Journal of Namibian Studies, 34 S2(2023): 119–134 ISSN: 2197-5523 (online)

Challenges in Enhancing Sustainable Sago Palm Cultivation in the Mukah Division of Sarawak, Malaysia

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Abstract

Sago (Metroxylon sagu Rottb.) has the potential to be an important commodity export for the state of Sarawak, Malaysia provided it can be cultivated sustainably by the sago farmers and in a large sago estate plantation. Its ability to accumulate large amount of starch in its trunk lead its to be regarded as the "starch crop of the 21st century". The study's goal is to investigate the many challenges faced by sago farmers in Sarawak's Mukah Division in cultivating sustainable sago palms. It uses a sustainable agriculture framework to describe the issues and challenges in improving sago cultivation. This study employed in-depth interview with all stakeholders and observation as data collection. Results revealed that the pertinent issues and challenges for the sago farmers in sustainable agriculture includes integrating scientific methods with indigenous knowledge of sago cultivation, finding sago variety that produce high yield of sago starch, long maturity period of sago, the declining size of land to cultivate sago, competition from palm oil cultivation, and the absent of the sago board. Of a great concern is the reluctant of younger generation to enter the labour force in the sago industry.

Index Terms—Sustainable agriculture, sago palm cultivation, sago farmers, sago starch.

Introduction

Sago palm thrives in the swampy peatland especially in Sarawak, Malaysia; Moluccan Islands and Irian Jaya, Indonesia; Sepik, Papua New

Guinea and Mindanao, Philippines. Malaysia is the third largest country planted with sago in terms of hectares (59 thousand hectares) behind Indonesia (2.94 million hectares) and Papua New Guinea (1.02 million hectares) (Ahmad, 2014). Meanwhile, Mukah Division in Sarawak is the largest sago producing area in Malaysia with 42,310 hectares of land cultivated with sago and 70 percent are toiled by the small-scale sago farmers.

Sago starch has been traded in the Southeast Asia region for more than 700 years and at least 400 years in Sarawak Malaysia (Sim, 1985). According to Bujang (2015) on per acre basis, sago is known to be the world's highest starch producer at 25 t/ha/year. Sago produces high-yield dry starch approximately 150-300 kg per plant (Wahed et al. 2022). Sago can be compared to other foods as being 4 times as high as rice, 5 times as high as corn and wheat, and over 17 times as high as tapioca in terms of starch that it produced (Ishizaki, 1997). Sago starch is used largely in the food industries, household applications and has the potential for the development of single cell protein, lactic acid and biofuels (bioethanol and biodiesel).

In comparison to other producing areas in the Southeast Asia region, Sarawak is at the forefront of producing quality sago starch and commercializing it for industrial use (Lauvfa and Kavanamur, 2008). Sarawak is also the largest producer of sago flour in the world with 37,884 metric tons of sago starch valued at RM78.29 million in 2020 (Ling Hui, 2022). Hence there is a need to expand the cultivation of sago from small scale farmers to commercial plantation. Apart from encouraging the small-scale farmers to merge into estate plantation, the Sarawak government embarked on commercial plantation through the state agencies like Land Custody and Development Authority (LCDA). Incentives are also provided to the private sector to encorage establishment of estate plantation.

The Sarawak government also encouraging the sago farmers to cultivate sago by applying modern and scientific cultivation methods (Yaakub et al., 2018). However, the current practice shows that sago can only grow well in certain type of soil with certain care by the local sago farmers. Hence, the indigenous knowledge of sago cultivation is viewed as vital to be incorporated in the scientific methods of cultivating sago especially when the Sarawak state government is embarking on opening large track of land for sago commercial plantation. Thus, the objective of this paper is to investigate the issues and challenges in enhancing sustainable sago palm cultivation by the sago farmers in the Mukah Division of Sarawak, Malaysia.

Materials and Methods

Sustainable Agriculture

The United Nations Sustainable Development Goals (UN SDGs) that was ratified in 2015 had placed the importance of sustainable agriculture for the world development. Sustainable agriculture (Figure 1) consists of three main elements namely, environmental quality (health); economic efficiency (profitability); and social responsibility (social & economic equity) (Azman et al., 2012). Figure 1 central area depicts how the three primary elements that stand for the objective of attending sustainable agriculture intersect. Thus, agriculture sustainability is predicated on the notion that, while tending to our immediate needs, we must not overlook or jeopardize the ability of the next generation to address its own needs.

