



Analysis of Legowo Row Planting System and System of Rice Intensification (SRI) of Paddy Field (*Oryza Sativa* L.) Toward Growth and Production

AUTHORS INFO

M. Darmawan
Ichsan Gorontalo University
m.darmawan98@yahoo.com
+6285255797260

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Abstract

Rice is the main commodity crops in the province of Gorontalo, in addition to maize and pulses. One alternative technology to increase productivity is through application of Legowo cropping system that is engineered way of planting the tiles so that there is a spacious room extends to one direction between two rows of rice plants, while the other way seemed more tightly. In rice cultivation with system of transplanting, planting distance is one factor of production that is very important because it determines the productivity achieved. This research is expected to be a reference for farmers, especially in the province of Gorontalo to carry rice cultivation so as to increase the production of rice plants. The design of the study is a Randomized Complete Block Design by comparing between systems that are often used by farmers, namely row planting system tiles (S0), the system of row planting Legowo (2: 1) (S1), system of row planting Legowo (4: 1) (S2), planting system SRI (S3). The parameters of observations made were plant height, number of tillers, production (kg/plot), and observations of soil samplesman. The results showed treatment plant system of tiles provide number of tiller and height of plants that are best compared with other treatments. The best results for a number of productive tillers, the average production of grain/plot, grain weight of 1000 grain was in the treatment plant system Legowo row 2: 1.

Keywords: Legowo, SRI, cropping systems, paddy field

A. Introduction

Rice is the main commodity crops in the province of Gorontalo, as well maize and pulses. Efforts to increase production have been carried out, both in extensification and intensification. Efforts to increase production have been carried out, both in intensification and intensification. However, in recent years, increasing of rice production in the province of Gorontalo does not reach the expected target, while demand for rice continues to increase every year. Projected demand for rice in the year 2010, about 41.50 million tons and is expected to rise to 78 million tons in 2025, so that by 2010 there will be a deficit of about 12.78 million tons of rice (13.50% per year) if no improvement productivity and expansion of harvest area. The average productivity of paddy rice by the Provincial Agriculture Office of Gorontalo in 2014 was 49.18 ku per hectare that the production is not too much different from the years 2012 and 2013 which is 48.01 and 52.01 ku per hectare (BPS, 2015).

Production of rice in the province of Gorontalo was still below the average of the national rice production that is 51.28 ku per hectare. This is because the area of agricultural land decreases in the presence of wetland conversion to non-paddy fields. One alternative technology to increase productivity is through application of cropping system Legowo that is engineered way of planting the tiles so that there is a spacious room extends to one direction between two rows of rice plants, while the other way seemed more tightly. In rice cultivation with system of transplanting, planting distance is one factor of production that is very important because it determines the productivity achieved.

Legowo row planting system (tajarwo), a planting system that takes into account the array. Legowo row pattern is alternating between two or more rows of rice planting and one blank row. The goal of the system Legowo row planting is that the plant population per hectare can be maintained and even improved (Nazlah, 2011), according to Sakti & Ihwan (2012) system Legowo row planting makes all plants into plants aside to absorb sunlight and good air circulation, gain nutrients are evenly and simplify maintenance of plant.

Conventional cropping systems that generally performed by farmers in Gorontalo is a tile row planting system that is 20 x 20 cm or 25 x 25 cm. With rows of tiles this system, the plant population is estimated 160-180 thousand plants per hectare. Through the planting system Legowo 2: 1 & 4: 1, from some of the research results can improve plant population, approximately 15-25% of the population of rows of tiles. Therefore, by simply introducing the system of planting in paddy rice farming that is done by farmers in Gorontalo, is expected to increase rice production in the province of Gorontalo. In this regard, it is necessary to do research on the effects of different cropping systems on the performance and growth of rice production.

B. Methodology

The research was conducted in the form of experiments were arranged in a Randomized Block Design consisting of four (4) treatment planting method. The treatment is S_0 (tiles row planting system (control)), S_1 (Legowo row planting system (2: 1)), S_2 (Legowo row planting system (4: 1)) and S_3 (S.R.I cropping system). Dose of fertilizer are used according to the recommendations after the use of the Test Device Wetland, each treatment was repeated four (4) times so that there are twenty plots treated with the size of the plots 4 m x 6 m. Implementation of research activities include seed preparation, seed selection, land preparation, seeding, planting, maintenance, fertilizing, observation, and harvest.

