

Improvement of Integrated Sago Processing in Meranti Islands Regency

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ABSTRACT

Sago plant (*Metoxylon SP*) for the community in the Regency of the Meranti Islands has an important role in the life and economy of its people. The prospect of developing the sago business in Meranti is still promising because The land used has only reached 43% of the available land, and management can still be optimized. Sago processing that is currently operated is still running conventionally. That is, it only produces sago starch products. Its by-products in the form of waste from the pulp (repu) and skin (uyung) have not been optimally utilized. This study aims to optimize the processing of by-products into high-value products through improving sago management towards the concept of a zero waste industry in the Meranti Islands Regency, Riau Province. The results of the research that has been carried out show that it is necessary to add a process flow to the processing so that the resulting sago repu is not wet. The resulting dried sago repu will expand its utilization. From supporting studies, the results of studies that have been carried out show that fermentation using *Trichoderma* can increase protein by 18-22%. Using this *Trichoderma* mushroom, sago pulp can be used as animal feed or as raw material for biomass

Keywords: by-products, feed, integrated sago, repu, biomass

INTRODUCTION

The sago plant (*Metroxylon sp*) is a tropical plant that spreads in the lowlands of Southeast Asia and Malaysia, located between latitudes 10° N and 100° LS and up to an altitude of 700 m above sea level [1]. The Meranti Islands Regency is the largest sago-producing area in Indonesia which has been known for a long time. Sago for people in the Riau region has become part of life and economic drivers [2]. In addition to having great potential in providing a source of

carbohydrates to accompany rice, its great potential also applies as a source of animal feed, industrial foodstuffs, and energy sources.

Sago plantations in Meranti have become the main source of income for almost 20% of the Meranti people. Sago or *rumbia* plants belong to the type of tropical *palmae* plants that produce starch in the stem (steam). A sago ready for harvest can produce 180 – 400 kg of dried sago flour.

Adult or ripe and cut sago plants (ready for harvest) are 8 to 12 years old or 3-5 meters high. The production of sago (Sago Flour) in the Meranti Islands per year reaches 440,339 tons (in 2006). [3]. The productivity of sago plant land per year (excision condition) in producing sago flour in the Meranti Islands reaches 9.89 Tons / Ha.

At 2006 in the Meranti Islands 440,000 tons, more sago flour was produced from sago processing plants (sago refineries). No exact data was obtained on the number of refineries and the capacity of processing refineries, but it is estimated that 50 sago refineries are using semi-mechanical technology and most of them still use sunlight for drying. The current condition of the people's sago refinery in the Meranti Islands Regency is generally located on the edge of the river, and the sago/repu dregs produced are generally thrown into the river body, causing pollution. [4] The condition of the process water used in sago refineries is generally brownish peat water without a water treatment process so the quality of the sago produced is not good. In the dry season, process water is often polluted with seawater so that the quality of sago is damaged. In the sago processing industry with a large capacity, the river water will accumulate with the remaining sago starch extracted from the extraction [5]. If this continues, there will be an accumulation of sago starch waste which will result in river water pollution. The development of the sago industry not only provides benefits but can also hurt the environment

[6]. The sago processing industry with a large capacity can cause the accumulation of organic pollutants due to waste if not managed properly [7]. Therefore, it is necessary to improve the production process to improve the quality of sago starch and environmentally friendly handling of sago pulp and improve the quality of pulp as a source of feed [8], [9].

The purpose of this study is to develop integrated sago processing to reduce waste yields so that sago refineries work in an environmentally friendly manner. And increase the added value of sago pulp and leather waste for the use of economic potential in the Meranti Islands Regency, Riau Province. The proposed way to solve the sago repu/dregs problem without drastically changing the production pattern is to add equipment packages to reduce the moisture content in the sago repu from > 60% to <30%. The improvement of this process flow can increase the use of repu as an industrial raw material. The addition of screw press unit equipment so that sago repu / dregs as waste can be resolved so that the sago dregs can later be increased in use value to become animal feed or *briket* [10].

Solid fermentation of sago hampas can produce bioconversion products that can be used as ingredients for ruminant (cattle) and poultry (chicken) animal feed formulations [11]. The use of h sago dregs in ruminant animal feed can reach 40% and in poultry, it reaches 25%.

MATERIALS AND METHODS

The object of research used as material in this dest research is one sago refinery in this observation is CV Kilang Sagu Harapan (CV KSH) which began operating in 1995 CV KSH has a garden with an area of ± 300 Ha with a productivity per production process (two days) reaching 8,200 kg. The need for sago tual to be produced at this processing plant ranges from 400 to 450 tual per production process [3].

