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The role of superior varieties in increasing rice productivity on tidal lands in South Sumatra

Kontribusi varietas unggul untuk meningkatkan produktivitas padi lahan pasang surut Sumsel mendukung katahanan pangan nasional

Niluh Putu Sri Ratmini[1*)], Pandu Hutabarat[2], Siti Khusniyati[2]
[1]Research Center for Food Crops, National Research and Innovation Agency, Jl. Raya Bogor-Jakarta, Cibinong, Bogor 16911, West Java, Indonesia
[2]Agricultural Instruments Standardization Agency South Sumatera, Kol. H. Burlian Street No. 83 Km.6 Palembang 30153, South Sumatera, Indonesia

[*)]Corresponding author: nps_ratmini@yahoo.com. Tel.: +62-813-7787-7327

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ABSTRAK

Pengembangan lahan pasang surut sebagai lahan pertanian merupakan salah satu peluang untuk mencukupi kebutuhan pangan. Penelitian ini bertujuan untuk mengetahui kontribusi Varietas Unggul dalam meningkatkan produktivitas padi pasang surut di Sumatera Selatan. Penelitian dilakukan di Kabupaten Banyuasin tahun 2021 dengan menggunakan metode survey dan wawancara. Jumlah kecamatan yang diambil samlping sebanyak sembilan kecamatan yang merupakan pewakil lahan passng surut. Data yang dikumpulkan dalam penelitian ini adalah hasil gabah kering panen (ubinan), varietas yang digunakan, jenis dan dosis pupuk yang digunakan, cara tanam serta indek pertanaman. Selain data primer, sebagai data pendukung juga dilakukan pengambilan data sekunder berupa luas lahan masing masing wilayah serta kondisi iklim. Data yang diambil ditabulasi dan dianalisis deskriptif. Hasil penelitian menunjukkan bahwa Tingkat produktivitas varietas unggul padi lebih tinggi dari produktivitas rata rata kabupaten. Peningkatkan produktivitas dengan penerapan varietas unggul mencapai 1,5 t/ha

Kata kunci: rawa, padi, Banyuasin, indek tanam

ABSTRACT

The development of tidal land as agricultural land is an opportunity to meet food needs. This study aimed to determine the contribution of superior rice varieties in increasing tidal rice productivity in South Sumatra. The research was conducted in Banyuasin Regency in 2021 using survey and interview methods. Samples were taken from 9 sub-districts, which are representative of low-tide land. The data collected included harvested dry grain (tiles), the varieties used, the type and dose of fertilizer applied, planting methods, and cropping index. In addition to primary data, secondary data was also collected as supporting information, such as land area for each region and climatic conditions. The data was tabulated and analyzed descriptively. The results showed that the productivity level of superior rice varieties was higher than the district's average productivity. The increase in productivity by applying superior varieties reached 1.5 t/ha.

Keywords: Banyuasin, coping index, low land, rice

INTRODUCTION

The characteristics of land in Indonesia vary greatly from soil diversity, physiography, climate, parent material, landforms and also altitude (Liu et al., 2022) to facititate management it was necessary to group them based on character into several agroecosystems, including suboptimal land. Sub-optimal use of land as agricultural land is one strategy to meet increasing food needs (Qurani & Fawzi, 2022) due to increasingly high population growth (Mahdawi et al., 2021; Rostiana & Rodesbi, 2020) as well as maintaining food adequacy due to the impact of climate change (Inose et al., 2019; Mahmood et al., 2012; Suryanto et al., 2023). The development of agricultural land to suboptimal land is one solution due to the reduction in fertile land due to competition for non-agricultural land use (Putri et al., 2019). Swamp land is one of the agroecosystems which is classified as suboptimal land, including tidal land, swamp land and peat (Mulyani & Sarwani, 2013). According to Sulaiman et al. (2018) in South Sumatra it is estimated that there are 3.358 million ha which is divided into 0.855 million ha of tidal land, 1.246 million ha of swamp land and 1.257 million ha of peat land.

The obstacles faced in developing agricultural land on tidal swamp land are acid soil, salt water intrusion, high solubility of aluminium, iron, sulphidie acid and manganese, low content of main nutrients such as N, P and K, low exchangeable bases and characterized by the presence of a layer of pyrite (Chandra et al., 2015), the presence of stress from pyrite concentrations can cause the soil to become acidic (Anda & Siswanto, 2002; Migaszewski et al., 2007; Sulaiman et al., 2019). In anaerobic conditions, pyrite will be stable, but in aerobic or dry conditions pyrite is dangerous because it releases iron and dissolves in water. This condition causes the soil pH to become very low and at the same time the presence of organic material results in the formation of aerobic conditions and H_2S (Wang et al., 2016). The high solubility of iron and aluminum will cause rice plants to experience confusion and nutrient disturbance (Chérif et al., 2009; Onyango et al., 2019; Saaltink et al., 2017), disrupting root architecture Li et al., 2016; Shamshuddin et al., 2014), this results in low productivity of tidal land. This problem can be controlled by applying location specific technology.

