The 14th International Sago Symposium

The Role of Sago in Achieving the Sustainable Development Goals

Program and Abstracts

7th, July, 2023

Gakushikaikan, Tokyo, Japan

The Society of Sago Palm Studies

The 14th International Sago Symposium

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Program

Registration 9:00 - 10:00

Opening Remark 10:00 - 10:05
Hiroshi Ehara (Chair of the 14th International Sago Symposium)

Guest Speeches 10:05 - 10:15

Keynote Speeches 10:15 - 11:15
Hiroshi Ehara (Nagoya University, Japan)
Hengky Novarianto (Indonesia National Agency for Research and Innovation, Indonesia)

Plenary Session 11:15 - 12:15
Margaret Kit Yok Chan (Universiti Teknologi MARA, Malaysia)
Takashi Mishima (Mie University, Japan)
Keith Galgal (FAO PNG, Papua New Guinea)

Lunch Break 12:15 - 13:00
Business Meeting 12:20 - 12:50 (Room 2)

Oral Session 1 13:00 - 14:30 (Room 1 / Online)
Oral Session 2 13:00 - 14:30 (Room 2 / Online)
Oral Session 3 13:00 - 14:15 (Room 3 / Online)

Coffee Break

Poster Session 14:30 - 15:15 (Room 2 and 3)

Oral Session 4 15:15 - 16:30 (Room 1 / Online)
Oral Session 5 15:30 - 16:45 (Room 2 / Online)
Oral Session 6 15:30 - 16:30 (Room 3 / Online：AAACU Session)

The Asian Association of Agricultural Colleges and Universities (AAACU) is a network of agricultural colleges and universities in Asia, established in 1972 with the main mission of improving human welfare through agriculture, education, research, and extension. It will co-organize a session in SAGO 2023 with invited speakers coming from AAACU member institutions.

Closing Ceremony 16:45 - 17:00 (Room 1)

Reception Party 17:00 - 18:30 (Reception Room)

Keynote Speeches 10:15 - 11:15 (1st Room / Online)

Hiroshi Ehara
Recent Achievements toward SDGs through Collaborative Activities between Sago-producing Countries and User Countries

Hengky Novarianto
Sago Development and Use Policy as Local Food Diversification for Food Security

Plenary Session 11:15 - 12:15 (1st Room / Online)

Margaret Kit Yok Chan
Should a Certification Scheme be in Place towards a More Efficient, Sustainable, and Resilient Sago Industry?

Takashi Mishima
Quality of Sago Starch for Worldwide Promotion

Keith Kulakit Galgal et al.
Potential for Up-Scaling Sago Production in Manus Province, Papua New Guinea

Oral Session 1 13:00 - 14:30 (1st Room / Online)

Yoshinori Yamamoto
Comparison of Growth Characteristics and Yield Potential of Starch-accumulating Palms

Mochamad Hasjim Bintoro Djoefrie et al.
Sago Production Potential in Several Regions in Indonesia

Yoshihiko Nishimura
Regional Characteristics and Transformation of Sago Palm Utilization in Traditional Rural Areas—From the cases of the three regions: West Papua, Indonesia, Southeast Sulawesi, Indonesia, Northwest Mindanao, Philippines

Saki Ehara
Variation in the Consumer Prices of Sago Starch and Other Starch in Jakarta, Indonesia

Yukio Toyoda et al.
Possibility of Up-Scaling Sago Production in Sepik Area, Papua New Guinea

Hafidawati et al.
Potential Study of Sago Dregs Waste as Renewable Energy: Quality and Economic Value of Sago Dregs Briquette Production

Oral Session 2 13:00 - 14:30 (2nd Room / Online)

Endang Yuli Purwani et al.
Impact of Ultrasonication Treatment on Resistant Starch (RS) Content and Characteristics of Sago Starch

Budi Santoso et al.
Maltodextrin from Sago Starch at Different Hydrolysis Times

Ansharullah Ansharullah et al.
Formulation of Sago Based Biscuit: Incorporation of Sea Cucumber (*Holothuria scabra*) Powder to Improve its Sensory and Nutritional Properties

