SAGO PALM 29: 39－47 (2021)

Commercialization of sago starch in Indonesia: Production, consumption and international trading

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Keywords: Indonesia, Demand, Production, Sago starch, Trading

Introduction

Starch is one of the essential sources of energy in the diets of humans and animals. Currently, the world production of starch is estimated to be around 85 million tons, which is dominated by corn, potato, and tapioca starches (International Starch Institute, 2020). Starch is used as a binder, thickener, and stabilizer in the food and beverage industries.

Sago is one of the starches that is obtained from the trunk of *Metroxylon sagu* Rottb. It has been used as a staple food, traditional ceremony, and a source of cash income for local communities in Indonesia. Recently, sago has been used in various industries. Thus, it is not only seen as food but also a functional commodity with economic value. However, sago palm is still not considered an important commercial crop at national level.

In order to understand sago starch commercialization, this paper summarizes the current production, consumption, and international trading of sago starch in Indonesia. In addition, key recommendations to promote the commercialization of sago starch will be explained for better utilization and as a consideration in determining the policy direction for sago palm development in the future.

Production of sago starch

The annual global production of sago starch is approximately 656,000 tons, mainly from Sarawak and Indonesia. The sago industry in Sarawak is well established with modernized sago-processing factories and has become an important source of export revenue. In contrast, Indonesia has the biggest sago area, but the national productivity is still quite low. It stated that 85% of the total sago world is located in Indonesia (Directorate General of Estate Crops, 2020), with Riau, Papua, and Sulawesi as major areas for sago palm cultivation. According to data from The Directorate General of Estate Crops, the sago area began to decline sharply at 48,115 ha in 2008 and then peaking at 306,805 ha in 2017 (Figure 1) with the majority of sago areas (96%) and production (76.6%) are owned by smallholders (Figure 2). During 2004-2017, national sago production still grew convincingly, namely from around 14,544 tons in 2004 to about 432,913 tons in 2017. The significant growth of the harvested area was largely due to the growth in the sago area and the result of several programs to increase the production of sago. These programs include the local food diversification program (MP3L) by the Food Security Agency and the Sago Development Program from the Directorate

