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Analysis Quality Value of Rice Agroindustry in Agam District

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A B S T R A C T

The rice agroindustry is a business that carries out post-harvest handling activities in the form of drying processes, processing grain into rice, and marketing rice. In the grain drying process, it is necessary to pay attention to the moisture content so that the rice produced is of high quality. The grain moisture content that must be achieved for grain storage and milling is 14%. This study aims to analyze the quality characteristics of rice in Agam Regency. This research used a purposive sampling method. The results showed that the water content of rice in Agam Regency ranged from 12.05- 13.41% and the quality of rice in Agam Regency was classified as medium rice with a head grain range of 76-82%, while the SNI 6128 2020 standard for premium rice on the head grain was at least 85%.

Contribution to Sustainable Development Goals (SDGs):
SDG 2: Zero Hunger
SDG 8: Decent Work and Economic Growth
SDG 9: Industry, Innovation, and Infrastructure
SDG 12: Responsible Consumption and Production
SDG 17: Partnerships for the Goals

1. INTRODUCTION

1.1. Research Background

West Sumatra's rice production 2022 by district or city amounted to 795,306.4 kg. The potential area of paddy fields supports the high rice production in Agam Regency. The raw rice field area in Agam Regency reached 26,330.13 ha. In 2022 the rice harvest area was 70,156 ha with a total production of 392,873.6 tons of GKG (milled dry grain). Milled dry grain is harvested dry grain that has been dried. Usually, farmers sell their grain directly to intermediary traders or the closest rice agroindustry to the land in the form of dry harvested grain.

Rice agroindustry is a business that carries out post-harvest handling activities in the form of drying processes, processing grain into rice, and marketing rice. In the grain drying process, it is necessary to pay attention to the moisture content so that the rice produced is of high quality. The grain moisture content that must be achieved for grain storage and milling is 14% [1]. Grain content above 14% is Gabah Kering Panen (GKP), and 14% moisture content is called Gabah Kering Giling (GKG).

The role of the rice agroindustry is very important in determining the quality of the rice produced. The quality of the grain used influences the quality of the rice produced. Grain harvested in the rainy season and then stacked in the milling warehouse lowers the quality of the rice produced. Agroindustries that process grain into rice still do not pay attention to the quality produced, so in each agroindustry, there is no grade or group of rice quality according to Indonesian National Standards (SNI). The rice produced is marketed in one-sack packages without being equipped with a quality standard description, so marketing is limited to certain consumers only.

1.2. Literature Review

1.2.1. Grain Postharvest Handling

The rice plant is a plant that belongs to the family Poacea or grasses and is a species of Oryza Sativa L. Rice cultivation is widely practiced in several parts of the world because it is a staple food for some of the world's population. The countries that produce the most rice are the People's Republic of China, which produces about 31% of the total world rice production, followed by India, 20%, and Indonesia, 9%. Indonesia's rice production has not met the needs of its people so Indonesia needs to import rice from abroad. Indonesia imports rice, accounting for 14% of the total rice traded globally [2].

In drying activities the moisture content of the grain is reduced. Grain moisture content during milling will affect the physical quality of the rice. Grain moisture content is the water content contained in the grain, which is expressed in units of percent. According to [3], grain moisture content of less than 14.2% or more than 14.2% will reduce the physical quality of rice. Grain moisture content that is not optimal will produce more broken rice.

Grain that has met the requirements with a moisture content of 14.2% can be milled. The grain milling system is a series of machines that carry out the process of milling grain, namely from dry milled grain to rice ready for consumption [4]. The series of grain-milling equipment is commonly called a rice milling unit (RMU). The grain milling process carried out through the rice milling unit certainly provides added value based on the yield produced. Research results [5] added value obtained from large-scale rice mills amounted to Rp 417.74 with a percentage of 65% and small-scale rice mills amounted to Rp 240.00 with a percentage of 35%.

1.2.2. Rice Attributes

Rice refers to grains of rice (paddy) removed from their hulls, which have had their outer layers removed through milling and polishing using hullers, grinders, and polishers. Rice is the main product derived from the milling of rice harvested from the rice plant, where all the husk layers are removed, and all or part of the bran and rice bran layers are divided. If the rice is only stripped of its outer layer or husk, it is referred to as brown rice. Brown rice from which all or part of the outer layer has been removed during the polishing process is referred to as milled rice [6].

1.2.3. Rice Quality

Ref. [7] states that rice quality standards in Indonesia depend more on consumer preferences, and the quality of rice available in the Indonesian market today varies and tends to be inconsistent due to the mixing of different rice varieties and often the addition of bleaching agents or other aromas, which can change the physical characteristics of the rice. According to the Indonesian National Standard (SNI) 2020, there are several general criteria for setting national rice quality standards, namely a) Rice that has been stored for a long time and is free from pests and diseases usually begins to attract weevils; the presence of weevils indicates that the rice is free from chemicals, but not the best quality rice. b) Fresh rice can also contain weevils as it can be contaminated by other rice that already contains weevils. Aged rice (over a month old) usually has a faint, musty aroma, especially before milling or if the grain is not thoroughly dried. Free from a mixture of bran and rice bran. c) Free from chemicals that are harmful and detrimental to consumers.

