Increasing the Competitiveness of Agroindustry Sago Products through Resource Optimization

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Abstract— **The main source of agro-industrial raw materials mainstay of Meranti Islands Regency is Sago plants. The research aims to optimize resource use to increase the Sago agro-industrial competitiveness. Surveys were used as the research method. The census was chosen to take 56 respondents for review. SEM-PLS and Diamond Porters used data analysis methods—factors condition: natural, human, scientific, capital, and infrastructure resources. Demand conditions include household or small industry demand, export demand, and demand between districts, provinces, and countries. Related and supporting industries include manufacturing, home, distribution of Sago farmers, Sago refineries ownership, and a sewage treatment industry. Firm structure, strategy, and rivalry have competition between regions and countries and create labor. The government's role includes ease of licensing, research on Sago, land mapping, access to capital, and coaching. Chances include domestic political conditions and the use of social media. Competitiveness can be reflected in business profits. Results of the research show that demand conditions, firm structure, factor conditions, related and supporting industries, strategy and business competition, government involvement, and chances were determinants of increasing competitiveness of the agro-industrial Sago product. However, the condition factors (physical/natural resources, infrastructure resources, human resources, capital resources, and scientific resources) determine the most. In the future, utilization conditions need to be optimized to increase the competitiveness of the Sago agro-industrial as well as improve the welfare of the community.**

Keywords—**Competitiveness; agroindustry; Sago; natural resources; human resources.**

I. INTRODUCTION

Sago is one of the reliable agricultural products to develop the future industry. The farm industry contributes to economic growth, employment creation, and inequality reduction in developing nations. Therefore, agricultural commodities concern academics and policymakers because their prices fluctuate[1]. Farmers always strive to get high economic benefits from their products. In low-income countries, many producers of agricultural products in the global market have strong competitiveness [2].

Meranti Islands Regency has the most prominent public Sago plantation in Indonesia, and its production level is high. Data to statistics from 2020, the Sago plantation in the Riau Province's Meranti Islands covered 51,750 hectares and produced 351,967 tons of Sago. Meranti Sago production and 74.43% of national Sago production. Among the Sago cultivating commodities, the starch that the Sago plant generates is a necessary food [3]. In addition, extracts from Sago stems are also used for non-food [4]. Extensive Sago plantations can make Sago agro-industrial a mainstay to improve the economy of the people of Meranti Islands. In Thailand, in Sago wetlands, various species of fish are economically profitable [5]. A business will be successfully conducted in an area if government policies support it.

Government attention to smallholder plantations is needed to improve the standard of agricultural output and farmers' income[6]. Community plantations require financial support and careful planning [7]. Size and economies of scale are essential issues in the agricultural business and many industries [8]. Therefore, core competencies must be developed in the company.

Sago agroindustry is an activity that is widely carried out and can be relied upon by the Meranti community. In several Sago production areas in Indonesia, Sago has become the local community's wisdom and has excellent potential to meet culinary and industrial needs. Sago is also a staple food.

However, rice is the leading staple food consumed by the people of Indonesia [9]. In developing countries, regulation must be designed for optimal development, as it is urgently needed for price control [10]. According to Khadzhynova et al. [11], some of the policy consequences for Southeast Asian countries dealing with the problem of food insecurity for that there are three aspects of concern: food availability, accessibility, and stability. The global food crisis is partly due to the rise in food consumption and the decline in rice output [12]. Many Asian developing nations still experience food insecurity [13]. Sago reliably supports food security due to its high carbohydrate content. Currently, the technology used in the Sago agroindustry of the Meranti islands is still simple. However, the people of Meranti are strongly motivated to run their businesses.

The problem small industries face in general is product competitiveness [14]. The pressure of globalization demands companies to increase product competitiveness. Products that have high competitiveness will be more accepted by the market, both domestic and international market. Regarding agro-industrial, Sago has development prospects. Sago and its derivatives can be used as food and non-food ingredients. However, its use in the non-food industry is still limited [15]. According to Ansanay et al. [16], Sago starch has unique functional properties that allow it to be employed for both culinary and non-food applications. Therefore, Sago agroindustry can be relied on to boost the economy of the Meranti Islands [17].