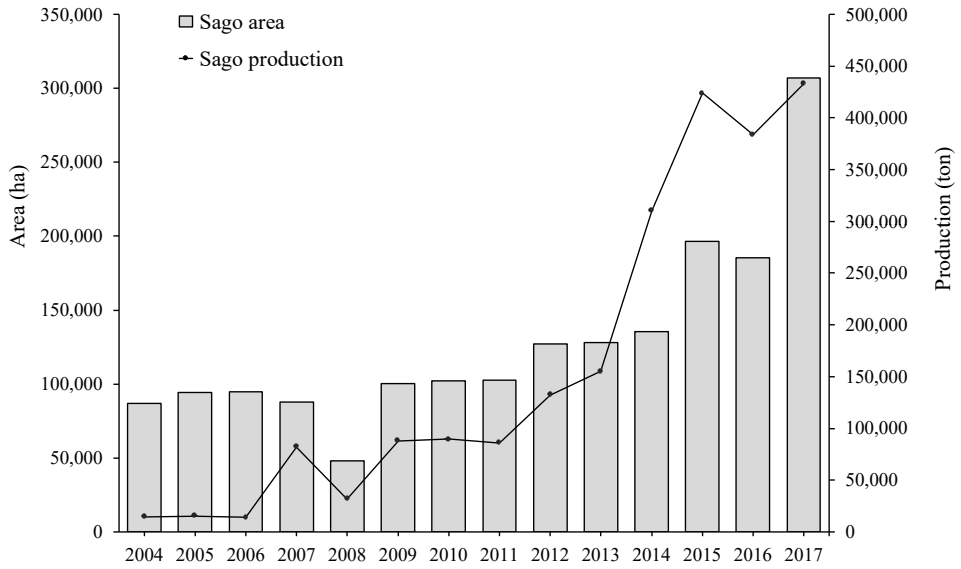

Fig 1. Sago area and its production in Indonesia from 2001 to 2017

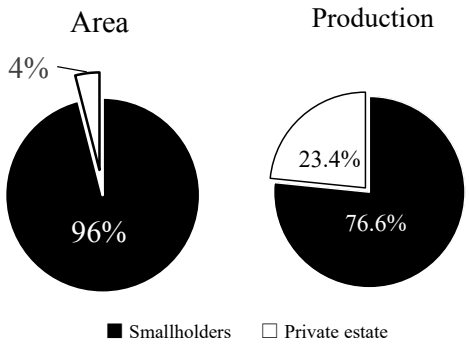

Fig 2. Comparison of sago area and its production between smallholders and private estate

of Perennial crops of the Ministry of Agriculture (Trisia et al., 2016). Data from the Directorate General of Estate Crops (2020) also showed the national productivity of smallholders was 1.2 ton/ha and private state was 8.6 ton/ha. Although the productivity growth by the private state is higher than smallholders, it is still far below the expected national productivity of 10-15ton/ha/year. Furthermore, specific studies have been done in South Sulawesi and Riau to calculate starch yield per ha. According to Yamamoto (2019), starch yield per ha in South Sulawesi is between 4.5 to 13.5 tons/year and 1.4 to 22.2 tons/year in Riau, which are far below from the estimated potential yield of 25 – 40 tons/ha/year.

In terms of domestic trading, sago starch is mostly sold in the domestic market rather than the international market. Dried sago is mainly produced in Selat Panjang, Riau, with an average price of Rp 5,000/kg and then distributed to Java Island through Cirebon with a range price of Rp 6,000 - Rp 10,000/kg (Trisia and Ehara, 2020) or sold to glass noodle (*sohun*) factory. Meanwhile, the price of wet sago in South Sulawesi, for example, is between Rp 2,400 - Rp 3,333/kg. Although the dried sago starch price is higher than wet sago, the local market in eastern Indonesia is still filled with wet sago. It is because smallholders consider producing wet sago is less effort with simple process compared to dried sago but still give good profit (Trisia et al., 2018). Furthermore, the price of sago starch in the domestic market has hardly been touched by government pricing policy. The price is entirely determined by the market mechanism, which depends on demand and supply. Since the price of dried sago is higher than tapioca starch, sago starch is considered less competitive, although it is believed by retailers that sago starch has more long-term durability than other starches (Trisia and Ehara, 2020).

In order to identify the cause of the low productivity of sago starch in Indonesia, we