1.3. Research Objective

This study aims to analyze the quality characteristics of rice in Agam Regency.

2. MATERIALS AND METHODS

2.1. Research Location

The research was conducted in Agam Regency, West Sumatra Province. The study focused on the sub-districts of Ampek Angkek, Candung, Baso, Tilatang Kamang and Kamang Magek. The research location was chosen because it considers that this sub- subdistrict is the center of rice in Agam Regency through West Sumatra Governor Decree No. 525-757-2021.

This study used a purposive sampling method with the following criteria for selecting research samples: (1) the location of the agroindustry is in the center of grain production with an average production above 20 tons/year, (2) the agroindustry is actively operating with a minimum of 500 kg of raw material per process, (3) the agroindustry has a grinding machine with a grinding capacity of 0.75 tons or more, and (4) processing grain until marketing rice products.

2.2. Materials and Tools

The materials used in this study include rice obtained from Agam Regency, West Sumatra. The tools used in this research are questionnaire forms, office stationery, analytical tools in the form of glass, ovens, spoons, spatulas, label paper, analytical scales.

2.3. Research Design

This research is descriptive. Descriptive research is research that describes the characteristics or properties of a situation. According to [8], “descriptive research is research that answers questions related to the object of research”.

Sample withdrawal is done by judgmental sampling. According to [8], “judmental sampling can be used to obtain information based on certain criteria following the research objectives”. Added [8], “A more specific judgmental sampling method with this is purposive sampling, namely the selection of samples based on personal research expected to represent the existing population.”

2.4. Research Procedure

The primary and secondary data in this study were primary and secondary data. Primary data was obtained from relevant parties such as rice agroindustry owners, the Food Service, the Agriculture Service, farmers and consumers. Secondary data was taken from the Central Bureau of Statistics, Food Service, Agriculture Service, and literature studies. Primary data collection techniques can be done by means of interviews, observations, laboratory tests, and questionnaires.

2.4.1. Interview

Interviews were conducted with rice agroindustry owners to obtain data to determine the added value of rice agroindustry.

2.4.2. Observation

The observation technique was used to obtain data on rice quality and internal and external factors of the agroindustry.

2.4.3. Laboratory Testing

The National Standardization Agency (2020) guides the resulting rice quality standard. In this rice SNI, there are two indicators, namely, general quality requirements and special quality requirements. General rice quality requirements consist of (1) free from pests and diseases, (2) free from musty, sour, or other foreign odors, (3) free from a mixture of bran or rice bran for whiteness rice, (4) minimum whiteness degree of 95%, (5) maximum moisture content of 14%, (6) free from chemicals that are harmful and detrimental, and safe for consumers.

Specific quality requirements for rice consist of: (1) head grains (%), (2) broken grains (%), (3) groats (%), (4) red grains (%), (5) damaged grains (%), (6) lime grains (%), (7) foreign bodies (%), (8) grains (grains/100 g).

2.4.4. Analysis Method

Tests are carried out to determine the quality of rice following SNI 6128: 2020. Moisture content can be determined by the gravimetric method following AOAC Official Method 925.10.

3. RESULT AND DISCUSSION

3.1. Rice Quality Analysis

The physical characteristics of paddy examined from collection to milling include paddy moisture level, paddy size and appearance, whole paddy and husked paddy, and cracks in the paddy. The physical characteristics of paddy will affect the amount of milled yield produced [9]. Ref. [10] indicated that the factors of moisture content, hull content, and paddy type strongly influence the paddy standard in Indonesia. Research findings conducted by Ref. [11] showed that rice varieties significantly affect milling yield and yield loss. According to Ref. [12], the standard of paddy and rice is affected by inadequate post-harvest management, which can reduce the quality and quantity of paddy and rice.

SNI 6128 of 2020 serves as the standard for categorizing rice quality classes in Indonesia, while in 2017, the Indonesian Minister of Agriculture issued MOA No. 31 on rice quality classes as the basis for revising the rice SNI to refresh the national rice standard. The results of the rice quality analysis are presented in Figure 1.

No	Komponen mutu	Satuan	Agroindustri Beras				
			Ampek Angkek	Candung	Tilatang Kamang	Baso	Kamang Magek
1	Kadar Air	%	13,3	13,04	12,05	13,41	12,22
2	Drajat Sosoh	%	100	100	100	100	100
3	Butir Kepala	%	81	78	76	82	79
4	Butir Patah	%	18	20	21	16	18
5	Butir menir	%	1	2	3	2	3
6	Butir Rusak	%	0.5	1	2	0.5	2
7	Butir Kapur	%	0.5	0.5	0.5	0.5	2
8	Benda Asing	%	0	0	0	0	0

Figure 1. Rice Quality Analysis.

Findings from the rice quality component tests presented in Figure 1 show differences in the percentage of moisture content, degree of whiteness, head rice, broken rice, groats, broken grains, calcified grains, and foreign matter/grains. Different quality test results can be influenced by the type and nature of the grain, milling techniques and equipment, the quality of the rice used, and the quality of the rice.

