

Development of biofortified rice for reduce stunting rates in South Sumatra Province

Pengembangan padi biofortifikasi untuk penurunan angka stunting di Provinsi Sumatera Selatan

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ABSTRAK

Kekurangan unsur Zn dalam tubuh merupakan salah satu permasalahan serius kekurangan gizi di Indonesia karena menurunkan daya tahan tubuh, produktivitas dan kualitas hidup manusia, serta menjadi salah satu faktor penyebab kekerdilan (stunting). Stunting mengkhawatirkan karena dapat menimbulkan gangguan pertumbuhan dan perkembangan anak yang ditandai dengan tinggi badan anak di bawah standar. Salah satu faktor penyebab stunting karena berkurangnya konsumsi seng (Zn) terutama pada ibu hamil dan anak-anak. Kekurangan unsur Zn didalam tubuh dapat diperbaiki melalui konsumsi bahan makanan yang mengandung Fe dan Zn. Penulisan ini bertujuan untuk menginformasikan dan menyampaikan gagasan bahwa salah satu upaya yang dapat dilakukan dalam menurunkan angka stunting melalui Pengembangan padi Biofortifikasi yang akan menghasilkan beras nutrizink. Untuk mengevaluasi dampak pengembangan padi tersebut maka dilakukan evaluasi terhadap produksi padi tersebut dan pengaruhnya terhadap penurunan stunting di beberapa kabupaten di Sumsel. Metode yang digunakan adalah wawancara, rekapitulasi data primer dan sekunder. Upaya budidaya padi Biofortifikasi sudah dilakukan di Sumatera Selatan sejak 2021 di OKU Selatan (1000 ha), tahun 2022 di Lahat (1000 ha) dan tahun 2023 di delapan kabupaten (8000 ha). Secara umum produksi padi Biofortifikasi di Kabupaten OKU Selatan (5,28 ton GKP) dan Kabupaten Lahat (5,08 ton GKP). Berdasarkan Survei Status Gizi Indonesia (SSGI) Tahun 2021 terjadi penurunan prevalensi stunting rata-rata di Sumsel tahun 2022 menjadi 18,6 % yang mengalami penurunan dari 24,8% pada tahun 2021 termasuk di kabupaten pengembangan padi Biofortifikasi. Berdasarkan fakta bahwa pengembangan padi Biofortifikasi dapat menjadi salah satu upaya menurunkan stunting, Pemerintah Daerah makin memperluas budidaya padi tersebut hampir di semua kabupaten/kota.

Kata kunci: kerdil, Nutrizinc, padi biofortifikasi, prevalensi

ABSTRACT

Lack of the element Zn in the body was one of the serious problems of malnutrition in Indonesia because it reduces endurance, productivity and quality of human life, and was one of the factors causing stunting. Stunting is worrying because it can cause problems with a child's growth and development, which is characterized by the child's height being below standard. One of the factors causing stunting is reduced consumption of zinc (Zn), especially in pregnant women and children. Deficiency of the element Zn in the body can be corrected by consuming foods that contain Fe and Zn. This writing aims to inform and convey the idea that one of the efforts that can be made to reduce stunting rates is through the development of Biofortified rice which will produce nutritious rice. To evaluate the impact of rice development, an evaluation was carried out on rice production and its

effect on reducing stunting in several districts in South Sumatra. The method used was interviews, recapitulation of primary and secondary data. Biofortified rice cultivation efforts had been carried out in South Sumatra since 2021 in South OKU (1000 ha), in 2022 in Lahat (1000 ha), and in 2023 in eight districts (8000 ha). In general, Biofortified rice production in South OKU Regency (5.28 tons dry Grain/ha) and Lahat Regency (5.08 tons Harvested Dry Grain/ha). Based on the 2021 Indonesian Nutritional Status Survey (INSS) saw a decrease in the average prevalence of stunting in South Sumatra in 2022 to 18.6%, which decreased from 24.8% in 2021, including in Biofortified rice development districts. Based on the fact that the development of Biofortified rice can be an effort to reduce stunting, The Regional Government was increasingly expanding rice cultivation in almost all districts/cities.