An industry known as "agroindustries" uses agricultural products as its primary source of raw materials [18]. Agriculture-related economic activities require natural resources, processing, and storage of final goods [19]. Although this activity has been practiced for a very long period in the Sago agricultural sector in the Meranti Islands, it has not been practiced in an ideal manner. Its development of it will undoubtedly provide income and welfare for the community. The level of community welfare can improve people's conditions [20]. More competition can result in enhanced community welfare [21]. Interest can be achieved when the company has a quality and competitive product. Quality and competitive products can be influenced by many factors, including human resources [22], [23]. Diamond Poter's Theory states there are four primary components (demand conditions, factor conditions, supporting industries, and firm structure strategy and rivalry, related), and two additional components (role of government and chances) is a theory that researchers widely use to analyze factors related to commodity competitiveness, such as research to various micro, small and medium enterprises (MSMEs) [24], paddy industry [25]. Small and medium enterprises (SMEs) can be influenced by strategic factors, namely opportunities, threats, strengths and weaknesses [32].

The Sago agro-industrial business in Meranti Islands is also trying to develop its business and increase competitiveness. However, the weak information obtained by Sago entrepreneurs related to their competitiveness makes this business grow slowly. The public does not yet know the most dominant factor as a determinant of the competitiveness of the Sago agro-industrial. Therefore, this research is essential to do. This study examines the factors that can increase the competitiveness of Sago agro-industrial products.

II. Materials and Method

The Research is done using quantitative methodologies. The survey has been conducted on 56 people's Sago refineries in the Meranti Islands Regency. Data collection was taken from interviews with agro-industrial Sago owners. SEM-PLS version 3.0, Likert scales, and diamond porters were the analytical techniques used in this study. The analytical framework from Diamond Poter's Theory approach consists of four primary and two additional components.

Factors condition (FC) includes physical or natural resources (origin and availability of raw materials, availability of water), human resources (heritage of human resources, education, skill), scientific resources (technology used), capital resources (availability of capital, origin of money), and infrastructure resources (location of Sago refinery, port location, and transportation). Demand conditions (DC) include household or small industry demand, export demand, and demand between districts, provinces, and countries. Related and supporting industries (RS) include manufacturing industries made from Sago, household industry, Sago farmers' distribution, Sago refineries' ownership, and a sewage treatment industry. Firm structure, strategy, and rivalry (FS) include competition between regions and countries and employment. The role of government (GV) is to provide ease of licensing, research on Sago, land mapping, access to capital, and development. Chances (CH) include domestic political conditions and utilization of social media. Furthermore, competitiveness (CV) can be reflected in business profits.

III. Results and Discussion

A. Measurement and Structural Model

Validity and reliability tests are used to determine the measuring model of the Meranti Islands' Sago industry's competitiveness. Convergent validity and discriminant validity are documented in the outer validity test for reliability as determined by composite reliability. Convergent validity was used to determine the correlation between the leveling item and the construct in the study. If an item's correlation with the measurement construct is more than 0.70, it is considered to have a large individual size. However, a loading factor value of 0.50 to 0.60 is seen as sufficient for the preliminary investigation of the construction of the measurement scale. The variables in this study are Factor Conditions (12 items), Demand Condition (2 items), related and supporting industries (5 items), firm Structure, Strategy, and Rivalry (3 items), Role of Government (5 items), and Chances (2 items). Based on the validity test, 3 items (FC5, GV1, and GV3) are invalid; the loading factor value < 0.6, so it was removed from the model. The validity test results for the last stage are shown in Figure 1.

