Supply chain flows of sago business in Polewali Mandar Regency, West Sulawesi Province

Dwi Ahrisa1*, Arman Amran1, Andi Marlisa Bossa Samang2, and Andi Nirmayasari Mangga1

1 Agribusiness Study Program, Faculty of Agriculture and Forestry, Sulawesi Barat University, Jalan Prof. Dr. Baharuddin Lopa, S.H, Talumung, Majene Regency, 91412, Indonesia
2 Agricultural Crop Technology Study Program, Faculty of Agriculture and Forestry, Sulawesi Barat University, Jalan Prof. Dr. Baharuddin Lopa, S.H, Talumung, Majene Regency, 91412, Indonesia

Abstract. Sago palm is a potential starch-producing plant capable of providing economic benefits to the local community. However, its utilization still needs to be improved. Hence, optimal supply chain management is expected to control the availability of sago starch and other processed sago products to be more effective and sustainable. This study aims to analyze three supply chain flows: information flow, product flow and financial flow. This research was conducted from June to December 2022 at a sago starch production center in Polewali Mandar Regency, Independent Agricultural and Rural Training Center (P4S) of Cahaya Duta Palili. The samples in this study were purposively selected, which were 30 sago farmers, an owner of sago processing company P4S Cahaya Duta Palili, an owner of Sabar Jaya Rempah Shop, and ten consumers. The analytical method used is a mixed method using data analysis techniques, namely qualitative descriptive analysis and marketing margins. The results showed that P4S has the highest profit margin, with a cost of Rp 250,000, and P4S can make a profit of Rp 2,750,000 per production. The product and financial flows have been running well and effectively, but the flow of information to supply chain actors between farmers and P4S needs to run more efficiently. This is due to a lack of communication and information between them. Farmers do not know when P4S needs raw materials, which can hinder the flow of products, finances and information in each supply chain.

1 Introduction

An estimated 30% of the food produced for human consumption globally is lost or wasted somewhere along the food supply chain [1]. This has immense implications for the overall supply chain performance and the nutritional, food security and livelihood sustenance of smallholders. Between 2000-2019, food loss and waste generation reached approximately 23-48 million tons/year, equivalent to 115-184 kg/capita/year. Most of the food loss and waste is experienced in three segments: production, post-harvest and storage, and processing and packaging [2].

* Corresponding author: dwiahrisaputri@unsulbar.ac.id

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Sago palm is a native Indonesian plant with great potential. Indonesia accounts for 15% of the world's total hectares of sago palm, with the most significant production area being in West Papua. As a starch-producing plant, sago can even substitute wheat flour to produce white bread, biscuits and cookies. The substitution in the range of 30%~40% will not have any effect related to the quality of the product [3]. Hence, sago starch consumption in Indonesia offers a significant opportunity to contribute to both economic sustenance and the alleviation of food insecurity among agri-food actors in the agri-food chain [4].

Recently, in Japan, the price of sago exported to Japan has skyrocketed: according to NSP, the 80% price increase is due to a shortage of supplies from Ukraine and Russia. Besides being a staple food made from sago, Indonesia uses it as an ingredient for making biscuits. Based on Mustika's finding, a sago processing company in North Luwu supplies PT. Mayora has as many as 800 sacks every month. Regarding energy, sago can be used as an alternative energy source that is environmentally friendly, bio-ethanol, because the carbohydrate content is relatively high at 85% compared to corn at 71% and cassava at 24%.

Moreover, sago also has a significant role in the textile industry. Sago is a fiber binder, thus making the machine easier to spin. The ability of sago to bind fiber bundles will facilitate the process of making cloth as desired [5].

The logistics and management of agri-food value chains are also typically designed to optimize the economic returns to entrepreneurs entering new markets or introducing new products or practices to established markets [6]. Logistics in agriculture is gaining more importance as it deals mainly with the smooth supply of food and other agricultural products from the producer to the final consumer. It is essential to consider the principles that apply to other logistics subsystems. The critical components of logistics have been an essential feature of industrial and economic life for countless years. Still, it is only in the relatively recent past that logistics has been recognized as a significant function in its own right.