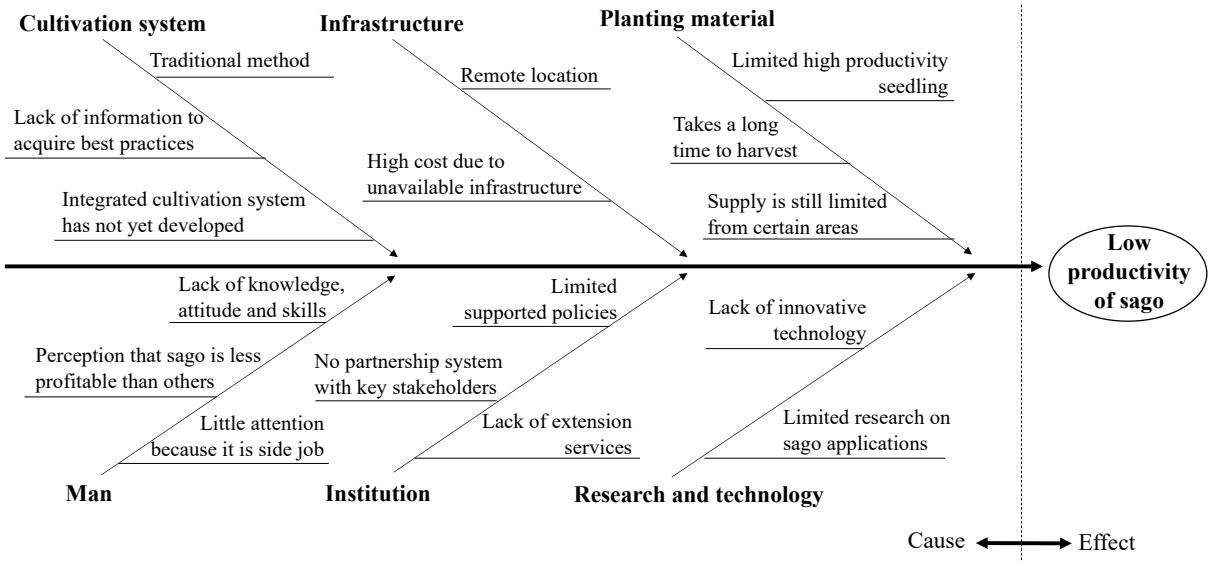

Fig 3. Cause and effect of low productivity of sago based on fishbone diagram

provided cause and effect on the fishbone diagram (Figure 3). Planting material, infrastructure, cultivation system, man, institution, and research and technology are factors that cause low productivity of sago in Indonesia. Limited high productivity seedling and limited supply from certain areas are the main causes for the lack of available planting material. Currently, only four varieties (Sagu Bestari-Riau, Sagu Meranti-Riau, Sagu Baruq-North Sulawesi, Sagu Molat-Maluku) have been registered in the Plant Variety Protection of Ministry of Agriculture. In addition, many people abandoned sago palm since it takes a long time (8-10 years) to harvest and high cost because they need to go to a remote area and sometimes without proper infrastructure.

In Indonesia, most smallholders are still cultivating in the traditional way or even lack of knowledge, attitude, and skills on sago cultivation. This is because sago palm is inherited from generation to generation with minimum efforts to increase productivity. Smallholders have the perception that sago is just a side job and less profitable than other commodities. These constraints have caused many smallholders to switch from sago palm to other crops such as cacao and palm oil or selling their sago land to other people. In addition, the integrated cultivation system and its management have not yet developed and informed well, especially on how to determine the best cultivation and cropping pattern based on the local situation. Meanwhile, limited supported policies, lack of extension services, and no partnership system between smallholders with national and private state cause less priority for sago to be nationally developed. Finally, lack of research and innovative technology can cause low productivity due to inefficient production. Therefore, the direction to improve productivity should cover the quality of planting material with a better cultivation system, knowledge encouragement for smallholders, and effectiveness of research and technology to maximize production. According to a study from Ahmad (2014), sago productivity can increase up to 25 tons/ha/year by implementing intensive cultivation with best management practices and technology. In addition, institutional supports such as policies, subsidies, and institutional organizations are needed in order to promote sago as a commercialization crop.

Consumption of sago starch

In Malaysia, sago starch is mainly used for addition (at 20–30%) in flat rice noodles and rice vermicelli production. Despite the higher prices, as compared with cassava or corn starch, sago is preferred to create rice noodles and vermicelli less brittle to handle and chewier in texture (Jong, 2018).

Meanwhile, sago starch is consumed as sticky dough and roasted sago, which are originally from wet sago. Sago can also be found in the form of processed products, namely: dried sago, sago noodle, *sohun*, meatball, and a variety of snacks. In fact, Metragakusuma et al. (2016) mentioned that 63 sago-based products exist in 21 provinces in Indonesia.