The next test for the Average Variance Extracted (AVE) value demonstrates convergent validity. The model condition has good validity if each latent variable has an AVE value of > 0.50. This meant that, on average, one latent variable might explain more than half of the variations in its indicators. Furthermore, the composite reliability value, Cronbach's Alpha are indicators of the reliability test, and a positive outcome is indicated by a number above 0.7. The reliability test results are shown in Table I.
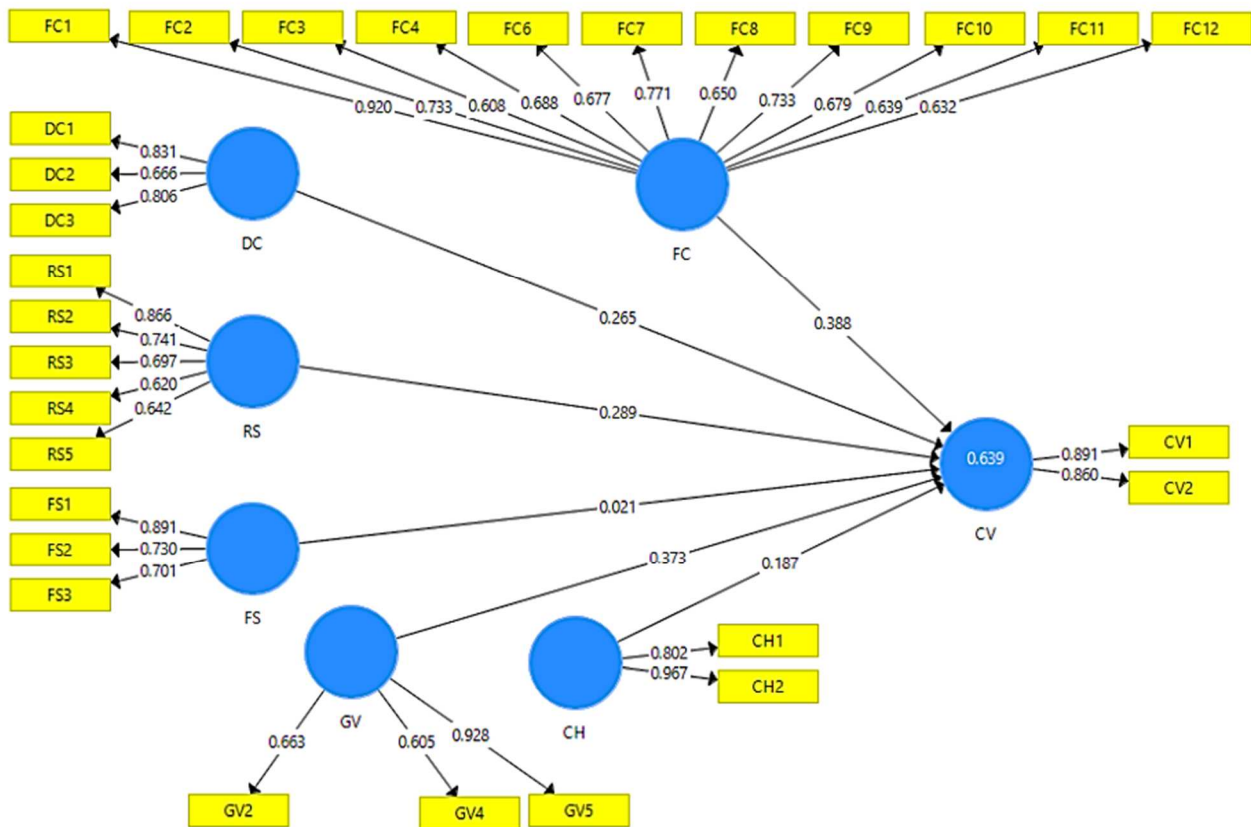
Fig. 1 Final Validity Test

TABLE I
RELIABILITY TEST RESULTS

	Cronbach's Alpha	Average Variance Extracted (AVE)	Composite Reliability
Competitiveness	0.696	0.767	0.869
Factors condition	0.875	0.501	0.896
Demand condition	0.680	0.594	0.813
Supporting related industry	0.761	0.516	0.840
Firm structure, strategy, and rivalry	0.702	0.606	0.820
The role of government	0.641	0.556	0.784
Chances	0.767	0.788	0.881

In Table I, the composite reliability test results for each variable seem to be greater than 0.70, and Cronbach's Alpha is greater than 0.6. This demonstrates that the variables employed are trustworthy and can be used repeatedly in hypothesis testing. Evaluation of structural models is used to assess the strength of the relationship between latent variables and construction. It is shown to value the path and determination coefficients (R^2). The goodness fit of the model was measured using R-square and Q-square. The value of the coefficient of determination (R^2) in this study was obtained at 0.639. That is, 63.90% of Sago agroindustry competitiveness in Meranti is determined by factor conditions, demand, industrial presence, strategy, firm structure and competition, the role of government, and chances. The value of Q^2 was

obtained by 0.361 > 0. It means that the model has predictive relevance. In PLS, testing each relationship was performed using bootstrapping simulation. The purpose of this exam is to reduce the issue of aberrant research data. Table II shows the values of the path coefficients.

