The distribution and adoption of rice varieties in Lampung Province

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Abstract. The IAARD has released several new superior inbred varieties (NSIV) with the abbreviation Inpari (Irrigation Rice Inbred), namely Inpari 1 to Inpari 44. The released varieties have diverse characteristics. Some of Inpari's varieties have been tested and disseminated to farmers in Lampung. This paper was to determine the distribution of Inpari varieties in Lampung and the main problem in NSIV adoption. Data was collected through the literature study, secondary data from related agencies and interview with key person. The data obtained was analyzed descriptively. The result shows that the distribution of Inpari varieties were still not widely developed in Lampung Province. The dominant use of Inpari varieties was Inpari 30 variety, which were 10.04% in 2017 and 6.96% in 2018. While other Inpari varieties were below 1%. The main problem in NSIV adoption is the NSIV’s characteristics that suitable with farmers’ preference and the seed availability.

1. Introduction
The provision of superior rice seeds is a strategic way to support food security with an agribusiness perspective. Seed production program for annual food crops is served the availability of superior variety and certified seeds. The development of food crop seedlings is expected to support food security and provide welfare for the actors, especially farmers. By using good quality and certified seeds, crop production and productivity can be increased. The use of quality seeds from superior varieties in rice cultivation has succeeded in increasing production and productivity so that in 1984 Indonesia was recorded as achieving rice self-sufficiency, although after 1990 there was an increase in production and productivity [1].

Based on some previously studies on the commercialization of seeds with indicators of planting area, age of use of varieties and wide distribution, it was found that the most commercial superior variety was IR64, this variety was planted in almost all provinces in Indonesia for nearly 15 years since its release in 1986 [2]. Furthermore, it was explained that these varieties in the 2002/2003 planting season were still predominantly planted by farmers, covering 50% of the rice planting area in Indonesia. The Ciherang variety began to replace the dominance of IR 64 since 2004, and has continued nowadays [3].

The availability of good quality seeds from high-yielding varieties is important in the rice seed production system, both for self-consumption and commercial purposes. The use of improved varieties has benefits, such as uniformity of growth and similarity of harvest time. In addition, high yielding varieties generally have advantages in terms of yield both quantity and quality, consumer preferences,
adaptability and resistance to pests and diseases which have a low impact on production costs for fertilizers and pesticides [4].

Increasing production of food crops through increased productivity can be achieved through the use of quality superior varieties of seeds [5]. The existence of seeds itself is important in the mechanism for distributing to farmers or other users. Users can feel the benefits of these new varieties if the seeds are available, both in sufficient quantity and meet farmers preferences.

In general, farmers still use the Ciherang variety of rice seeds at 72.13% [6]. However, the Ciherang variety is not the only superior variety. In fact, many high yielding new varieties have been produced and can be selected to the suitable planting environments, farmers' preferences and the market. The IAARD since 2008 to 2016 has released 44 Inpari varieties as New Superior Inbreed Variety (NSIV) of rice [7] which have been distributed to farmers in Indonesia. The names of NSIV include Inpari (Inbred Paddy for Irrigation land), Inpara (Inbred Paddy for Swamp land), Inpago (Inbred Paddy for dryland). These varieties have a variety of characteristics, both age, productivity, pest and disease resistance, and other advantages. Although there are quite a lot of NSIV that farmers can use, the adoption level of Inpari is still low. So it is necessary to conduct a study to determine the causes of the problem so that a strategy can be formulated in an effort to solve the problem.

This paper was to determine the distribution of Inpari varieties in Lampung and the main problem in NSIV adoption.

2. Materials and methods
The research was done in Lampung Province in February-June 2020. Data was collected through the literature study, secondary data from related agencies and interview with key person. The data obtained was analyzed descriptively using statistical function in Excel program.

3. Result and discussion

3.1. The spreading of rice variety in Lampung Province
In this study we divide four type of rice varieties in Lampung province. There are superior inbreed variety (SIV), new superior inbreed variety (NSIV), hybrid variety and local variety. The superior inbreed variety (SIV) is inbreed rice variety that has high yield but it released before 2008, the name of SIV usually use the name of river or lake in Indonesia such as Ciherang, Ciliwung and Mekongga. Meanwhile, NSIV is inbred rice variety that has high yield and released since 2008, the name of NSIV that is produced by IAARD is Inpari (irrigated rice)/Inpara (swamp rice) and followed by number such as Inpari 9, Inpari 10 and Inpari 30 (the bigger the number means the NSIV is newer).

The use of rice varieties in Lampung Province was still dominated by SIV (77.85% in 2017 and 85.60% in 2018) followed by NSIV (11.94% in 2017 and 9.93% in 2018). Some farmers still used local varieties of rice in Lampung, even though the use of local varieties in 2018 (4.46%) was lower than in 2017 (9.63%). However, the use of local varieties in Lampung Province was higher than the use of hybrid varieties (0.68% in 2017 and 0.62% in 2018). Local varieties usually was used in upland or marginal land which is some improved varieties doesn’t suitable with this environment. Due to the fact that the yield highly influenced by the conditions [8], farmers preferred using local varieties because its adaptability with the environment.
Even SIV was dominated rice variety in Lampung Province, but most of them is Ciherang (47.26% in 2017 and 53.01% in 2018). Besides Ciherang, Cilamaya muncul and Mekongga also had highly adopted by farmers. Farmers use Cilamaya Muncul and Mekongga was about 7.10-11.12%. The use of Cilamaya Muncul increased in 2018, on the other hand Mekongga decreased. Old varieties such as IR 42, IR 64, PB 42, and PB 64 almost disappeared except IR 64 that is still used by the farmers.