This research applies a secondary research method (desk research) that involves the use of

information that has been collected by others through primary research. The secondary research process consists of four steps that can be repeated if needed: (1) identifying the subject's domain and related sources of information; (2) collecting data; (3) comparing data from various sources where possible; and (4) analyzing the data. The material used as external secondary data includes sources from the media and previous research related to the use of sago waste. This article, therefore, identifies the types of waste generated from sago

treatment plants, the prospects and challenges of their utilization based on previous studies, and proposes recommendations for sago waste

RESULTS AND DISCUSSION

Sago Processing Process

In Riau, the use of sago is currently still focused on sago starch as its main product. The development of downstream products is still relatively limited. By-products in the form of waste from sago pulp (repu) and sago tree bark (uyung) have not been optimally utilized. Sago refinery owners generally dump sago dregs waste into rivers and sago skins have not been widely used [8]. The Meranti Islands Regency has an area of 45,000 ha of sago plantations of which about 20,000 ha are managed semi-intensively. The potential of sago plantation waste has been underutilized. The sago processing process produces advanced waste in the form of bark around 17-25% and sago pulp 75-83%. Sago pulp can be used as a mixture of biogas substrates because it contains a lot of organic matter, especially carbon and animal feed if processed properly. [12] So far, sago dregs have been wasted and polluted the aquatic environment around the Meranti Islands Regency which is indicated by the turbid water around the area. Based on data from the Ministry of Industry and Trade, there are 47 sago processing plants spread across various locations in the Meranti Islands. Generally, sago factories are located by the river and most sago factories have no sewage management plan. There is a tendency for sago factories to simply dump their waste into rivers [13]. The impact is a change in parameters in the water around the sewage area, both in terms of color and taste. This is an early indication of the occurrence of water pollution. Waste is produced from peeled sago bark (uyung) and sago solid waste (pulp or repu in the local language) produced from sago processing. So far, tens of tons of solid waste have been disposed of by the sago industry [14].

During the extraction of sago starch, the sago stalks are washed, debarked, and rasped before the grinding or pulping process. During the entire production process, a large amount of water

management to support a sustainable sago industry.

(20 liters of wastewater per kg of sago starch production) is discharged because sago wastewater is rich in carbohydrates, solid suspended fibers and solids, unexplored starch, cellulose (fibrous residues from impulse), nitrogen compounds, cyanoglucosides, and insoluble fiber. This waste, contains high concentrations of organic matter (such as proteins, lipids, and carbohydrates) and is reported to be acidic and emits a foul odor causing pollution and deterioration of environmental quality globally [6].

Sago waste is usually mixed with wastewater and discharged into rivers or deposited infactory compounds. Each note of extracted sago starch produces and discharges about one note of sago waste into nearby rivers. Almost the same amount of sago waste is discharged into nearby rivers, thereby causing serious environmental pollution problems. The high demand for biological oxygen (approx. 5820 mg/L) and chemical oxygen (about 10,220 mg/L) in wastewater affects marine life and water quality through microbiological degradation by consuming dissolved oxygen in the water [14].

Sago Processing Process

Processing of sago flour can be carried out both traditionally and modernly. The modern sago flour production process is expected to be able to utilize sago as a flour ingredient to the fullest and meet market needs. CV Kilang Sagu Harapan is one of the largest sago refineries as a sago flour processing plant located in Tanjung Village which operates semi-mechanically.

The sago logs to be processed are first skinned (peeled off) on the outside. This part of the outer skin is hard and 2 – 3 cm thick. This stripping usually uses an ax or a rather large knife. The purpose of the stripping process is to separate the cork-shaped inside from its hard and thick outer

shell. Then the inside is cut into small pieces and put into a grater machine in the form of a rotating nailed drum. Later this shredded engine was replaced with a shredding engine with a stainless steel vessel with a 7 HP diesel motor, this shredding machine worked similarly to a coconut shredding machine [16], [17].

The result of the grater will be carried by the kanban mechanically and fall on the reservoir. The grater is then mixed with water and stirred manually using human power (sometimes using a mechanical system), this process is the process of extracting sago into flour (starch). Stirring in this stirring medium is a process of enumeration of sago stem meat (which is cork-shaped) with the help of water as a catalyst. The result of this extraction produces fibers (fiber) and granules to be then filtered with a cloth made of nylon with a size of ± 200 mesh. This extraction process produces pulp which the Meranti community calls "repu" which then becomes the cause of pollution of the rivers around meranti because the sago refineries in Meranti are located on the edge of the river.

