Model of The Sago Bioindustry in Southeast Sulawesi, Indonesia

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Abstract

Sago is known as a super crop because it is able to produce very large amounts of starch, which reach 20–40 tons per hectare. However, the economic value is relatively low. The research was conducted to obtain a model formulation for the sago bioindustry in Southeast Sulawesi. The research was conducted using multiple methods, namely surveys, FGDs, and limited production trials. Data analysis uses a system-dynamic approach. The results showed that the application of bioindustry principles through the utilization of sago waste into compost as much as 37 tons per year and the manufacture of liquid sugar as much as 10 tons per year, followed by government intervention in increasing the area of sago planting area to 250 ha per year, will provide an additional production of 218%, an additional land area of 160%, an additional employment of 216%, and an additional total income of 254% compared to the current sago management model. The application of bioindustry is able to provide direction for the development of sago in a sustainable and competitive manner.

Keywords: Bioindustry, sago, dynamic model.

1. Introduction

Sago (*Metroxylon sagu Rottb*.) is an important and largest starch-producing plant, so it is known as the "starch crop of the 21st century". This plant grows well in freshwater swamps, peat swamps, watersheds, around water sources, or swamp forests. Sago plants have high adaptability to marginal land, which does not allow optimal growth for food crops and plantation crops. Sago accumulates carbohydrates in the form of starch in its stems, which begin to form at the age of 4-5 years after planting and can be harvested after 8–12 years. Production of dry starch in one stick reaches 116,69–372,89 kg. The potential for dry starch production reaches 15–40 tons per hectare per year. This production is much higher than food commodities such as rice (15–20 tons/ha/year), corn (20–25 tons/ha/year), and cassava, with a production range of around 25–30 tons/ha/year (Bintoro et al., 2010; Yan et al., 2022; Bantacut, 2010; Bukhari et al., 2017; Utami et al., 2014; Oladzadabbasabadi et al., 2017; Tjokrokusmo, 2018; Wan et al., 2016a; Wan et al., 2016; Dewi et al., 2016; Du et al., 2020).

Indonesia has the largest sago plantations in the world, covering an area of 5,5 million ha (Bintoro et al. 2016; Flach, 1997), the majority of which are sago forests found on the island of Papua, as well as several parts of Indonesia, namely the island of Sumatra, Sulawesi Island, and Maluku. Most of these plants are used as staple foods (Pratama et al., 2018; Ahmad et al., 2016).

Most of the utilization of sago is still limited as a staple food, causing this plant to have low economic value even though the potential for utilization is very large. Sago can be used as food, bioethanol, environmentally friendly plastics, pharmaceuticals, and sweeteners, as well as a source of carbohydrates with a low glycemic index suitable for diabetics, animal feed, and compost (Bintoro et al., 2010; Bantacut, 2010; Bukhari et al., 2017; Utami et al., 2014; Tjokrokusmo, 2018; Wan et al., 2016a; Wan et al., 2016b; Syakir, 2014; Lay 2012).
The opportunity to use sago as sugar and compost is very strategic for Indonesia. Especially for sugar, Indonesia is still the largest sugar importer, reaching more than 2 million metric tons per year. Some of the things that cause problems are the decline in sugarcane land and the decreased productivity of sugarcane because the competitiveness of sugarcane is lower than other crops such as rice, corn, onions, and various other food crops, so farmers are less interested in cultivating sugarcane. In addition, the low efficiency of the sugar factory results in a lack of synergy between various institutions in achieving sugar nationally (Subiyakto et al., 2016; Wahyudi, 2021; Dianpratiwi et al., 2018; Soraya et al., 2019; Rachmadhan et al., 2020; Saputra, 2020; Rahman et al., 2018). Thus, the effort to use sago as a source of sugar is the right step.
On the other hand, along with the increasing price of inorganic fertilizers and the increasing demand for organic agricultural products, the demand for compost is also increasing. One of the inexpensive materials that can be processed into compost is sago pulp. The potential for sago pulp is enormous, as it can reach around 75 tons per hectare (Abidin and Asaad, 2015).
Apart from being related to potential, another problem faced in developing sago in Southeast Sulawesi is the trend of significant decline in sago land.