TABLE II
VALUE OF PATH COEFFICIENT

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (| O/STERR |)	P Value
FC → Competitiveness	0.388	0.368	0.085	4.552	0.000
DC → Competitiveness	0.265	0.251	0.069	3.857	0.000
RS → Competitiveness	0.289	0.279	0.095	3.053	0.002
FS → Competitiveness	0.021	0.059	0.141	0.149	0.882
GV→ Competitiveness	0.373	0.351	0.113	3.311	0.001
CH → Competitiveness	0.187	0.162	0.085	2.183	0.030

The T-statistic value indicates the significance of the variable, while the path coefficient suggests the nature of the relationship between the variables (positive or negative). The probability value can be seen from the significance of the P value smaller than 0.05 because several variables influence it.

If the effect is insignificant, the P value will appear to be greater than or equal to 0.05. Based on Table II, the essential variables determining Sago industries' competitiveness are factor conditions, demand factors, supporting related industries, the government's participation, and chance. The result shows from the analysis were factor condition, demand condition, supporting related industry, firm structure, the role of government and chances, all original values of the sample (path coefficient) positive, and significant, except the firm structure, strategi dan rivalry, where path coefficient positive and insignificance.

B. Discussion

The community-managed Sago agroindustry business in Meranti needs improvement. The results revealed that the condition of these factors has a significant and positive effect on the ability of the Sago agroindustry products of the Meranti community to compete. This factor determines the competitiveness of Sago agroindustry products. A factor condition is a condition that describes a country's position in the elements of production (inputs needed to compete) in an industry. Features in the Sago agroindustry include physical or natural, human, scientific, capital, and infrastructure resources.

Physical or natural resources in the agro-industrial are related to the source of raw materials. Sago agroindustry requires raw materials. The raw material for the Sago agroindustry business was Sago palm. Sago palm resulted from Sago stem; Sago stems cut to a length of about 110 cm. If appropriately managed, Meranti Islands can produce high-quality raw materials (Sago palm) in high quantities. Sago comes in three varieties: thorny, non-thorny (Sago Load), and a rare thorny kind (Sangka Sago). However, the type of Sago that is widely used is thorn Sago; its distribution is wider because pests of wild boars, monkeys, and langurs damage other kinds of sapling or young Sago. The dry starch production per tree is 226.34 kg, carbohydrate content 88.19%, and the moisture content 10.36%, with one Sago thorn stem containing 8.5 Sago palm. Under Selat Panjang Meranti, Sago thorns have been made available as a national high-yielding cultivar. Guaranteed quality and quantity of Sago raw materials can increase the competitiveness of the Sago agroindustry [26].

The raw material for the Sago agroindustry business comes from the Meranti area. In the Meranti Islands, Sago plantations may be found in every area. The owner of the Sago refinery and his family also own a Sago plantation. The raw material (Sago palm) is the basic ingredient processed by the Sago refinery in Meranti to produce dried Sago flour. Agribusiness organizations use production contracts more often to synchronize their supply chains because they need a regular supply of quality agricultural raw materials [27].
In the Sago agroindustry, around the Sago refinery, there are people's Sago plantations. The existence of this plantation will meet the needs of raw materials in production.

Processing Sago palm into Sago flour requires much water. Water is essential and needed by humans for plants, drinking, industrial support, and ecosystems [28]. The Meranti Sago agroindustry water resources are obtained from water sources around the refinery. The Sago refinery was located near the coast in a riverside area. The existence of rivers around the

Sago refinery can support Sago agroindustry activities, especially as a means of transportation. Raw materials (Sago palm) before processing are stored along the river near the refinery so as not to be damaged. The process starts with transporting Sago palm from its stockpile in the river to the refinery, which is then processed to produce Sago flour.

