Acceleration of Sago Food Diversification in Improving the Welfare of Sago Farmers in Riau Province

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Abstract. There have been many efforts to increase agricultural productivity as a step to improve farmers' welfare, one of which is through food diversification. Processing sago into various kinds of processed food products is a strategic to accelerate sago diversification. The market potential for sago starch in Riau Province is quite growing along with the local food products development. The purpose of this study was to analyze practical steps as an acceleration of sago food diversification so that opportunities could be identified in improving the welfare of sago farmers in Riau Province. This study used a survey method through interviews and direct observation regarding raw materials and processing methods for sago-based food products and the development of sago diversification products. As a support, secondary data is used through documents and reports related to local processed food in Riau Province, nutritional aspects, community and farmer empowerment, as well as increasing added value of products as supporting economic aspects. It was analyzed through a comparison between the increase in population and the potential for sago production. The existing diversified sago food products have good consumer acceptance and nutritional aspects.

1. Introduction

Non-rice food diversification is an effort to increase agricultural productivity at the local level and accelerate rural economic growth. The dependence of public food on rice is a consequence of the green revolution as a policy set by the government in the past. It cannot be denied that the popularity of rice as a staple food commodity also increases the selling value of farmers both economically, socially, and politically so that rice farmers, especially in Java, have grown into an interest group with strong bargaining power.

Apart from that, along with the increasing population, rice needs also continue to increase every year. This condition is an opportunity to re-popularize local non-rice food sources such as sago, corn, tubers, etc. Of course, the government's contribution in popularizing non-rice local food must be substantial in the form of partiality through policies, regional strategic plans, and other stimuli.
The Government of Indonesia continues to promote food diversification efforts. To replace the function of rice in Indonesia, there are at least 77 commodities that can be used as alternative food sources. One of the local food sources with great potential to be developed is sago. From data from the Food Crops, Horticulture and Plantation Service of Riau Province in 2019, Riau Province is one of the leading producers of sago in Indonesia, where there is an area of 82,713 ha, consisting of 20,200 ha owned by companies and 60,513 ha owned by communities, with flour production in 2017 recorded at 326,725 tonnes.

In 2016, Riau Province declared sago as one of the superior regional products, with the tagline "Sago Greets the World", which at the same time received an award from MURI, with 369 types of processed products made from sago as recorded. Of course, as a window of information, continuous promotion is needed either directly or through the media.

Riau Province is one of the Sago Plant producing provinces in Indonesia. Riau is an area with the prospect of cultivating sago plantations because part of the plantation land is peatland, located very much to support agricultural activities so that sago plantations develop well. The development of sago as an alternative food must be seen as a colossal work of all government, society, and the business world. The involvement of all stakeholders will increase the competitiveness of sago and open market taps. The positive correlation is that the market will look at the potential of sago as food and non-food raw material.

Sago starch is a suitable alternative food material because its productivity can reach five times that of corn rice. In addition, sago is also the best source of carbohydrates, which can potentially increase food diversification [17]. The starch content in sago averaged 93-95% with 27% amylase and 73% amylopectin, and 0.25% crude protein, and 0.32% fiber [1].

The market potential for sago starch is growing in line with the development of local food products. Therefore, the local Sago Food business opportunity is still quite open for new business people. The sago market, which is still dominated by export needs, is a potential market. In contrast, domestic demand is still dominated by small and medium-sized industries that utilize sago as raw material.

The high potential of productivity sago, coupled with technological developments, the application of sago starch as an innovative food ingredient cannot be separated from its benefits which have a moderate glycemic index (<55) [15]. This makes sago more potential than rice and corn in terms of health. In addition, the gel from sago starch is more rigid with a low adhesion level so that it does not break easily compared to the properties of other starch gels [6].

