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LOCAL WISDOM SAGO PLANTATIONS' ASSISTANCE IN SUSTAINABLE SAGO FARMING: INNOVATION CLUSTERS AS A SUSTAINABLE SAGO DEVELOPMENT MODEL (2000-2023)

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ABSTRACT

Global climate change poses a threat to food supplies since it leads to long-term droughts, excessive rains, pest infestations, and disease outbreaks. Indonesia has access to Sago, a promising food resource for ensuring food security. Sago thrives in wetlands and peatlands despite its considerable starch content. Therefore, effective sago plantation management requires addressing environmental, economic, social, and institutional considerations, as well as making significant advancements in sago innovation clusters. The presence of alternatives, such as the Sago innovation cluster, enhances collaboration and competitiveness. This study examines the growth of sago plantations and the indigenous knowledge systems used to maintain them. A qualitative systematic literature review (SLR) employing the TERASI technique scrutinizes pertinent journal articles published between 2000 and 2023. Harzing Publish, or Perish, utilizes Google Scholar as its primary source for academic literature. Retrieve scholarly material pertaining to the topics of "Sago Plantations," "Sustainability," "Local Wisdom," "Benefits of Sago Plantations," and "Innovation Clusters." Studies indicate that low productivity, insufficient farmer institutions, and unsupportive legislation hinder the growth of sago plantations. The utilization of indigenous knowledge in sago management enhances the long-term viability of gardens. Further investigation into the sago plantation is required. Subsequent research endeavors should prioritize the exploration of indigenous knowledge in order to establish enduring sago crops. For the sustainable growth of Sago, it is necessary to introduce innovative approaches, such as establishing Sago innovation clusters that are based on local knowledge, in order to gain a deeper understanding of the local communities.

***Keywords**: Sustainability; Sago plantation; Local knowledge; Benefits of Sago; Innovation Clusters.*

ABSTRAK

Perubahan iklim global menimbulkan ancaman terhadap pasokan pangan karena menyebabkan kekeringan jangka panjang, hujan lebat, serangan hama, dan wabah penyakit. Indonesia memiliki akses terhadap Sagu, sumber pangan yang menjanjikan untuk menjamin ketahanan pangan. Sagu tumbuh subur di lahan basah dan lahan gambut meskipun kandungan patinya cukup besar. Oleh karena itu, pengelolaan perkebunan sagu yang efektif memerlukan pertimbangan lingkungan, ekonomi, sosial, dan kelembagaan, serta kemajuan signifikan dalam kelompok inovasi sagu. Kehadiran alternatif, seperti klaster inovasi Sagu, meningkatkan kolaborasi dan daya saing. Studi ini mengkaji pertumbuhan perkebunan sagu dan sistem pengetahuan adat yang digunakan untuk memeliharanya. Tinjauan literatur sistematis kualitatif (SLR) yang menggunakan teknik TERASI meneliti artikel jurnal terkait yang diterbitkan antara tahun 2000 dan 2023. Harzing Publish, atau Perish, menggunakan Google Cendekia sebagai sumber utama literatur akademis. Menggali materi ilmiah yang berkaitan dengan topik

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"Perkebunan Sagu", "Keberlanjutan", "Kearifan Lokal", "Manfaat Perkebunan Sagu", dan "Kluster Inovasi". Penelitian menunjukkan bahwa produktivitas yang rendah, kelembagaan petani yang tidak memadai, dan peraturan perundang-undangan yang tidak mendukung menghambat pertumbuhan perkebunan sagu. Pemanfaatan kearifan lokal dalam pengelolaan sagu meningkatkan kelangsungan kebun dalam jangka panjang. Diperlukan penyelidikan lebih lanjut terhadap perkebunan sagu. Upaya penelitian selanjutnya harus memprioritaskan eksplorasi kearifan lokal untuk menghasilkan tanaman sagu yang tahan lama. Untuk pertumbuhan Sagu yang berkelanjutan, perlu dilakukan pendekatan inovatif, seperti pembentukan klaster inovasi Sagu yang berbasis pada kearifan lokal, guna mendapatkan pemahaman yang lebih mendalam mengenai masyarakat lokal.

