

# PHYSIOLOGICAL RESPONSE AND GROWTH OF RICE IN THE SALIBU CULTIVATION SYSTEM

B. E. Farhanissa<sup>1</sup>, E. D. Hastuti<sup>2</sup>, M. Izzati.<sup>2</sup>, D.  
Susanti <sup>3</sup>, A. Riyanto<sup>3</sup>, T. A. D. Haryanto<sup>3\*)</sup>

<sup>1</sup> Diponegoro University Biology Master Student

<sup>2</sup> Faculty of Science and Mathematics  
Diponegoro University

<sup>3</sup> Faculty of Agriculture Jenderal Soedirman  
University

\*)Corresponding author email: [totok.haryanto@unsoed.ac.id](mailto:totok.haryanto@unsoed.ac.id)

## Abstract

Rice is one of eleven commodities whose the availability is continuously maintained by the Ministry of Agriculture during the Implementation of Community Activity Restrictions (PPKM). Salibu is an effort to increase land productivity by increasing the harvest index from 2 to 3 even up to 4 harvests in 1 year. This study aims to examine the physiological and growth characteristics of the five rice varieties in the first Salibu of Legowo planting system, to find out which varieties are best used for rice's Salibu, to determine the pattern of the relationship between characters and the yield of grain weight per clump of rice plants. This research was conducted in Karang Tengah Village, Purbalingga using a split-plot design with a basic design Completely Randomized Block

Design (CRBD) and four replications. The varieties used were Inpago Unsoed 1, Inpari 24, Inpari 32, Inpari 43, and Logawa. The results showed that the variety had a significant effect on the amount of chlorophyll, flowering time, and panicle length. Characters that closely related and had a high direct effect on yield were stomatal density, number of productive tillers, and number of grains. Therefore, these characters could be used as indicators of selection for high-yielding rice.

## Introduction

Covid-19 caused increased risk and uncertainty, disturbing the food supply chain, and decreasing farmer households' income. Meanwhile, the political will of the government to support agricultural development is essentially important, such as setting production priority across regions, distribution of agricultural products, and relief packages for farmers exposed to covid-19. This finding is expected to push agriculture to be more resistant in dealing with any emergencies this country might face in the future. (Oelviani et al 2022). Rice is one of eleven commodities whose availability is continuously maintained by the Ministry of Agriculture during the Implementation of Community Activity Restrictions (PPKM). The eleven commodities include rice, meat, sugar, eggs, chili, shallots, garlic, chicken pieces, and cooking oil (Ariestyanti, 2021).

Indonesian rice production is influenced by the harvested area and rice productivity, while the rice harvest area is influenced by the previous year's harvested area, and Indonesian rice productivity is influenced by pesticide prices and labor wages (Widyawati, 2014). One of the efforts to increase land productivity through increasing the harvest index from 2 to 3 or even up to 4 harvests in 1 year can be achieved using Salibu technology. Salibu is a rice plant that grows back after the remaining stems of the harvest are pruned (Nainggolan, 2014).

Salibu technology can also increase the Harvest Index because farmers no longer carry out soil processing and nurseries that are only needed for early plants. As a result, the production period is shorter. This technology can also overcome the limitations of superior varieties because subsequent plant growth occurs through shoots, therefore that the quality of the variety remains the same as the initial plant (Nainggolan, 2014).

This study aims to examine the physiological and growth characteristics of the five varieties of rice in the first salibu cultivated by jajar legowo super, to find out which varieties are best used for rice salibues, to determine the pattern of the relationship between characters and the yield of grain weight per clump of rice plants.

## RESEARCH METHODS

This research was conducted in Karang Tengah Village, Kemangkon Subdistrict, Purbalingga Regency, Indonesia and Agronomy and Horticulture Laboratory, Faculty of Agriculture, Jenderal Soedirman University. This research lasted for approximately 5 months. The materials needed in the study included 5 varieties of rice (INPAGO UNSOED 1 (V1), INPARI 32 (V2), INPARI 43 (V3), INPARI 24 (V4), and Logawa (V5)). which has been harvested first, rice field area of  $\pm 3,300 \text{ m}^2$ , basic fertilizer (Urea), phonska, and biodecomposer (Agrodeko 1). The tools used in this study were stationery, label paper, analytical balance, ruler, nameplate, oven, observation sheet, calculator, tweezers, measuring cup, PUTS, SPAD, microscope, pH meter, plastic, sprayer. This study used a split-plot design with a Completely Randomized Block Design (CRBD) with four replications.