Generally, sago plants in Tana Luwu grow naturally and in cultivation. Otherwise, sago production in West Sulawesi Province is a little small. In 2019, Mamuju and Polewali Mandar Regency produced 322 tons and 199 tons of sago, respectively. Other regencies, such as Mamasa and Majene, only produced 35 tons, while Pasangkayu produced 6.87 tons. However, Majene, Pasangkayu and Polewali produced the highest sago productivity by 1400 kg/ha/year, 1145 kg/ha/year, and 1081 kg/ha/year. As for 2020, there was no significant increase. This was likely due to converting agricultural land and housing [8]. Sago in West Sulawesi grows wild and needs to be appropriately developed. Independent Agricultural and Rural Training Center, Pusat Pelatihan Pertanian dan Perdesaan Swadaya, or P4S, is a training center for producing dried sago starch in Polewali Mandar Regency. However, logistics and supply chain problems have been encountered since the center was established. The long-chain and broad distribution of sago starch leads to higher prices without adding extra value. The availability and quality of infrastructure, such as roads, ports and transport networks, heavily influence the sago supply chain. Thus, this study is considered essential to provide a foundation for figuring out the three flows of the supply chain, namely product flow, information flow and financial flow, to determine the proper function in the supply chain.

2 Methods

The research was conducted in a sago production center in Polewali Mandar Regency, West Sulawesi Province, called P4S Cahaya Duta Palili. This study applied a mixed-method approach, both qualitative and quantitative. Focus group discussion (FGD) as a qualitative data collection methodology is carried out in groups, with the interview process in a structured, semi-structured or unstructured manner [9]. Data collection starts from June to December 2022. Primary data was obtained directly from the research location by
obtained from relevant books, journals, government publications, and other supporting scientific sources.

The samples in this study included 30 sago farmers, P4S Cahaya Duta Palili as a sago company, Sabar Jaya Rempah Shop and ten consumers. The selection by purposive sampling was based on the consideration that the respondents were the parties who knew well the perspectives of companies and markets on the conditions of implementing partnerships in the supply chain.

The analytical method used is a mixed method using data analysis techniques. The first analysis uses qualitative descriptive analysis. It provides an overview of the supply chain of sago starch products at P4S Cahaya Duta Palili regarding product flow, information flow, and financial flow by looking at the supply chain network system or the distribution of sago starch products from farmers to P4S Cahaya Duta Palili to Sabar Jaya Rempah Shop, or directly to consumers through the marketing system used at P4S Cahaya Duta Palili. The second analysis uses marketing margin. This was used to obtain financial flows calculated based on reducing the selling price with the purchase price for each supply chain actor in marketing or the sum of the marketing costs incurred and the profit earned by each supply chain actor, which mathematically can be formulated as follows:

\[
\pi_i = P_{ji} - P_{bi} - C_i
\]

Description:
Mi = Marketing margin at agency level-i
Pji = Sales price for marketing agency at level-i
Pbi = Purchase price for marketing agency at-i
Ci = Cost of marketing agency at level-i
\(\pi_i\) = Profit of marketing agency at level-i
MT = Total Margin

3 Results and discussions

A supply chain is a place for the distribution of goods and services from producers to final consumers; in the supply chain, there is a concept with a regulatory system related to product flow, information flow and financial flow. This arrangement is essential due to the many links in the sago starch supply chain [10]. Sago supply chain has several aspects that must be considered related to the flow of products, information and finance. Product flow in the sago supply chain is the distribution of products in the form of dried sago starch. The flow of information relates to communication between supply chain actors involved in marketing sago products consisting of sago farmers, P4S Cahaya Duta Palili, Sabar Jaya Rempah Shop and consumers, while the financial flow is the distribution of value in cash; the financial flow consists of costs that must be paid and the profit earned by each supply chain actor involved in the sago supply chain.

The production distribution pattern is inseparable from the sago supply chain. The distribution process indirectly forms a channel that connects each actor in the sago supply chain. There are supply chain channels at P4S Cahaya Duta Palili, namely sago farmers, P4S Cahaya Duta Palili, Sabar Jaya Rempah Shop, and consumers. Sago farmers sell sago to P4S Cahaya Duta Palili, then process sago purchased from farmers into sago and sell it to Sabar
Jaya Rempah Shop and consumer. Sabar Jaya Rempah Shop is an intermediary in selling dried sago starch products and resells to consumers.

Product flow, financial flow and information flow of dried sago starch at P4S Cahaya Duta Palili consists of several supply chain actors as described in Figure 1.

Fig. 1. Supply chain flow of sago business in P4S Cahaya Duta Palili

Description:
- : Product Flow
- : Financial Flow
- : Information Flow

Fig. 1 about the flow pattern of the sago supply chain at P4S Cahaya Duta Palili shows that the supply chain flow is divided into product, information and financial flows. There are four actors consisting of:
1. Sago farmers are the first supply chain actors. Farmers are a source of raw material providers in the form of raw materials; farmers sell their sago for Rp 100,000 to Rp 150,000 per tree, depending on the size of the sago trunk.
2. P4S Cahaya Duta Palili is the second chain actor producing dried sago starch.
3. Sabar Jaya Rempah Shop is a marketing agency that deals directly with P4S Cahaya Duta Palili to sell dried sago starch to consumers.
4. Consumers are the last chain that consumes dried sago starch.

