The Potential of New High-Yielding Varieties Development in Tegal Regency

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Abstract. Tegal is one of the districts that has the opportunity to become one of the centers for rice production in Central Java Province. This is indicated by the relatively high paddy field area, ranked 9th in Central Java. However, rice production in Tegal Regency was only ranked 15th. One effort to improve IP is through the use of new high yielding varieties (VUB). This paper examined the opportunities for developing VUB rice in Tegal Regency. Primary data obtained from interviews with farmers and field staffs. Analysis of potential development was assessed from the feasibility of 32 and 43 VUB Inpari rice farming, Mekongga variety. The results of the study show that VUB rice farming was more feasible to be cultivated compared to the existing varieties. This was indicated by the R/C of both VUB rice which were higher than the existing variety. The response of farmers to both VUB rice was indicated by demand of most sub-districts in Tegal Regency to the two varieties. Therefore, it was necessary to guarantee the availability of VUB rice seeds in the market. This can be done by developing seed breeders of these varieties through Desa Mandiri Benih or a private seed company.

1. Introduction
In 2017, Tegal Regency had a standard area of 38,735 ha of rice fields or ranked 9th in Central Java after Kebumen (39,839 ha) and Sragen (39,928 ha) [1]. Even though the area of paddy field in Tegal Regency was on the 9th position, rice production in Tegal Regency was only ranked 15th. The low IP means of 39,036 ha area available, the land harvested area could only reached 65,505 ha [3]. This land harvested area could be optimized if the planting index were more than one. According to Maulana [4], the planting index has a significant role in increasing the growth of paddy production. The result of SWOT analysis from Swastika et al5 showed that the increasing of planting index has become one of strategic policies to compensate the massive of land conversion in Indonesia [5].

One of efforts to improve IP is through the use of new high yielding varieties (VUB). High yielding varieties are one of innovations that is able to increase the production of rice. The study of FAO has showed that varieties as a single input could contribute partially 16% to the production of rice, but if it is integrated with fertilizer and irrigation, it could increase the production of rice production up to 75% [6]. The evaluation of World Bank has illustrated that the improved varieties could contribute 5% higher
to the rate of increase in rice production compared to fertilization which is only 4% [7]. In addition, the use of varieties with early maturity could also increase cropping index (IP) and overcome the problem of drought [8].

The introduction of new high yielding varieties (VUB) of rice in Tegal Regency has been carried out since 2010 until recently, especially for irrigation rice inbred (Inpari). The variety was introduced through the activities of the Agricultural Research Agency either in the form of variety testing or variety introduction (in the form of farm demonstration, plot demonstration or technology demonstration). Inpari varieties introduced were from Inpari 1 to 6 which were released in 2008 until Inpari 42 and 43 which were released in 2016 [9]. These varieties were introduced because of its potential production that could reach 10.58 tonnes/ha (Inpari 42) and 9.02 tonnes/ha (Inpari 43) [10] that were considered as higher compared to the common varieties planted by farmers in Tegal Regency such as IR 64 (6 t/ha), Ciherng (8.5 t/ha), Situbagendit (6.0 t/ha), dan Mekongga (8.4 t/ha) [11]. Despite the wide varieties of Inpari introduced, there were only some varieties used by the farmers. Therefore, it is necessary to understand the performance of VUB and response from farmers and officers as the users of varieties. This paper studies specifically the distribution of dominant VUB varieties and the existing ones, the reasons of farmers for selecting the VUB, and the feasibility analysis of VUB that have been demonstrated in Tegal Regency.

2. Materials and Methods

2.1. Research Location and Time
The study was carried out in the Village of Bulakpacing, Dukuhwaru District, Tegal Regency, Central Java Province. The study was conducted from November 16th to 20th, 2018. The location of the study was determined purposively because it was one of the demonstration plot locations for the introduction of new high yielding varieties of rice seeds.

2.2. The Type of Data
The data used are primary and secondary data. Primary data were obtained using a survey method. The survey method is a study that takes a sample from one population and uses a questionnaire as a primary data collection tool [12]. Thus, primary data were obtained from interviews with farmers as users of certified VUB. Meanwhile, the farmer respondents were 50 farmers and selected using a simple random sampling method.