Kata kunci: *Keberlanjutan; perkebunan sagu; pengetahuan lokal; Manfaat Sagu; Klaster Inovasi.*

INTRODUCTION

The escalating global climate change, characterised by phenomena such as drought, floods, insect infestations, and diseases, poses a growing threat to food security (Rajakal, 2020; Timisela, 2022). In order to address this dilemma, Indonesia possesses sago, an exceedingly promising food resource. Sago is characterised by its significant starch content (Naim, 2016; Rajakal, 2021), ability to withstand challenging climatic conditions (Nafchi, 2011; Rahmaizi, 2022), and adaptability to inhospitable soil types like swamps and peat (Fadli, 2021; Kawahigashi, 2006), where other plant species struggle to survive (Monda, 2022; Santosa, 2018). Sago trees possess pneumatophores, enabling them to thrive in damp soil to a maximum depth of 1 metre (Inubushi, 1998; Ismail, 2023). The diverse sago species present in Papua, Maluku, and even Sumatra provide evidence of the sago's origin. Indonesia boasts the world's largest sago acreage, spanning an impressive 5.4 million hectares (Monda, 2022; Mujtaba, 2020). The majority of this region is occupied by indigenous sago plants that thrive organically in the woods of Papua. However, the area utilised for production purposes amounts to around 318,563 hectares.

Sago is a readily accessible commodity in Indonesia, although its utilisation still need enhancement. The significance of sago plants is in their ability to be transformed into many derivative products (Setyawan, 2022; Sjahza, 2019). Advantages: The presence of sago holds significant significance and is intimately intertwined with the lives of Indonesian individuals. Sago, a primary food source, is utilised in many regional cuisines to create meals such as papeda, sago rendang, sago plate, and other traditional delicacies (Dahliani & Maharani, 2018; Oladele, 2020; Zemp, 2019; Hariyadi, 2020; Chaivatamaset, 2011). In addition to its culinary applications, sago is also intricately linked to the social (Santika, 2019), cultural (Dahliani & Elban, 2019), and environmental dimensions of society (Jekayinfa, 2013). Ownership of a sago can symbolise an individual's social status and serve as a customary family legacy, akin to an inheritance or a bridal dowry. Additionally, it can be used as a method of making up for traditional penalties (Santika, 2021), representing harmony (Chandrasekaran & Bahkali, 2013), employed in customary assemblies (Bentivoglio, 2018), and aiding in the preservation of the environment. Sago stems serve as a sustainable construction material for housing. Furthermore, sago, a local gastronomic delicacy, exhibits significant promise as a viable alternative to rice in the foreseeable future. Thus, sago is a crucial necessity.

In the end, these requirements can only be fulfilled by either natural sago forests or cultivated sago forests, both of which currently have restricted productivity. Sago farming in the

Meranti Islands yields a starch production of just 10 tonnes per hectare per year, significantly lower than the sago production in South Sorong, which amounts to 34.59 tonnes per hectare per year, and Sarawak, Malaysia, which reaches 23 tonnes per hectare per year. Hence, to enhance the quality of sago, it is imperative to revive sago plantations and intensify conservation endeavours (Dahliani et al., 2022; Ibrahim, 2020). This necessitates the enactment of governmental policies for the administration and preservation of sago, with the primary objective of safeguarding sago forest resources, upholding ecological equilibrium (Dahliani & Saputra, 2018; Mahmud, 2019), augmenting productivity, and guaranteeing the sustained availability of raw materials. Implementation of conservation measures is vital to guarantee the enduring survival of sago.

Efforts to preserve sago, a readily available commodity in Indonesia, are necessary to enhance its use. The majority of the parts of the sago plant can be subjected to further processing in order to create derivative products (Inubushi, 1998; Sibarani, 2018). Efficient sago management is crucial for enhancing the productivity of sago utilization and maximizing its potential. The evaluation of sago resources' sustainability is conducted by considering social (Pratiwi et al., 2023), production (Martunis et al., 2023), and environmental variables (Saleh et al., 2021). Sago plantations supply the necessary raw materials to fulfill diverse sago requirements. The sustainability evaluation of sago development encompasses five dimensions: economic, ecological, socio-cultural, technological, and institutional.