The variety is a sub-plot consisting of 5 levels, namely Inpago Unsoed 1, Inpari 24, Inpari 32,

Inpari 43, and Logawa. The observed characters were stomatal density, chlorophyll count, net assimilation rate (LAB), plant height, flowering time, number of productive tillers, panicle length, total grain number, and percentage of filled grain. Data were analyzed by Analysis of Variance (ANOVA) and Duncan's Multiple Range Test (DMRT) with an error rate of 5%. Relationships between characters were analyzed by correlation coefficient and path analysis using SPSS version 20.

## RESULTS AND DISCUSSIONS

### The growth and Physiological Characters

The varieties tested had a significant effect on the variables of flowering time, panicle length, and the amount of chlorophyll. However, the difference in this variety is no different from the other characters. According to Ikhwan (2018), yield components can describe types of rice varieties that vary, such as many or few tillers, long or short panicles, grain density in panicles, and grain size, thus, the influence of cultivation components on one or several yield components can relate to each other. Table 1. Results of variance on the growth and physiological characters of rice

| Character                         | Variety Response |
|-----------------------------------|------------------|
| <b>Physiological Character</b>    |                  |
| Stomata density (SD)              | NS               |
| Total amount of chlorophyll (TC)  | S                |
| Net assimilation rate (NAR)       | NS               |
| <b>Growth Character</b>           |                  |
| Plant height (PH)                 | NS               |
| Flowering time (FT)               | S                |
| Number of productive tillers (PT) | NS               |
| Panicle length (PL)               | S                |

|                            |    |
|----------------------------|----|
| Total amount of grain (TG) | NS |
| Percentage of grain filled | NS |
| Grain weight per clump     | NS |

Description: NS= not significant, S= significant

## 2. Response of Varieties to Physiological Characters of Rice Plants

Based on table 2, it is known that the highest amount of chlorophyll in the Logawa variety with a total chlorophyll of 17,467 units and the lowest amount of chlorophyll in the Inpari 24 variety as much as 10,642 units while the Inpago variety (15,646 units), Inpari 43 variety (14,938 units) and Inpari 32 (11,546 units). According to Nio Song Ai (2011), the greater the amount of chlorophyll in a plant, the more active the plant will be to carry out photosynthesis. This is because, in the process of photosynthesis, chlorophyll utilizes solar energy, triggering CO<sub>2</sub> fixation to produce carbohydrates and provide energy for the ecosystem as a whole. The carbohydrates produced in photosynthesis are converted into proteins, fats, nucleic acids, and other organic molecules.

Table 2. Results of variance on all physiological characters of rice

| Treatment | SD<br>(unit/cm <sup>2</sup> ) | TC<br>(unit)         | NAR<br>(g/cm <sup>2</sup> /week) |
|-----------|-------------------------------|----------------------|----------------------------------|
| V1        | 987,717                       | 15,646 <sup>ab</sup> | 1,146                            |
| V2        | 1031,069                      | 11,546 <sup>b</sup>  | 0,581                            |
| V3        | 1007,948                      | 14,938 <sup>ab</sup> | 0,675                            |
| V4        | 981,936                       | 10,642 <sup>b</sup>  | 0,522                            |
| V5        | 986,994                       | 17,467 <sup>a</sup>  | 0,093                            |
| F count   | 0,191                         | 3,199*               | 1,930                            |
| Prob F    | 0,941                         | 0,031                | 0,138                            |

Note: SD= stomatal density, TC = total chlorophyll, NAR= net assimilation rate

\*numbers followed by the same letter (a or b) on the same line

showed no significant difference between varieties

According to Aziez (2014), the net assimilation rate shows that leaves and light are the determining factors in the formation of assimilation results. The wider the leaf area and the light absorbed, will determine the amount of assimilation results. According to Aziez's research (2014), it is also known that the net assimilation rate (LAB) 0-3, 3-6, and 6-9 MST is influenced by the interaction of varieties with cultivation methods. The net assimilation rate was associated with leaf area and dry matter resulting from a certain period. The inhibition of leaf expansion will have an impact on decreasing the capacity of the leaves to absorb light (Maisura et al, 2015)