No doubt, there are some differences among scholars with regards to the concept of sustainable agriculture. However, almost all scholars agreed that in order to achieve sustainable agriculture it is pertinent to maintain the quality of the environment, to have some form of economic justifiability and socially desirable locus. In order to achieve the succes in terms of environment and economic, it must not neglect the economic and social equity especially in the context of quality of life for the farmers.

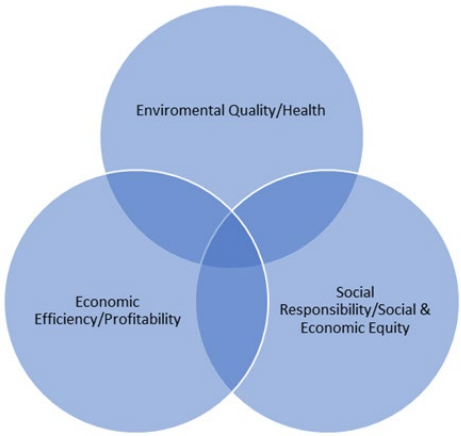
Prior to the concept of sustainable agriculture, the development of the agriculture sector heavily relied on the conventional methods of producing, increasing and sustaining the crop production. Food productivity soared because of new scientific methods and technologies, mechanization, specialization, and government policies that focus on maximizing production and reducing the prices of food. Through scientific methods such as using chemical fertilizers and Genetically Modified Organisms (GMO) seeds, the agriculture sector managed to overcome the problem of pests and crop diseases (Zhang, 2016). Chemical fertilizers have been used to overcome the fungal diseases in sago cultivation such as mealybugs, cycad scale, sooty mold, bus spot and fungal leaf spot. The usage of chemical fertilizers have increased in the sago cultivation in Sarawak as the government subsidized it. However, Atikur Rahman and Zhang (2018) identified that an excessive use of chemical fertilizers in agriculture sector in Bangladesh had caused lower crop yield and environmental degradation.

Over the years, there has been a rise in environmental and health concerns in the agriculture industry, particularly among farmers, which has prompted initiatives to minimize the use of chemical fertilizers, lessen water pollution and recycle waste. Awg Adeni et al. (2013) stated that sago waste or *hampas* from processing sago stems into sago starch can be a source to be used as substitute substracte to produce glucose. Recent study done on sago waste or *hampas* from processing sago

stems into sago starch has shown that it can be turned into biogas, as an alternative energy (Hammado, 2020).

Through sustainable agriculture, it is expected that the quality of life and income of the farmers will be improved further. However, to make sustainable agriculture works, it really depends on the farmers themselves with the assistance of other interested parties such as government agencies and private sectors. No doubt, sustainable agriculture is a way forwards especially in expending agriculture sector due to the growing demand for agriculture products.

Figure 1. Sustainable Agriculture.



Source: (Adapted from Agricultural Sustainability Institute.

https://sarep.ucdavis.edu/sustainable-ag and Azman et al., 2012)

Methods

This study employed a qualitative method that involved in-depth interview and observation. Creswell (2012) asserts that qualitative research is an investigation into the direction of comprehending the data gathering techniques utilized when a social problem is reviewed. Semi structured in-depth interviews (Table 1) were conducted in Mukah and Dalat Districts in the Mukah Division with 20 participants consisted of (10) sago farmers; (2) village headmen (*Ketua Kaum*) and (2) (*Penghulu* – an official appointed by the government to oversee several villages); (2) Chairman of Sago Farmers' Associations (in Mukah and Dalat); (2) CRAUN officers and (2) Agriculture Department officers. Pseudonym was used for the participants instead of their real names to protect them and to remain anonymous. According to Merriam and Tisdell (2015), experience and knowledge of the wider experts will provide enormous insights into the need to enhance and improve the quality of sustainable agriculture. Semi structured interview protocols were planned and carried out to guide the in-depth interview session with the participants. Each semi structured interview lasted between 30

and 60 minutes. Montoya (2016) stated that questions in a semi structured interview will give participants some room of flexibility in their responds. Observation was carried out on the cultivation of sago by farmers on the field and at the CRAUN Research station in Dalat.