3.1.1. Water Content

The analysis showed that the moisture content of the sample rice ranged from 12.05% to 13.41%. According to rice quality standards, the moisture content of the sample rice meets the criteria for medium and premium rice quality, with an upper limit of 14% moisture content. The moisture content of rice, whether high or low, is influenced by the moisture content of the milled dry grain (MDG). The analysis showed that the moisture content of GKG from the five agroindustries ranged from 12.05% - 13.41%. The grain drying process has been carried out on adequate drying floors. However, farmers usually do not have a device to measure the moisture content, which means that operators perform quality control of the drying process by subjectively assessing the dryness of the grain.

At humidity levels of 65-95% and temperatures between 30-33.8 ^{o}C, rice with a moisture content of 12% is relatively stable in storage when compared to rice with a moisture content of 13.04-13.41%, as it is closer to the equilibrium moisture content (EMC) for rice, which is between 15.5-18.8%. Storage at low air humidity is required to reduce the absorption of water from the air into the rice and inhibit the activity of microorganisms and fungi [13].

3.1.2. Degree of Rice Shredding

The shucking process impacts the properties of the rice that has been produced. Excessive or insufficient shaving will affect the appearance and nutritional value of the rice produced. Over-milling will result in rice with lower moisture, ash, fat, and protein content, while the carbohydrate content remains unchanged. Carbohydrates accumulate in the endosperm, the largest part of the rice grain [14]. The research results by Ref. [15] showed that the degree of shaving affects the amylose content, starch digestibility, and dietary fiber present in rice. The degree of shucking can affect the concentration of Zn in rice; greater shucking leads to a decrease in Zn levels [16]. The quality level of rice can be evaluated based on the degree of shucking. The results of the shaving degree observation can be seen in Figure 2.

The results of the tests carried out can be seen in Figure 1. The rice sample has a 100% degree of shaving, this indicates that the shaving process is carried out perfectly. The rice shaving used in the tested samples meets the standards for medium- and high-quality rice (minimum degree of shaving value of 95%).

3.1.3. Head Rice, Broken Grain, and Damaged Grain

Various post-harvest practices can cause differences in the proportion of head rice and broken rice. The rice samples showed a percentage of head rice that varied from a minimum of 76% to a maximum of 82.0%. Figure 1 shows that the head rice quality analysis results show that none of the samples meet the premium rice quality criteria, but all rice mills meet the requirements of the medium rice standard. Several factors can cause high broken grains,

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such as the moisture level of the rice, the condition of equipment and machinery, and operator subjectivity.

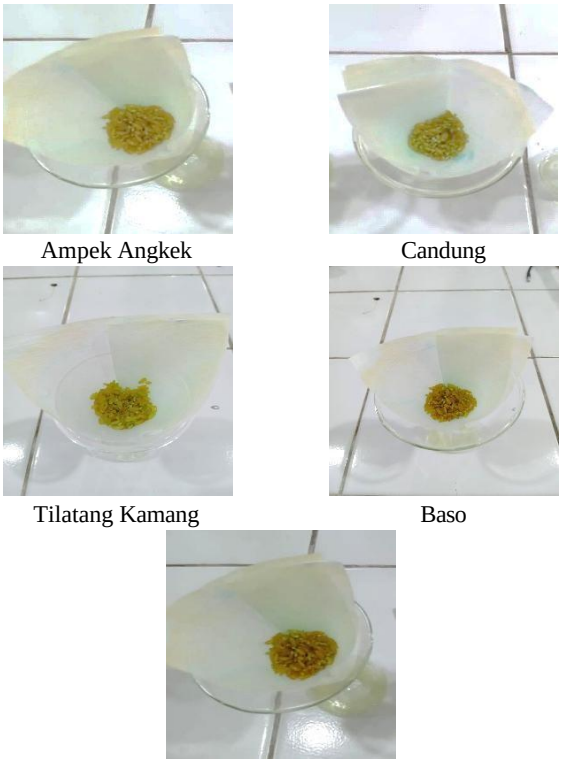

Figure 2. Rice shucking.

3.1.4. Foreign matter

Foreign matter in rice refers to non-rice objects mixed with rice during harvesting or threshing. Foreign matter commonly mixed in rice consists of stones, grains, and other objects [6]. This study's samples are classified as super head quality according to the Indonesian National Standard and are expected to be free of foreign matter. Based on the data collected from the field, the samples did not contain any foreign matter with the lowest percentage being 0%.

Although the rice from the five industries is not categorized into the premium grade due to its high broken grain and groat content, this does not eliminate the potential initiatives to increase the economic selling value of the rice. One approach is to process the groats into rice flour, which can be used as raw material for making wet noodles

4. CONCLUSION

The results of the moisture content analysis and degree of shredded rice samples of all agroindustries follow SNI 2020 of 12.05-13.41%. The special quality class of rice based on SNI for Ampek Angkek and Baso agroindustries is in the Medium 1 quality class. Candung, Tilatang Kamang, and Kamang Magek agro-industries fall into the Medium 2 quality class.

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