Rahmah Zikra Utami et al.
Diversity of Medicinal Plants in the Sago Area of Siberut National Park, West Sumatra

Dwi Ahrisa Putri et al.
Analysis of Sago (*Metroxylon sagu* Rottb.) Supply Chain in West Sulawesi, Indonesia

Darma et al.
Small Scale Mechanical Processing of Sago in District Momi Waren, Manokwari Regency, West Papua Province

Oral Session 3 13:00 - 14:15 (3rd Room / Online)

Mardiani Dwi Agustin et al.
Genetic Diversity of Sago (*Metroxylon* spp.) in Lingga District, Kepulauan Riau

Ariel Nur Alifan Firmansyah et al.
Genetic Relationship of Sago (*Metroxylon* spp.) in West Siberut and North Siberut, Mentawai Islands Regency, West Sumatra

Naasih El Ibaad Abhal et al.
Genetic Relationship of Sago (*Metroxylon* spp.) Based on RAPD Analysis: A Case of Mamuju District, West Sulawesi Province, Indonesia

Melika Jehan et al.
Sago (*Metroxylon sagu* Rottb.) Agroforestry Based on Morphological Characters, Physical Environment and Productivity in Siberut National Park, Indonesia

Malimas Jariyapong et al.
Soil Carbon Stock Comparison of Sago Palm Plantation and Monoculture Crop Around Converted Wetland in Southern Thailand

Oral Session 4 15:15 - 16:30 (1st Room / Online)

Rampisela D.A. et al.
Knowledge Co-Production Practices in Nurturing Local Innovators for Promoting Conservation and Use of Sago Palm (*Metroxylon sagu*) and its Product

Mochamad Suwarno et al.
Development of Sustainable Sago Plantation on Peatland Towards Commercial Level

Primadhika Al Manar et al.
Ethnobotany of Sago in the Malay Community in Lingga Regency, Riau Islands, Indonesia

Ridho Afriansyah et al.
Ethnobotany of Sago (*Metroxylon sagu* Rottb.) in Mentawai Community, Siberut National Park, Mentgawai Islands District, Indonesia

Dwi Ratna Sari et al.
Agronomic Prospects for New Sago Palm Cultivation by Farmers: Time to Harvest and Associated Cultivation Management

Oral Session 5 15:30 - 16:45 (2nd Room / Online)

Agus Triputranto et al.
Improve the Process Flow by Utilizing Wet Sago Biomass to Increase the Productivity and Economics of Sago Processing in Meranti, Riau

M.N. Ahmad and K.B. Bujang
The Potential of Sago Frond as Large-Scale Animal Feed

Yulius Barra' Pasolon et al.
Utilization of Palm Oil By-products for Sustainable Crop Production in Marginal Land

Suriya Chankaew et al.
Utilization of Sago Palm Rachis to Woven Local Fishing Gear at Nakhon Si Thammarat Province, Thailand

Seprianto Palitak et al.
The Effect of Palm Oil Organo-Waste and NPK Fertilizers on Growth of Manno Sago Seed

Oral Session 6 (AAACU Session) 15:30 - 16:30 (3rd Room / Online)

Benito Heru Purwanto
Further Direction of Sago Palm Studies from Soil Science Point of View

Koki Asano et al.
Nitrogen-Fixing Bacterial Community in Sago Palm Roots in Different Soil Environments of East Malaysia and South Thailand

Destieka Ahyuni et al.
Characteristics of Sago Palm Suckers as Planting Material and Their Subsequent Growth in Deep Peat Soil

Kietsuda Luengwilai et al.
Climatic Factors Affecting Palm Yield and Yield Prediction: A Case Study of Aromatic Coconut

Poster Session 1 14:30 - 15:15 (2nd Room)

Tomoko Kondo et al.
Comparative Study on the Properties of Various Commercial Sago Starches and Examination of Gluten-Free Pasta Using Sago Starch

Kazuko Hirao et al.
Application of Sago Starch in Karukan (Japanese Rice Flour Steamed Cake) Spheroid Echinate Symmetric Phytolith Assemblage in Sago Palm (*Metroxylon sagu* Rottb.)