Table 1: List of participants

Participant	Position	Roles	Gender
#01	Farmer	Sago farmer	Male
#02	Farmer	Sago farmer	Male
#03	Farmer	Sago farmer	Male
#04	Farmer	Sago farmer	Male
#05	Farmer	Sago farmer	Male
#06	Farmer	Sago farmer	Male
#07	Farmer	Sago farmer	Male
#08	Farmer	Sago farmer	Male
#09	Farmer	Sago farmer	Female
#10	Farmer	Sago farmer	Female
#11	Local civil servant	Village headman	Male
#12	Local civil servant	Village headman	Male
#13	Local civil servant	Penghulu	Female
#14	Local civil servant	Penghulu	Male
#15	Non governemnt organization	Chairman of Sago Farmers' Association (Mukah)	Male
#16	Non government organization	Chairman of Sago Farmers' Association (Dalat)	Male
#17	Sago research officer	Research scientist	Male
#18	Sago research officer	Research scientist	Female
#19	State civil servant	Agriculture officer	Male
#20	State civil servant	Agriculture officer	Female

Overview of the study location

Many of the sago farmers are from the Melanau ethnic group who lived in the Mukah Division, Sarawak especially in the coastal areas of Dalat, Mukah, Matu and Daro. The Melanaus are the fifth largest in terms of population in the state of Sarawak. Based on the 2010 Population

Census of Malaysia, the Mukah Division has a population of 110,543.00. The Melanaus comprised 60.6 percent, followed by the Ibans 18.6 percent and Malays 5.8 percent. It is almost impossible to understand the Melanau culture without mentioning sago.

Meanwhile, sago is locally known in Malaysia as *sagu*, *rumbia, mulong* or *balau*. The major producing area of sago in Malaysia is in the Mukah Division of Sarawak (See Table 2), particularly in Dalat (28,169 hectares), Mukah (6,472 hectares), Matu (4,306 hectares) and Daro (3,149 hectares). Recently, the Sarawak government has encouraged the sago farmers to join a large sago estate plantation and also provided incentives to private companies to commercially plant sago.

Table 2: Planted Area and Production of Industrial Crops by District/Division, Sarawak, 2014

District/Division	Planted area (ha)	Harvested area (ha)	Production (tons)
Kuching	-	-	-
Bau	-	-	-
Lundu	1.0	-	-
KUCHING	**1.0**	**-**	**-**
Sri Aman	21.0	-	-
Lubok Antu	21.0	-	-
SRI AMAN	**42.0**	**-**	**-**
Sibu	-	-	-
Kanowit	-	-	-
Selangau	386.0	38.0	574.1
SIBU	**386.0**	**38.0**	**574.1**
Miri		-	-
Marudi	1.0	-	-
MIRI	**1.0**	**-**	**-**
Sarikei	-	-	-
Meradong	1,432.0	-	-
Julau	-	-	-
Pakan	-	-	-
SARIKEI	**1,432.0**	**-**	**-**
Bintulu	178.0	1.0	13.4
Tatau	170.0	-	-
BINTULU	**348.0**	**1.0**	**13.4**

District/Division	Planted area (ha)	Harvested area (ha)	Production (tons)
Mukah	6,472.0	1,150.0	13,9742.10
Dalat	28,169.0	10,401.0	150,273.0
Daro	3,149.0	2.0	22.5
Matu	4,520.0	822.0	13,672.7
MUKAH	**42,310.0**	**12,375.0**	**177,910.3**
Betong	3,830.0	73.0	770.9
Saratok	983.0	5.0	81.0
BETONG	**4,723.0**	**78.0**	**851.9**
TOTAL	**49,243.0**	**12,492.0**	**179,349.7**

Source: (Industrial Crop Statistics Malaysia 2014, Department of Agriculture of Malaysia)

Since 1982, the Sarawak government has tried to improve and increase sago plantation as one of the important crops (Jong 1995). As such, an agency named Crop Research and Application Unit (CRAUN) was established in 1993 by the Sarawak State Government. In 1997, it was incorporated and known as CRAUN Research Sdn. Bhd and responsible to undertake more intensive research and development on sago to support and accelerate its development and conducting downstream research. At the same time, a research station has been established at Sungai Talau Station and a laboratory in Mukah.