The filter results from the extraction process have flowed into the reservoir (concrete tub or large wooden bucket) for the settling process, this process will separate the water from the extraction result (wet flour) After the reservoir is full of sediment then for the second time the sediment is stirred in a mortar medium to then flow into the reservoir for precipitate. After settling, wet flour is dried in the sun by utilizing sunlight.

In the observation of Sago Productivity and Quality in mechanical and semi-mechanical and semi-mechanical processing processes in Merbau District, Meranti Islands, in mechanical processing the sago flour production process lasts for 35 hours with the use of 26 workers with the number of products used as much as 7.5 tons and the products produced as much as 7 tons. While in semi-mechanical processing the production process lasts for 32 hours with the use of 10 workers with the number of products used as much as 1 ton and the products produced 750 kg [18]. The quality

standards of the sago produced still do not meet the SNI.

Potential sago waste

From the perspective of industrial starch production, sago coconut pith contains about 26% (dry weight) of pith waste. When the starch content was measured using rasper and comparatively determined the actual starch content using chemical extraction, the pith content was found to be 37 and 77% in dry weight, respectively. These results confirm that about half the volume of starch is left in the waste [19].

The results showed that sago leaves have a BK content of 45.08%; PK of 4.73%; LK of 0.50%; SK of 29.00%; Ash of 9.00%; BETN of 56.77%; NDF of 80.39%; and ADF 70.00% (Laboratory of Nutritional and Chemical Sciences, Faculty of Agriculture and Animal Husbandry UIN, 2014). While the pulp of sago has a dry matter content of 54.03%; GE 3,912 kcal/kg; BO 48.75%; PK 5.02%; NDF 67.78% and ADF 43.47% [14].

Proposed modification process.

With the rapid production of sago today, it produces several wastes, namely solid waste in the form of sago skin and liquid waste in the form of sago repu / pulp. Sago skin itself based on a survey of the field conducted at Mr. Amiruddin's refinery, sago skin is 100% reused as oven fuel which is useful for drying (dryer) wet sago into dry sago/sago starch [20]. Meanwhile, the current condition repu is directly discharged into the river without any further processing or conversion of use. It is feared that in the future there will be a special environment in the river area in the form of the shallowness of the river, disturbing the life of the flora and fauna that is there, etc [8].

One way to solve the problem of sago repu / dregs is by conducting an assessment and application of screw press technology. The screw press itself has been studied and applied by BPPT for the tapioca flour industry in the Lampung area and the results are quite good. It is hoped that with the development of screw presses, sago repu /

dregs as waste can be resolved so that the sago dregs can later be increased in use value to become animal feed or *bricket*.

Screw Press Working Principle

The repu that has been produced is accommodated in a repu bath, then with the help of a repu pump is pumped into a sieve. The sieve moves horizontally with a sieve length of about 4 meters. The sieve function reduces the moisture content in the repu, water will be wasted automatically due to gravity while the repu will be directed towards the *hopper*. Along the sieve will be installed mesh of different sizes. For example, when the prefix repu enters, a larger mesh will be used than the mesh close to the

hopper. When the repu has gone through the sieve, it will be accommodated into a tub/hopper. Under the hopper there is a *screw press*, later the repu will pass through the stem *screw press*, it is expected that the moisture content of the repu reaches $\pm 50\%$. The screw press chart is in Figure 1 and the plan is in Figure 2