## 3. Varieties Response to Rice Plant Growth Character

Based on Table 3, each variety has a different flowering period, the fastest flowering variety is Inpago Unsoed 1 (33 days) while the longest flowering variety is Logawa (41 days) which is not significantly different from Inpari 32 (38 days), Inpari 43 (39 days) and Inpari 24 (40 days). This fast flowering time is due to the influence of the crucifix. According to Erdiman (2012), the production time is shorter, it only takes 80-90% of the time compared to the first crop. Rohal Faza (1997) cited in Hermawati (2012), that the sooner the rice flowers, the faster the plants can be harvested.

Besides being caused by the influence of the salibu, the planting system which is the legowo plant system can also make rice flowering quickly. According to Abbas (2018),

the legowo planting system flowers faster than the tile planting system. The fastest average flowering age was shown by rice that planted with the Legowo 4:1 planting system, which is 65 days. The average panicle length shown in table 3, the Inpago unsoed 1 variety had the longest panicle (16.513 cm) but was not significantly different from the Inpari 24 (15.959 cm) and Logawa (15.565 cm) varieties and the shortest panicle length was the Inpari 32 (14,204 cm) but not significantly different from Inpari 43 (14.518 cm) and Logawa varieties. Panicle length is an important variable in determining production. The longer the panicle, the greater the chance for the formation of the number of grains per panicle (Utama and Haryoko, 2009).

#### **4. Correlation between characters**

The results of the correlation analysis between the characters of the rice varieties planted showed a very significant correlation between the characters of productive tillers and the number of grain (0.894\*\*), productive tillers with grain weight per clump (0.836\*\*), and the number of grains with grain weight per clump (0.833). \*\*).

According to Prabowo (2014), a correlation coefficient that shows a large number close to +1 or -1 can be used as the basis for selection criteria. This is because the correlation coefficient, which

shows a large number, means that it has a close relationship between the observed characters.

Positive and significant correlations were shown by stomatal density and grain weight per clump (0.383\*), net assimilation rate to grain weight (0.363\*), and stomata density to panicle length (0.339). According to Suryanugraha (2017), if two observed traits show a positive correlation, it can be explained that as a trait increases or increases in number, it will always be followed by an increase in size or an increase in the number of other traits. The amount of chlorophyll, flowering time, and the percentage of filled grain are the characteristics that have a negative but not significant correlation with the negative production results in this study.

The negative correlation value in two traits shows that an increase or increase in the number of a trait will be followed by a decrease in the size or number of other traits (Suryanugraha, 2017). The correlation coefficient between the characters which is not significant indicates that the characters have a not close relationship. This occurred in the correlation between plant height and the total number of tillers, the number of productive tillers, the weight of 1000 seeds, and the weight of grain per clump. The correlation between the total number of tillers and the weight of 1000 seeds also showed not significant (Prabowo, 2014)

Table 3. Results of variance on all rice agronomic characters

| Treatment | PH<br>(cm) | FT<br>(day)     | PT<br>(stem) | PL<br>(cm)        | TG<br>(item) | PFG<br>(percent) | GWPC<br>(gram) |
|-----------|------------|-----------------|--------------|-------------------|--------------|------------------|----------------|
| Variety   |            |                 |              |                   |              |                  |                |
| V1        | 86,1       | 33,125 <b>a</b> | 6,75         | 16,513 <b>a</b>   | 387,125      | 0,0021           | 1,547          |
| V2        | 75,088     | 37,625 <b>b</b> | 7,25         | 14,204 <b>c</b>   | 373,167      | 0                | 1,465          |
| V3        | 80,8       | 38,625 <b>b</b> | 6,33         | 14,529 <b>bc</b>  | 421,708      | 0,0236           | 1,379          |
| V4        | 79,1       | 39,25 <b>b</b>  | 6,458        | 15,960 <b>ab</b>  | 360,250      | 0,0003           | 1,388          |
| V5        | 82,288     | 41 <b>b</b>     | 6,708        | 15,565 <b>abc</b> | 402,333      | 0                | 1,510          |
| F count   | 2,208      | 4,140*          | 0,117        | 3,982*            | 0,134        | 0,948            | 0,103          |
| Prob F    | 0,098      | 0,011           | 0,975        | 0,013             | 0,968        | 0,454            | 0,980          |