As the demands for sago starch grows in the international markets, many researches have been conducted locally and internationally to expand the cultivation of sago in Sarawak and the region as a whole (Yong Chiew Ming et al., 2018; Mohamad Naim et al., 2016; Keita Nabiya et al., 2015). The attentions given on sago palm is due to the high amount of starch productivity in sago palms as compared to starch produced by other crops. Moreover, Stanton in Flach, (1997) stated that the advantages of sago palms are “economically acceptable, relatively sustainable, environmentally friendly, uniquely versatile, vigorous and promote socially stable agroforestry system”.

Results and Discussion

The findings from in-depth interviews with 20 respondents and observations revealed that the challenges for the sago farmers in sustainable agriculture include integrating indigenous knowledge with scientific methods of sago cultivation, finding sago variety that produce high yield, long maturity period of sago, the declining size of land to cultivate sago, competition from palm oil cultivation, reluctant of younger generation to enter the labour force in the sago industry, sago mills fixing the price of sago and the absent of the sago board.

Integrating indigenous knowledge from traditional methods with scientific methods

The World Commission on Environment and Development (1987) stated in its report that many scientific and social researchers have accepted the positive role played by indigenous knowledge of the local ecosystem especially in developing countries in formulation and implementation of sustainable development policies and projects. According to Grenier (1998), indigenous knowledge refers to "the unique, traditional and local knowledge existing within and developed around specific conditions of women and men indigenous to a particular area". No doubt, indigenous knowledge can be utilized to achieve sustainable development of local communities. For instance, in some cases of introducing new variety of crops, indigenous knowledge of the local community is required so that new variety will be able to adapt to the new type of environment, soil and weather.

The important of indigenous knowledge in sago cultivation among the Melanau community in Sarawak can be seen through the strong attachment to the crop which is rooted in its belief, custom and tradition. As such, many sago farmers still employed traditional and semi traditional methods in their farming practice. At the same time, the sago farmers also followed the traditional belief known as *palei* (social sanctions). The Melanau believe that life is inhabited by three forms of beings namely the spirits, human beings and other ecosystem species such as animals, plants, soils, river etc. The basis of their believe is to uphold 'moderation' values which derived from the concept of restraining oneself from over exploiting any beings in their environment. According to a sago farmer (#01) from Kampung Tellian Tengah, Mukah when interviewed, "if there is death in the area, we (the sago farmers) will not go to the farm for that day fearing any bad omen". In real fact, it is to show respect to the deceased and the family.

In order to increase production and efficiency in cultivating sago among sago farmers, the CRAUN officer interviewed (#18) stated that, the Sarawak government has introduced chemical fertilizers, proper drainage system, systematic spacing design for planting, uses of polybag and raft nursery to enable mass production of sago suckers and other new plantation methods. Despite, the government effort to introduce scientific methods, some small sago farmers are reluctant to accept many of the new planting and cultivating methods as it goes against their traditional ways. The Chairman of Sago Farmers' Association (Mukah) (#15) stated that,

> The scientific method failed to take into account the indigenous knowledge in the context of suppressing weeds and building drainage. In our traditional method, the weeds will not be cleared all the time as the sago suckers need the weeds to encourage the suckers to

> compete and grow taller. The drainage system will hampered the sago trees from getting water and nutrients especially during the dry seasons.

Based on site visit and observation at the LCDA sago plantation in Mukah, sago trees that were planted more than 12 years (maturity age), using the scientific methods did not grow tall or matured as expected. The different views if not address properly will hampered the programs and projects carried out by the Sarawak government. Therefore, it is important to allow integration of scientific and traditional methods as a way to overcome the problem.