Consumption of raw sago (wet sago) is common in the eastern part of Indonesia. Meanwhile, consumption in the form of sago-based processed products with added value (noodle, cookies, pudding, etc.) is mostly founded in the western part of Indonesia, including Java island. Data from Food Security Agency showed that the national projection of sago consumption needs increased from 142,543 tons in 2015 to 230,401 tons in 2017, mainly from regions in the eastern part of Indonesia such as Papua, Sulawesi, and Maluku (Figure 4 and 5). However, the national realization of sago consumption needs decreased from 134,156 tons to 101,963 tons in the same year. This consumption was considered very low compared to rice (24,979,671 tons) and wheat (2,675,399 tons). Although the national realization of sago consumption needs decreased, sago consumption

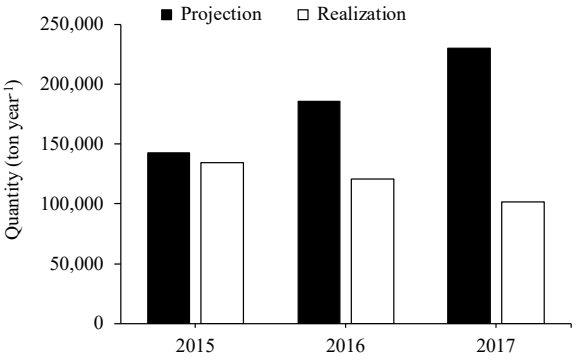

Fig 4. Projection and realization of sago consumption needs in Indonesia

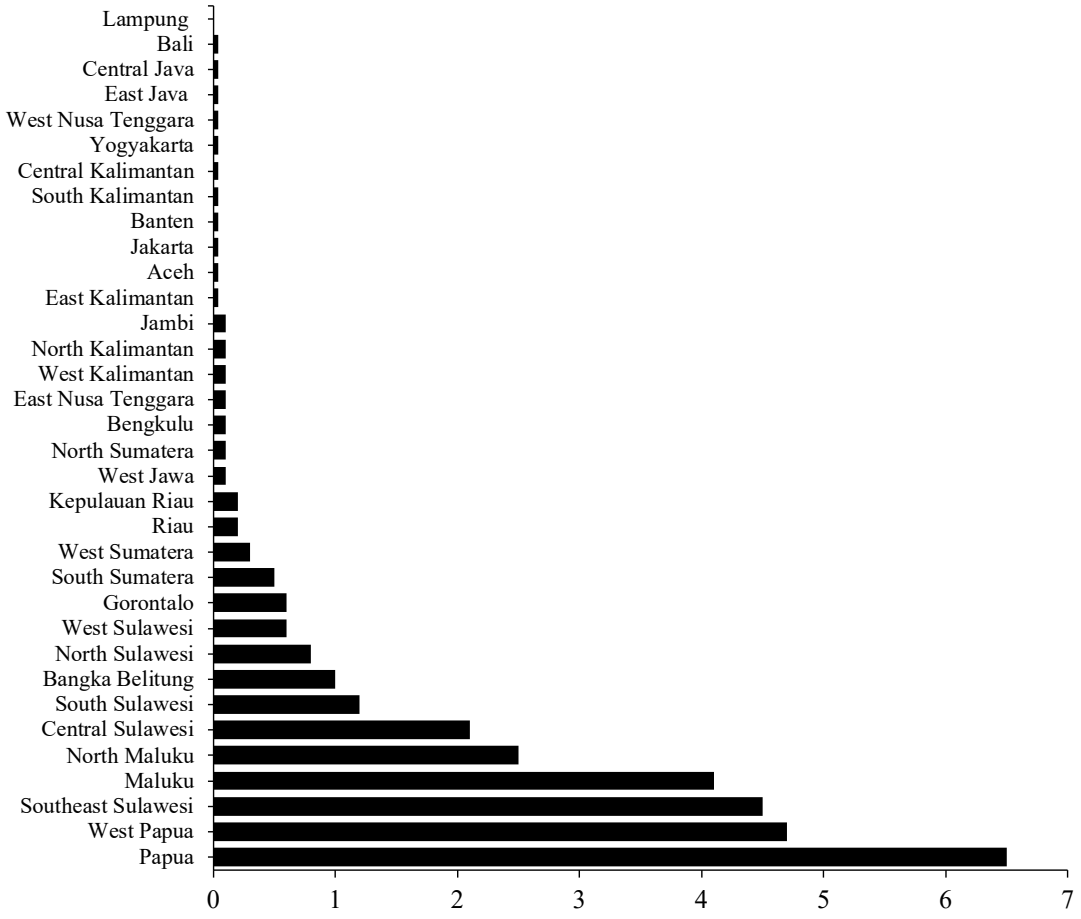

Fig 5. Distribution of sago consumption in each province

participation had increased from 1.61% in 2013 to 2.09% in 2018.