Several types of food products processed by sago and sago starch have been developed. Some of them include bakery products such as brownies and bread [24, 17, 7]. The sensory palatability of the diversified sago and sago starch products is generally well accepted by consumers [7, 17, 23], so that diversification of food made from sago and sago starch is a sustainable potential.

Increasing market bargaining power for sago certainly positively impacts sago farmers, especially in Riau Province. The market for sago, which has been controlled by two poles, with increasing local market demand, will change the poles into more poles so that farmers have more options to sell their sago.

The popularity of sago as an alternative food source is also in line with the vision of the Government of Indonesia, which continues to drive the informal sectors to continue to grow to meet market demand. The commitment of the Indonesian government must also be followed up by the Regional Government by issuing a priority scale for developing alternative food at the local level. Thus, sago farmers do not have to bother finding a market because clearly, the government is at the forefront of absorbing sago from farmers.

The acceleration of the diversification of non-rice food, especially from sago, has even received appreciation from the business world by placing the Meranti Islands Regency Government as the primary winner of an innovative Regional Government in developing non-rice alternative foods in 2019. In addition, efforts to promote sago as an alternative food source are also carried out through the
Nusantara Sago Festival (FSN), centered in Sungai Tohor Village, Tebing Tinggi Timur Subdistrict, Meranti Islands Regency, Riau Province.

Increasing the bargaining power of sago in a business context opens up opportunities for new economic centers, especially in the Meranti Islands Regency as the largest sago producing area in Riau Province and the other regions in Riau. In addition, market access that continues to grow must also be seen as an opportunity and a threat for sago farmers. The current economic pressure is coherent with the dependence of farmers and capital owners so that farmers are trapped in a closed financial system due to market control by a group of people.

2. Methodology
This study used a qualitative descriptive method to explain the description of the primary data and secondary data collected. This research was conducted in Meranti Islands Regency in 2020 with a total of 50 respondents. Meranti Islands Regency is a peatland area whose main agricultural crop is sago. Data collection was carried out by survey methods, interviews, observation, and documentation of research objects. Preliminary data collected included general data of respondents, product information (raw materials and processing methods), level of processing hygiene (application of suitable food production methods), and product development. Each respondent was only interviewed for one locally processed food product. Secondary data were collected from various reports and documents related to Riau's local processed food from agencies, agencies, related institutions in sustainable food security programs, overcoming nutritional problems, community empowerment, and increasing the added value of products for promotion and development.

3. Result and Discussion

3.1 Potential of Sago Plant
The commodity of processed sago products can be processed and cultivated in the sago plantation and agro-industry business because most of Riau's land is a peatland. Peat is good land for commodity sago crops. From the research results in 2016, there was a diversification of 369 types of processed products made from sago. Riau's local processed products include raw materials, processing methods, value-added analysis, nutritional content, and development prospects.

Table 1. As for the potential of the sago plant

| No | Type of Product                                               | Raw Material               |
|----|--------------------------------------------------------------|----------------------------|
| 1  | Roof, Wall, Traditional Medicine (other handicrafts)         | Leaf                       |
|    | Tepung Sagu, Mie sagu, Gula cair, Cookies, Sago             |                            |
|    | Flour, Sago Noodles, Liquid Sugar, Cookies, Sago Crackers,  | Stalks and Skins           |
|    | Sago Meatballs, Bioethanol (Other food products)             |                            |
|    | Adhesives, paper, partition boards, fuel, compost            | Rods, skins and processed waste |

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Based on reports related to food security, processing, and marketing of agricultural products (Department of Agriculture and Food Security of Riau Province, 2016), the focus of food security is still on the aspect of availability. The elements of distribution, processing of products and increasing added value, diversification of food consumption, and efforts to empower the community's economy, particularly in the food sector, have not received much attention. In the future, the focus of food and
development strategy should be directed to the implementation of a new paradigm food security of sustainable (*Sustainable Food Security Paradigm*). Regional food and nutrition policies need to be endeavored to encourage the provision of services, including: (a) strengthening efforts to increase the production of foodstuffs, both vegetable and animal; (b) development of food agriculture to ensure food security at the family and individual level with a sufficient supply and access to food that is sufficient, nutritionally balanced, and safe, including commodities of vegetables and fruits; (c) development of the food industry, especially the home scale food industry, which can promote the marketing of healthy food industry products; (d) diversification of food and nutrition consumption.