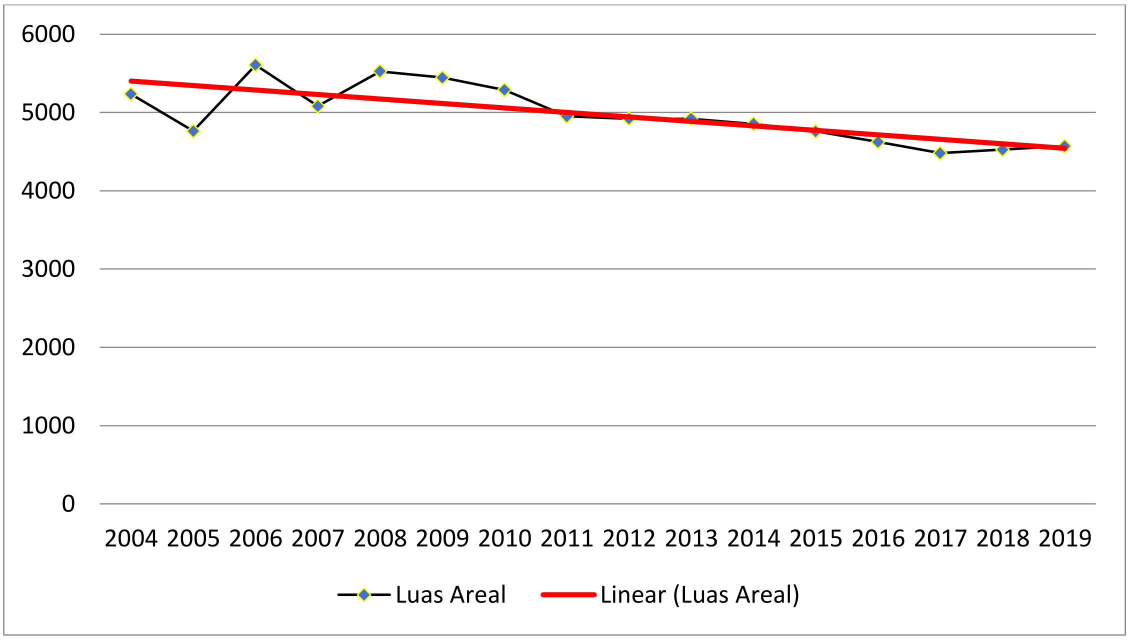

Figure 1. Development of Sago Area in Southeast Sulawesi in 2004-2019
Source: Southeast Sulawesi province plantation statistics (processed)

If the decrease in sago planting area is allowed to continue, it is feared that it will disrupt the availability of local food reserves for the people of Southeast Sulawesi. Therefore, the development of sago has a double meaning: apart from meeting local food availability, it will also provide opportunities for industrial development.

The interrelationships between the various components in the complex sago bioindustry model require a comprehensive and integrated understanding. One way to solve complex problems is with a systems approach. Through a system-dynamic approach, it is possible to design appropriate and implementable policy plans. The systems approach can be implemented in various fields (Widiatmaka et al. 2014; Firmansyah 2016; Marimin and Magfiroh 2013; Li et al. 2012; Murad 2019).

The research aims to formulate a sago bioindustry model in Southeast Sulawesi that is competitive and sustainable.

2. Research Methods

The research was conducted in several areas for the development of sago plants or products in Southeast Sulawesi in January–June 2022.

The research was carried out using multiple methods, including (1) a survey of two clusters, namely: (a) a cluster of 60 sago farmers selected by purposive random sampling; (b) sago processing clusters, namely 28 sago processing groups, both semi-modern and modern; (2) focus group discussions on the main actors of sago, including the government (Plantation Service, Trade Service, Environment Service, Village Head) and business actors, namely sago processing factories; sago farmers; academics; and researchers; (3) trials for the manufacture of selected bioindustry products, namely sago liquid sugar and compost. The production process of sago pulp compost is described in Abidin et al. (2019). The trial results were compared with the compost criteria based on Minister of Agriculture No. 70 of 2011. Furthermore, the liquid sugar production process refers to Budiyanto (2019). The production of liquid sugar was compared with the quality standard of glucose syrup according to SNI 01-2978-1992.

Data Analysis Method

Some of the data analysis used includes data analysis through several stages: building a Sago bioindustry model, validation, simulation, and alternative scenarios to the model using Powersim Studio 8 software. Modeling simulation aims to analyze the sago bioindustry before and after intervention (2015 to 2050). The model was built from three sub-models, namely the sago farmers sub-model, the wet sago processing sub-model, and the bio-industry sub-model. The validation test used is structural validation, which tests the validity of the model against real-world conditions. The test was carried out using statistical methods (Tasrif, 2007). Validation testing uses the MAPE (mean absolute percentage error) test method, or the mean absolute error with the formula:

$$\boldsymbol{MAPE = \frac{1}{n}\sum \frac{X_m - X_d}{X_d} x100}\%$$

Criteria (Morecroft 2007; Muhammadi et al., 2001):

MAPE < 5% = correct model

MAPE 5 – 10% = acceptable model

MAPE > 10% = model is unacceptable

In this study, there were 3 simulations: (a) the existing simulation, namely the current sago industry model, without any intervention; (b) a simulation of the application of bioindustry, namely the processing of 10 tons of liquid sugar per year and 37 tons of compost per year; and (c) the processing of 10 tons of liquid sugar per year, the processing of 37 tons of compost per year, and additional government intervention for additional land sago as much as 250 ha per year.