International trading: Export-import

According to data from the Ministry of Trade (2020), global starch demand is mainly from cassava starch (38.36%), corn starch (24.95%), potato starch (18.26%), wheat starch (8.17%), and other starches, including sago starch (5.21%) and inulin (5.04%). In terms of sago starch, Sarawak is a leading exporter with 41,000-51,000 tons of sago starch being exported annually to Peninsular Malaysia and Japan. Meanwhile, the export of sago starch from Indonesia is relatively short compared to Sarawak due to quantity issues and limited access to the international market.

Based on Figure 6, sago export from Indonesia reached its lowest point of 2,168 tons in 2011 before increasing up to 12,908 tons in 2018. The gradual increase in demand for sago starch was due to the increasing starch demand from food industries in other countries. In Japan, for example, raw sago starch is imported and then modified into oxidized starch. The oxidized starch is used as *uchiko* (dusting flour) for noodles, dumpling skins, and non-allergenic food. For non-food industries, sago starch is used for film and adhesive products (Takahashi et al., 2015; Sondari et al., 2018; Trisia et al., 2020). The value of sago starch then increased significantly, with the highest value being 4.2 million US$ in 2011. However, the value of exported sago starch fell to its lowest point at 1 million US$ in 2012. After that, the value of exported sago starch gradually increased to 3,2 million US$ in 2018. Based on export values, sago starch is mainly exported to Japan (49.2%), Malaysia (43.8%), Singapore (4%), China (1.7%), and other countries such as East Timor, Hongkong, and Tonga (1.3%) (Figure 7).

Despite an increase in the export quantity of sago starch, Indonesia is generally a net starch importer with