The paradigm of sustainable food security needs to consider four leading indicators [20]:

1. The availability of food (*food availability*) is essential. Still, it is not sufficient to guarantee food security for the community. Although the food limit (availability) is sufficient, if people do not have sufficient purchasing power, there will be a food crisis (*hunger paradox*), for example, malnutrition.

2. Community economic empowerment, especially those of the majority living in rural areas and the urban poor, increase purchasing power (*accessibility*).

3. Resistance to risk (*vulnerability*). The food system must also have sufficient resilience to the risk of a decline in food production due to natural factors, financial, social, and political crises. Therefore a social safety net is an essential component of a sustainable food security system.

4. The aspect of sustainability (*sustainability*). The element of sustainability requires the absence of adverse long-term developments (non-negative long-term trends) for the availability and accessibility of people to food.

The focus of agricultural development in Riau Province must be directed at empowering the post-harvest sector, processing, and marketing agricultural products. Various studies have increased added value, added value economic (increased income), and social added value (increased and job creation). [21] stated that processing food products will provide many benefits: (1) extending the time and availability of agricultural materials, making storage and distribution easier; (2) increasing economic added value in the form of financial benefits; (3) increasing social added value in the form of creating more job opportunities; (4) obtaining food products that are more attractive in terms of appearance (aesthetics), taste, nutrition and other physical characteristics; (5) availability of agricultural waste materials which are still helpful in producing other materials; (6) encourage the growth of other industries that support the agricultural industry, the growth of marketing centers and others.

The modern food industry also develops sago starch as a thickener, emulsifier, and binder, as a sweetener (sugar and syrup). The processed sago starch products currently developing are sago noodles, sago sugar (liquid and dry), sago pilus, sago crackers, sago fat, and sago meatballs.

![Figure 1. Types of Processed Sago Products](image-url)
There are two types of sago products: home industry and industrial products. Processed products processed by the home industry are sago fats, sago crackers, meatballs, sago noodles, and sago pilus. At the same time, the sector is sago sugar (liquid and crystal), sago noodles. Each product has a different marketing strategy because it is influenced by many factors. For example, the area can produce sago and continue to do sago agro-industrial business, including sago noodles and sago sugar. The distribution channels carried out in the marketing of sago products are:

In marketing the sago starch (flour), farmers sell sago starch to distributors in Selatpanjang and Malaysia for sale to consumers. Some sago farmers sell sago starch (starch) to household agro-industries. From this household agro-industry, starch (sago flour) will be processed into sago noodles, sago crackers, rending sago, and so on. Furthermore, the processed products will be sold directly to consumers in the market, and some will be sold directly to consumers in the market. Consumers prefer attractive packaging, price, color, and shape of processed material products.

The industry is a business or activity of processing raw materials or semi-finished goods into finished goods that have added value for profit. In the cocoa processing industry, quality and satisfaction are the main factors in achieving a healthy and economically profitable business profit [8].

The industry has broad linkages, both upstream in increasing farmer income through more competitive prices for cocoa beans and downstream in employment and expansion of the industrial sector and other service sectors [19].

The potential for developing the downstream cocoa industry is still huge when viewed from the abundance of available raw materials and opportunities to obtain added value and the absorption of a vast workforce so that cocoa business players in Indonesia must take advantage of it [16].

3.2 Procurement of Raw Materials

Raw materials are essential materials in a manufacturing company because raw materials are used in the production process. According to [13], raw materials make up a comprehensive part of the finished product. Another opinion is that raw materials are inventory goods purchased for use in the production process [18].