Various technologies are available to improve tidal land, including water management (Khairullah et al., 2021) (Imanudin et al., 2010). amelioration (Minarsih et al., 2021; Nurzakiah et al., 2012; Shamshuddin et al., 2016), fertilizing (Shamshuddin et al., 2017), and using superior varieties (Khairullah et al., 2021; Ratmini & Herwenita, 2021; Rout, 2014). Water management is aimed at removing toxic elements that dissolve in water such as iron, aluminum and sulfide acid resulting from pyrite oxidation. Ameliorantion with the aim of improving land quality, both physical, chemical and biological. Ameliorant include lime, biochar, manure, on acid sulphate land can actually increase rice yields (Ratmini, 2023). Besides that, the use of superior varieties plays an important role in increasing rice production in tidal land. Apart from increasing production, the use of superior varieties can also increase the agricultural index, because generally superior varieties have early maturity (Liundi et al., 2018; Paiman et al., 2020) The role of tidal land with the application of technology in contributing to increasing grain production in South Sumatra needs to be known, considering its potential as agricultural land is quite extensive. The objective of this research was to determine the contribution of superior varieties in increasing tidal rice productivity in South Sumatra.

MATERIALS AND METHODS

Location and Time of Research

The research was carried out in Banyuasin district of South Sumatra (Figure 1) which includes the districts of Tanjunglago, Muara Telang, Marga Telang Source, Sugihan Muara, Padang muara, Water Salek, Makarti Jaya, Rimau Island. The district was selected because it was a recession land (Imanudin et al., 2021; Megawaty et al., 2012) The research has been carried out in the MH 2021 growing season. The location used for the research was deliberately determined, adjusted to the harvest time at the site.

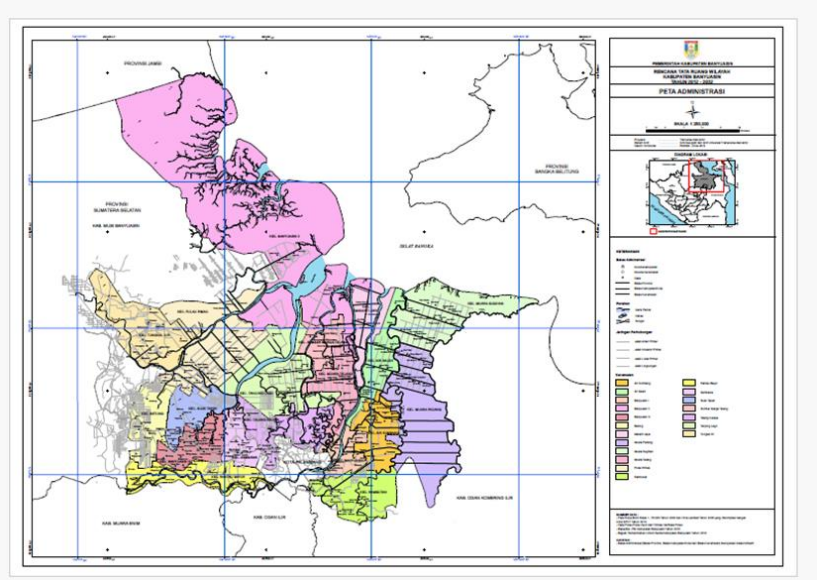

Figure 1. Distribution of tidal land in Banyuasin district

Survey Implementation

The survey was carried out to collect data on rice tiles that had been determined previously. The harvest location was chosen based on the condition of the rice which was perfectly mature and has uniform growth. The tile point was selected by observing the condition of the body that represented the surrounding area. Data collection was carried out by harvesting tiles directly and was complemented by interviews with farmers, which were carried out together with field officers and KSA officers from statistics with the area of tiles plots referring to government policies adjusted to planting methods Sutrisna et al., 2012). To ensure the level of production obtained, interviews were also conducted with local farmers, especially in locations with non-uniform crop conditions (Ardiansyah et al., 2021; (Saputra et al., 2022; Nong et al., 2021). Interviews were conducted with farmers who own the land and who work on the rice fields.