The data collected were the output, input, output and input prices of farming in the second planting season (MT) in March - June 2018. VUB rice that has been assessed for feasibility is Inpari 32 and Inpari 43 which were introduced in 2017 and 2018 Meanwhile, the existing variety used as a comparison and widely used by local farmers is the Mekongga variety. Additionally, interviews were also conducted with data administration officers from 17 sub-districts throughout Tegal Regency to obtain additional information related to the description of the distribution of high yielding varieties in Tegal Regency. Officer respondents were determined intentionally using purposive sampling based on the consideration that the officers knew the distribution of varieties in their respective regions.

The secondary data were obtained from relevant literature and reports in related institutions, namely the Office of Agriculture and Plantation of Central Java Province, Department of Agriculture and Food Security of Tegal Regency, Central Java AIAT, The Central Bureau of Statistics in the Provincial and District Level and other relevant agencies.

2.3. Data Processing and Analysis Methods
Data related to the distribution of both dominant existing varieties and new high yielding varieties in Tegal Regency were analyzed descriptively either qualitatively or quantitatively. Meanwhile, to demonstrate the potential for the development of new high yielding varieties, a feasibility analysis was carried out for the improved high yielding varieties introduced at the study site, Inpari 32 and 43 and the
existing variety commonly planted by local farmers, Mekongga. There are several indicators to analyze the feasibility of farming, as follows [13].

1. **R/C Ratio (RCR)**

   \[
   RCR = \frac{TR}{TC}
   \]

   RCR or R/C Ratio is the comparison between the revenue obtained and the costs expended. TR is total revenue (IDR), and TC is total cost of production (IDR). If RCR > 1, the farming is feasible and profitable. On the other hand, if RCR < 1, the farming is not feasible and profitable.

2. **BEP per Unit**

   \[
   BEP(Q) = \frac{FC}{P(Q) - VC(Q)}
   \]

3. **BEP of Price**

   \[
   BEP(P) = \frac{FC}{1 - \frac{VC(Q)}{P(Q)}}
   \]

   BEP(Q) is break even point per unit output. BEP(P) is break even point per price unit. FC is Fixed Cost (IDR), P(Q) is price per unit output (IDR/kg), and VC(Q) is the variable cost per unit output (IDR/kg).

4. **The Cost of Goods Sold (HPP)**

   \[
   HPP = \frac{TC}{Q}
   \]

   TC is the total cost of production (IDR), and Q is the output produced (kg).

### 3. Results and Discussion

#### 3.1. The Description of the Utilization of Rice Varieties in Tegal Regency

The rice varieties cultivated in Central Java between 2006 and 2011 were dominated by IR64, Way Apo Buru, Ciliwung, Membramo, and Ciherang. In 2006 – 2009, the average area planted by IR64 varieties in Central Java was around 69.1% [14]. IR64 continued to be the dominant variety until 2011, with Tegal Regency as one of the user areas. In the following years, the popularity of IR64 among farmers started to decline since the variety was considered vulnerable to pests and its production was likely to stagnate. The results of evaluation in 2015 declared IR64 variety as the third variety planted by farmers in Central Java after Situbagendit and Ciherang varieties. Similar indication also happened in Tegal Regency. IR64 was in the third position after Ciherang, Situbagendit, and Mekongga. The variety was distributed in nearly all districts with varying composition (Table 1).

In 2018, the popularity of IR64 was replaced by Ciherang because of its vulnerability to pest and the stagnation of its production [15]. Ciherang was able to be in the first position as the most widely variety used by farmers, amounting to 40.31%, while IR64 became the forth (11.99%) after Situbagendit (26.78%) and Mekongga (12.73%). Not only the existing varieties, but farmers also started to look for new high yielding varieties in the last 2 years such as Inpari 32. Inpari 32 was introduced firstly in 2015 and this variety was in the 5th rank when the research conducted and it include an area of 5.70% (Figure 1).
Table 1. The Distribution of Paddy Varieties Dominated in Tegal Regency