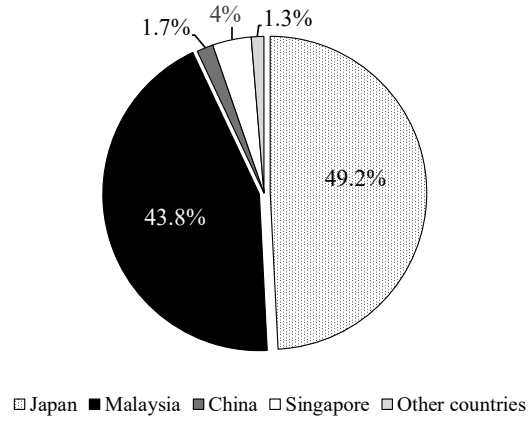

Fig 7. Sago export values by destination countries

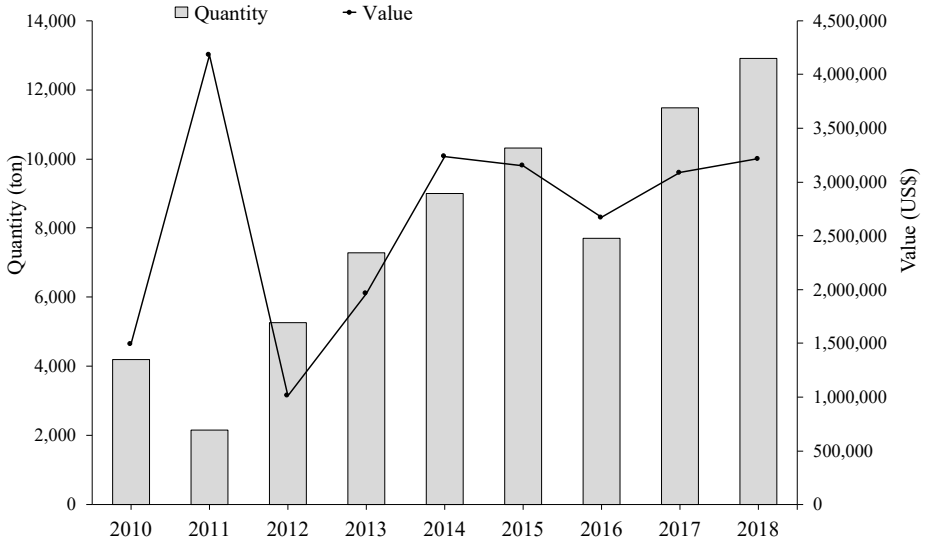

Fig 6. Export volume and value of sago starch in Indonesia

a total import value of nearly three times its export value in 2019, especially for corn starch and cassava starch (Figure 8). In fact, Indonesia ranks 25th as a starch exporter and ranks 3rd as a starch importer (Ministry of Trade, 2020). Imported products are used as raw materials for the food and non-food industries, including wood pulp, glue, textiles, cosmetics, and pharmacy. Although it is not significant, figure 8 also showed sago starch import with an amount of US$ 170,036 to Indonesia. Bantacut et al. (2020) stated that limited supply for high-quality starch and uncompetitive prices are reasons why import has happened. However, Syafa'at et al. (2005) stated that when a country exports and imports in the same period, it can be because of the commitment to maintaining quotas in trade relations between countries.

Growth opportunities for sago starch commercialization in Indonesia

There is a possibility that demand for sago starch will increase depending on how it is marketed. Commercialization strategies can be assessed from the point of view of strengthening domestic demand, promoting food import substitution, and export orientation in order to encourage the growth opportunities of sago starch.

a. Domestic demand

The demand growth for sago starch can be captured through the trade of sago starch from Riau to Cirebon, Java Island, since Riau is the main dried sago producer in Indonesia. Data from Cirebon port showed that the trend of sago starch trading has grown by 15%, from 74,895 tons in 2014 to 86,167 tons in 2018. It is also predicted that the demand for sago starch will continue to increase up to 114,671 tons in 2022 (Figure 9). In addition, Yamamoto (2019) stated that there are around 60 glass noodle factories in Cirebon that need 110,000-170,000 tons of sago starch per year.

The consumption of sago products may also increase in the future due to the popularity of sago