Long maturity period of sago

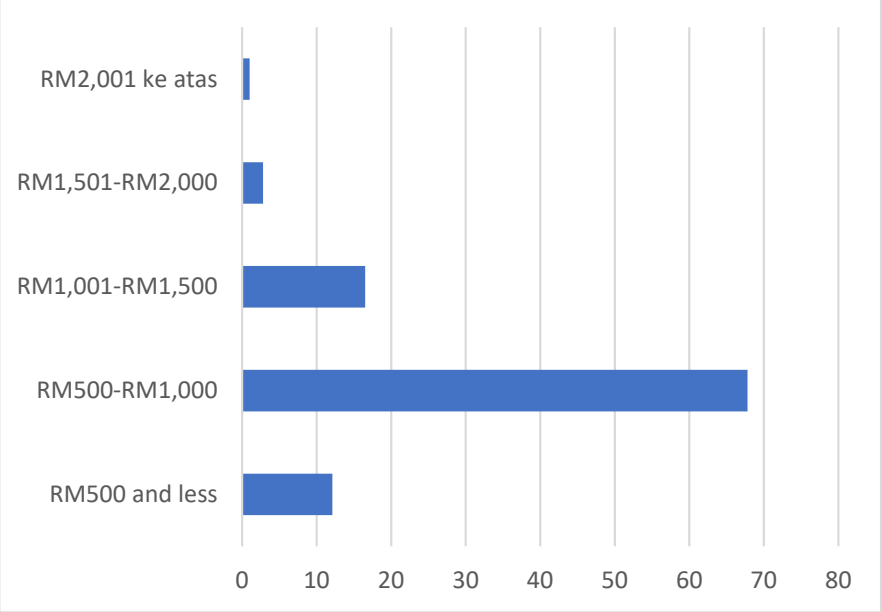
Sago palm has a long gestation period of 8 to 12 years which hampered the competitiveness of this crop in comparison to other crops like oil palm or rubber. Flach in Jong (1995: 15) stated that sago palm can grow in both peat and mineral soils but grow better and mature faster between 8-10 years in mineral soil. However, many of the land planted with sago palm in Mukah Division especially by LCDA plantation projects are either in the deep or shallow peat soils. The disadvantage of the deep peat soil to the shallow peat soil is that the roots of sago trees need to go deeper in the soil to get nutrients and hampered the growth of the trees. The long maturity period of sago palm put a challenge to the sago farmers in the context of stable income. As such, many sago farmers reluctantly perceived apart from sago cultivation they have to find a second source of income.

In order to sustain their livelihood, these sago farmers have to diversify their source of income through doing other jobs. For example, apart from being sago farmers, they are also part-time fishermen, carpenters or small traders. Some of them are growing vegetables, pineapples, bananas and other fruits as a source of income and for their own consumption. The sago farmer (#05) stated that:

> I have seven hectares of sago farm. I support my income by planting rambutan and durian trees. However, this year, I cannot get much, the monkeys and squirrels disturbed the durian and rambutan during harvest season. The forest has been cut down for oil palm plantation. The animals lost their source of food and attacked my fruits trees.

Due to long maturity period of sago and the small size of sago farm, it is expected that the income from the sago cultivation to be low. A survey (Figure 2) conducted by (Muhamad Naim et al., 2016) proved that 12.1 percent of the sago farmers earned less than RM500 a month and 67.8 percent earned between RM500 to RM1,000.

Figure 2. Melanau Sago farmers: Monthly Income



Source: (Muhamad Naim, Yaakub and Awang Hamdan, 2016)

Finding sago variety that produce high yield

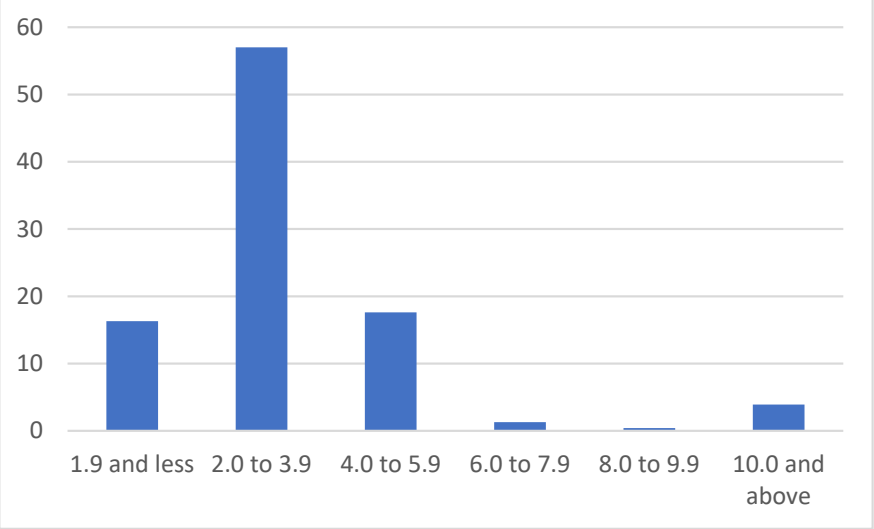
Sago is still lagging behind other crops in terms of financial return which discourage many farmers to expand their sago farms and potential investors from establishing commercial plantation. As such, it is important to improve the sago variety that is able to mature in less than 8 years and produce more starch for each sago palm log. This is where the Sarawak state government established CRAUN to undertake more intensive research and development on sago.

