Jurnal Ilmiah Ilmu Terapan Universitas Jambi
ISSN (Print) 2580-2240 (Online) 2580-2259
Volume 6, Nomor 2, Desember 2022

New Superior Varieties of Baroma and Nutrizinc Rice Seeds in West Tanjung Jabung Regency, Jambi Province

Julistia Bobihoe[1] & Endrizal[2]
Research Center for Food Crops, National Research and Innovation Agency, Indonesia
Research Center for Horticultural and Estate Crops, National Research and Innovation Agency, Indonesia.
Email korespondensi: julistia117@gmail.com

ABSTRACT

Seeds are an essential means of agricultural production, as well as being a carrier of technological change. The increase in rice production was caused by using superior varieties accompanied by better cultivation techniques compared to previous times. However, currently, superior and quality rice seeds are not available at planting locations, which can be realized based on applied science in the field of agriculture. The aim of the study is to build and open up rice seed business opportunities that can increase the productivity of rice plants and the income of breeder farmers. The New Superior Varieties used in this activity are VUB Baroma and Inpari Nutri Zinc FS/White label. The results of the study showed that the Baroma variety obtained a production of 6.9 t/ha, of which 4.5 tonnes of seed could be used, and the Inpari Nutri Zinc variety obtained a yield of 5.686 tonnes/ha, of which 3.2 tonnes of yield could be used as seed. The results of the farming analysis show that if the Baroma variety is used as seed, a profit of Rp. 35,420,000 with an R/C ratio of 4.69 and the Inpari Nutri Zinc variety, if used as seed, makes a profit of Rp. 29,420,000 with an R/C ratio of 4.07. The VUB Baroma rice seed farming business and Inpari Nutri Zinc provide higher profits than the consumption farming business with the difference between Baroma and Inpari Nutri Zinc profits each being IDR. 11,600,000/ha.

Keywords: Baroma, Inpari Nutrizinc, Increasing Farmer Income, New Superior Varieties of Rice, Seedlings,

INTRODUCTION

Seeds are an important means of agricultural production, as well as being a carrier of technological change. The increase in rice production was caused by the use of superior varieties accompanied by better cultivation techniques compared to previous times. New superior varieties are obtained through plant breeding, both carried out by government research institutions and by the seed industry which has an R&D division.

In subsequent developments, seeds not only function as material for planting purposes, but also function as a means of carrying technological innovation (Nugraha, 2003; Tahir et al., 2020; Andrianarison, Kamdem, & Kameni, 2022; Yongabo, 2022). For example, the benefits of new varieties with high yields will only be felt by farmers if sufficient quality seeds are available for planting. Therefore, the seed industry is very necessary to support resilient agriculture, especially to facilitate the dissemination of superior varieties to farmers and protect the quality produced during the production and distribution process so that superior varieties assembled by breeders reach the hands of seed consumers.

Superior varieties provide many technical and economic benefits for the development of an agricultural business, including: uniform plant growth so that harvests are simultaneous, higher yields, higher quality results and in accordance with consumer tastes, and plants will have high resistance to pests and disease and has high adaptability to the environment so that it can reduce the costs of using inputs such as fertilizer and medicine (Suryana and Prayogo, 1997; Bjornlund et al., 2020; Kamal et al., 2020; Abera et al., 2021; Khadlid et al., 2022).

Many rice varieties have been released, but not many are used by farmers. There are various obstacles to the lack of use of superior varieties, including: lack of information on the existence of superior varieties with various superior characteristics as well as limited availability of superior variety seeds, production of BS class superior varieties is still limited and the flow of source seeds from BS to ES is interrupted. One of the obstacles in producing source seeds is the limited knowledge of production technology possessed by seed production officers and seed breeders. To encourage the dissemination of superior seed varieties, variety introduction is needed, namely through variety socialization and provision of source seed production technology to seed breeders in production center areas.

The success of dissemination and adoption of superior variety technology is determined, among other things, by the ability of producers and the seed industry to supply and provide seeds appropriately to farmers. Therefore, a resilient seed system (productive, efficient, competitive and sustainable) is very necessary to support efforts to increase production and quality of agricultural products (BBP2TP, 2011; Zewdu et al., 2020; Hashimoto et al., 2022; Adesina et al., 2023; Onumah et al., 2023; Tiozon et al., 2023).