Note: PH = plant height, FT = flowering time, PT = productive tillers, PL = panicle length, TG = total grain, PFG = percentage of filled grain, GWPC = grain weight per clump.

\*numbers followed by the letter a or b in the same column indicate

Table 4. Correlation between observational characters

| CHAR        | CHARACTERS |      |       |       |        |        |               |         |        |                |
|-------------|------------|------|-------|-------|--------|--------|---------------|---------|--------|----------------|
|             | SD         | TC   | NAR   | PH    | FT     | PT     | PL            | NG      | PFG    | GWPC           |
| <b>SD</b>   | 1          | 0,14 | 0,211 | 0,24  | 0,117  | 0,112  | <b>0,339*</b> | 0,147   | -0,015 | <b>0,383*</b>  |
| <b>TC</b>   |            | 1    | -     | 0,054 | -0,028 | -      | -0,138        | -0,345* | -0,065 | <b>-0,278</b>  |
| <b>NAR</b>  |            |      | 1     | 0,231 | -0,182 | 0,264  | 0,155         | 0,241   | 0,009  | <b>0,363*</b>  |
| <b>PH</b>   |            |      |       | 1     | -0,239 | 0      | 0,17          | 0       | 0,139  | <b>0,174</b>   |
| <b>FT</b>   |            |      |       |       | 1      | -0,077 | -0,033        | 0,03    | 0,165  | <b>-0,03</b>   |
| <b>PT</b>   |            |      |       |       |        | 1      | 0,094         | 0,894** | -0,28  | <b>0,836**</b> |
| <b>PL</b>   |            |      |       |       |        |        | 1             | 0,258   | -0,022 | <b>0,195</b>   |
| <b>NG</b>   |            |      |       |       |        |        |               | 1       | -0,269 | <b>0,833**</b> |
| <b>PFG</b>  |            |      |       |       |        |        |               |         | 1      | <b>-0,189</b>  |
| <b>GWPC</b> |            |      |       |       |        |        |               |         |        | <b>1</b>       |

Note: SD = stomata density, TC = total chlorophyll, NAR = net assimilation rate, PH = plant height, FT = flowering time, PT = productive tillers, PL = panicle length, NG = number of grain, PFG = percentage of filled grain, GWPC = grain weight per clump

(\*) The correlation is significant at the 5% level.

(\*\*) The correlation is significant at the 1% level

## 5. The Direct Effect of Character on Grain Weight Per Clump

The direct effect is shown on the main diagonal underlined for each character. The bold number is the character that has a significant direct effect on

the weight of the grain per cluster. According to Rohaeni (2012), cross-tracing or path analysis can provide information on the indirect effect of a character through other characters on the character of seed/plant weight. The results of the path analysis in table 6 show that the density of stomata, productive tillers, and the number of grains have a significant direct effect on grain weight per clump. Based on path analysis, it was known that the number of grains had the greatest and most positive influence on the yield of grain weight per clump with a path coefficient of 0.193. This means that the amount of grain is an intermediary factor in obtaining high grain yields. The greater the amount of grain, the heavier the weight of the grain produced. This is following Kartina's research (2017), that the greater the number of tillers, the greater the chance of forming productive panicles. intensive selection on the positive side number of

tillers per plant and number of filled grains per panicle since these characters showed positive correlation with grain yield (Widyastuti et al. 2015)