| No | Regency | CHR  | SB   | MKG  | IR-64 | Inpari 32 | Others |
|----|---------|------|------|------|-------|-----------|--------|
| 1  | Tarub   | 86   | 3.00 | 5.00 | 2.00  | 2.00      | 4.00   |
| 2  | Talang  | 72   | 0.65 | 0.50 | 25.00 | 1.85      |        |
| 3  | Kramat  | 70   | 3.00 | 4.00 | 15.00 | 8.00      |        |
| 4  | Suradadi| 70   | 20.00| 8.00 | 2.00  | 4.00      |        |
| 5  | Pagerbarang | 55 | 30.00| 5.00 | 5.00  | 5.00      |        |
| 6  | Warureja| 53   | 5.17 | 22.70| 18.19 | 0.94      |        |
| 7  | Kedungbanteng | 50 | 15.00| 30.00| 3.00  | 1.00      | 1.00   |
| 8  | Pangkah | 50   | 35.00| 5.00 | 10.00 | 1.00      |        |
| 9  | Dukuhturi| 45  | 14.00| 20.00| 20.00 | 1.00      |        |
| 10 | Jatinegara| 40 | 20.00| 10.00| 10.00 | 20.00     |        |
| 11 | Dukuhwaru| 35  | 30.00| 25.00| 10.00 |           |        |
| 12 | Balapulang| 30  | 40.00| 20.00| 10.00 |           | 10.00  |
| 13 | Adiwerna| 20   | 50.00| 20.00| 10.00 | 10.00     |        |
| 14 | Lebaksiu| 17   | 80.00|      | 3.00  |           |        |
| 15 | Bojong  | 15   | 10.00| 30.00|       | 45.00     |        |
| 16 | Slawi   | 10   | 75.00|      | 5.00  | 10.00     |        |
| 17 | Margasari| 7.6  | 44.40| 3.69 | 29.90 | 14.41     |        |

*Notes: CHR = Ciherang; SB = Situbagendit; MKG = Mekongga

Figure 1. The Dominant Varieties Planted by Farmers in Tegal Regency

Until recently, Ciherang was still to be favored most by farmers in all districts in Tegal Regency, except for Lebaksiu, Slawi and Balapulang. The dominant variety planted by farmers in the three districts was Situbagendit varieties. As for IR64, the variety has started to lose its popularity, specifically in Warureja, Lebaksiu, Adiwerna, Slawi, and Balapulang. Meanwhile, Inpari 32 began to expand widely in 4 districts namely Warureja (18.19%), Kramat (8%), Surodadi (2%), and Kedungbanteng (1%). If the way farmers used the varieties are further analysed, it seems that farmers use the varieties according to its agroecosystem. Situbagendit is mostly planted in the agroecosystem with medium height (300-700 m asl). Those varieties are used in the neighboring sub-districts such as: Adiwerna, Slawi, Lebaksiu, Balapulang and Margasari.

Meanwhile, Inpari 32 was introduced firstly in Tegal Regency by Central Java Assessment Institute for Agricultural Technology (AIAT). Central Java AIAT was conducted demonstration plots in several locations in Tegal Regency, one of which was in Kramat sub-district. The demonstration in 2015 showed that the productivity of Inpari 32 could reach 7.92 tonnes/ha GKP and in 2016, the productivity increased to 8.08 tonnes/ha GKP or 1.93 - 2.09 tonnes/ha GKP higher compared to the production of the existing varieties which is 5.99 tonnes/ha [16]. Since Kramat District is selected as one of the demonstration plot
locations, it is not surprising to understand that the variety has been adopted by the neighboring sub-districts such as Warureja and Surodadi.

The increasing use of Inpari 32 by farmers indicates the potential of new high yielding varieties to be developed in Tegal Regency. Therefore, it could be concluded that farmers would adopt easier the new varieties if they have tried and perceived better the varieties. However, according to several farmer and officer respondents, the adoption to the new varieties is also strongly influenced by the role of the loggers in that location.