Raw material inventory is an inventory of goods used in the production process. It can be obtained from natural sources, purchased from suppliers, or from companies that produce raw materials for factory companies that use them. The procurement of raw materials before making a product is essential because it will affect the smoothness and quality of the product produced [2]. The following is an example of raw material for Tual sago in plantations.

![Figure 2. Raw material Tual Sago](image)

In addition to the cost of raw materials in carrying out the production process, companies also need supporting materials or supporting materials that only help or support the smooth running of the production process and function to increase revenue efficiency. According to [14], auxiliary materials are not part of the finished product or materials that, although they become finished products, are of relatively small value than the cost of goods manufactured. Auxiliary ingredients have a tiny portion, and even their use can be removed or replaced with other components.
3.3 Nutritional Potential of Sagu 
Sago is an agricultural commodity that can be a source of carbohydrates. Carbohydrates in sago can reach 52% with almost the same quality as carbohydrates in rice flour, potatoes, and cassava, but with a lower glycemic index. So that sago can be used as raw material for agro-industries such as raw materials for the food industry and raw materials for making liquid sugar. Other nutritional potentials of sago are its protein and mineral content, such as calcium, phosphorus, and vitamin B1, and vitamin C. Amylose content of 27% and amylopectin of 73% also dramatically affect the texture of sago starch. With the nutritional content that tends to be complete, the glycemic index value is relatively low. The fiber content in sago can improve the nutritional and sensory quality of processed food products from sago and sago starch.

3.4 The Potential of Sagu Resistant Stars to Health
Sago has a high starch content of 87.13%, with an amylose content of 39.14%, 60.76% amylopectin, and 0.69% resistant starch [9]. The percentage of resistant starch is related to the proportion of amylose and amylopectin contained in the starch structure [11]. The amount of amylose is often directly proportional to the starch's resistant starch. This is because the amylose bonds are more rigid, so they are resistant to digestion in the digestive system compared to amylopectin bonds [10].

Resistant starch (RS) is starch that cannot be digested by digestive enzymes and is resistant to stomach acid to reach the large intestine. It is fermented by probiotic bacteria [25]. [22] reported that resistant starch in food is claimed to have prebiotic properties in their research. The prebiotic content in food can stimulate good natural microbes (probiotics) in the digestive tract [12]. The fermentation of resistant starch by microflora will produce short-chain fatty acids such as butyrate, preventing colon cancer [5]. In addition, resistant starch also has hypoglycemic effects, hypocholesterolemic effects and reduces the risk of gallstone formation [4].

3.5 Food Products of Diversification of Sago and Sago Stars
The development of sago as a non-rice food ingredient should have increased with the number of diversified sago products. Efforts to develop sago agribusiness in Riau Province are expected to provide multiple benefits to the community, government, and related parties. The high number of people who consume sago is because sago is a source of carbohydrate food products other than rice with a taste readily accepted by the community.

Several important things that need to be considered in the utilization of the potential of sago as a component of food security include: 1) diversification of nutritious, attractive, and balanced processed sago products; 2) maintain and improve the sago-based food consumption pattern; 3) guaranteed quality and food safety; 4) utilization of appropriate technology; and 5) efforts to increase added value through refinement and enhancement of highly competitive sago-based processed products [23].

Several diversified food products from sago and sago starch have been produced. According to [7], noodles made from sago starch have organoleptic properties accepted by panelists. Even noodles made from sago starch have the advantage because they contain resistant starch, good for health and digestion.

Another product of sago diversification also has the potential for agribusiness innovation in bakery products. According to [24] and [17], brownies and bread made from a mixture of sago starch have sensory qualities that are not inferior to similar products made from wheat flour. In addition, when viewed from physical attributes such as texture, color, and aroma, processed sago products also attract consumer interest.