Keywords: Biofortifikasi rice, Nutrizinc, prevalence, stunting

INTRODUCTION

Stunting according to Presidential Regulation of the Republic of Indonesia Number 72 of 2021 is a child's growth and development disorder caused by chronic malnutrition and recurrent infections, characterized by the child's height being below the standards set by the Minister of Health. Meanwhile, according to the Ministry of Health, stunting is a growth disorder in toddlers so that the child's development is not in accordance (shorter) with the specified standards. According to the Ministry of Villages, stunting is a condition where a person's height is shorter than their general age (Kemendesa, 2017). The condition of failure to thrive in children under five causes children to be too short for their age, so that some are called short (stunted) and very short (severely stunted) toddlers. This condition occurs if the toddler's body length (PB/U) or height (TB/U) according to his age is compared with the 2006 who-mgrs (multicentre growth reference study) standard (Sutarto et al., 2018). Stunting is worrying because it can cause problems with the growth and development of children due to chronic malnutrition and recurrent infections which are characterized by their length or height being below standard. Astuti et al. (2013) stated that Indonesia is one of the countries that still experiences serious anemia problems due to a lack of micronutrient intake, especially iron. Based on WHO data, the prevalence of stunted toddlers in Indonesia contributed to the highest prevalence in the Southeast Asia region in 2005-2017 with an average figure of 36.4% and in 2022 it will fall to 21.6% but is still above the WHO standard which should be less than 20%. The problem of

nutritional intake consumed during pregnancy and infancy, especially the adequate level of zinc and iron nutrients, is caused by the mother's lack of knowledge regarding health and nutrition before pregnancy, resulting in low access to nutritious food (Wahdah et al., 2015). One of the factors that causes dwarfism or stunting is the lack of consumption of the nutritional zinc (Zn) which occurs in society, especially in pregnant women and children. Lack of the element Zn in the body is one of the serious problems of malnutrition in Indonesia, thereby reducing human endurance, productivity and quality of life, deficiency of the element Zn can be one of the factors causing stunting (Black et al., 2008).

Deficiency of the element Zn in the body can be corrected by consuming foods that contain nutrients such as Fe (iron) and Zn (zinc). Prevention and reduction of stunting rates cannot be done only by the health sector but by involving cross-sectors including the agricultural sector through the development of Biofortified rice (Brown et al., 2004; Sanjeeva et al., 2020). The Inpari IR Nutrizinc and Inpago 13 Fortiz varieties have a higher Zn content than ordinary rice varieties so they are considered Biofortified varieties. Biofortified rice development is a fast and appropriate way in various rice cultivation areas which is also a target for reducing stunting. The development of IR and Inpago which are rich in Zn of course refers to evaluating the growth and yields of these varieties from various locations so that farmers continue to obtain optimal profits. Based on direct field observations, it turned out that the growth and yield of Biofortified rice in South OKU and Lahat showed relatively good growth. Meanwhile, from limited interviews with farmers, information was

obtained that farmers also liked the program with relatively good income. The harvest from Biofortified rice can be directly consumed by farmers, distributed to markets or sent to various places. To find out more about Biofortified rice cultivation in two years in various districts in South Sumatra, research was carried out, and the objective of this research was to finding out the reduction in stunting rates, including in South Sumatra.

ALTERNATIVE FOOD INGREDIENTS FOR STUNTING PREVENTION

Serious nutritional problems, characterized by the large number of cases of malnutrition among children under five of school age, both boys and girls, still occur in Indonesia (Sutarto et al., 2018). Nutritional problems at school age could cause low quality education levels, high absenteeism rates and high school dropout rates. Stunting was caused by multi-dimensional factors and was not only caused by poor nutrition experienced by pregnant women and toddlers, but there were various factors including poor parenting practices, including the mother's lack of knowledge regarding health and nutrition both before and during pregnancy, and after the mother gives birth; limited health services for mothers during pregnancy and quality early learning; and lack of access to clean water and sanitation (Sutarto et al., 2018). In terms of nutritional factors, the problem of iron deficiency was a serious problem for Indonesia and most developing countries. Apart from resulting in reduced endurance, productivity and quality of human life, deficiency of the Zn nutrient was also one of the factors causing stunting, the prevalence of which was quite large and evenly distributed in Indonesia. Food was one of the things humans need to survive. Food security refers to the ability of individuals or groups to provide adequate access to food both economically and physically, safely and nutritiously to meet their needs in order to live a healthy and good life. According to various studies, households that experience food insecurity tend to have toddlers with stunting (Safitri & Nindya, 2017).