Fidrianto, B.E et al.
The Possibility of Sago Starch as a Healthy Food

Poster Session 2 14:30 - 15:15 (3rd Room)

Masanori Okazaki et al.
Spheroid Echinate Symmetric Phytolith Assemblage in Sago Palm (*Metroxylon sagu* Rottb.) Leaflet

Yasunobu Tokuda et al.
Antioxidant Polyphenols in Sago Starch Affected by Wet and Dry Extraction Processing

Yasunobu Tokuda et al.
Sago Starch as an Innovative Fermentation Aid for Tempeh Fungi (*Rhizopus oligosporus*)

Mitsuhisa Baba et al.
Sensory Evaluation of Cookies Made from Sago (*Metroxylon sagu*) and its Mixture with Taro (*Colocasia esculenta*) Starch

Recent Achievements toward SDGs through Collaborative Activities between Sago -producing Countries and User Countries

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Abstract
Sago palm, a starch resource plant distributed in Southeast Asia and Melanesia that adapts to adverse environments, is not only a food crop but is also expected to be utilized as a raw material for allergy-free foods, biofuel, and other industrial uses. Recently, the demand for sago palm has been increasing in response to the new normal of society after the coronavirus disease (COVID-19) and Sustainable Development Goals (SDGs). Such an increase in the demand for sago starch comes against the backdrop of the deterioration of the environment due to climate change, unforeseen social problems, and the need to strengthen food security and the resilience of the food system. Another factor is the growing global desire to ensure a healthy life. This presentation will highlight recent activities and efforts based on interdisciplinary thinking and multidisciplinary approaches that contribute toward meeting SDGs through cooperation between sago palm-producing countries and user countries. Some of these developments include: (1) specific nutrient-use efficiency—the nutrient absorption and translocation characteristics of sago palm that aid in the efficient uptake of potassium even from poor soil or salt-damaged land; (2) the development of sustainable nutrition management in the nursery and field based on the analysis of the symbiosis between useful microorganisms, nitrogen fixation bacteria (NFB), and/or arbuscular mycorrhizal fungi (AMF), and sago palm; (3) the development of optimal applications for cooking or processing that utilize the characteristics of sago starch, which does not contain gliadin, one of the allergen components of food allergies; (4) the recycling of the residue after sago starch extraction by liquefaction and saccharification; (5) the production of organic fertilizer using sago starch extraction residue as a material and its effective utilization; (6) the streamlining of the supply chain to add value to sago starch produced by small-scale farmers—providing knowledge and technology to manufacture commodities that will meet growing market requirements. These developments and others will be introduced.

Key words: Food security, Healthy living, Resilience of the food system, Supply chain, Sustainable development

Sago Development and Use Policy as Local Food Diversification for Food Security

Hengky Novarianto

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Abstract
Food security is a very challenging matter, in the midst of intensifying climate change, conditions of world economic pressure, environmental degradation, and the situation that Covid-19 pandemic is still not over. A sustainable agri-food system should provide a variety of sufficient, nutritious and safe foods at affordable prices for everyone, so that no one suffers from malnutrition or hunger of any kind. Indonesia has the largest sago area of around 5.5 million ha and sago area spreads over the large islands of the archipelago, and it spreads widest in Papua Province. The area, distribution and potential for sago production are quite large, but the reality is that harvesting and processing sago into starch still faces various obstacles; sago productivity is still low, the location of sago is far from residential areas, harvesting is difficult and expensive due to limited infrastructure and social culture, and not much of the sago starch goes to downstream products. Papua Province is the center of diversity of sago palm germplasm. The area of sago forests in the province is around 90% of the total area in Indonesia. The results of research on sago exploration, morphological characterization, productivity observations, molecular markers show that the greatest genetic diversity of sago is found in Papua Province, especially around Lake Sentani, Jayapura Regency. Dozens of types of spiny sago (*Metroxylon rumphii* Mart.) and non-spiny (*Metroxylon sagu* Rottb.) have been identified by various researchers from universities, research institutes, as well as sago observers, and researchers from Japan. During the time of 2010-2022, four superior varieties of sago have been released, namely: *Sago Molat*, *Sago Selatpanjang Meranti*, *Sago Bestari*, and *Sago Tana Luwu*, with starch productivity of 250-650 kg/tree. The innovative sago agro-industry model supporting food security was implemented in 2021 in North Luwu Regency which aims to increase added value and high competitiveness, and to support a sustainable sago industry. The government needs to adopt the policies which develop sago palm as local food security.