3.1 Product Flow

The product flow at P4S Cahaya Duta Palili has been running smoothly, starting from farmers selling sago trees to P4S Cahaya Duta Palili with an average purchase of 2 trees from P4S Cahaya Duta Palili with a selling price of Rp 100,000 per tree for each production. Sago purchased from farmers is then processed into dried sago starch at P4S Cahaya Duta Palili. Sago is ready to be sold and distributed to Sabar Jaya Rempah Shop and consumers.

The following product flow is Sabar Jaya Rempah Shop. This shop obtained dried sago starch products by ordering them by phone. Sabar Jaya Rempah Shop orders 50 to 60 packs of dried sago starch for each order, and within a month, this shop usually orders 1 to 3 times. Consumers at Sabar Jaya Rempah Shop usually buy 1 to 3 packs. The selling price offered by Sabar Jaya Rempah Shop to consumers is Rp 17,000.

The following product flow is consumers who buy dried sago starch directly from P4S Cahaya Duta Palili by coming directly to P4S Cahaya Duta Palili and buying 1 to 4 packs at a selling price given by P4S Cahaya Duta Palili for Rp 15,000/kg. This is to the research...
conducted [11], which states that the flow of products or raw materials sent from suppliers to processing manufacturers is then produced to produce products. This product will be sent to distributors, who then distributors send goods to retailers, and then the goods will move up to the final consumer.

3.2 Information Flow

It is undeniable that the flow of information plays an essential role in the supply chain. Those with good supply chain performance must be those who can manage transparent and accurate information flows. Information conveyed through the communication process is carried out to maintain a sense of trust between each supply chain actor [11].

The information flow on sago at P4S Cahaya Duta Palili is from upstream to downstream and vice versa between each supply chain actor. The flow of information between Farmers and P4S Cahaya Duta Palili has not run smoothly. This is due to a need for more communication and information between farmers and P4S Cahaya Duta Palili. Farmers do not know when P4S Cahaya Duta Palili needs raw materials. This can hamper the production process if one day there is a change, such as the result of the weather, which can reduce the price and quality of raw materials, and stock cannot be fulfilled.

The flow of information at P4S Cahaya Duta Palili and Sabar Jaya Rempah Shop has been running smoothly and always maintains good communication. The information submitted by P4S Cahaya Duta Palili and Sabar Jaya Rempah Shop is related to ordering times, which are always on time, and information about the price of dried sago starch to be marketed.

The information flow has also occurred with Sabar Jaya Rempah Shop and consumers, which have been running smoothly. The flow of information between Sabar Jaya Rempah Shop and consumers is related to information on the amount of dried sago starch from consumer requests and also the amount to be purchased. This information flowed to P4S Cahaya Duta Palili to estimate the amount of dried sago starch to be produced. Similarly, consumers who buy directly at P4S Cahaya Duta Palili. This research is by research [12], which states that the flow of information is essential in expediting the flow of products and financial flows in the supply chain. This flow of information is related to the supply of product capacity still in supermarkets, which distributors, factories and farmers often need. Factories also often need information about the availability of production capacity owned by suppliers. Information about the status of shipments of raw materials is often needed by companies that send or receive these products. Information flows reciprocally from farmers to final consumers and vice versa.

3.3 Financial Flow

The process of cash flow to sago flour at P4S Cahaya Duta Palili started with consumers buying dried sago starch from P4S Cahaya Duta Palili and Sabar Jaya Rempah Shop, with the selling price at Rp 15,000 and Rp 17,000 respectively, then P4S Cahaya Duta Palili with Sabar Jaya Rempah Shop made a transaction when sending dried sago starch by P4S Cahaya Duta Palili, then will be exchanged for a cash note by P4S Cahaya Duta Palili. This cash note contains the dried sago starch from Sabar Jaya Rempah Shop and the amount to be paid. The following financial flow P4S Cahaya Duta Palili buys two sago trees from farmers at a time of Rp 100,000 per tree. P4S Cahaya Duta Palili incurs an additional fee of Rp 150,000, including transportation, logging, electricity, and fuel costs.

Dried sago starch flour at P4S Cahaya Duta Palili in one production reaches 200 kilograms. Within a week, P4S Cahaya Duta Palili was able to produce two times. Every 200 kilograms of dried sago starch flour produces as many as 200 packs of dried sago starch in
1-kilogram packages. So once the P4S Cahaya Duta Palili production produces 200 packs and is sold at Rp. Spices are sold to consumers at a selling price of Rp 17,000 per kilogram.