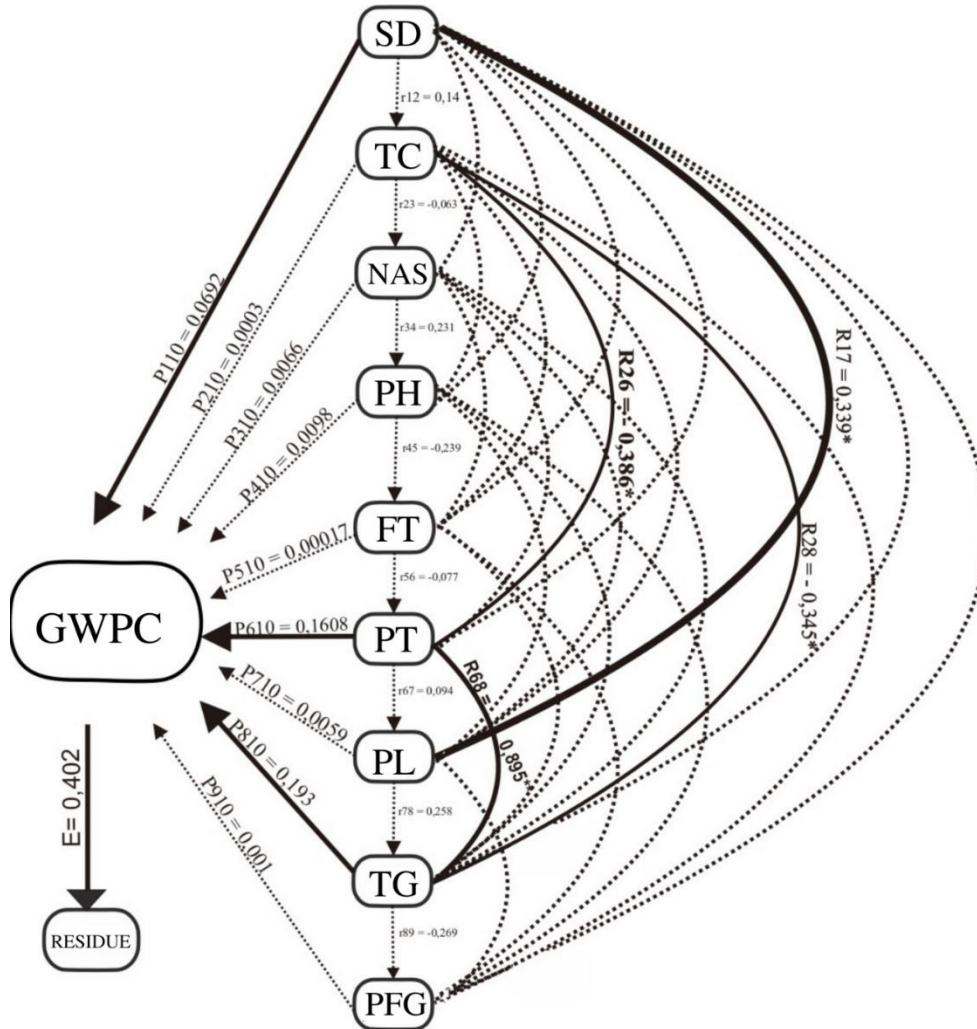
The results of the analysis show that the residue in this study is  $R = 0.402$ . This value is a contribution from other characters that were not included in the study to determine the direct and indirect effect between characters on the character of the results. According to Rohaeni (2012), the residual value is the total value of the direct residual effect that has not been calculated on characters that have not been identified. The residual value is close to zero, meaning that the path analysis used is more effective in explaining the cause and effect of the correlation values and the observed characters are more complete to explain the values of direct and indirect effects.