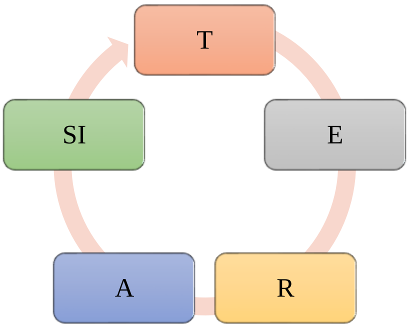
The community possesses indigenous knowledge, norms, and regulations that have evolved and shaped distinct behaviors within certain groups for the sustainable management of sago land (Dahliani, 2019; Hariati et al., 2017). Utilizing local knowledge and understanding can aid in developing environmentally sustainable agricultural systems (Liew, 2018; Sanyang, 2016; Sari & Malik, 2023). It can also foster harmonious coexistence between humans and nature and promote more ecologically responsible behavior (Azhar et al., 2023; Febrinda et al., 2023; Sugiono et al., 2023). The utilization of indigenous knowledge in diverse agricultural practices can enhance crop productivity. Local competence in water management is essential for peatland communities to effectively control humidity levels in sago production ecosystems and minimise the risk of land fires.

Prior studies have explored strategies to sustain the long-term survival of sago palms. This research distinguishes itself from prior studies by incorporating conservation initiatives, encompassing the community in activities such as clearing sago forests, growing sago trees in forested regions, utilizing the land for food production, and establishing sago farmer collectives. Food products serve as a means of communication through oral speech and provide society with shared cultural knowledge. Develop and execute a sago plant management plan in Angata District that utilizes local knowledge and maximizes its potential—broadening the scope of sago processing techniques. Utilizing Indigenous knowledge can contribute to the sustainable advancement of society, the economy, the environment, and governance in the long run. Hence, successful management of sago plantations necessitates the integration of environmental, economic, social, and institutional factors alongside substantial progress in sago innovation clusters. The existence of different options, such as the Sago innovation cluster, improves cooperation and competitiveness. Local wisdom encompasses the innate ability and transmission of virtuous ideals that sustain a harmonic equilibrium between persons and their surroundings.

Incorporating indigenous knowledge into the development process is more efficient as it is firmly rooted in the fabric of society. Nevertheless, the prioritisation of applying a regional wisdom approach is lacking, and further research on local sago knowledge is still necessary. This study aims to examine the intricacies of sago plantation growth and the diverse indigenous knowledge systems that contribute to promoting sustainable sago development. To address the difficulties in establishing sago plantations, a thorough examination of the available literature can be conducted. This evaluation should adopt a complete strategy that incorporates indigenous knowledge to address the gaps in the development of these plantations effectively.

METHOD

This research uses a qualitative descriptive methodology, specifically the Systematic Literature Review (SLR) method. The systematic literature review (SLR) method covers all relevant research on a particular research subject (Vedianty et al., 2023). The research procedure followed the "TERASI" technique, which consists of five unique components, as illustrated in Figure 1.



Bagan 1. Teknik “TERASI” dalam SLR

Figure 1 illustrates the “TERASI” technique used in this work, with the first stage marked with the letter “T.” The evidence is irrefutable. Determine the search page selection criteria that will be used to select articles for analysis. The next stage requires the application of the letter "E." The letter E represents the next stage, "Elimination". The manuscript elimination method is carried out by conducting a keyword search to find publications that are relevant to the research topic. The third phase consists of the letter "R." In the third stage, the reports obtained in the second stage are consolidated through combining keywords. This is done to limit the size or scope of something. The fourth stage is designated "A." Step "A" outlines the analysis procedure. Publications were selected based on their titles and abstracts after analysis and are fully accessible. The final phase includes the letter “SI,” which explicitly signifies the act of concluding. Conclusions are drawn from the search results of ten articles and then used to produce results and a discussion.