Key words: Accession, Agroindustry, Local food security, Productivity, Variety

Should a Certification Scheme be in place towards a more Efficient, Sustainable, and Resilient Sago Industry?

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Abstract
As much as 17% of global greenhouse gas emissions comes from the agriculture sector in recent years attributing to deforestation, chemical fertilizers and pesticides use. In the light of this, many companies and investors move to include Environmental, Social and Governance (ESG) in their management where sustainability extends beyond environmental issues, forcing all farmers to meet some ESG goals for that company's market. How will ESG affect the sago industry? Sago palm (*Metroxylon sagu Rottboel*) grow naturally in sago forest mostly in the peat or swamps between latitude 10° north and 10° south in Southeast Asia and Pacific Island countries. Historically sago has been the traditional staple food. Classified as one of the highest starch-producing plants in the world, sago starch export has been on the rise due to the high carbohydrate content potential as an alternative to the world's carbohydrate crisis and the extensive use in various food applications and non-food purposes. There have been tremendous changes in sago forest areas due leading to habitat fragmentation and the over-exploitation of natural resources including semi-domestication and cultivation. The threat has already been observed to have effect on sago palm diversity due to the failure to protect ecosystem integrity, exploitation, and climate change influence. Up until now, sago palm is still utilized to a scale where it has not made a real difference to these issues. A study indicated sago palm cultivated on peatlands falls in the "sustainable" category when assessed based on the social, economic, and environmental aspects of sustainability with no major issue relating to climatic change. However, in Indonesia, the Ministry of Agriculture has already taken steps to impose policies such as Sago Management and Development Program supported by a Regulation on Standard Operating Procedure for Certification and Control of Sago Seed and Good Sago Cultivation Guidelines. In Malaysia, the Laws of Sarawak has been enacted with the establishment of Sago and Nipah Development Board Ordinance 2022. One of the functions relates to implement policies and developmental programs to ensure the viability and sustainability of the sago industry in the State. It is time for all stakeholders to take initiatives to consolidate research findings on all aspect of sago industry. The goal is to formulate a regional certification scheme emulating the sustainable palm oil certification scheme introduced as a response to address the negative environmental and social impacts associated with the development of oil palm (*Elaeis guineensis*) industry.

Key words: Certification scheme, ESG, Natural Forest, Sago palm, Sustainability

Quality of Sago Starch for Worldwide Promotion

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Abstract

Sago starch is harvested from the pith of *Metroxylon sagu*, which is grown wild in Malaysia, Indonesia, and Papua New Guinea, mainly. Sago starch is a pure carbohydrate containing almost no protein or fat. Sago starch is a staple food in producing countries, where it is eaten in a gelatinous state after being cooked. In Japan, sago starch is used primarily as a dusting powder for making noodles. It is also used as a raw material for modified starch for paper manufacturing.

The export of sago starch is subject to the CODEX standard, which does not specify the pasting properties of starch, so it is likely that a variety of starch with different properties is produced and exported. Therefore, we purchased a number of starches sold in the Indonesian market and exported them to Japan, and evaluated their physicochemical properties.

Starch is composed of amylopectin and amylose. The physicochemical properties depend on the plant's origin. We hypothesized that the physical properties of sago starch would not differ significantly among the samples. However, the results demonstrated a wide range of physicochemical properties. The results suggest that these properties may arise during the post-harvest conditioning stage.

In addition to *Metroxylon sagu,* we also studied *M. warburgii*, *M. vitiense*, and *M. amicarum*. These also had the tendency to accumulate starch in the pith. Despite their low starch yield, they showed physicochemical characteristics similar to those of *M. sagu* in starch.

