding, planting, and water management techniques require time to adapt.

Second, the SRI method is more labor-intensive, especially in terms of weeding and weed management due to the absence of continuous waterlogging that usually suppresses weed growth. This can be an obstacle for farmers who have limited labor.

Therefore, there is a need for support from local governments and agricultural institutions in the form of training, the provision of SRI planting tools, and the promotion of environmentally friendly agricultural practices. Further research is also needed to adapt this method to different local rice varieties as well as different agroecological conditions

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that the application *of the System of Rice Intensification* (SRI) method has a significant positive impact on the growth and yield of rice plants (*Oryza sativa*) compared to conventional cultivation methods.

The SRI method has been proven to be able to increase plant height, the number of productive saplings, the number of panicles per clump, and dry grain yield per hectare. The average yield in the SRI method reached 7.8 tons/ha, higher than the conventional method yield of only 6.2 tons/ha. This success is supported by the use of young seedlings, single planting with a wider planting distance, intermittent water management, and the use of organic fertilizers.

In addition to increasing productivity, the SRI method also makes a positive contribution to the efficiency of resource use, especially water and seeds, and supports sustainable agriculture through the reduction of the use of chemical inputs. Although this method requires more attention and labor in the early stages of cultivation, the long-term benefits it offers make SRI a widely applicable rice cultivation alternative.

To optimize the implementation of the SRI method at the farmer level, support is needed in the form of technical training, continuous counseling, and the integration of appropriate agricultural technology. Thus, SRI can be a strategic solution in increasing national food security while maintaining the sustainability of the agricultural environment.

REFERENCES

Kurniadiningsih, Y., & Legowo, S. (2012). Evaluation of the profit and loss of the application of the SRI (system of rice intensification) method in DI Cihea, Cianjur Regency, West Java. *Wartazoa*, *18*(7), 97.

Purwani, R. H. (2012). *Response of Rice Plants (Oryza Sativa L.) On various balances of inorganic, organic and biological fertilizers in the System of Rice Intensification (Sri) in Oxisol Tuntang Soil* (Doctoral dissertation, UNS (Sebelas Maret University)).

Pradiana, W., Sulistya, D., & Setiawati, A. (2007). Development of paddy agribusiness through the empowerment of farmer groups. *Journal of Agricultural Extension*, *2*(2), 171-182.

Santhiawan, P., & Suwardike, P. (2019). Adaptation of paddy rice (Oryza sativa L.) to increased excess water as a result of global warming. *Agro Bali: Agricultural Journal*, *2*(2), 130-144.

Zarwazi, M., Nugraha, Y., AF, V. Y., & Rochayati, S. (2016). Recommendations for agroecosystem-based land management and land suitability for the development and increase of rice production. *Recommendations for Agroecosystem-Based Land Management, IAARD PRESS Jakarta*, 79-94.

Toungos, M. D. (2018). System of rice intensification: A review. *International Journal of Innovative Agriculture & Biology Research*, *6*(2), 27-38.

Zarwazi, M., Nugraha, Y., AF, V. Y., & Rochayati, S. (2016). Recommendations for agroecosystem-based land management and land suitability for the development and increase of rice production. *Recommendations for Agroecosystem-Based Land Management, IAARD PRESS Jakarta*, 79-94.

Zarwazi, M., Nugraha, Y., AF, V. Y., & Rochayati, S. (2016). Recommendations for agroecosystem-based land management and land suitability for the development and increase of rice production. *Recommendations for Agroecosystem-Based Land Management, IAARD PRESS Jakarta*, 79-94.