RESULT AND DISCUSSION

Benefits of Sago Plantations Traditional wisdom in creating and managing sustainable sago farming was carried out in this research using the Systematic Literature Review (SLR) method. The stages of the SLR method are used to identify, review, interpret, and interpret all available research with certain research questions relevant to this research, broadly following the "TERASI" method with 5 steps. The first step in the "TERASI" method is carried out in this research, where the first stage is the letter "T." It is determined. Determine what is meant by deciding the search page that will be used to select which article will be analyzed. H The Harzing Publish or Perish platform usesdatabases from Google Scholar, Scopus, WOS, Crossef, and Semantic Scholar. However, the focus of this research is limited to the Google Scholar database from 2000 to 2023. The second step is with the letter "E." The letter E represents the second step, which means "Elimination." Manuscript elimination was done by searching for articles that matched the focus of this research by entering keywords. The first keyword entered on the search page can be seen in Figure 2. Figure 2 in the first elimination stage is to enter the keywords "*Innovation Cluster" and "Sago Plantation."* Manuscripts containing these keywords span the last ten years, from 2000 to 2023. Result in 362 articles published from 2000 to 2023, focusing on the keywords "Innovation Cluster" and "Sago Plantation." The results show that research on how efforts are made and studies on " *Sustainability"* are still special topics and are of great interest. However, this step is the basis for the results that will be obtained at the next stage because this stage is not yet the focus of this research but is still general. The third step is the letter "R". The third step is to reduce the articles obtained from the second step by combining keywords. This is done to narrow the scope. The combination on the search page is to enter the keyword *" sustainability,"* focusing on sustainable efforts on *"sago plantation."*

The search results used are the results of the previous step, which are then searched

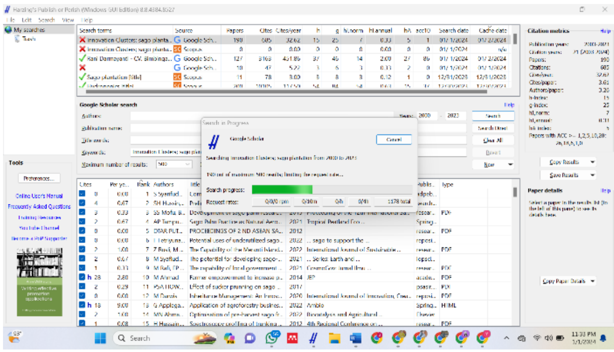


Figure 1. Halaman Penelusur yang digunakan dalam teknik "TERASI"

using 3 keywords, namely *"sustainability" and "sago plantation," and "Innovation Cluster"* with the results that can be seen in Figure 3. The results in Figure 3 are the results of the reduction that has been carried out using two keywords, which are then also carried out by sorting which articles are relevant and which are not. The relevance of an essay refers to research (Darmayanti et al., 2023) by looking at where the article was published. Moreover, the completeness of the existing data, namely the title, author's name, journal name, volume, and article number up to the year and even the entirety of the DOI number. The literature results in the third step are used as the basis for data to proceed to the next step, namely the fourth step, the letter "A." Step letter "A" describes the analysis steps. For the next analysis, articles are selected based on title, year, author's name, and abstract, and they can be fully accessed (complete with PDF). The final step is the letter "SI," i.e., conclude. The conclusions obtained from the article search results in the last step can be seen in four articles match the focus of this research with search results in English and Indonesian language journals, with the keywords "*Sustainability,"; "sago plantation,"; "local knowledge,"; "Benefits of Sago," and "managing sustainable,"* as well as " *sago cultivation* " and "Innovation Cluster" or and are further used in producing results and discussions. Discussing the SLR results using the TERASI technique is explained in several ways.

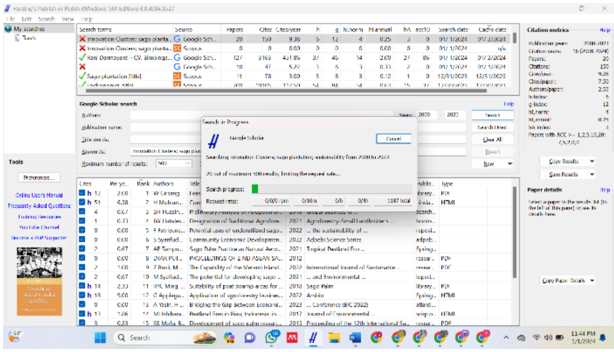


Figure 3. Halaman Penelusur yang digunakan dalam teknik "TERASI" dengan 3 keyword