CRAUN is specialized in researching for new sago variety and breeding. However, the research on reducing gestation of sago palm to mature need time to produce results. Without reducing the gestation period of maturity for sago there is difficulty to convince potential investors especially from the private sector to establish sago commercial plantation.

Declining size of land to cultivate sago

In terms of the distribution of land size among the sago farmers, a survey (Figure 3) done by (Muhamad Naim et al., 2016) identified that 96.1 percent of the small scale sago farmers has less that 10 hectares of land planted with sago. About, 16.3 percent has less than 2 hectares and 3.9 percent has more than 10 hectares. The small size of sago farm has lead the government to encourage the sago farmers to join the mini estate plantation like Sago Smallholders Satellite Estate Development Programme (SSSED) under LCDA projects.

Figure 3. Distribution of land size of sago holding (hectares)



Source: (Mohamad Naim et al., 2016)

Based on the survey, many farmers inherited the sago palms farms from their parents and grandparents, they may harvest the sago palms monthly for daily expenses. However, most of them perceived that to cultivate a new batch of sago palms, they have to wait for another 8-12 years before harvesting. Currently, many of the sago farmers interviewed are harvesting the sago palms that are cultivated by their parents and grandparents. They do not cultivate new crops due to lack of cultivable lands inherited from their ancestors. At the same time, a *Penghulu* (#13) when interviewed, had commented that "sago farmers in my areas in Dalat had submitted application to the government's land agency to acquire more land to plant sago but to no avail." Basically, there is a strong competition between choosing to open more track of government land for sago with the immediate competitor, oil palm.

Competition from oil palm cultivation

Some sago farmers in Mukah are in dilemma whether to continue cultivating sago or changing to other crops that can safe time and bring more income. According to Dollah and Mohd Yaakop (2003) many sago farmers has decided moving from cultivating sago to oil palm, rubber and pepper. This trend has not changed. Based on our interview with the sago farmer (#06), "more than half of my friends stated that they are willing to change from cultivating sago to oil palm."

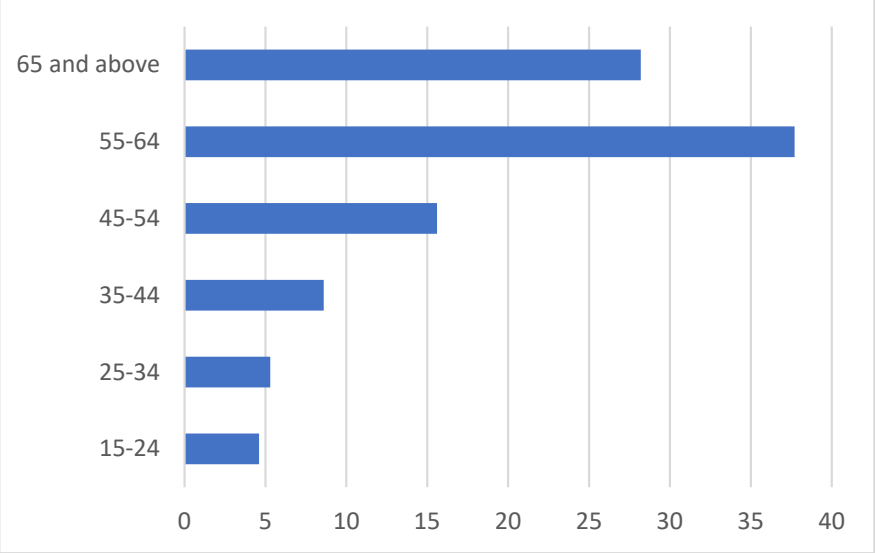
Basically, the long maturity period of sago trees and the difficulty to find workers during harvesting the sago trees have discouraged the sago farmers to maintain and expand sago cultivation. They are attracted to the stable price of the palm oil and the support that the growers got from the government in terms of subsidies and other financial support.

Even in difficult time during Covid-19 pandemic and when palm oil is facing restriction and potential banned from the European Union, the government embarked on finding new markets to export palm oil and providing financial assistance to the oil palm farmers.