The use of sago starch as a raw material for bakery and noodle products needs to be further developed to increase the added value of sago starch and reduce wheat flour consumption. With the increasing number of needs for the use of sago as raw material for food processing, the sustainability of the productivity of the sago plant is also getting higher, so that it can have a positive effect on improving the welfare of sago farmers in Riau Province.
3.6 Social and Welfare Aspects of Sago Farmers
Diversification of food consumption is an effort to establish or cultivate a diverse and balanced, and safe food consumption pattern in sufficient quantity and composition to meet nutritional needs to support a healthy, active, and productive life. The indicator for measuring the level of diversity and the balance of people's food consumption is a score of the Expected Food Pattern (PPH), shown with a value of 95. Diversification of food consumption will provide encouragement and incentives for delivering food products that are more diverse and safe for consumption, including food-based products local resources. In terms of production activities, diversifying food consumption can minimize the risk of monoculture business, reduce price volatility, reduce disturbance to biota in an area, increase farmers' income, and support the preservation of natural resources.

Efforts to develop food consumption can also be used as a momentum for Regional Governments to stimulate new economic growth centers in rural areas. In addition, if viewed from the importance of food self-sufficiency, diversifying food consumption can reduce consumer dependence on a type of food. Thus, diversifying food consumption is the foundation of sustainable food security and has a vast development dimension, both social, economic, and environmental. So far, efforts to diversify food have been carried out by each sector, but there are still significant problems faced in diversifying food consumption today, namely:
1. The score for the quality of diversity and balance of nutritional consumption according to expectations has not been achieved (PPH score only reached 81.9 in 2008). So far, the achievement has been very slow and fluctuating.
2. The high gap in the nutritional quality of food consumption between rural and urban communities
3. There is a downward trend in food consumption based on local resources.
4. Slow development, dissemination, and application of local food processing technology to increase practicality in processing, nutritional value, economic value, social value, image, and acceptance.
5. The provision of incentives for businesses and communities that develop various processed local food products is still not optimal.
6. Lack of facilitation for economic empowerment to improve food accessibility that is diverse, nutritionally balanced, and safe.

Program for increasing community food security to reduce poverty in each region and fulfill the food needs up to the household level in sufficient quantities and of good quality, safe, equitable, and affordable. Law No. 7 Tahim 1996 emphasized that increasing food security is a shared responsibility between the government and society developed through the household level. One of the government's efforts to achieve food security is implemented through Government Regulation (PP) No. 68 of 2002 concerning Food Security, which states that the provision of food is organized to meet the needs of household food consumption which continues to grow over time to time.

PPH is a measure widely used in the analysis of community food diversification and at the regional level. Some of the obstacles that hinder diversification at the household level include the low level of public awareness of the use of yards. The government has not been optimal in counseling about the importance of nutrition for families. Meanwhile, from the institutional aspect, potential institutions have been identified which are expected to be able to narrow the gap (disparity) between actual and potential food patterns, namely arisan groups, PKK recitation groups, posyandu, women farmer groups, collaborative business groups, neighborhood units, dukuh groups, youth groups, groups. religion / custom [3].

4. Conclusion
Sago is a plantation product developed in Riau Province with a very high production value. Sago-based food diversification is carried out as a strategic step to increase the productivity and welfare of sago farmers. The diversification of sago food products has been successfully developed into 369 local processed products in Riau Province. The modern food industry also develops sago starch as a thickener, emulsifier, and binder, as a sweetener (sugar and syrup). The processed sago starch products currently developing are sago noodles, sago sugar (liquid and dry), sago pilus, sago crackers, sago fat,
and sago meatballs. The economic, social, and nutritional aspects of sago food diversification in Riau Province are felt to be very beneficial to the welfare of sago farmers. These potentials can continue to be improved if the gap between the potential resources and opportunities for developing sago food diversification can be identified. The processing that emphasizes quality continues to be enhanced in processing processed sago products in Riau Province.

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