1. Sago Sustainable Development Model: Innovation Cluster

The Sago Sustainable Development Model estimates that without policy or conservation efforts, sago reserves in Papua will decrease by 2044, as shown by dynamic system simulations conducted by Thahir et al. in 2014. Therefore, the sago management system must effectively meet production needs while maintaining the sustainability of cropland—the Malaysian government plants sago in rubber and oil palm plantations in Sarawak for commercial purposes. According to Mohamad Naim et al. (2016), Malaysia is the second largest producer of sago after Indonesia. The Meranti Islands in Indonesia cultivate Sago in the largest quantities. Secret Package: Sagoon PT National Sago Prima applies intensive planting practices.

At the same time, a small-scale, moderate-intensity agricultural approach is also being implemented. Rubber cultivation is carried out as a means of generating additional income. Maluku applies the "dusting" technique to cultivate sago and crosagon in one bed. The proposed paradigm is an implementation of the Innovation Cluster Development paradigm based on Regional Featured Products (PUD), which is rooted in local wisdom. The Sago industry development plan is focused on upstream-downstream chain innovation by fostering collaboration with four main stakeholders: government, universities, corporations, and the community. Implementing a cluster strategy will improve plan implementation. Clusters are a viable option as they facilitate increased synergy. An innovation cluster is a group that includes innovative start-ups of various sizes, research institutes, and other institutions that share similar characteristics and operate in the same sector and region. Innovation clusters encourage innovation by fostering close interaction, sharing resources, exchanging knowledge, and facilitating technology transfer, networking, and information dissemination. Local governments must form industrial clusters in certain locations through affiliated organizations to create a conducive environment for downstream industrial activities, including manufacturing and marketing. This region has one or more groups of sago production facilities and investment activities close to each other. Clustering aims to effectively identify, monitor, and evaluate economic activities or production centers related to collaboration in several industrial and geographical aspects.

2. Challenges of developing sustainable sago plantations

Challenges in developing sustainable sago plantations: Lack of government attention and limited markets hinder sago cultivation in Indonesia. The sago agribusiness system has many interrelated subsystems. Water management, bond systems (institutional aspects), and product supply (low productivity) are challenges for sustainable sago plantation management. Government policies can also be improved to help SAGO grow. Indonesia's sago industry can improve. Modifying various interrelated regulations is very important. The first difficulty in realizing sustainable sago plantations is the limited sago yield, as seen in Table 1.

Table 1. Difficulties In *Developing Sustainable Sago Plantations*

No	Difficulty Type	Information
1.	Environmental factor	Environmental factors are important because sago plants thrive in peat habitats vulnerable to fire and land subsidence without effective water management (Afdah & Yuniwati, 2020; Yuniwati et al., 2008). International demand for agricultural products such as palm oil has led to the commercialization and widespread adoption of monoculture farming (Rokhmawati et al., 2022). An extensive network of canals helps drain peatlands (Riyanti et al., 2023). Excessive water drainage increases the danger of forest fires and drought (Rawa & dan Efektivitasnya, 2021). Plastic culture, an important part of local knowledge (Hu, 2020), must be considered even if the moisture-dependent sago palm is threatened (Liang, 2021).
2.	Slow Growth	The slow regrowth of sago in the forest limits the supply of raw materials. In areas planted with sago, yields can be increased. Traditional Indonesian sago farming is passed down from generation to generation with little emphasis and is handled as a side business. Long sago harvest times reduce farmers' garden maintenance (Kusumaningsih et al., 2024; Yuniwati et al., 2024). Management controls weeds and pests (Putra et al., 2023; Yuniwati et al., 2023). Sago plantations must be improved so that productivity is higher. Restoring sago plantations is critical to their survival. Increasing productivity can help ensure the availability of sago raw materials in the face of land competition with oil palm (Eugenio-Gozalbo et al., 2021; Green & Duhn, 2015).
3.	Farmer organizations are not yet optimal.	Lack of availability. Requirements for the reliability of microfinance organizations force farmers to use intermediaries. Because farmers needed more money, government support for natural sago resources, and limited markets, they set up non-formal sago processing institutions (Egerer, 2019a; Spilková, 2018). System: In the Meranti Islands, producers sell sago stalks in three ways. Examples are direct sales to producers (refineries), own processing through factory rental, or bond sales. Due to poor prices, farmers often lose money by selling bonds. This strategy often leads to debt, leaving farmers unable to pay and losing land to repay their loans (Cummings et al., 2008; Egerer, 2019b). Individual gardens are growing. However, the efficiency of sago cultivation must be improved.
4.	Insufficient assistance Regulations	: Transmigration destination areas must designate sago and other lowlands for government programs. Lack of community involvement in sago management, motivation, and farmer assistance contributes to low sago utilization. Import regulations and other agro-industry expansion efforts are needed to address this. Sago supervisors tend not to increase social collaboration. No national policy regulates sago cultivation, like rice, corn, and