Seeds were used in this study is a new high yielding varieties (VUB) Inpari 7. Seed selection is done by laying eggs in a container of water, the container is added a little salt to the eggs floating around in the middle of the container. Then the seeds to be sown soaked in a salt solution. The seeds that float was discarded while the sank seeds was used for scattering in the nursery. Seedbed given Urea 400 gr., planting space adjusted with a spacing of 25 cm of farmers in general, as well as the spacing of Legowo row that has been modified to suit their treatment, namely Legowo row 2: 1 and Legowo row 4: 1 with 2-3 seeds per clump. While for the SRI cultivation system, transfer of seedlings from the nursery to the plots with seedlings treated using 3 weeks after transplanting (WAT) or 21 WAT. With a spacing of 30 cm x 30 cm, as many as 1 seedling per hill. Parameter observations of plant height, number of tillers, production, grain weight is one thousand grains, the number of filled grain, grain hollow, and the number of grains per tassel.

C. Result

1. Number of Tillers

Cropping systems significantly affect the number of seedlings produced by rice paddy fields Inpari 24 at ages 2 WAT, 4 WAT and 6 WAT. The results of a further test using test Honestly Significant Difference (HSD). The average number of tillers by observation at age 2 WAT, 4 WAT, and 6 WAT.

Table 1 shows that at ages 2 WAT to 6 WAT treatments cropping system significantly compared with the tile system (control). Treatment tile system showed the highest results in the number of tillers compare other treatments.

Table 1. Average Number of Tillers Age 2, 4, 6 WAT Paddy field (*Oryza sativa* L.)

Cropping system	Average Number of Tillers		
	2 WAT	4 WAT	6 WAT
Tilles row (S0)	8.15 _c	28.45 _c	43.05 _b
Legowo 2:1 (S1)	6.95 _b	28.95 _c	51.00 _c
Legowo 4:1 (S2)	6.95 _{bc}	23.25 _b	37.20 _a
SRI (S3)	1.90 _a	18.10 _a	44.30 _b
HSD 0.05	2.80		
HSD 0.01	1.16		4.30

Description: The figure followed by the same letter are not significantly different at the level of advanced HSD test 0.05 and 0.01. WAT: Weeks After Crop.

2. Plant Height

Results of statistical analysis of high accretion rice plant during the observation to observation 2 MST, 4 MST, 6 MST is as follows

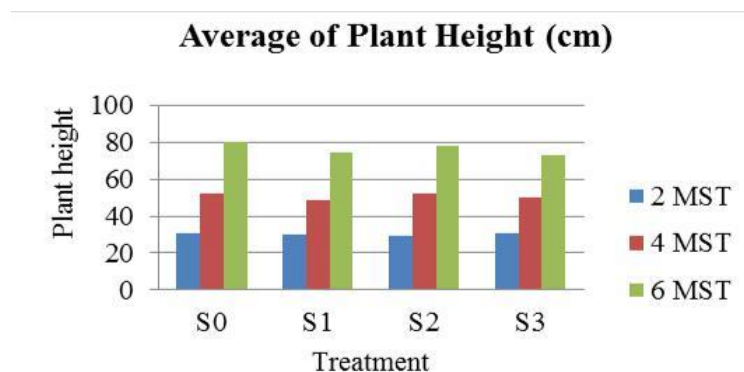


Figure 1. Average of Plant Height

Figure 1 shows that treatment of cropping systems provide a significantly different effect compared to the control treatment. The highest treatment is treatment of tiles compared to other treatments

3. Number of Productive Tiller

The observation of the number of productive tillers and statistical analysis are not significantly affected all treatments. Diagram of average number of seedlings each treatment can be seen in figure 2.

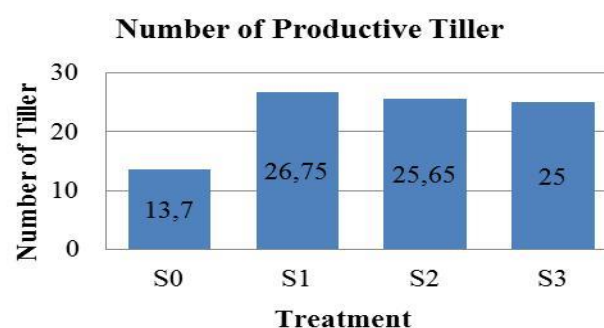


Figure 2. Number of Productive Tiller

Figure 2 shows that treatment of cropping system Legowo 2: 1 showed the highest yield compared with treatment with other cropping systems. The treatment of system Legowo 4: 1 and system of S.R.I shows the number of tillers that is higher than the cropping system tiles.

4. Production of grain/plot (kg)

Results of statistical analysis for the treatment of cropping systems on the production of grain / plot are as follows:

Table 2. Average production of Grain / Plot Paddy field (*Oryza sativa* L.)

Treatment	Average of Production
	Grain/Plot (kg) in Water content 22 % (kg)
Tilles row (S0)	28.85 a
Legowo 2:1 (S1)	48.00 c
Legowo 4:1 (S2)	38.40 b
SRI (S3)	33.60 b
BNT 0.01	6.96

Description: The figure followed by the same letter are not significantly different at the level of advanced HSD test 0.05 and 0.01.