Based on figures obtained from the Indonesian Nutrition Status Survey (SSGI) conducted by the

Indonesian Ministry of Health in 2022, there was a decrease in the stunting rate in Indonesia in 2022 compared to 2021, namely by 2.8% from 24.4% to 21.6%, while Indonesia's stunting rate target in 2024 based on the National Medium Term Development Plan (RPJMN) was 14%. a reduction of another 7.6% was needed. According to Sutarto et al. (2018), preventing stunting could be done, among other things, by fulfilling the nutritional needs of pregnant women, providing exclusive breastfeeding until babies aged 6 months, providing complementary breast milk (MPASI) in sufficient quantity and quality to babies aged over 6 months, carrying out monitoring the growth of toddlers in posyandu, increasing access to clean water and sanitation facilities, and maintaining environmental cleanliness. One of the efforts made in the agricultural sector was to provide food sources that contain higher levels of Zn. The levels of important minerals such as Fe and Zn could be increased through a biofortification program in rice seeds. Biofortified rice or biological fortification was rice produced through a plant breeding process carried out to meet the micronutrient content of food (Umar et al., 2019). The nutritional content of food could be improved and even increased through this activity. Biofortification was an intervention effort (introducing nutritional elements) to increase the concentration of nutrients available to plants in the form of agronomic intervention through fertilization or genetics through plant breeding (Wairich et al., 2022).

Biofortification in Indonesia was very important and strategic because it was associated with the high prevalence of iron deficiency anemia and stunting due to the lack of consumption of the Zn element in the community, especially in children because currently available rice generally has inadequate micronutrients (Hartoyo, 2022). According to BALITBANGKES (2013), iron deficiency anemia (AGB) occurs if the hemoglobin (Hb) concentration was below 11 g/dl in pregnant women, whereas in non-pregnant mothers aged 15–49 years and children under five the concentration was 12 g/dl each and 11 g/dl. Biofortified rice has been widely discussed by experts, namely Descalsoto et al. (2018),

Moniuddin et al. (2020) and Nagesh et al. (2021). New Superior Varieties (VUB) were produced by the Indonesian Ministry of Agriculture's Rice Research Center (BB Padi) through the assembly of conventional rice varieties that have high zinc content in 2019, which were named Inpari IR Nutri Zinc lowland rice with advantages including having an average content of Zn 29.54-34.51 ppm and average production yield reached 6.21 tons/ha GKG, harvest age 115 days after sowing, rice texture was fluffy (Priatna et al., 2020). In 2020 BB Padi, Ministry of Agriculture of the Republic of Indonesia again released VUB biofortified rice, a type of upland rice which has a high zinc content, named Inpago 13 Fortiz, with advantages including having an average Zn content of 34 ppm in broken-hull rice and an average production yield reaching 6.53 tons/ha GKG.

The advantages of biofortification include that it could be developed for staple foods, it was cheaper and more profitable in terms of cultivation because fortified seeds were only needed once at the start of use, then the seeds from subsequent plantings could be further developed by other farmers, beneficial for nutritionally vulnerable consumer communities, and the rice that will be produced on average has high production and was environmentally friendly.

According to Indrasari and Kristamtini (2018), increasing the Fe content in rice will not change the appearance, taste, texture or cooking quality of rice because the mineral iron was a very fine element so it will not change the way rice was cooked and the consumer's diet. If the element was added to rice, not paddy, it will change the appearance of the rice to be colored according to the element added, such as a yellowish color if beta carotene was added, which will cause a change in the level of consumer preference.

DEVELOPMENT OF BIOFORTIFICATION RICE IN SOUTH SUMATRA

The Long term plan from the government for 2020–2024 need for efforts to increase quality and competitive Human Resources (HR) by accelerating the reduction of stunting by

strengthening economic resilience by increasing the availability, access and quality of food consumption through food fortification and biofortification, especially rice fortification and biofortification.