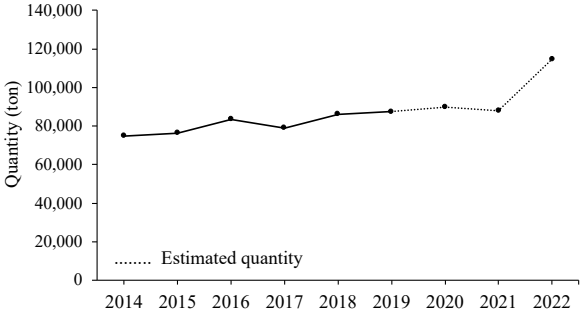

Fig 9. Sago demand from Riau to Cirebon, Java Island

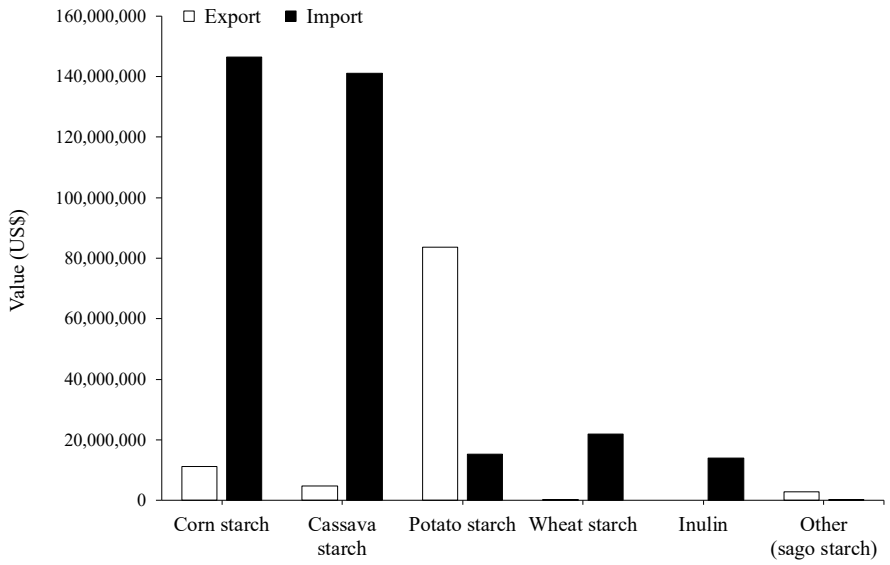

Fig 8. Indonesia's starch trade balance in 2019

food processing (*kapurung*) and dried sago in South Sulawesi. The number of *kapurung* restaurants has increased with an average growth of 28.7% during the last 14 years. According to Metaragakusuma et al. (2017), there are 26 *kapurung* restaurants that need approximately 11.7 tons of wet sago every month, which means a total of wet sago needed in 2022 is about 41 tons/ month or 492 tons/year approximately. In addition, an interview with a dried sago producer in Palopo, South Sulawesi, showed an increase in the sales quantity from 617 kg/month in 2014-2015 to 34 tons in May 2020. The producer also believes that the demand for dried sago starch from South Sulawesi will increase gradually. Since the participation in sago consumption at the national level shows an increasing trend, thus, it is also expected that sago starch commercialization will in line with an increase of value-added. Product quality improvement, better marketing, and promotion of sago benefit as a gluten-free and non-allergenic food or alternative source of energy are several strategies to increase the value-added of sago products.

b. Food import substitution

The utilization of sago starch as a substitute is still not well known, although several studies revealed that wheat flour could be substituted by sago starch in producing bread, cookies, Chinese noodle, and instant noodle (Konuma et al., 2012; Kondo et al., 2013; Ali et al., 2018; Hirao et al., 2018). Historically, wheat-based products were not widely consumed in Indonesia until the early 1990s. However, due to changes in the lifestyle to urbanization and population growth, the imported wheat flour was increased rapidly (Bourgeois and Kusumaningrum, 2018). Currently, 10.7 million tons of wheat is imported to Indonesia with a value of 2.8 billion US$ (Figure 10). The end-users of imported wheat are big and modern food industries (31%), retailer (21%), bakery (23%), noodle (10%), traditional cake (6%), biscuits (4%), cake (2%), pancake (2%) and pastry (1%) (USDA, 2020).

In order to support sago-based industries and promote the utilization of sago starch, the national government encouraged food industries in Indonesia to substitute 10 % of imported wheat flour with sago starch in 2019. The replacement of imported wheat flour with sago starch is expected to increase sago starch demand by 1.1 million tons and produce up to Rp 2.4 trillion (US$ 170 million) of benefits annually (Food Security Agency, 2019). This commitment will minimize dependence on agro-food imports, strengthen national food security, and enhance sago diversification product value. However, it should be