Data Collection and Analysis

The data collected includes the yield of harvested dry grain (tiles), the varieties used, the type and dose of fertilizer used, planting methods and cropping indices. Apart from primary data, as supporting data, secondary data was also collected in the form of land area for each region and climatic conditions. The collected data was tabulated and descriptive analysis was carried out.

RESULTS

Climate Characteristics

Tidal farming systems were generally strongly influenced by local and global climate conditions, river tidal conditions and salt water intrusion. Climatic conditions generally influence planting time, plant growth and the development of pests and diseases. Daily rainfall and humidity conditions (Figure 2) during 2021. Climate conditions during 2021 were classified as normal, rainfall occurs throughout the year with peak rain occurring in November and December. The lowest rainfall in August, dry and wet months during a year were 5 and 7 months. The higest air humidity reaches 98% and the lowest was 23%. The average humidity throughout 2021 was 86% (humid).

Air temperature and duration of sunlight (Figure 3) show a fairly even distribution. Air temperature ranges from 23-30 ºC while sunlight ranges from 0-9.4 hours/day. The relationship between rainfall, humidity, air temperature and duration of sunlight was very strong and could be seen from climatic conditions.

Tidal Land Area in Banyuasin Regency

The total area of rice fields in Banyasuin Regency was 202,682 ha, consisting of 161,917 ha of tidal rice fields, 30,767 ha of lowland rice fields and 9,998 ha of currently unused rice fields (Table 1). Tidal land was spread across 16 sub-

districts of the 19 sub-districts and was the largest rice field compared to Lebak rice fields. The sub-districts that have the largest areas of tidal rice fields were Muara Sugihan, Muara Telang and Air Salek sub-districts, while the ones with the least were Betung sub-district. In the districts of Tungkal Ilir, Muara Padang, Muara Sugihan, Air Salek and Sumber Marga Telang, all of the rice fields were tidal rice fields. Tidal rice fields could be planted with rice twice a year depending on the type of water overflow, although productivity in the second planting season was still lower than in the first planting season. The average rice planting index in 2017 in Banyuasin Regency was 1.28 and with a productivity level of 5.1 t/ha (Table 2).

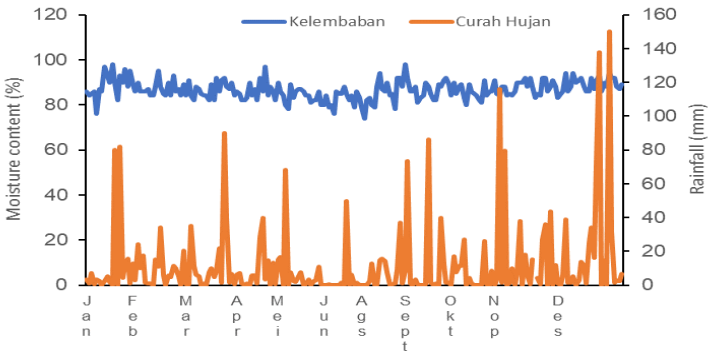

Figure 2. Humidity and rainfall conditions in the South Sumatra region in 2021

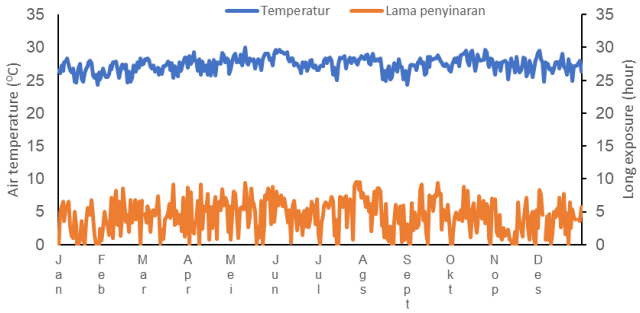

Figure 3. Conditions of air temperature and duration of sunlight in the South Sumatra region in 2021

Table 1. Area of rice fields by sub-district and type in Banyuasin Regency (Hectares), 2017