3.2. The Development of New High Yielding Varieties of Rice in Tegal Regency

The varieties have been developed since 1985. The development has been directed to increase productivity, improve the taste of rice, increase resistance to plant pests (OPT) and environmental stress (climate change). For example, IR64 varieties were developed with the characteristics of rice seeds that are resistant to brown planthopper biotype 3 and bacterial leaf blight, as well as to environmental stress (climate change), with a better rice flavor, early maturity, high yield potential, and the ability to grow faster. Therefore, it is reasonable if the variety has become the dominant variety used by farmers and popular until now. The breeders also remain to use the elders of this variety to develop other rice varieties.

Fahmi (2008) through his study on farmers’ preferences for VUB in Kediri Regency, East Java province stated that farmers are more likely to use VUB rice seeds with high production or yields, and resistance to pest and disease (OPT) [17]. Farmers also prefer to use VUB with the characteristics such as: unlikely to fall, easy to market, early maturity and easy to obtain. This study has been supported by the study of Fachrista et al. (2012) which emphasises factors influencing the preferences of farmers to VUB due to productivity and resistance ability to pests (pests and plant diseases) [18]. Marketing has become an invaluable aspect in some locations [18]. New varieties have been valued cheaper by loggers due to the characteristics of plants that are not usual such as in the shape of bullet grain and others. Therefore, the new varieties introduced in Tegal Regency should have at least similar characteristics as the varieties that are widely used by local farmers, for instance IR64 and Ciherang, or other varieties derived from both varieties.

By considering farmers’ preferences to the varieties, the Government through the Central Java AIAT has introduced Inpari as the new high yielding varieties. The varieties introduced are from Inpari 1 to Inpari 43. However, farmers are not likely to adopt all the varieties. Most farmers are more likely to use Inpari 32 than other Inpari varieties. In 2013, farmers in Kedungbanteng Sub-District had planted 60% of the total paddy field area with Inpari 13, but this was a special case. Farmers planted Inpari 13 due to the outbreak of brown plant hopper pests at these locations and it did not last longer due to the difficulty in threshing the grains, the untasty rice and the lower price of grains given by the loggers. Other types of Inpari that have been introduced in several districts such as Pagerbarang and Kramat are Inpari 1, Inpari 6, Inpari 10, Inpari 20, Inpari 23, and Inpari 28. However, farmers do not use these varieties because of the difficulty in obtaining seeds of these varieties.

In 2015, Inpari 30, 31, 32 and 33 were introduced in different sub-districts such as in Lebaksiu, Pagerbarang, and Dukuhwaru. According to the study, those varieties had been perceived positively by farmers. Among those varieties introduced, farmers in Lebaksiu Sub-district interested to use the 3 varieties as follows: Inpari 30, 32, and Inpari 33, but farmers favoured more Inpari 32. In 2017, Inpari 42 and 43 were introduced in Bojong and Dukuhwaru Subdistricts. The demplot showed a satisfactory performance of those varieties. In Bulakpacing Village, Dukuhwaru Subdistrict, the production of Inpari 43 had reached 3.15 tonnes from the land area of 0.35 ha or equal to 9 tonnes/ha. Meanwhile, the production of Inpari 42 in Lengkong Village, Bojong Subdistrict had reached 7.5 tonnes/ha of 3 tonnes/ha higher than Ciherang and Situbagendit which were usually planted and produced 4.5 tonnes/ha.

The preferences analysis of farmers and loggers in 17 subdistricts in Tegal Regency showed that most farmers had positive perceptions toward the new high yielding varieties of Inpari 32, 42, and 43.
The results of the study illustrate the potential of VUB rice seeds to develop (to be adopted) in Tegal Regency. The identification to demand of VUB in Tegal Regency could be seen in Table 2.