In this study, we present these results and hope to contribute to further developing applications for sago starch.

Key words: Export, Quality, Sago Starch

Potential for Up-Scaling Sago Production in Manus Province,P apua New Guinea

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Abstract

Manus Island in Papua New Guinea is a food insecure province with low-income level and low economic activities at provincial, district and household levels. Sago starch is a staple food that provide food security for the island province. Manus Island has a rich natural sago palm resource. A pre-feasibility study was conducted in three sample locations – Maraman, Laues and Wireh representing the main island of Manus between 17 – 24 September 2022. The Rapid Rural Appraisal (RRA) method was used to assess the utilization of sago palm for food security and for cash sale at the local markets in Lorengau town.
It is estimated that there is 2,000 ha of natural sago forest resource on Manus Island and are located along the coast. At a conservative dry starch yield of one ton/ha/yr, the existing sago resources has a potential to produce 2,000 ton of dry sago starch per year. Currently, utilization of the sago palm resource is confined to close proximity to villages and hamlets. It is estimated that only 10% of is utilized as staple with limited trading. Large areas are left untouched and underutilized. Traditional and inefficient processing techniques have greatly impaired sago starch productivity in Manus. There are 5-6 folk varieties identified by the locals, namely *Pao*, *Pamat*, *Pomolou*, *Nduri* and *Amoi*. All are claimed to be high in starch yield. The average starch yield of 32% is lower than those of cultivated sago palms in Indonesia and Malaysia (av 40% wet starch). Nonetheless, higher yields are expected if these palms are grown under better light condition and growing environments. Most varieties are reasonably high starch yielding. To improve sago starch yield and income on Manus Island, a sago value chain is proposed through increased sago starch production and marketing.

Key words: Food, Manus, Sago, Value Chain, Yield

Comparison of Growth Characteristics and Yield Potential of Starch-accumulating Palms

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Abstract

Palms belonging to 8-12 genera are known to accumulate starch in their trunks, but with the exception of the sago palm (*Meteroxylon sagu*), there have been remarkably few reports on their starch productivity. Against this background, the researches on four starch-accumulating palm species in three genera, sugar palm (*Arenga pinnata* (Ap): n=20), 'Sagu Baruk' (*A. microcarpa* (Am: n=6), fishtail palm (*Caryota mitis* (Cm): n=5) and gebang palm (*Corypha utan* (Cu): n=10), growing in Indonesia other than sago palm, were conducted. In this report, the growth characteristics and starch productivity of these starch-accumulating palms at harvest stage were compared with those of the sago palm (Ms: n=133), which the authors have been studying for many years, including the oil palm (*Elaeis guineensis* (Eg): n=3) at the time of replantation.

The plant length was around 20 m with the exception of Cm, and Ap, Am, and Cu showed a trend toward longer trunk length than Ms, but the trunk diameter was thinner in Ap and Am than in Ms, and thicker in Cu. These results indicated that trunk weight (volume) was Cu>> Ap≒ Ms> Eg> Am> Cm. Differences in pith dry weight closely related to the starch content showed a similar trend to trunk weight. Average starch percentage in pith (dry weight basis), another determinant of the starch content, was higher in the order Ms (67)> Cu (58)≒ Am (54)> Cm (34)≒ Ap (30)> Eg (12%), with greater variation in the percentage for Ap. The starch content of the surveyed individuals showed a range of 2 (Cm)-1394 kg (Cu), with significant differences. The average starch contents were Cu (963)>> Ms (356)>> Ap (140)> Am (71)> Eg (44)> Cm (3 kg), with 5 of the 10 surveyed individuals in Cu exceeding 1 ton, higher than the highest recorded for Ms (975 kg). Although Am is inferior to Ms in terms of the starch content per individual, it is clustered, with a trunk diameter of about 15 cm, making harvesting and starch extraction easier than with Ms, and its starch percentage is slightly inferior to Ms, so it can be expected to produce a starch yield per area equivalent to Ms, depending on planting density.