In subsequent developments, seeds not only function as material for planting purposes, but also function as a means of carrying technological innovation (Nugraha, 2003; Munarko et al., 2020; Sravan, Singh & Neupane, 2021; Afolabi et al., 2023; Varinderpal-Singh et al., 2023). For example, the benefits of new varieties with high yields will only be felt by farmers if sufficient quality seeds are available for planting. Therefore, the seed industry is very necessary to support resilient agriculture, especially to facilitate the dissemination of superior varieties to farmers and protect the quality produced during the production and distribution process so that superior varieties assembled by breeders reach the hands of seed consumers.

METHODOLOGY

The seeding process was carried out at the seed breeding location in Rawa Medang Village, Batang Asam District, West Tanjung Jabung Regency, Jambi Province, which was carried out at MK 2019. The rice seeds used were the new superior varieties (VUB) Baroma and Inpari Nutrizinc (FS seed class/white label). The data collected includes agronomic data, production data, use of production facilities and use of labor. Seed activities refer to Seed Production Technology for paddy fields, Table 1 (Agricultural Research and Development Agency, 2007 and BBP2TP, 2013.). The level of efficiency of the technology applied is analyzed using the R/C ratio (Swastika 2004 and Malian 2004).

Table 1. Reference for rice seed technology in Rawa Medang Village, Batang Asam District, West Tanjung Jabung Regency, Jambi Province in MK> 2019

Technological components	Seed technology
Variety	• VUB Baroma and Inpari Nutri Zinc
Location selection	• Fertile land with irrigation water and good drainage channels • Clean from plant residues/other varieties • Clean from pests/diseases • The minimum distance between different varieties is 3 m
Land preparation	• The best land for source seed production is used land of the same variety from the previous season or fallow land
Nursery	• Make a nursery bed with a height of 5-10 cm, a width of around 110 cm, length as needed • The area of land for seeding is around 4% of the production area (400 m2 per hectare planted) • Sow the seeds evenly in the seedbed

	• Urea, SP 36 and KCl fertilizers 15 g/m2 each • Application of pesticides when necessary.
Planting	• Seedlings are moved to the field when they are 10-15 DAP • Seedlings planted should have the same physiological age (characterized by the same number of leaves, for example, seedlings with 2 or 3 leaves) • Planting is done with 2-3 seeds/planting hole • Planting distance 25x25 cm or 20x20 cm, depending on a variety • The remaining seeds that have been removed are stored in the plot as material for planting • Embroidery is carried out at 7 HST using seeds of the same variety and age
Irrigation arrangements	• After planting, maintain a water level of around 3 cm for up to 3 days • During the flower primordia until the pregnancy phase, the water level is maintained at around 5 cm to suppress new shoots • During the pregnancy phase until the flowering phase, the land is periodically irrigated and dried alternately (alternately, intermittently) • The plot is irrigated to a height of 5 cm, then left until the rice fields are dry for 2 days, and then irrigated again to a height of 5 cm, and so on • After completing the flowering phase until the seed-filling period, the water level in the cultivated land is maintained at 3 cm • Intermittent irrigation in the seed ripening phase, then 7 days before the land begins to dry to make it easier to harvest
Fertilization	• In soil processing I, organic materials are applied (manure 1 ton/ha) • At planting time or a maximum of 1 WAP, apply 75 kg • Urea/ha, 100 kg SP 36/ha and 50-100 kg KCl/ha • 4 WAP follow-up fertilization is carried out with 75 kg Urea/ha
Pest/disease control	• Integrated Pest Management (IPM)
Weed control	• Weed control can be done manually either by hand or using a gas rake or by using chemicals (herbicides).
Roguing	• Roguing is an activity to remove intersection types (clumps of plants whose morphological characteristics deviate from the characteristics of the clumps of the variety being produced), mixed other varieties and discarding other plants