### Table 2. Demand to VUB Rice Seeds to be Planted in the Growing Season of 2019 in Tegal Regency

| Subdistrict  | Demand to VUB Inpari |
|--------------|----------------------|
|              | 42       | 43       | 32       | 33       | 45       | 30       | 1       |
| Margasari    | √        | √        | √        | √        |          |          | √       |
| Bojong       | √        |          |          |          |          |          |         |
| Balapulang   | √        |          |          |          |          |          |         |
| Pagerbarang  | √        |          |          |          |          |          |         |
| Lebaksiu     |          | √        |          |          |          |          |         |
| Jatinegara   |          |          | √        |          |          |          |         |
| Kedungbanteng|          |          |          | √        |          |          |         |
| Pangkah      | √        |          |          |          |          |          |         |
| Slawi        |          | √        |          |          |          |          |         |
| Dukuhwaru    | √        |          |          |          |          |          |         |
| Adiwerna     |          | √        |          |          |          |          |         |
| Dukuhhti      |          |          | √        |          |          |          |         |
| Talang       |          |          |          |          |          |          | √       |
| Tarub        |          |          |          |          |          |          | √       |
| Kramat       |          |          |          |          |          |          | √       |
| Suradadi     | √        |          |          |          |          |          |         |
| Warureja     |          |          |          |          |          |          | √       |

3.3. The Feasibility Study of Farming with New High Yielding Varieties in Tegal Regency

According to the preferences analysis on farmers’ demand in Tegal Regency, the potential of the new high yielding varieties to be developed or adopted could also be seen from the comparison of feasibility study on using the new high yielding varieties and the existing varieties. The comparison of feasibility study is useful to determine the relationships between the performance of varieties and the increasing on farmers’ income. In this study, the existing variety used in the feasibility study is Mekongga, while the new varieties used are Inpari 32 and 43. Both new varieties are used since the varieties are favoured mostly by farmers in the location of study. The results of the feasibility study could be seen in Table 3.

The results of the feasibility analysis of rice farming using existing and new high-yielding varieties (Table 3) showed that the farming using these three varieties is feasible to do. This is indicated by the R/C value which is higher than one. When compared between varieties, VUB Inpari 32 and 43 have a higher R/C value than the Mekongga variety.

On the production aspect, Inpari 43 has a higher production compared to two other varieties. This is consistent with the the characteristics of the Inpari 43 variety which has a yield potential of 9.02 tons per hectare of MPD [19]. Meanwhile, the Inpari 32 variety has a lower production than Inpari 43 and Mekongga, but the production is still higher compared to the district's average production of 6.30 tons per hectare of MPD.
Table 3. The Feasibility Study Analysis of Inpari 32 and 43, as well as Mekongga in Dukuhwaru Subdistrict, Tegal Regency

| Description       | Mekongga       | Inpari 32      | Inpari 43      |
|-------------------|----------------|----------------|----------------|
| Investment Cost (IDR) | 1.075.000     | 1.075.000      | 1.075.000      |
| Fixed Cost (IDR)   | 6.983.333     | 6.925.000      | 6.983.333      |
| Variable Cost (IDR) | 12.512.000    | 9.015.000      | 11.895.000     |
| a. Inputs (IDR)    | 3.962.000     | 2.455.000      | 3.625.000      |
| b. Labour (IDR)    | 8.550.000     | 6.560.000      | 8.270.000      |
| Production* (kg)   | 8.200         | 7.237          | 9.000          |
| Gross Income (IDR) | 19.864.667    | 20.047.600     | 24.321.667     |
| Net Income (IDR)   | 19.666.020    | 18.797.600     | 24.078.450     |
| BEP(Q)             | 2.133         | 1.948          | 2.008          |
| BEP (P) (IDR)      | 10.237.783    | 9.352.005      | 9.636.799      |
| HPP (IDR)          | 2.377         | 2.203          | 2.098          |
| R/C Ratio          | 2.02          | 2.18           | 2.29           |
| ROI (%)            | 18.48         | 17.49          | 22.62          |

Meanwhile, if the production costs of farming using these 3 varieties are compared, Inpari 32 has the lowest production costs compared to the other two varieties. The low cost of production is due to the planting location of Inpari 32 variety which is not in the similar location with two other varieties. Therefore, the costs incurred are also different. For example, in the location of Mekongga and Inpari 43, farmers have to irrigate their fields with pumps, and as a result, the production costs increase. Meanwhile, at the Inpari 32 planting site, increasing cost of production happens because farmers have to pay irrigation fees or P3A fees to water their plantation. Thus, although production and revenues from Inpari 32 rice farming are lower, the profits are still higher. This could be seen from the R/C value which is still higher compared to planting with the existing varieties (Mekongga). In addition, if it is optimized, Inpari 32 could produce even higher and it could reach 8.42 tons per hectare or higher than the production of Mekongga varieties in this study (BPTP Jawa Tengah, 2018). This is supported by the study of Pramono et. al. which shows the R/C value of rice farming using Inpari 30, 31 and 32 in Batang, Central Java around 1.68 [20].