Table 5 direct and indirect effects between characters

|     | SD                   | TC            | NAR           | PH            | FT             | PT                   | PL            | NG                   | PFG          |
|-----|----------------------|---------------|---------------|---------------|----------------|----------------------|---------------|----------------------|--------------|
| SD  | <b><u>0.0692</u></b> | -0,001        | 0,004         | 0,006         | 0,000          | 0,012                | -0,007        | 0,017                | 0,000        |
| TC  | -0,001               | <u>0,0003</u> | 0,000         | 0,000         | 0,000          | 0,003                | 0,000         | 0,003                | 0,000        |
| NAR | 0,004                | 0,000         | <u>0,0066</u> | 0,002         | 0,000          | 0,009                | -0,001        | 0,009                | 0,000        |
| PH  | 0,006                | 0,000         | 0,002         | <u>0,0098</u> | 0,000          | 0,000                | -0,001        | 0,000                | 0,000        |
| FT  | 0,000                | 0,000         | 0,000         | 0,000         | <u>0,00017</u> | 0,000                | 0,000         | 0,000                | 0,000        |
| PT  | 0,012                | 0,003         | 0,009         | 0,000         | 0,000          | <b><u>0.1608</u></b> | -0,003        | 0,157                | -0,003       |
| PL  | -0,007               | 0,000         | -0,001        | -0,001        | 0,000          | -0,003               | <u>0,0059</u> | -0,009               | 0,000        |
| NG  | 0,017                | 0,003         | 0,009         | 0,000         | 0,000          | 0,157                | -0,009        | <b><u>0.1930</u></b> | -0,004       |
| PFG | 0,000                | 0,000         | 0,000         | 0,000         | 0,000          | -0,003               | 0,000         | -0,004               | <u>0,001</u> |

Note: SD = stomata density, TC = total chlorophyll, NAR = net assimilation rate, PH = plant height, FT = flowering time, PT = productive tillers, PL= panicle length, NG = number of grain, PFG = percentage of filled grain.

**Figure 1. Path analysis diagram**



Information: SD = stomata density, TC = total chlorophyll, NAR = net assimilation rate, PH = plant height, FT = flowering time, PT = productive tillers, PL = panicle length, NG = number of grain, PFG = percentage of filled grain, WGPC = weight of grain per clump  
( ) thick black line indicates a significant effect

Stomata and chlorophyll are biological components that greatly determine the initial synthesis of organic compounds used for physiological processes throughout the plant life cycle. Stomata are often used as one of the genetic characteristics for selection because they are related to production and plant resistance to pests and diseases (Mashud, 2007).

In the path analysis image, it can be seen that stomatal density has a significant correlation with panicle length and grain weight per clump. In addition, the amount of chlorophyll was also significantly positively correlated with the percentage of filled grain. This is because the leaf is the place where photosynthesis takes place. There are stomata in the leaf that function as the entry and exit of O<sub>2</sub>, CO<sub>2</sub>, water, and light which play a major role in photosynthesis which causes an influence on the yield component. This is following Mashud's research (2007) that the effect of stomata and chlorophyll on coconut production is closely related to the number of coconut leaves.

Based on path analysis, it was found that productive tillers had the greatest and most positive influence on seed yield per clump with a path coefficient of 0.786. This means that the number of productive tillers is an intermediary factor in obtaining high grain yields. The more the number of productive tillers is, the heavier the weight of the grain produced. This is to the research of Kartina et al (2017) the more number of tillers, the greater the chance of forming productive panicles. The number of panicles per hill and the number of filled grains per panicle could be used as selection criteria for yield in hybrid rice.

(Widyastuti et al. 2015)

## CONCLUSION

1. Salibu-cultivation showed variations in flowering time, panicle length, and the amount of chlorophyll.

2. Characters that are closely related and have a high direct effect on yields are stomatal density, number of productive tillers, and number of grains, therefore they can be used as indicators of selection for high-yielding rice.

3. The best plant variety for Salibu cultivation based on grain weight per clump is Inpagu Unsoed 1.

## SUGGESTION

Salibu has the biggest problem of increasing pest intensity caused by the non-uniform growth of rice with other rice fields around the research area. Therefore, it is necessary to apply the salibu on a large enough area so that it does not increase pests.