Biofortification was one approach in improving community nutrition, a new paradigm in the world of agriculture through the assembly of functional rice which aims to obtain superior varieties with high yield potential containing microelements, vitamins and other nutrients that were useful for health (Abdullah, 2017). Improving community nutrition through plant biofortification was a more cost-effective strategy than the use of pharmaceutical supplementation (De Steur et al., 2017) and was an important strategy to reduce malnutrition, especially in developing countries (Talsma et al., 2017; Saenchai et al., 2021).

According to Trijatmiko et al. (2016), biofortification was an activity carried out through the assembly of functional rice varieties that contributes to increasing the antioxidant (anthocyanin) content in rice which was beneficial for health. The production of superior functional rice varieties with high yields, early maturity, resistance to major pests and diseases, and high rice quality plays an important role in meeting functional food needs, increasing farmers' income and contributing to improving public health. The results of research conducted by Wirth et al. (2009) stated that the Fe content in biofortification of rice plants through genetic engineering based on transgenic technology could increase 6.3 times several rice varieties, whereas according to Johnson et al. (2011), the Zn content will increase 2.0 times.

The South Sumatra Provincial Government through the Budget of the South Sumatra Province Department of Agriculture, Food Crops and Horticulture, sourced from the Indonesian Ministry of Agriculture's APBN funds, since 2021 has begun implementing Biofortified Rice Development activities covering an area of 1,000 Ha in South OKU Regency, followed by 1,000 Ha in Lahat Regency in 2022 and 8,100 Ha. Ha in 2023 will be spread across the districts of South OKU, Lahat, Empat Lawang, Muara Enim, Musi Rawas, Ogan Ilir, OKU and East OKU (Table 1).

Table 1. Biofortified rice development activities covering in South Sumatra on 2021, 2022, and 2023

District	Area (Ha)		
	2021	2022	2023
OKU Selatan	1,000		500
Lahat		1,000	1,500
Empat Lawang			1,100
Muara Enim			2,200
Musi Rawas			400
Ogan Ilir			200
OKU			200
OKU Timur			2,000
Total	1,000	1,000	8,100

In 2023, apart from receiving an allocation for Biofortified rice development activities in the Provincial Assistance Task budget covering an area of 1000 Ha allocated to Muara Enim, Musi Rawas, Ogan Ilir and OKU Regencies, South Sumatra Province will also receive an activity allocation through the Assistance Task budget in the Ministry The farm covers an area of 7,100 Ha spread across South OKU, Lahat, Empat Lawang Regencies, Muara Enim and East OKU.

The aimed of developing Biofortified Rice was expected to encourage increased production of Biofortified Rice, especially in South Sumatra Province, which will produce rice with a higher Zinc content because along with the development of science and technology, in our daily lives the function of rice was not only as a source of carbohydrates but also plays a role in health functions as a source of functional food (Windiyani & Rusdianto, 2020).

The targets for developing rice rich in Fe and Zn were people who do not have the ability to buy animal foods rich in iron and zinc with high bioviability. People from this group rely on rice as a staple food source as well as a source of minerals that could be consumed every day, while the Fe content in ordinary milled rice was quite low. Biofortified rice produced from the Biofortified Rice Development Activity could be used as a complement to the food diversification program that has been developed by the government as one of the efforts made to overcome nutritional problems in society, especially those from economically weak groups (Shaw & Friedman, 2011). The development of Biofortified rice in South Sumatra Province, apart from being carried out as an effort to prevent stunting from an early age through complementary food sources of nutrition, could

also increase farmers' opinions because the selling price of the rice produced was higher than ordinary rice.