	• Plants infected with stem borer or other plant diseases such as tungro should also be removed during roguing.
Harvest	• Before harvesting begins, several equipment that will be used for harvesting (thresher), drying (drying floor, drying machine) must be prepared and cleaned so that it does not become a source of contamination. For sacks, new sacks should be used • Before harvesting, it must also be ensured that in the area to be harvested there are no remaining panicles left in the planting which are removed during roguing, especially during the last roguing (1 week before harvest) • Harvesting should be done per variety. Seed candidate • then put it in a sack with a label (variety name, harvest date and production location)
Seed processing	• Inspection of processing equipment before seed processing begins must be carried out • Seed processing includes drying, cleaning, grading (if necessary) and packaging • When drying by drying, the drying floor should be provided with a roof to prevent the temperature from being too high on the drying floor. • When using a drying machine, drying temperature must consider the initial seed moisture content
	• Another thing to pay attention to is: try not to mix the seeds during drying and drying should be done 4-5 hours/day (not later than 12 noon • Avoid mixing/exchanging seeds with other varieties during drying and processing • Drying should be done 4-5 hours/day (not later than 12 noon) • Seeds that have been processed are put in new sacks and clearly labeled inside and outside the sack • If the processing equipment will be used for other varieties, • then the tool must be cleaned from the remains of seeds of other varieties.
Seed storage	• Temporary seed storage (waiting for seed certificate) can be used in plastic sacks and placed in an air-conditioned room • Seed packaging that is equipped with a certificate must take into account several things including: storage time, seed moisture content when stored and conditions (RH and temperature) of the storage room • Storage for commercial purposes is preferable

	Use a 0.8 mm thick plastic bag that is tightly sealed • The seed storage warehouse should meet the requirements, not leak, the floor must be solid and have sufficient ventilation • The stacking method should be arranged in such a way that the pile is neat, easy to control, does not collapse easily and goods can go in and out easily • On each pile of seeds there is a control card which provides information, variety name, harvest date, location, original quantity and final stock amount).

Source: Badan Litbang Pertanian, 2007 dan BBP2TP, 2013

RESULTS AND DISCUSSION

Biophysical Characteristics of Locations

The study location has flat topography with a height of 10-15 m above sea level. Land cultivation by farmers is designated as rice fields with an ownership area of 1.75 ha/KK and yard land with an average area per household of 0.25 ha. The yard land is used as housing and mixed gardens, while the business land is irrigated rice fields used for growing rice and secondary crops. The soil in Sri Agung Village has characteristics including black gray to dark brown because the organic material has been reduced, has a crumbly structure and sandy clay texture, low nutrient content and slightly acidic soil pH, namely 4.89. The land conditions in this area are quite good with moderate fertility levels. The soil type is generally alluvial with a clayey texture. Water resources are available throughout the year because this area is a technically irrigated area. The rainfall pattern in Sri Agung Village is almost even throughout the year with an average rainfall of 2,600 mm/year. The highest monthly rainfall generally occurs in December/January and the lowest rainfall in August. Usually the rainy season in Sri Agung Village starts in September/October and the dry season in April/May. In general, the farming system that is developing in Sri Agung Village is a food crop-based farming system with a planting pattern: Paddy-Palawija/Bera. Lowland rice is usually planted during the rainy season, planting time is at the beginning of the rainy season, namely September/October and harvesting is done in January/February. The time to plant rice after the first rainy season rice harvest is February/March and harvest in May/June. After harvesting MH rice and MK rice, it is followed by secondary crops, namely soybeans, in July/August and harvesting is carried out in October/November.

New Superior Varieties (VUB) Baroma and Inpari Nutrizinc

In accordance with the variety description, the new superior variety Baroma has the potential to be developed in irrigated rice fields with a production potential of 9.1.8 t/ha, with an average yield of 6.01 tonnes/ha and VUB Inpari Nutri Zinc has a potential yield of 9.98 t/ha with an average yield of 6.21 (Sasmita, P, et al, 2019; Chaudhuri, Bera, & Dutta, 2023; Yu et al., 2023).

The Baroma variety is a substitute variety for premium rice, especially Basmati. The type of Basmati rice that is currently available can only be grown in the northern parts of India and Pakistan, so to fulfill this rice you still have to import it and the price is relatively expensive. Baroma has an average yield of 6.01 tons/ha GKG (milled dry grain) and a potential yield of 9.18 tons/ha, higher than the Basmati variety. This variety has a shorter appearance than Basmati with larger plant stems. The Baroma variety has a plant height of approximately 112 cm with a number of productive seedlings of approximately 17 stems. The harvest time for the Baroma variety is around 113 days after sowing (HSS). The amylose of this variety is 25.55% with the texture of spring rice and the rice elongates after the cooking process by 1.5 times. "This variety's resistance to pests and diseases is better compared to Basmati," he explained. Baroma is suitable for cultivation in irrigated rice fields at an altitude of 0-600 m above sea level. Baroma is premium rice which must maintain the integrity of the rice grains. It requires special post-harvest handling, especially during milling because the grain is small and long, so the possibility of it breaking is high (Kang et al., 2023; Pircher et al., 2023; Horton et al., 2023).