## REFERENCES

- [1] Abbas, W, Riadi, M and Ridwan, I. 2018. Respon tiga varietas padi (*Oryza sativa* L.) pada Berbagai Sistem Tanam Legowo. <http://journal.unhas.ac.id/index.php/jppa/article/download/5742/3172>.
- [2] Ariestiyanti, D. 2021. bawang putih dalam analisis perkembangan harga bahan pangan pokok di pasar domestik dan internasional juli 2021. Pusat Pengkajian Perdagangan Dalam Negeri, Badan Pengkajian Dan Pengembangan Perdagangan, Kementerian Perdagangan Republik Indonesia.
- [3] Aziez A F, D Indradewa, P, Yudonos and E Hanudina. 2014. Analisis pertumbuhan varietas lokal dan unggul padi sawah pada budidaya secara organic. *Agroupy Vol VI.No.1. September 2014 ISSN: 1978-2276*
- [4] Erdiman. 2012. Teknologi salibu meningkatkan produktivitas lahan 3-6 ton/ha/tahun dan pendapatan petani (Rp 15-25 juta /tahun). Balai Pengkajian Teknologi Pertanian Sumatera Barat. Laporan Hasil Pengkajian tahun 2012. BPTP Sumatera Barat.
- [5] Hermawati, T. 2012. Pertumbuhan dan hasil enam varietas padi sawah dataran rendah pada perbedaan jarak tanam. *Vol 1 No.2 ISSN:2302-6472*



- [6] Ikhwani and Rustiati, T. 2018. Respons varietas padi dengan beras berkarakter khusus terhadap pemupukan dan cara tanam. *Penelitian Pertanian Tanaman Pangan Vol. 2 No. 1*.
- [7] Kartina, N, B P Wibowo, I A Rumanti, and Satoto. 2017. Korelasi hasil gabah dan komponen hasil padi hibrida. *Penelitian Pertanian Tanaman Pangan Vol. 1 No. 1 2017*.
- [8] Maisura, M A Chozin, I Lubis, A. Junaedi, and H. Ehara. 2015. Laju asimilasi bersih dan laju tumbuh relative varietas padi toleran kekeringan pada sistem sawah. *J. Agrium 12(1), Maret 2015. Hlm. 10-15 ISSN 1829-9288*
- [9] Mashud, Nurhaini. 2007. Stomata dan klorofil dalam hubungannya dengan produksi kelapa. *Bul. Palma No. 32*
- [10] Nainggolan, K, I M Harahap, and Erdiman et al. 2014. *Teknologi melipatgandakan produksi padi nasional*. Gramedia Pustaka Utama. Jakarta
- [11] Nio Song Ai and Yunia Banyo. 2011. Konsentrasi klorofil daun sebagai indikator kekurangan air pada tanaman. *J. Ilmiah Sains Vol. 11 No. 2, Oktober*
- [12] Oelviani, R, Jauhari, S, Hariyanto, W, Basuki, S, Triastono, J, Kusumasari, A C. (2022). Impact of covid-19: how to achieve resilience in the indonesian agricultural sector?. In: Chaiechi, T., Wood, J. (eds) *Community Empowerment, Sustainable Cities, and Transformative Economies*. Springer, Singapore.
- [13] Prabowo, H., D W Djoar, Pardjanto. 2014. Korelasi sifat-sifat agronomi dengan hasil dan kandungan antosianin padi beras merah. *Agrosains 16(2): 49-54 ; ISSN: 1411-5786*
- [14] Rohaeni, W R, and K Permadi. 2012. Analisis sidik lintas beberapa karakter komponen hasil terhadap daya hasil padi sawah pada aplikasi agrisimba. *Agrotrop, 2(2): 185-190 (2012) Issn: 2088-155x*
- [15] Rohal, F. 1997. Pewarisan sifat agronomi varietas padi gogo lokal. *Skripsi Fakultas Pertanian Universitas Riau*.
- [16] Suryanugraha, W A, Supriyanta, and Kristamtini. 2017. Keragaan sepuluh kultivar padi lokal (*oryza sativa* l.) daerah istimewa yogyakarta. *Vegetalika. 2017. 6(4): 55-70*
- [17] Utama, M Z H and W Haryoko. 2009. Pengujian empat varietas padi unggul pada sawah gambut bukaan baru di kabupaten padang pariaman. *J. Akta Agrosia 12(1):56-61*.
- [18] Widyastuti, Y Satoto and I A Rumanti. 2015. Performance of promising hybrid rice in two different elevations of irrigated lowland in indonesia. *Agrivita Vol 37 No. 2 June - 2015 Issn : 0126-0537*
- [19] Widyawati, W, Syafria, and M M Mustadjab. 2014. Dampak kebijakan tarif impor beras terhadap kinerja ekonomi beras di indonesia. *Habitat Volume XXV, No. 2, ISSN: 0853-5167*