REDUCTION OF STUNTING RATES IN SOUTH SUMATRA PROVINCE

The selection of locations for Biofortified Rice Development activities in South Sumatra Province was based on the still high stunting rate in each district receiving activity aid allocations. In this activity, each hectare of land assisted receives an allocation of 25 kg of biofortified rice seeds plus other inputs (NPK fertilizer, biological fertilizer and organic amendments). The average per hectare yield obtained by farmers receiving assistance in South OKU Regency and Lahat Regency was 5.28 tons of GKP and 5.08 tons of GKP respectively. The average prevalence of stunting in South Sumatra Province based on the 2022 SSGI results has decreased from 2021 by around 6.2% from 24.8% to 18.6% below the national level but still above the RPJMN target of 14% in 2024. Survey results data SSGI showed that out of 17 regencies/cities, 8 regencies/cities have a stunting rate of less than 18.6% with the lowest stunting rate being 11.6% in Pagar Alam City, while there were 9 other regencies/cities that still have stunting rates above 18.6% with The highest stunting value was 25.4% in Musi Rawas Regency (Figure 1).

According to Almatsier (2012) selecting and consuming good food will influence the fulfillment of daily nutritional needs to carry out and maintain normal body functions, conversely, if the food selected and consumed was not appropriate (both in quality and quantity), then the body will lack nutrients. -certain essential nutrients.

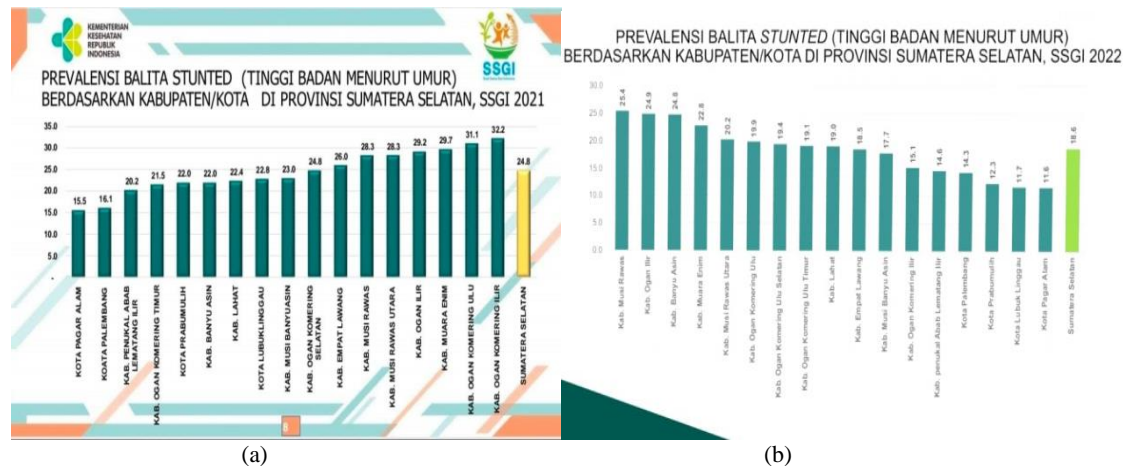


Figure 1. Distribution of district/city stunting rates in 2021 (a) and 2022 (b) in South Sumatra Province (Data source from the 2021 and 2022 Indonesian Nutrition Status Survey)

One of the PMT activities that was routinely carried out at the Community Health Center or Posyandu was to provide and provide additional nutritious food to meet the nutritional needs of the community, especially those who live nearby.

Indonesia was still experiencing an increase in stunting rates due to insufficient intake of micronutrients, especially iron, which could cause serious anemia problems (Astuti et al., 2013). One of the government programs in an effort to reduce stunting rates programmed by the Ministry of Villages, Development of Disadvantaged Regions and Transmigration was giving pregnant women a minimum of 90 iron tablets during pregnancy (Kemendesa, 2017). In line with these activities, Nutrizink rice produced from the Biofortified Rice Development activity could be an alternative additional food that could be given to the community, especially to adolescent women, adult women and pregnant women and toddlers to meet nutritional needs, especially Fe and Zn elements in an effort to reduce the number of stunting in South Sumatra Province. Providing additional food with nutritional intake containing high levels of Fe and Zn through PMT to adolescent and adult women, especially unmarried women, was an initial step in preventing stunting from an early age.

CONCLUSION

One effort that can be made to reduce stunting rates is through the consumption of nutrizink rice produced from the development of Biofortified rice. A decrease in the prevalence of stunting

occurred in several districts that developed Biofortified rice. Efforts to reduce stunting rates in South Sumatra Province need to be intensively carried out quickly through the development of Biofortified rice cultivation more widely and continuously for each planting season and paddy field typology.

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