These results indicate that there are palms with higher starch productivity and easier harvesting and extraction operations than sago palms, and point out the importance of investigating and researching starch-accumulating palms other than sago palms.

Key words: Growth characteristics, Indonesia, Starch accumulating palm, Starch yield potential

Sago Production Potential in Several Regions in Indonesia

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Abstract
Indonesia has vast natural sago forest areas, especially in the provinces of Papua, South Papua, Central Papua, West Papua, and Southwest Papua, as well as in the lowlands of the Papua Mountains. Apart from Papua, sago is also found in provinces on the islands of Sulawesi, Kalimantan, Sumatra, and Maluku. Sago in Indonesia covers an area of 5.5 million hectares. Sago productivity in Indonesia reaches up to 20-40 tons of dry starch per hectare. However, not much is known about the yield of dry sago starch per tree. In this research, we compare the yield of dry sago starch from each tree of sago palm-producing regions in Indonesia, namely South Papua, Papua, Central Papua, West Papua, South Sulawesi, Southeast Sulawesi, Central Sulawesi, West Sulawesi, South Kalimantan, West Sumatra, and the Riau Islands. Measurement of the dry sago starch yield was carried out by comparing the volume of the sago tree to the volume of the sample and then multiplying it with the weight of the dry starch sample. The result shows that the highest production in South Papua was found in the Mappi regency amounting to 1197 kg. The highest in Papua Province was 443 kg in Jayapura Regency, while in Jayapura City it was 447 kg. In Central Papua Province, especially in Mimika Regency, the highest production was 402 kg in Central Mimika District. In West Papua Province, the highest production was 414 kg in South Sorong Regency, while in Southwest Papua Province, the highest production was 362 kg in Sorong City. In the Province of Southeast Sulawesi, the highest production was in South Konawe Regency, amounting to 445 kg. In South Sulawesi, the highest production was found in North Luwu Regency, amounting to 477 kg. In West Sulawesi, the highest production was found in Mamuju Regency amounting to 717 kg. In Central Sulawesi, it was found in Parigi Moutong Regency amounting to 429 kg. In South Kalimantan, it was found in Candi Laras District, Tapin Regency amounting to 178 kg. On the island of Sumatra, it was observed in West Sumatra, especially in the Mentawai Islands Regency, and in the Riau Islands Province, especially on Lingga Island. The highest production was found in the Mentawai Islands at 585 kg, while on Lingga Island it was 299 kg.

Key words: Kalimantan, Maluku, Papua, Sulawesi, Sumatra

Regional Characteristics and Transformation of Sago Palm Utilization in Traditional Rural Areas — From the cases of the three regions: West Papua, Indonesia, Southeast Sulawesi, Indonesia, Northwest Mindanao, Philippines.

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Abstract

The sago palm originated in New Guinea Island and spread widely to tropical regions. It has penetrated into the culture of the propagation area and has become an important resource in people's lives, not only for food but also for building/living materials. Therefore, we examined the regional characteristics of the growing environment, social environment, and economic conditions of the sago palm and classified them in three regions. The present sago palm habitats can be classified into wild sago forest, transplanted sago forest, small scale forest, mixed forest and free-standing sago tree. This growing condition indicates the diverse processing forms of sago as follows.

(1) The most distinctive features are the process of cutting the sago stem into small pieces and the method of extracting starch from the small pieces of sago stem.

The fragmentation technology has been propagated by dividing into standing ax type and sitting ax type. The starch-extracting is propagated by changing from a hand-kneading form to a foot-stepping form. These morphological differences are changing from self-sufficient sago starch production to commercial sago starch production due to economic factors.

(2) The use of sago starch changes from self-sufficiency as a staple food to one of multiple staple foods. And the form of use changes from staple food to confectionery and processed food for noodle production. Furthermore, it became a powder production with versatile use.

As a result, sago starch has become a starch material that is in contrast to other starch powders.

We summarized the transformation of sago starch as a food in three areas.