**Figure 1.** The use of rice varieties in Lampung Province in 2017-2018 (%).

**Figure 2.** The using of superior inbreed varieties (SIV) of rice in Lampung Province in 2017-2018 (%).
Inpari is a NSIV that is developed by IAARD. These varieties were disseminated and adapted in Lampung Province since 2010. However, the use of Inpari varieties recorded in UPTD BPSB TPH Lampung Province 2017/2018 were Inpari 2, 9, 10, 13, 18, 19, 20, 22, 30, 31, 32, and Inpari 33. The dominant distribution of Inpari varieties was Inpari 30 of 10.04% in 2017 and 6.96% in 2018, while the use of other Inpari varieties was still below 1%.

![The using of Rice NSIV in Lampung Province (%)](image)

**Figure 3.** The using of new superior inbreed varieties (NSIV) of rice in Lampung Province in 2017-2018 (%).

### 3.2. Farmers preferences in adoption of NSV rice

The previous study in Pubian district Central Lampung Regency showed that the averaged productivity of Inpari 30 was 4.58 t/ha, Inpari 31 was 4.56 tons/ha, Inpari 33 was 4.80 t/ha, Inpari 42 was of 5.56 t/ha and Inpari 43 was 5.33 t/ha [9]. Meanwhile, in Candipuro District South Lampung Regency, the average productivity of Inpari 10 GKP was 4.77 t/ha, Inpari 18 was 4.03 t/ha, Inpari 19 was 6.07 t/ha [10]. The average yield of the Inpari variety is still below the average result of the description. The results in 2010 in Pesawaran District showed the productivity of Inpari 9 was around 7.68 t/ha [11]. Other study showed the Inpari 9 in North Lampung produced 5.46 t/ha [12]. Even though it was introduced to farmers since 2012, the use of Inpari 9 variety until 2017 was only 0.03%, and in 2018 there were no farmers who planted Inpari 9.

The results of Inpari 10 carried out in Pasawaran were 7.53 t/ha and Inpari 13 obtained yields of 8.46 t/ha [13], which is higher than the potential yield. Meanwhile, the Ciherang variety as a comparison only produced 6.61 t/ha. However, the use of the Inpari 10 variety by farmers was still below 1%. The Inpari 13 in East Lampung Regency had productivity around 6.24-6.76 t/ha, while at the same location, the production of the Ciherang variety was only around 4.4 t/ha [14]. However, the use of Inpari 13 in 2017 was only 0.01% and in the following year 2018 none the farmers planted Inpari 13.

The Inpari variety spreading in Lampung Province had an average yield ranging from 4.80-7.20 tons/ha meanwhile according to description [7] the potential yield is 7.00-10.58 tons/ha.
However this average is not the only factor that influencing the adoption. Technology specific variables such as acceptability could explain farmer’s behavior in adoption of variety, so it is important to pay attention in preferences to characteristics of variety [15]. Agree with that statement, study in Donggala showed that some characteristics of rice performance is a key for farmers to adopt the variety [16].

Based on the result of interview with farmers, some characteristic of variety is important in order to adoption of variety (table 1). The result showed that characteristics such as high resistance of pest, grain shape and high yield is important for farmers whether or not they use the variety. Meanwhile, plant height, panicle position and rice flavor is less important means farmers especially in irrigated land doesn’t really care about these characters. Rice flavor is important for most of high-income consumer, while low-income consumers think that this characteristic is not crucial for choosing rice [17].

| No | Variable          | Score |
|----|-------------------|-------|
| 1  | Plant height      | 3.07  |
| 2  | Number of tillers | 3.97  |
| 3  | Pest resistance   | 4.27  |
| 4  | Panicle position  | 3.33  |
| 5  | Grain shape       | 4.43  |
| 6  | Yield potential   | 4.47  |
| 7  | Rice flavor       | 3.20  |
| 8  | Seed availability | 4.37  |

1.00-1.80 (very unimportant), 1.81-2.60 (unimportant), 2.61-3.40 (quite important), 3.41-4.20 (important), 4.21-5.00 (very important)

Besides the growth and yield, seed availability also important so farmers can adopt new variety. Increasing the accessibility for seed of varieties improves the adoption decision [18]

4. Conclusion

Based on the results, we conclude that the use of NSIV such as Inpari is still not widely developed in Lampung Province. The dominant use of Inpari variety is Inpari 30, which is 10.04% in 2017 and 6.96% in 2018. Meanwhile, other Inpari varieties are still below 1%. Continuous dissemination and introduction are needed so that the Inpari variety can be widely used by farmers in Lampung.

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