According to those facts mentioned above, it could be concluded that the new high yielding varieties such as Inpari 32 and Inpari 43 have the potential to be developed or adopted in Tegal Regency. By looking at the potential of production and its characteristics, demand for Inpari 32 and Inpari 43 is expected to increase, and this should be anticipated by the Government. The results of interviews with several farmers stated that farmers will remain to use the new varieties if the availability of the seeds is guaranteed. Thus, the availability of seeds is important since farmers are willing to buy uncertified Inpari 43 (Jabal) at a high price (IDR 10,000/kg). This is consistent with the study of Hendrawati et al. which indicates one of factors influenced farmers’ perceptions or farmers’ willingness to adopt certified seed is the certainty toward the availability of the varieties [21].

Mejaya and Hakim mentioned some factors influencing the low adoption of farmers to certified seeds in the dissemination location between 2011 and 2015 are: (1) the unavailability of extension seed (ES) for Inpari after the dissemination (display/demfarm); (2) the rice seed growers are hesitate to produce Inpari since they do not receive any benefit from the increased yield/ha; (3) the rice grain of the new varieties have a lower price than the existing varieties; and (4) the lack of involvement of local extension workers in the introduction of new high-yielding varieties [15]. Therefore, accessibility and selling price are the main factors for farmers to be able to adopt certified new high yielding varieties. It is recommended for the Government to guarantee the availability of new high-yielding varieties either by using the plantation of local government, the Villages for Self-Sufficiency Seed, or seed companies.
4. Conclusion
The new high yielding varieties such as Inpari 32 and Inpari 43 have the potential to be developed in Tegal Regency. This could be seen from the demand of those varieties which spread almost equally in every subdistrict in Tegal Regency. Additionally, the feasibility study on those two new high yielding varieties shows that both new varieties are feasible compared to Mekongga. This could be seen from the R/C value of Inpari 32 (2.18) and Inpari 43 (2.29) which were higher compared to the R/C of Mekongga (R/C ratio 2.02).

To guarantee the availability and accessibility of those varieties, it is recommended for farmers to develop the new varieties in their region, for the local government to utilize their seed plantation. The availability of seeds could also be maintained through local grower seeds and other big companies such as Sang Hyang Sri. The Government could also use the new varieties as one of aids or subsidized inputs.

Acknowledgments
The authors gratefully acknowledge the Central Java AIAT for financially support the research, and thus, the research could be conducted smoothly.