Marketing margin is defined as the difference in prices at the farm level and at the retailer level [13]. Table 1 shows that the profits in each chain are different; the highest profit margin is found in P4S Cahaya Duta Palili, with a cost of RP 250,000, P4S Cahaya Duta Palili can generate profits for each production of Rp 2,750,000. This is because P4S Cahaya Duta Palili processes the raw material into dried sago starch products, adding value to the sago product, which previously had a capital of Rp. 100,000 so that it could benefit Rp. 2,750,000 in one production. Likewise, Sabar Jaya Rempah Shop who bought dried sago starch flour at P4S Cahaya Duta Palili for Rp 15,000 and sold it at Rp 17,000, so from this selling price, Sabar Jaya made a profit of Rp 2,000 per kilogram.

The purchase price of dried sago starch purchased by consumers at P4S Cahaya Duta Palili is different from the selling price at Sabar Jaya Rempah. Because consumers buy directly from dried sago starch producers, the selling price offered by P4S Cahaya Duta Palili is cheaper than that at Sabar Jaya Rempah. This is because Sabar Jaya Rempah Shop is a retailer of dried sago starch, so the selling price is higher than at P4S Cahaya Duta Palili. This is also similar to research conducted [14], which states that financial flows in the supply chain are in the form of cash payments for products sold. The financial flow consists of components of costs and benefits received by each link involved and flows from downstream to upstream. The marketing profit margins in the dried sago starch supply chain at P4S Cahaya Duta Palili are as follows:

### Table 1. Dried Sago Starch Marketing Profit Margins

<table>
<thead>
<tr>
<th>No</th>
<th>Marketing Channel</th>
<th>Rupiah/Tree/Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Farmer</td>
<td>Rp 100,000</td>
</tr>
<tr>
<td></td>
<td>Selling Price</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>P4S Cahaya Duta Palili</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buying Price</td>
<td>Rp 100,000</td>
</tr>
<tr>
<td></td>
<td>Selling Price</td>
<td>Rp 15,000 x 200kg = Rp 3,000,000</td>
</tr>
<tr>
<td></td>
<td>Total Cost</td>
<td>Rp 150,000</td>
</tr>
<tr>
<td></td>
<td>Logging</td>
<td>Rp 60,000</td>
</tr>
<tr>
<td></td>
<td>Transportation</td>
<td>Rp 50,000</td>
</tr>
<tr>
<td></td>
<td>Electricity</td>
<td>Rp 20,000</td>
</tr>
<tr>
<td></td>
<td>Fuel</td>
<td>Rp 20,000</td>
</tr>
<tr>
<td></td>
<td>Profit Margin</td>
<td>Rp 2,750,000</td>
</tr>
<tr>
<td>3</td>
<td>Sabar Jaya Rempah ShopShop</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buying Price</td>
<td>Rp 15,000</td>
</tr>
<tr>
<td></td>
<td>Selling Price</td>
<td>Rp 17,000</td>
</tr>
<tr>
<td></td>
<td>Profit Margin</td>
<td>Rp 2,000</td>
</tr>
<tr>
<td>4</td>
<td>Consumer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selling Price at P4S Cahaya Duta Palili</td>
<td>Rp 15,000</td>
</tr>
<tr>
<td></td>
<td>Selling Price at Sabar Jaya Rempah ShopShop</td>
<td>Rp 17,000</td>
</tr>
</tbody>
</table>
4 Conclusion

The sago supply chain at P4S Cahaya Duta Palili involves farmers, Sabar Jaya Rempah Shop and consumers. The product and financial flows have been running well and effectively, but the flow of information to supply chain actors, namely farmers and P4S Cahaya Duta Palili, needs to run more efficiently. This is due to a lack of communication and information between farmers and P4S Cahaya Duta Palili. Farmers do not know when P4S Cahaya Duta Palili needs raw materials so that can hamper product flow, financial flow and information flow in each supply chain of dried sago starch products.

Acknowledgements

Acknowledgements are conveyed to the DIPA Grant of Universitas Sulawesi Barat in 2023 as the funder for this research. Subsequently, the owner of P4S, Cahaya Duta Palili, Ms. Sunarsih, comprehensively supported researchers during the data collection stage. Remember the enumerators, field assistants and all sago business actors in Polewali Mandar Regency for participating so that this activity can be appropriately conducted.

References

5. M. Mustika, IAIN Palopo (2021)
8. W. Boateng, 3, no. 7 (2012)
10. I. Apriani, other, Universitas Islam Riau (2019)
13. M. Rizal, “MARGIN DAN EFISIENSI PEMASARAN LADA”.