Sago processing requires quite a lot of water, and the Sago palm was peeled and grated, watered, and accommodated in a tank filled with water. Water was also used to extract Sago starch, which separates the trash from Sago starch. So that the garbage does not drift into the reservoir, a filter cloth is used. The swimming pool can store up to 30 tons of Sago starch. Next, washing is carried out, and the drying stage is to reduce the moisture content and speed up drying using a rotary vacuum machine. The next step is drying. The drying of Sago starch carried out by the people's Sago business in Meranti Islands Regency varies, which traditionally uses sunlight for 2-3 days, depending on the weather. Drying with a burning oven utilizes solid waste (Sago skin) that is burned, and the work floor is made of zinc or cement to transmit heat. Some entrepreneurs also carry out the combined method. That is, the result obtained with sunlight and an oven is better. Drying can also be done with flash dryers, dryers used in industry through evaporation to dry wet materials, with faster drying time. Increasing the competitiveness of the Sago agro-industrial can be done by improving technology. The use of better technology, with quality raw materials, in addition to increasing productivity. The competitiveness of Sago flour products is determined by the quality and quality they possess. Natural resources will be the basis of product competitiveness in the international market if it gets a touch of technology from entrepreneurs.

Human resources in the Sago agro-industrial are generally obtained from around the Meranti Islands Regency and Java Island. The number of workers working in each factory ranges from 15 to 39 people. The education level of the workers was primary school at 22.58%, junior high school at 32.26%, senior high school at 41.94%, and university at 3.23%. Workers from Java Island dominated the labor force of the factory. They have been skilled in Sago processing activities such as palm stripping, splitting, and stirring Sago, while administrative personnel is dominated by local labor.

The people's Sago refinery in the Meranti Islands still uses simple technology and is semi-mechanical [15]. They still use old, modified equipment, so the products produced are not optimal. Therefore, the availability of science and technology resources such as universities, research institutions, and other knowledge sources must be optimized, which can support increased competitiveness. The Meranti district government provides research institutes and universities opportunities to research Sago.

Capital resources in the Sago agro-industrial are related to the availability of capital, the origin of money. Capital is one of the factors of production that can affect the products produced. The Sago agro-industrial business in Meranti Islands is mostly a heritage business, and its capital also comes from individual capital. However, some refinery owners obtain money by borrowing from existing financial institutions. Agroindustry uses business capital loans to purchase manufacturing equipment, raw material inventories, and marketing costs [29].

Furthermore, infrastructure resources in the Sago agro-industrial business are more directed at economic infrastructure, namely the physical infrastructure needed to support Sago agro-industrial activities, including transportation, telecommunication, and energy infrastructure. Sago agro-industrial activities in Meranti utilize more rivers. The river is used to store stocks of raw materials (Sago palm) so that damage does not occur. The location of the Sago refinery in Meranti is on the edge of the river, so water transportation will facilitate the transportation of raw materials and product distribution. Production of Sago (Sago flour) is transported by ship to the port.

Infrastructure has an essential role in Sago agro-industrial activity. The existence of infrastructure in an area, quality, and quantity can be influenced by geographical conditions, demographics, and social conditions [30]. The availability of an effective and efficient transportation network and other supporting facilities, such as telecommunication and energy, will facilitate transactions between buyers and resellers—the infrastructure system in everyday life. Inadequate road conditions and limited land transportation should concern the government.

The infrastructure to support the Sago agro-industrial business seems to be lacking. In terms of the existence of infrastructure can help trade cheaper and easier to increase competitiveness. According to Malisan et al. [8], seaports and airports are infrastructures the government supports to maintain competitiveness in Korea. However, in archipelagic areas, such as Meranti, water transportation is the dominant transportation used by the community. Optimal utilization of water transportation for the Sago agroindustry is expected to increase the competitiveness of Sago agroindustry products.

To increase the competitiveness of Sago agro-industrial products in the Meranti Islands, optimal utilization of condition factors owned by the region ultimately still requires government policy. The government does not directly affect efforts to increase the industry's competitiveness but involves the determining factors of competitiveness. The government's role is to facilitate efforts to encourage companies in the industry to improve and improve competitiveness. The government can influence the accessibility of business actors to various resources through its policies, such as natural resources, human resources, capital formation, science and technology resources, information, setting product quality standards, and other related policies. Therefore, managing this potential will enhance the nation's position as a successful Sago producer worldwide [31].

IV. CONCLUSIONS

The study's findings offer hints about Diamond Poter elements (conditional variables, demand variables, supporting industries, firm structure, rivalry, government roles, and opportunities) that can be relied upon to increase the competitiveness of the Sago agroindustry in the Meranti Islands Regency. The factors determining competitiveness most are condition factors, including physical/natural, human, scientific, capital, and infrastructure resources. The competitiveness of Sago agro-industrial can be improved by optimizing the utilization of this resource.

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