Table 2 shows that the treatment system of Legowo row planting and cropping system of S.R.I provide a significantly different effect than tiles cropping systems (control). Treatment Legowo row planting system 2: 1 showed the best results compared to the treatment of other cropping system.

5. Grain Weight of 1000 grains (g)

The observation of grain weight of 1000 grains and statistical analysis showed no real effect on each treatment. Diagram of 1000 grain weight of each treatment can be seen in figure 3

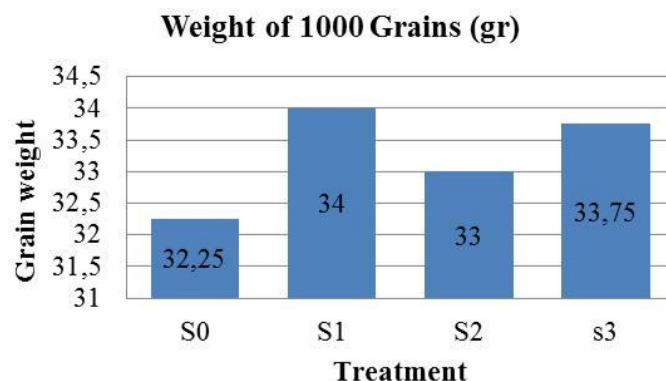


Figure 3. Weight of 1000 grains

Figure 3 shows the treatment using Legowo row planting system 2: 1, Legowo 4: 1, S.R.I cropping system showed a higher yield than the cropping system tiles. The treatment of cropping systems 2: 1 showed the grain weight of 1000 grains that is the highest as compared to the control treatment.

D. Discussion

At age 2 MST, tiles cropping systems produce the most number of suckers compared to four other cropping systems. This is due to the age of 2 weeks after planting, planting system tiles are commonly grown by farmers as much as 5-8 seeds/hill more than seeds planted 2-3 seeds/hill at planting system Legowo and SRI are only 1 seeds/hill. But at the age of 4 WAT and 6 WAT, the number of seedlings produced Legowo system 2: 1 began to evolve to become the most widely compared cropping system tiles and SRI. This is consistent with results of previous studies that the cropping system Legowo 2: 1 can increase the number of tillers up to 15-20%.

Legowo cropping systems, particularly Legowo 2: 1 result in the production of highest grain/plot with 48.00 kg/plot is significantly different from that of grain production/plot of four other cropping systems. This is in line with the Legowo planting system that can increase the number of tillers through clumps of plants inset on the edge. Increasing the number of chicks that influential to the amount produced panicles and grain/panicle formation. Through the planting system Legowo 2: 1 open space (Legowo) becomes greater that causes photosynthesis role in grain filling to be optimal. Excellence Legowo row planting system, when compared to tile cropping system is the number of plants per unit area more, so productivity is more, with the distance of alternating air circulation and causes the incoming sunlight more.

Higher yields achieved by Legowo cropping system than the system of tiles. The wider spacing of tillers produce more, better root growth compared with a spacing narrower, but to get grain quality grain seeds are better used Legowo 2: 1. Legowo 2: 1 is able to reduce the void caused by the effects of plant roadside (Badan Litbang Pertanian, 2007). Results of research of Abdulrahman *et al.* (2011) showed that in cropping Legowo 2: 1 with a spacing (25 x 12.5 x 50) cm, is able to increase the yield between 9.63 to 15.44% compared to the model of the tiles.

Ease obtained on the system Legowo according Kamandalu *et al.* (2006) in the way of weeding, fertilizing and plant maintenance, while the problems still faced by farmers in the application of planting Legowo system, inter alia: the farmers are not yet convinced of the technology cropping system Legowo, lack capital, lack of agricultural machinery, and the lack of detailed information on cropping system Legowo.

Production of rice from the research results in the conversion of hectares that each treatment S0 = 12, 02 tons/ha, S1 = 20.00 tons/ha, S2 = 10.98 tons/ha, S3 = 16.00 tons/ha and S4 = 14.00 tons/ha. Thus it can be seen that among the tested treatments, treatment Legowo row planting system 2: 1 provides the highest result among other treatment.

E. Conclusion

1. The Legowo cropping systems in general may increase the number of tillers and grain production/plot cropping system than the tiles and the SRI system. The production is converted into hectares that each treatment S0 = 12.02 tons/ha, S1 = 20.00 tons/ha, S2 = 10.98 tons/ha, S3 = 16.00 tons/ha, and S4 = 14.00 tons/ha.
2. Planting system Legowo 2: 1 is the best cropping systems that can significantly increase the number of tillers and grain production/plot.

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