Inpari IR Nutri Zinc has many advantages over several other varieties in terms of Zn content. Based on descriptive data issued through the Decree of the Minister of Agriculture in 2019, the Zn content in this variety is 34.51 ppm while other varieties such as Ciherang contain 24.06 ppm. It is hoped that these advantages will contribute to the success of the government's program in overcoming zinc nutritional deficiencies and minimizing stunting in Indonesia. Apart from causing a decrease in human endurance, productivity and quality of life, Zn deficiency in the body, Zn deficiency is also a factor in stunting. This variety has an amylose content of 16.6 percent. Apart from being rich in nutrients, this variety also has high productivity, is resistant to WBC, Blas and Tungro, and has a delicious rice taste. Healthy lifestyles that continue to develop encourage increasingly high public demand for healthy food.

The growth performance of Baroma and Inpari Nutri Zinc plants is quite good. Pests that appear in the vegetative phase of rice plantings include javelin, false white, sundep, while in the generative phase such as sting grasshoppers, beluk, rats and birds. Intensity of pest attacks in the vegetative and generative phases quite low. Pest control is carried out using integrated pest management

The vegetative data observed were: plant height, number of productive tillers, plant height. Yield component data: panicle length, filled grain/panicle, empty grain/panicle, weight of 1000 grains and production.

The new superior variety (VUB) Baroma has plant height (115 cm), number of productive tillers (18 stems), panicle length (27.2 cm), filled grain/panicles (105 grains), empty grain/panicles (30.40 grains) and weighs 1000 grains (26.04 gr). Rice production obtained from VUB Baroma seeding activities was 6.50 t/ha (GKG), and seed production was 4.5 tons/ha. VUB Inpari Nutri Zinc has plant height (90 cm), number of productive tillers (17 stems), panicle length (27.9 cm), filled grain/panicles (99.9 grains), empty grain/panicles (21.40 grains) and weighs 1000 grains (26.56 gr). Rice production obtained at VUB Inpari Nutri Zinc was 5.69 t/ha (GKG), and seed production was 3.2 tons/ha.

Table 2. Average plant height, panicle length, number of filled grains, number of empty grains, weight of 1000 grains and yield of several new superior varieties on irrigated land

Variety	Plant height (cm)	Number of product ve offspring (btg)	Panicle Length (cm)	Number of Filled Grains (grains)	Number of Hollow Grains (grains)	Weight 1000 grains (gr)	Yield (t/ha)
BAROMA	115	18	27,2	105,00	30,40	26,04	6,50
Inpari Nutri Zinc	90	17	27,9	99,90	21,40	25,56	5,69

Results of VUB Baroma and Inpari Nutri Zinc Seed Farming Analysis

The results of the analysis of the VUB Baroma farming business with a production of 6.5 t/ha, if used for consumption, provides a profit of Rp. 19,670,000 (R/C ratio 3.05). There is a difference in farming costs between consumption rice and rice used as seeds, this is because processing it into seeds requires an additional cost of IDR. 1,250,000/ha, so the total costs required for the VUB Baroma seed farming business reach Rp. 9,580,000/ha (Table 1). The VUB production of Baroma rice obtained was 6.5 tonnes/ha, of this production which was used as seed was 4.5 tonnes/ha, with a seed price of Rp. 10,000 (FS/white label seed class), so that the revenue from the VUB Baroma rice farming business which is managed as a seed business becomes Rp. 45,000,000 with a profit of Rp. 35,420,000 (R/C ratio 4.69). The VUB production of Inpari Nutri Zinc rice obtained was 5.9 tonnes/ha, of this production, 3.9 tonnes/ha was used as seed, with a seed price of Rp. 10,000 (FS seed class/white label), so that the revenue from the VUB rice farming Inpari Nutri Zinc rice which is managed as a seed business to Rp. 39,000,000 with a profit of Rp. 29,420,000 (R/C ratio 4.07).