Subdistrict	Low Tide	Polder Valley	Temporary Follow Land	Total
Rantau Bayur	-	17.974	1.026	19.000
Betung	244	90	318	652
Suak Tapeh	673	222	173	1.068
Pulau Rimau	16.505	-	2.150	18.655
Tungkal Ilir	4.951	-	-	4.951
Banyuasin III	-	1.875	-	1.875
Sembawa	708	-	726	1.434
Talang Kelapa	1.560	-	350	1.910
Tanjung Lago	13.924	-	196	14.120
Banyuasin I	574	3.171	1.334	5.079
Air Kumbang	986	-	836	1.822
Rambutan	-	7.435	1.729	9.164
Muara Padang	11.295	-	-	11.295
Muara Sugihan	27.390	-	-	27.390
Makarti Jaya	13.579	-	72	13.651
Air Salek	21.391	-	-	21.391
Banyuasin II	10.341	-	905	11.246
Muara Telang	25.022	-	753	25.775
Sumber Marga Telang	11.765	-	-	11,765
Banyuasin	161.917	30.767	9.998	202.682

Table 2. Harvested Area and Production of Paddy by Districts in Banyuasin Regency, 2017

Subdistrict	Wetland Paddy (ha)	Produktivity (t/ha)
Rantau Bayur	18.125.8	5.11
Betung	136.6	5.21
Suak Tapeh	1.028.1	5.19
Pulau Rimau	24.539.1	5.09
Tungkal Ilir	7.166.2	5.09
Banyuasin III	1.829.9	5.20
Sembawa	725.9	5.12
Talang Kelapa	1.521.6	5.16
Tanjung Lago	15.867.7	5.10
Banyuasin I	5.051.6	5.20
Air Kumbang	2.722.3	4.92
Rambutan	7.769.1	5.14
Muara Padang	13.583.4	5.11
Muara Sugihan	39.104.7	5.16
Makarti Jaya	13.303.4	5.12
Air Salek	29.504.9	5.08
Banyuasin II	14.780.2	5.07
Muara Telang	41.678.9	5.08
Sumber Marga Telang	16.840.3	5.11
Banyuasin	255.289.7	5.10

District Rice Productivity

Rice production for each sub-district was determined by regional conditions, harvested area and also the production of rice planted. Each sub-district has different regional characteristics, such as salt water intrusion constraints for areas near river mouths, iron poisoning constraints on land dominated by acid sulfate land and also flooding/drought constraints depending on the type of water overflow. Based on the results of data collection in the field, the average productivity of tidal rice for each sub-district ranges from 5.31 -7.61 t/ha (Figure 4), the lowest in Air beetle sub-district was 5.31 t/ha and the highest in Muara Sugihan and Muara Telang sub-districts. respectively 7.88 and 7.83 t/ha. Rice productivity on tidal land was no less than rice productivity on irrigated land with fewer technical obstacles compared to rice fields on tidal land.

The rice productivity obtained will affect overall production in each sub-district. Rice production in each sub-district was determined by the harvested area. This will affect the contribution of tidal land to the district's rice production.

Use of Varieties

The choice of variety will affect rice production. Variety selection was determined based on land conditions, pests and diseases, price and interest. The main factors that usually determine were local production and selling prices. As tidal land, of course the land factor was; also very much a consideration and determines the varieties to be planted. Tidal land farmers were very advanced in determining the rice varieties to be planted. The use of superior varieties has long been applied by farmers, to increase production and the relatively short lifespan of rice so that it could be planted twice a year.

The varieties most commonly planted on tidal land include the Inpari 32, Inpari 42, Ciherang, Supadi, Mapan, Bromo and Komojoyo varieties (Figure 5). Inpari 32, 42 and Ciherang were new superior rice varieties, Supadi and Mapan were hybrid rice while Bromo and Komojoyo were local superior varieties. The highest production was the Inpari 42, Supadi and Mapan varieties with 8.89 each; 8.73; and 8.93 t/ha and the lowest were Ciherang and Bromo respectively 6.81 and 6.41 t/ha.