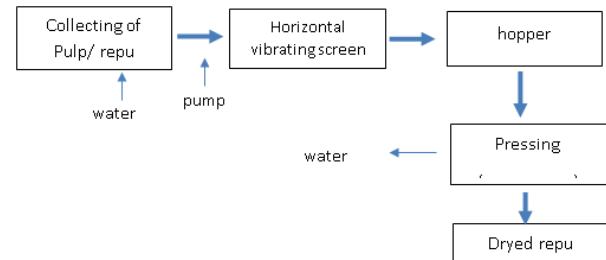


Figure 1. The screw press chart is in

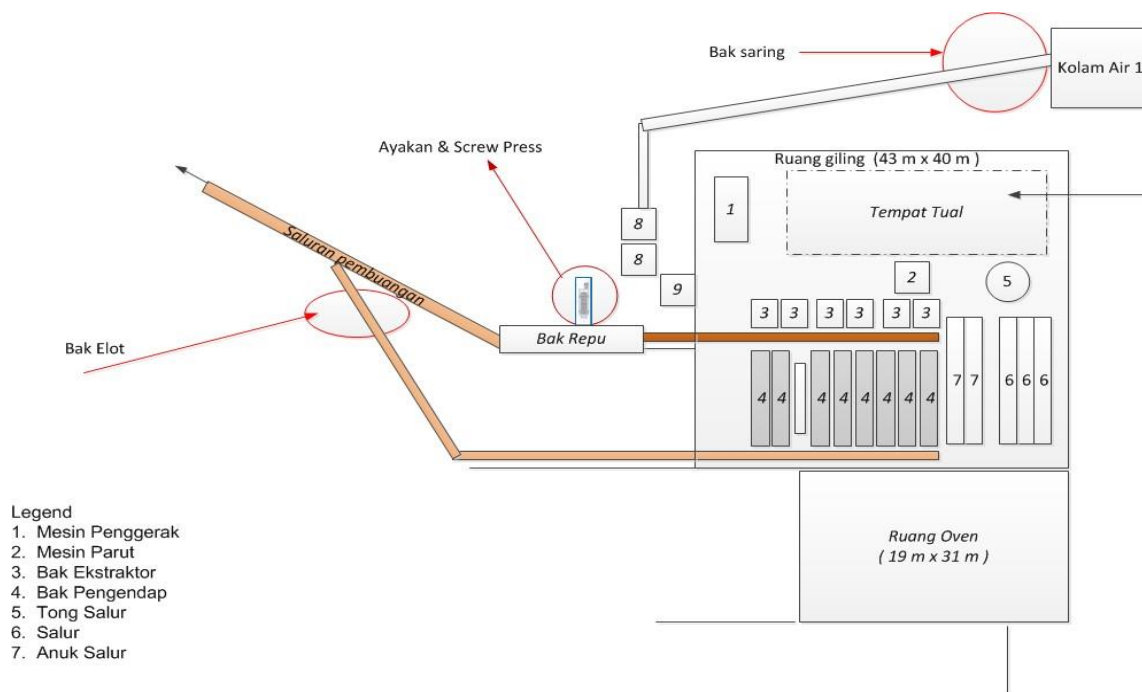


Figure 2. Mr. Amirudin's Screw Press Placement Chart
Utilization of repu as feed

Livestock is a source of animal protein, it needs to be increased in production at minimal cost and utilize agricultural industrial waste as a source of feed ingredients. From the results of the fermentation process of materials, The digestibility of dry matter and the digestibility of organic matter of each feed ingredient of agricultural industry waste is the highest in sago pulp compared to other

sources such as coconut meal, kecep pulp, coffee grounds, brown skin, coffee waste [11].

Ampas sago contains sago starch that escapes filtration and sago hampas fiber. Sago hampas analysis still shows nutritional content including 85.1 % DM as feed ingredients, 2.2 % DM crude protein, 5.5 % DM crude fat, 30 - 45 %

DM starch, 30 - 35 % DM fiber, 4.5 % DM ash, Calcium 0.4 g / Kg DM, Phosphor 0.2 g / Kg DM, and gross energy 17.1 MJ / Kg DM. The nutrients contained in Sago Pulp Animal Feed are about 21% Lignin or woody substance, 20% Cellulose or main carbohydrates, 3% Protein, and 18% Crude fiber. This composition is already ideal enough to be used as animal feed, it's just that farmers will usually increase the level of protein contained in the waste by carrying out the fermentation process [14].

Based on observations, the daily weight gain

CONCLUSION

The addition of a press unit to the sago processing production process flow has proven to be able to handle the problem of sago biomass as a by-product. It is even able to increase the added value of this sago biomass. Economically, this addition is only in the value of the investment that must be added, but when compared to utilization and environmental impact, it shows more useful results. Because sago biomass that was previously in wet conditions will be difficult to utilize. After going through the screw press the moisture content

(PBBH) data of cows is measured once per two weeks while the feed consumption data is measured daily. The feed treatment given had no noticeable effect ($P > 0.05$) on the consumption of BK and PBBH Bali cattle in each treatment. Meanwhile, the complete feed treatment has a very noticeable influence ($P < 0.01$) on the digestibility of dry matter (KCBK). Giving fermented sago waste up to 50% produces PBBH of 0.58 kg / day [14].

of sago hampas can be 30%. With these water content conditions, the fermentation process can be done in the formulated feed application for cows. The availability of biomass / hampas sago is a new economic potential for the Meranti patent area in providing cattle feed. And the direct point is that the sago mill will be a new income in addition to the sago starch that has been obtained so far. And at the same time, it can overcome the pile of repu that interferes with the environment

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