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Table 3. Costs of rice farming (per ha) VUB Padi Baroma and Inpari Nutri Zinc between Consumption Results and Seed Results in Rawa Medang Village, Batang Asam District, West Tanjung Jabung Regency, Jambi Province MK 2019

No	Description	Physique	Variety			
			Baroma		Inpari Nutri Zinc	
A	**Production Costs (Rp)**	Volume	Nilai (Rp) Hasil	Nilai (Rp) Benih	Nilai (Rp) Hasil	Nilai (Rp) Benih
	1. Seed	25 kg	225.000	225.000	225.000	225.000
	2. Urea	150 kg	600.000	600.000	600.000	600000
	3. SP36	100 kg	260.000	260.000	260.000	260000
	4. KCl	50 kg	400.000	400.000	400.000	400000
	5. NPK Ponska	-	-	-	-	-
	6. Pesticide	1 paket	500.000	500.000	500.000	500000
	7. M Dec	2 kg	35.000	35.000	35.000	35000
	8. Agrimeth (organic fertiliser)	500 gr	135.000	135.000	135.000	135000
	Jumlah		2.155.000	2.155.000	2.155.000	2155000
B	**T. Work Costs (Rp)**					
	1. Nursery	4 HOK	300000	300000	300000	300000
	2. Soil processing	Wholesale	1500000	1500000	1500000	1500000
	3. Remove the seedlings	Wholesale	300000	300000	300000	300000
	5. Planting	Wholesale	1500000	1500000	1500000	1500000
	6. Fertilization	4 HOK	300000	300000	300000	300000
	7. Weeding	4 HOK	300000	300000	300000	300000
	8. H&P control	3 HOK	225000	225000	225000	225000
	9. Harvesting/processing	Borongan	1250000	1250000	1250000	1250000
	10. Seed Processing	Borongan	0	1750000	0	1750000
	Total		**5675000**	**7425000**	**5675000**	**7425000**
	Total (A+B)		**7.830.000**	**9580000**	**7.830.000**	**9580000**
C	Results (kg/ha)		6.500	4.500	5.700	3900
	Price (/Rpkg)		4.500	10.000	4.500	10000
	Reception (Rp/ha)		29.250.000	45.000.000	25.650.000	39.000.000
	Profit (Rp/ha)		21.420.000	35.420.000	17.820.000	29.420.000
	R/C ratio		3,73	4,69	3,27	4,07

The results of the implementation of the activities show that the VUB Baroma and Inpari Nutri Zinc seed activities can increase farmers' income, the more rice produced as seeds, the higher the income earned by farmers.

Response from Farmers and Related Services

Farmers' responses to VUB Baroma and Inpari Nutri Zinc were very positive because based on farmers' observations, from growth in the field to the results obtained by VUB Inpari 13, it was better than other varieties planted by farmers. Apart from that, VUB Baroma and Inpari Nutri Zinc have a smooth rice taste according to the tastes of farmers in Rawa Medang Village, and are resistant to Blast disease.

The implementation of seed business activities received a positive response from farmers and related agencies. In the institutional and marketing aspect, the Pudak village nursery collaborates with the West Tanjung Jabung District Agriculture Service, marketing and distributing Baroma and Inpari Nutri Zinc seed products to farmers for rice planting activities in the following season. With the VUB Baroma and Inpari Nutri Zinc seed businesses, farmers in Dea Rawa Medang do not experience difficulties because quality/labeled seeds are already available on site, and can meet the seed needs of almost all rice fields in Batang Asam Tanjung Jabung Barat District.

CONCLUSION

The Baroma rice new superior variety (VUB) seed business made a profit of IDR. 35,420,000/ha with an R/C ratio of 4.69, VUB Inpari Nutri Zinc made a profit of Rp. 29420000/ha with an R/C ratio of 4.07. VUB Baroma rice and Inpari Nutri Zinc seed farming businesses provide higher profits than consumption farming businesses with the profit difference between Baroma and Inpari Nutri Zinc each being IDR. 11,600,000/ha. Farmers in Rawa Medang Village are currently not experiencing difficulties with rice seeds, because VUB seeds are already available at the location. From the results of the VUB Baroma and Inpari Nutri Zinc seed business covering an area of 4 ha, it has been able to meet the needs of 90% of the rice fields in Batang Asam District, West Tanjung Jabung Regency, Jambi Province.

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