(1) As a staple food for wild sago forest society - Papuan type

(2) As one staple food in traditional societies (regions with multiple staple foods) - Southeast Sulawesi type

(3) Use of sago as a side dish (economic development area) - Mindanao type

As a result, sago palm utilization and starch extraction methods vary according to needs. It has become clear that with the economic development of society, sago has diversified from staple food to various foods, and that starch extraction methods have also developed into more efficient means. People in areas with sago palm found their own value of sago and used it in their own way. In the future, as global socio-economy is progressing, it will be necessary to think about how sago palms can contribute not only to economic value but also to humankind in response to global environmental problems.

Key words: Northwest Mindanao, Sago extraction, Sago palm, Southeast Sulawesi, West Papua

Variation in the Consumer Prices of Sago Palm Starch and Similar Powdery Starch Obtained from Other Crops in Jakarta, Indonesia

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Sago palm has been recognized as a potential plant resource for many occasions for several decades. The starch from that potential plant resource can be purchased at various places nowadays, for example, the local traditional markets, the modern supermarkets or retailers and online shops. Since 2020 the Covid-19 pandemic, the lifestyles of consumers had been changed all over the world, and here in Jakarta too. People gradually tend to purchase by online shopping, so the goods would be delivered directly from stores to their houses. On the other hand, after May 2022, Covid-19 infection has been started to settle down and the consumers' purchasing style is becoming back to the time of before Covid-19. This report presents the result of the prices of sago starch and similar edible powdery starch obtained from other crops at various places including retail stores and online stores. JETRO reported the number of Indonesian internet users, and in 2018 it was just 171 million people, but on the middle of 2020, it became 196 million and the Internet penetration rate increased around 8.9 points from the previous year, which was 73.7%. Indonesia's total e-commerce transaction price in 2020 was US$ 32 billion, which was 54% up compared to the previous year. Not only that, the total EC retail price in 2020 was about US$ 16.9 billion, with the growth rate of 27.0% compared to the previous year, and the analysts said it would grow to US$ 28.4 billion by the time of 2024. It is easy to guess the online purchasing will be more common. However, the percentage revenue of the EC purchasing is still only 6.1% of total retail sales. The method of current research is simple; checking the price of sago and resemble starch at the several retail stores chosen from every level (which means the target of consumers' income classes) and the official online stores. The analyzing price of sago starch shows that compared to the main similar starches such as flour, tapioca starch, the sticky rice starch, the price of sago starch remains quite high position when the price calculated by 100g each. Of course, there were rarer starches such as "the black potato starch" "the banana roots starch" and those remained more expensive price.

Key words: E-commerce transaction, Jakarta, Retail prices, Sago starch

Potential Study of Sago Dregs Waste as Renewable Energy: Quality and Economic Value of Sago Dregs Briquette Production

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Abstract

Currently, the world's energy consumption tends to depend on fossil fuels. Renewable energy is still underdeveloped. Indonesia has the potential to develop renewable energy, especially from the field biomass. One of the biomass is sago dregs waste which can be processed into briquettes. Sago dregs briquettes can be used as an alternative fuel that can be a solution to the energy crisis. Economically, sago dregs briquettes can be a very potential business. Making sago dregs briquettes can be done with the simplest technique. For this reason, it is necessary to carry out a calculate economic value of sago dregs briquettes. This research was conducted using sago starch waste adhesive with a weight percentage of 5 % of the weight of sago dregs briquettes. The results of this study were that sago dregs briquettes had a moisture content 9.74 %, ash content 11.44 %, volatile matter content of 15.89 %, and calorific value 4,598 kcal/kg. When compared with the quality of Indonesian national standard (SNI) 01-6235-2000 briquettes, sago dregs briquettes have not reached the specified quality standards. The results of calculating the economic value of production in local micro, small and medium enterprises (MSME's) to produce sago dregs briquettes with a capacity of 1,350 kg total income per month is IDR.5,461,865 with a net profit is IDR.243,000. The production cost of sago briquettes is IDR. 4,045/kg and the selling price that can be offered to consumers is IDR.4,225/kg. In this calculation, break-even point (BEP) value per unit of sago briquettes in one month is 1,255 kg while payback period is 22 days.

Key words: Economic value, Renewable energy, Sago dregs briquette