	soybeans. Sago land is not protected from conversion to rice fields. Several locations prioritize sago protection, such as Jayapura Regency, which has issued Regional Regulation Number 3 of 2000 to preserve sago forest areas, and Central Halmahera Regency, which has implemented Regional Regulation Number 18 of 2018. Meranti Islands Regency, as the main producer of sago, requires regional regulations. Instead, they used the government's "One Day with Sago" campaign to promote Sago as a regional icon.

3. Increasing Sago Production

Several aspects need to be considered to increase sago production, including genetic, environmental, cultivation management, and harvesting aspects (Chua et al., 2021). Some of these things can be influenced by several factors, which can be seen in Table 2.

Table 2. Factors Influencing The Increase In Sago Production

No	Factor	Information
1.	One of the genetic factors	Sago is diverse, as seen from the many variants and regional names. Eastern Indonesian sago varieties are Molat, Tuni, and Para, while Western Indonesian sago varieties are Duri, Bemban, and Sangka. Each variety has different starch quantity, quality, and features (Al-Jaaf, 2022). However, biomass usually influences sago starch production. Plant biomass impacts starch production (Fidio, 2020; Moumtaz, 2019).
2.	Soil types and temperature	Soil type, temperature, and humidity affect the growth and productivity of sago. Sago grows in mineral soil and peat (Li, 2020). Sago grows best in swampy ground influenced by sea tides. The roots are not submerged, the organic matter is high, and the water is brown and slightly acidic. The microorganisms that grow sago thrive in this environment (Akhlamadi, 2021). Sago grows best at altitudes below 400 meters above sea level, temperatures above 15, and humidity above 90 percent, with a light intensity of 900 joules/cm2/24 hours and rainfall of 2000 mm/year (Arkoun, 2012; Yeremenko, 2018).
3.	Harvest	Sago must be harvested now. Young sago is harvested when the plant flowers. This phase of flower emergence has the most starch (Zheng, 2020). If harvested too early or past maturity, starch production will decrease
4.	Management	Although sago can grow without care, thinning will affect the quality of the stems. Sago plantations require management for internal and external reasons. Farmers' knowledge, attitudes, motivation, and skills are internal factors. External influences include extension efforts, farmer groups, culture, promotion of sago products, availability of agricultural loans, and sago system infrastructure (Tavares-Dias, 2018).

4. Sago Cultivation Factors

Sago cultivation and various sago processing businesses can boost the community's economy thanks to local wisdom. Consider economic, environmental (ecological), social, cultural, and institutional factors to optimize results and ensure the sustainability of sago management in the long term. How these factors are to be considered in sago cultivation can be seen in Table 3.