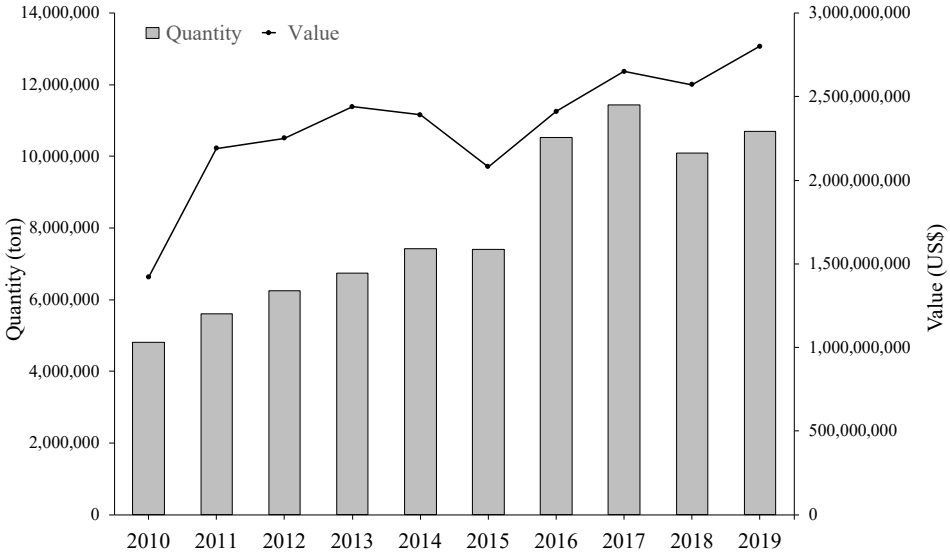

Fig 10. Imported wheat and its value from 2010 to 2019

noted that commitment from the government should also be implemented with clear targets, including the development of the downstream sago industry.

c. Export orientation

Apart from domestic consumption, growth opportunities for sago starch can be developed in the international market. Currently, the demand for sago starch from Indonesia for the global market is existed but is still limited. For example, the quantity export of sago starch from Indonesia to Japan on average is 3,204 tons, smaller than the average quantity of 13,924 tons from Malaysia, although the average price is lower (Figure 11). Several studies stated that quality issues and low competitive advantage with other starches are reasons why sago starch importation from Indonesia is considered small (BFPRO 2016; Takahashi et al., 2015, Trisia et al., 2020). Therefore, improvement of sago starch quality and its continuity are essential in order to gain a position in the global market (Yamamoto, 2019, Trisia et al., 2020). In addition, it is also essential to improve market access by developing strategic alliances with foreign exchange partners and promoting supply chain efficiency by providing an adequate infrastructure and organized logistics for exports.

Acknowledgement

This work was supported by JSPS KAKEN Grant JP18KT0041.

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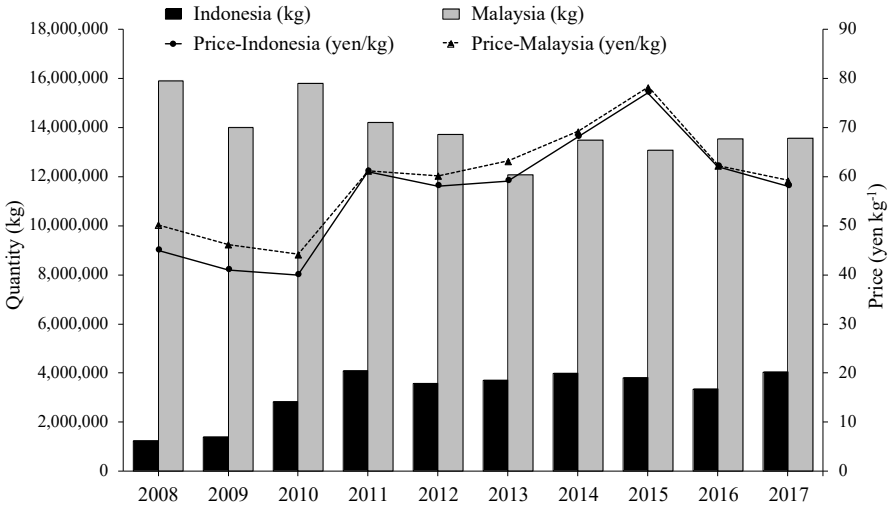

Fig 11. Sago starch import in Japan from 2008 to 2017

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