Reluctant of younger generation to enter the labour force in the sago industry

The demographic data from the survey (Figure 4) conducted by (Yaakub et al., 2018) reveled that in terms of age, many of the sago farmers are aging, as 37.7 percent is in the 55-64 years and 28.2 percent in the 56 and above years. This showed that 65.9 percent of the sago farmers are 65 years and above. Thus, it is not a surprise that there is a problem of acute labour shortage and the issue of sustainability of labour force in the sago industry.

Figure 4. Sago farmers age bracket



Source: (Yaakub et al., 2018)

Some of the children of these sago smallholders are still schooling while others have secured jobs either in the public or private sectors. Thus, their children who are working, are having stable income and they are not interested to work in the sago farms. Many of them had left Mukah and Dalat to work in big cities in Kuching, Miri and Bintulu and West Malaysia. The younger generations are more interested to formal employment where they are able to earn a steady income.

According to Ahmad Ishak et al., (2021) on their study on rural youth's participation in the sago industry in Sarawak, many youth who work in the sago industry are Melanau ethnic group and they preferred to work as part-timers. The study also identified six main constraints that deterred their participation namely income, commodity price, new

knowledge, physical infrastructures, assistance and training. An agriculture officer (#20) when interview stated that:

(Sago) is a hard work and you have to get your hand dirty most of the time. Very few of the young generation nowadays are interested in agriculture. They see working in the farm, toiling the land as difficult with less return. Many parents also do not want their children to be sago farmers like them because of unstable income. They want their children to work in government or private sectors, more stable income with social benefits.

No doubt, many youth considered that working condition in a sago farm is hard and tiresome especially tendering to the sago trees, felling down and transporting the sago logs from the farm to the nearest river or sago mills. The connotation of 4Ds (Dirty, Dangerous, Difficult and Demeaning) employment in agriculture resulted to youth tried to avoid these jobs (Ahmad, et.al., 2018). This stigmatization among youth in agriculture sector has also hampered the ability of government and private sectors to attract the rural youth to work in the sago industry.

Absent of the Sago Board

Most of the commodities in Malaysia like palm oil, coffee, pineapple and pepper have their own Boards that look after the interest of the particular industry. The Board will assist in the development of the industry from research, planting, harvesting, subsidies and marketing of the commodity. Since palm oil price is fluctuating now due the banned in import of palm oil by the European Union, the Palm Oil Board is buying oil palm fruits from the farmers at the higher price than the actual market price. This help the farmers to cushion on the impact of the decline of palm oil prices to their income.

Unfortunately, for so long, sago has never had a Board to help with the industry. In early February 2022, the Sarawak state government passed a Bill in the state assembly to establish a Nipah and Sago Board with a paid up capital of RM5 million (Ling, 2022). To date, the Sago Board has yet to be formed. Until it is set up, the absent of the sago board will hampered the development of the sago industry from the upstream and downstream sectors.

Conclusion

The evidence presented here suggests that there are diverse key challenges to the sago farmers to enhance sustainable sago cultivation. Among the pertinent challenges are amalgamating indigenous knowledge with scientific methods of sago cultivation, finding sago variety that produce high yield, long maturity period of sago, the declining size of land to cultivate sago, competition to change sago to oil palm cultivation, lacking interest among the younger generation to enter the labour force in the sago industry, sago mills fixing the price of sago

and the absent of the sago board. Serious attention from the government on the issue of pricing determination should be emphasized to ensure that price manipulation does not occur by any parties. The establishment of Nipah and Sago Board like other crops need to be speed up to ensure the proper planning and development of the sago industry and to deter the sago farmers from changing their cultivating sago to oil palm. It is recommended that sago stakeholders have an effective communication to address and streamline any misconception, misinformation, and differences among them. The potential establishment of of more estate sago plantation by the government and private sectors and the integration of traditional and modern methods of cultivating sago would lessen the resistance from the sago smallholders and open up more job opportunity for the youth. As sago palms take a long time before harvested, diversification of the sago farmers' income should be continued. Given that the sago palm is synonymous with the Melanau community, young people need to be encouraged and assisted to continue the tradition of cultivating sago palms. No doubt, all these efforts would ensure the survival and improvement of the sago industry in Sarawak.

Acknowledgement

The authors would foremost like to thank the Ministry of Higher Education Malaysia for the Fundamental Research Grant Scheme (FRGS) FRGS/1/2020/SS0/UNIMAS/02/4 and Universiti Malaysia Sarawak (UNIMAS). The authors would also like to thank the Melanau community for their cooperation and greatly assisted in the research.

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