References
[1] Dinas Pertanian dan Ketahanan Pangan Kabupaten Tegal 2017 ‘Perkembangan Luas Tambah Tanam (LTT) Padi Kabupaten Tegal’. Bahan paparan Rakor UPSUS (Tegal: Dinas Pertanian dan Ketahanan Pangan)
[2] Badan Pusat Statistik Provinsi Jawa Tengah 2017 Jawa Tengah dalam Angka 2017 (Semarang: BPS Jawa Tengah) pp 435.
[3] Badan Pusat Statistik Kabupaten Tegal 2017 Kabupaten Tegal dalam Angka 2017 (Slawi: BPS Tegal) pp 395
[4] Maulana M 2004 Jurnal Agro Ekonomi 22(1) 74-95
[5] Swastika DKS, Wargiono J, Soejitno, Hasanuddin A 2007 Analisis Kebijakan Pertanian 5(1) 36-52
[6] Las I 2003 Peta Perkembangan dan Pemanfaatan Varietas Unggul Padi Dokumen Balitbangtan, Oktober 2003
[7] Fagi AM, Abdullah B, dan Kartasatmadja S 2001 Peranan Padi Indonesia dalam Pengembangan Padi Unggul Prosiding Budaya Padi (Bogor: Pusat Penelitian dan Pengembangan Tanaman Pangan)
[8] Kushartanti E, Suhendrata T, Romdon AS, Rohman E, dan Nurhalim 2018 Kaji Terap Inovasi Pertanian Kabupaten Tegal: Laporan Kegiatan. (Semarang: Balai Pengkajian Teknologi Pertanian Jawa Tengah)
[9] Wahab MI, Satoto, Rachmat R, Guswara A, and Suharma 2017 Dekripsi Varietas Unggul Baru Padi 2017 (Jakarta: Badan Penelitian dan Pengembangan Pertanian Kementerian Pertanian)
[10] Jamil A, Mejaya MJ, Praptana RH, Subekti NA, Aqil M, Musaddad A, dan Putri F 2016 Deskripsi Varietas Unggul Tanaman Pangan 2010-2016 (Bogor: Pusat Penelitian dan Pengembangan Tanaman Pangan Badan Litbang Kementerian Pertanian)
[11] Suprihatno B, Daradjatun A, Satoto, SE Baehaki, Widiarta IN, Setyono A, Indrasari SD, Lesmana OS, dan Sembiring H 2009 Deskripsi Varietas Padi (Sukamandi: Balai Besar Penelitian Tanaman Padi Badan Litbang Pertanian Kementerian Pertanian)
[12] Singarimbun M and Effendi S 1989 Metode Penelitian Survai (Jakarta: LP3ES) pp 336
[13] Soekartawi A, Soehardjo, Dillon JL, and Hardaker JB 1995 Ilmu usahatani dan penelitian untuk pengembangan petani kecil (Jakarta: Universitas Indonesia)
[14] Suprihanto B dan Darajatun A 2009 Kemajuan dan Ketersediaan Varietas Unggul Padi (Sukamandi: Balai Besar Penelitian Tanaman Padi) pp 22
[15] Mejaya MJ dan Hakim L 2017 Upaya Percepatan Adopsi Varietas Unggul Baru Padi Inpari downloaded on December 1st, 2019 from http://pangan.litbang.pertanian.go.id/files/seminar/2017/Adopsi%20VUB%20Padi%20Inpari%20MJM26012017.pdf
[16] Prihasto A, Yuwono DM, Romdon AS, Prasetyo FR, Anomsari SD, Nurhadi DU, Martono, Nurhalim and Rohman E 2016 *Pelaksanaan Pendampingan UPSUS Pajale di Jawa Tengah: Laporan Kegiatan*. (Ungaran: Balai Pengkajian Teknologi Pertanian Jawa Tengah) pp 79.

[17] Fahmi D 2008 *Analisis Sikap dan Kepuasan Petani Padi terhadap Benih Padi Varietas Unggul di kabupaten Kediri Jawa Timur*. Skripsi (Bogor: Program Studi Manajemen Agribisnis, Fakultas Pertanian Institut Pertanian Bogor) pp 120

[18] Fachrista IA, Rusmawan D, Issukindarsyah, dan Anggraini HD 2012 *Preferensi Petani Kabupaten Bangka Selatan Terhadap Beberapa Varietas Unggul Padi Sawah*. Prosiding, Seminar Kedaulatan Pangan dan Energi 2012, Tanggal 27 Juni 2012 (Madura Jawa Timur: Universitas Trunojoyo)

[19] Harwanto, FD Arianti, AS Romdon, S Basuki, SD Anomsari, DU Nurhadi, FR Prasetyo H, Nurhalim dan E Rohman 2018 *Pendampingan UPSUS Komditas Unggulan di Jawa Tengah Laporan Kegiatan* (Semarang: Balai Pengkajian Teknologi Pertanian Jawa Tengah)

[20] Pramono J, Yuwono DM, dan Romdon AS 2017 *Keragaan Hasil Penerapan Komponen Pengelolaan Tanaman Terpadu pada Program Upaya Khusus Peningkatan Produksi Padi Di Jawa Tengah (Studi Kasus Di Wilayah Pantura Barat)* Prosiding Seminar Nasional Inovasi Teknologi Pertanian Spesifik Lokasi Inovasi Pertanian Spesifik Lokasi Mendukung Kedaulatan Pangan Berkelanjutan (Bogor: BBP2TP) pp 387-392

[21] Hendrawati E, Yurisnthae E, dan Radian 2014 *Journal Social Economic of Agriculture* 3(1) 53-57