Table 3. Aspects That Influence Sago Cultivation

No	Aspect	Information
1.	Economy	Sago requires less maintenance, thereby reducing production costs. A study is needed to determine the minimum profitable sago cultivation area. However, the analysis shows that sago cultivation is good and efficient (Brigagão, 2019). Sago farmers in Luwu Regency earn a monthly income of two million rupiah. This indicates that sago farming is profitable and beneficial. Also, sago can replace rice and is safe to consume (Kusumo, 2017). Sago palms are a great asset owners can use for major financial needs such as parties or children's education. Because each sago stalk produces 10 to dozens of sago stalks with a price of around five tens of thousands of rupiah per stalk, this also proves that from the economic sector, sago cultivation has a big impact and is a financial asset that cannot be underestimated (Peng, 2019).
2.	Maintenance	Intensive maintenance for the first three years involves cleaning and distributing debris under the tree to maintain moisture and growth and control pests. The annual semi-forest sago crop produces tens of tonnes of dried Sago. This amount exceeds desert rice production (Tian, 2019). By optimizing land use, an integrated agricultural system on sago plantations can increase people's income. Farmers can plant secondary crops such as areca nut and other plants that produce crops more quickly while waiting for the harvest (Arancon, 2011; Gresley, 2019). Sago is very important for the economy of the Tohor River. This plant is promising and safe for peatlands.
3.	Ecological	Sago plants are environmentally friendly and easy to grow (Simatupang & Harianja, 2018). Planting sago on peatlands helps protect residential areas from oil palm plantations. This ecosystem absorbs carbon and captures water (Achmad et al., 2023; Budiarti et al., 2023; Fauziyah et al., 2021). Sago can be planted in peatlands that do not have drainage channels to avoid peat sinking (Rahmawati et al., 2022; Yulianeta et al., 2022). However, canals or ditches must be built to transport the sago palms to processing factories. Water management must be carried out to maintain water levels and prevent damage. The residents of the Meranti Islands built canal blocks called "tebat" to control groundwater and soak the sago plants. This also reduces land fires (Amandangi et al., 2020). Community participation and sustainable program implementation are

		possible. This canal block reduces waste with sago shells (Kartini et al., 2023; Liliani et al., 2021). In mineral-rich soil, careful zoning will increase water absorption in sago farming. Maluku uses dusung planting. This water will then flow into the sea and spread throughout the region, where land production increases, river fish populations grow, and the sea becomes clear. This can increase income.
3.	Social and Cultural	Ownership of sago land protects communities and increases self-confidence (Darmayanti et al., 2023; Manasikana et al., 2023), encouraging communities to exercise their rights. Sago is important in rural culture. Many Papuan and Toraja rites include Sago. Huluuan MeraSagoRiau traditionally counts sago plants while moving (Budiarti, 2009; Wondal et al., 2023). The city government uses these activities to attract tourists. Lumoli Maluku culture can reduce poverty if implemented. These cultures have two sides. Masohi appreciates cooperation and assistance. Second, Badati symbolizes Masohi's history of feeding participants. However, low community resources prevent them from exploiting Sago's extraordinary potential to overcome poverty. Even though Sago has great potential, the community needs more resources to keep them poor (Ayed, 2022; Balart, 2016).
4.	Institutional	Local institutions can help Sago develop psychologically because people follow traditional rules rather than government programs, which may fail (Parletta, 2019). However, government assistance is very important, especially in promoting national ideals that can be adopted into regional regulations. The government and community are working together to restore the peatlands of the Meranti Islands.

Table 3 shows that the ecology of the peatland sago planting prog program, the Meranti Islands is ana that prioritizes sustainable ecological, socio-economic, and traditional defense (Manhães, 2012; Sihombing, 2022). Village forest access provides institutional support for land management. Legal access to village forests empowers communities to improve and sustain the local economy (Yesilyurt, 2020).

CONCLUSION

Sago plantations face productivity problems that can threaten the supply of raw materials. Therefore, sago plantations require continuous rejuvenation. Economic, ecological, social, cultural, and institutional variables must be considered for the sustainability of sago plantations. Management solutions that use local knowledge and skills can overcome these problems. Communities easily accept local knowledge strategies because of their strong foundation in social customs, culture, and values. Using holistic local wisdom, this article's evaluation finds that sago plantations no longer need to be established. This study investigates how local insight helps establish sustainable sago plantations, raising relevant questions for future research. Because the sago refinery factories in Meranti and Indragiri Hilir Regencies are located on riverbanks, long-term investment to upgrade these factories is less attractive. Therefore, new factories that make dehydrated sago flour are becoming more attractive. Investors can choose a factory location that meets all standards. The new facility to convert wet sago starch into substitute sago starch can meet community needs. Local cultural innovation clusters, which require ongoing activities, drive the sago sector. Building and developing a dry sago flour factory is one example. They help with management and technology training and set sago pricing rules. They are growing the downstream industry by making instant, liquid, powdered sago starch derivative products and holding investment development workshops.

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