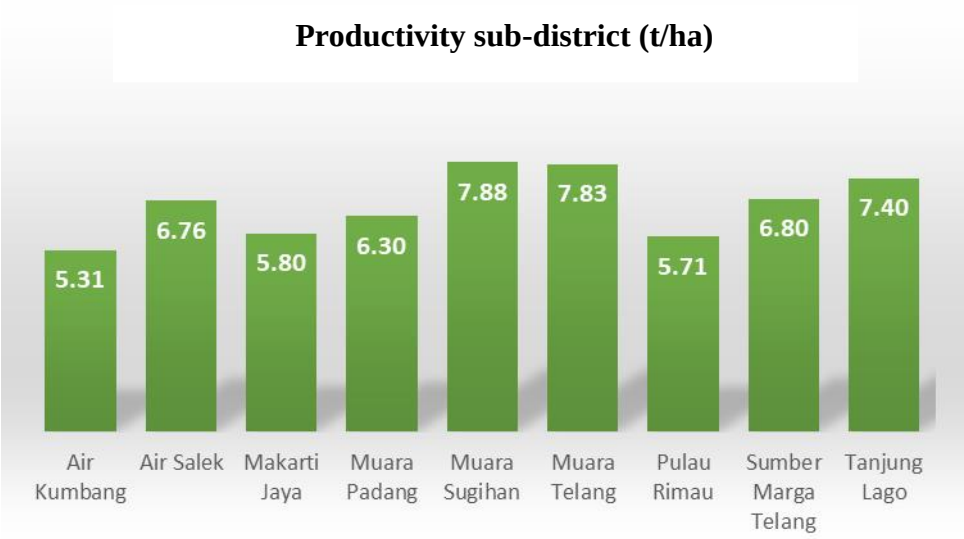

Figure 4. Tidal rice productivity for each sub-district in Banyausin Regency

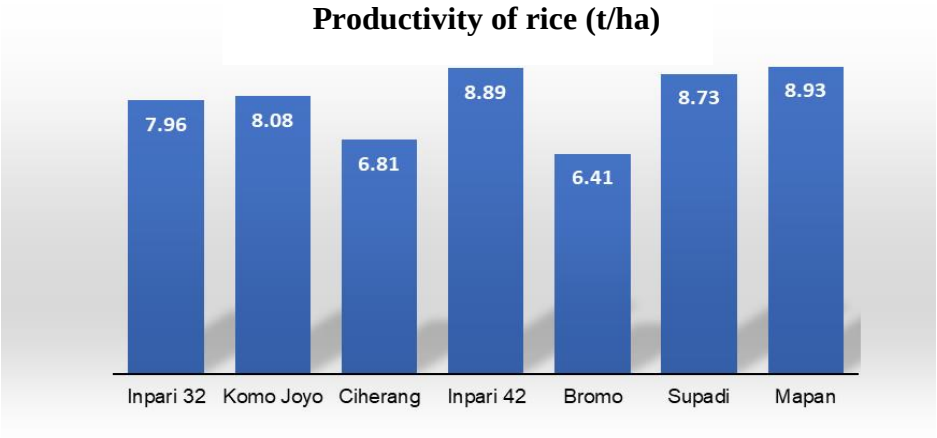

Figure 5. Productivity of rice varieties planted in the tidal areas of Banyuasin Regency

DISCUSSION

Land productivity is influenced by the level of land fertility, pest and disease attacks, the environment, and the level of plant productivity. Integrated crop management by integrating various technological components, using superior varieties that have high yields and are adaptive to the local environment, managing nutrients well and in accordance with environmental conditions, and integrated management of pests and diseases is expected to increase crop production.

Tides are known to have very complex land constraints, but with wise and wise management they can provide high yields. Adaptive variety selection is a location-specific technological approach. The role of superior varieties is very large in increasing production. Superior varieties have certain advantages over each variety, including resistance to certain pests and diseases (Liana et al., 2023), resistance to immersion for a certain period of time (Van Khanh Triet et al., 2018), resistance to environmental stress (Javaid, 2020; Ratmini et al., 2021), resistance to shade with a certain shade intensity (Alridiwirsah et al., 2018) Apart from considering environmental factors, plant characteristics are also taken into consideration by farmers in determining which varieties to plant. These characters include the shape of the stem, the number of tillers, the shape of the rice grain and the selling value (Surdianto et al., 2021).

The use of superior varieties is one of the efforts made to increase production. New

superior varieties on tidal land are beneficial from a technical and economic perspective, this is because the plants will have uniform plant growth, harvest time at the same time and have high yields. Superior varieties are one of the cultivation techniques related to increasing production, the important thing is that the variety can adapt to environmental and land conditions. Good agronomic performance of a plant and high yields indicate that the variety has the ability to adapt to an environment. Using varieties that are resistant to pests and diseases in cultivation will reduce expenditure on pest and disease control.

Crop production is influenced by climatic conditions (Figures 2 and 3) showing that the climatic conditions at the research location show that even rainfall really supports plant growth and production. Rainfall that is evenly distributed throughout the year supports production during the planting season, both the rainy season and the dry season. The use of superior varieties provides higher productivity compared to the district average rice productivity. This shows that the use of superior varieties can increase rice production. Research needs to be carried out regarding the use of superior varieties using location-specific technology.

CONCLUSSION

From the research results, it can be concluded that the use of superior varieties can increase rice productivity in the tidal fields of Banyuasin Regency. Productivity increases to 1.5 t/ha by using superior varieties. Research on the use of superior varieties needs to be carried out with the application of location-specific technology.

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