3. Results and Discussion

The sago bioindustry model is a series of systems that must be discussed holistically, starting from land availability, existing conditions of sago plantations, management models, and economic aspects.

Sago Flour Production Pattern

The pattern of flour production passes through various stages. This can be seen in Figure 2.

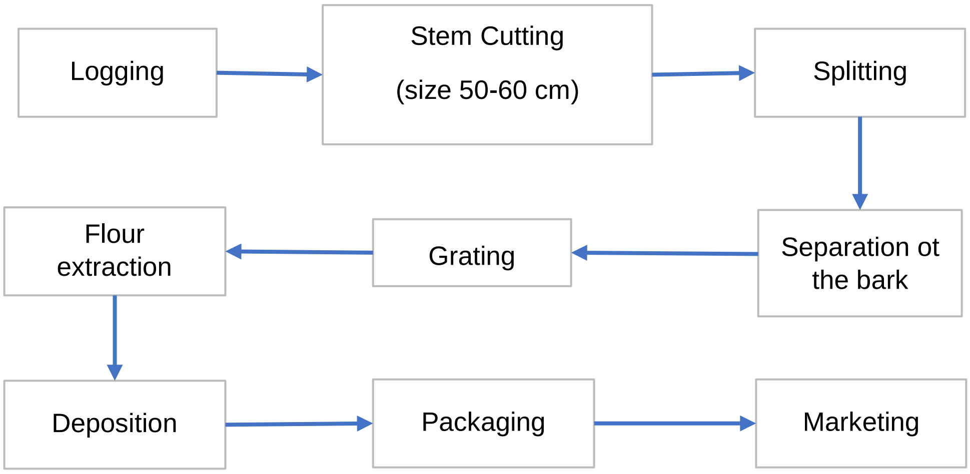

Figure 2. Flow of Sago Flour Processing

Even though they have the same stages, it seems that in the practice of processing sago, there are various different characteristics. This will reflect processing that is conventional, semi-modern, or modern. The characteristics of each sago processing model are presented in Table 1.

Table 1. Characteristics of the Sago Processing Model in Southeast Sulawesi 2021

Charasteristics	Sago Processing Model		
	Conventional	Semi Modern	Modern
Processing Site	Move around	Settling down	Settling down
Water Sources	Small rivers, swamp deposits, or shallow wells	Rivers, surface wells	Rivers, drilled wells
Grating	Machine	Machine	Machine
Flour Ekxtraction System	Manual	Manual	Machine
Flour Deposition	Plastic sheeting	Plastic sheeting	Cement floor/stainless

Source: Observations and direct interviews, 2021

Sago Bioindustry Products

The products of the sago bioindustry that were focused on in this study were liquid sugar and sago waste compost. The resulting liquid sugar production has the characteristics presented in Table 2.

Table 2. Characteristics of Sago Liquid Sugar in Southeast Sulawesi 2021

Parameter	Units	Sago Liquid Sugar	SNI
Flavor	-	Sweet	
Total dissolved solids	*Brix*	56,4	
Reduced sugar	%	51,46	Min 30
Glucose	%	32,69	

Source: Laboratory analysis results of the Bogor Agricultural Postharvest Center, 2022

The total dissolved solids shows the content of materials dissolved in the solution. The calculation of the value of total dissolved solids (TPT) is expressed in °Brix, which is a scale based on the percentage of weight in solution of sugar. Measuring the value of total dissolved solids (TDS) using a refractometer aims to roughly measure total sugar. Basically, TPT is sugar (glucose, sucrose, and fructose) and various other compounds such as organic acids, soluble amino acids, fats, minerals, and others. Refractometers measure TPT based on its refractive index. The refractive index value is obtained from the speed of light in a vacuum compared to when light penetrates the sample. When light penetrates the sample, its speed will decrease. This is due to the presence of dissolved solids in the sample. The higher the concentration of dissolved solids in the sample, the higher the index of refraction. This also applies inversely.

The process of making liquid sago sugar with a starch to water ratio of 1:4 is through a liquefaction process at 95°C with the addition of 1,2 mL kg^{-1} of starch α-amylase enzyme. Then it went through a saccharification process at 60^oC with the amyloglucosidase enzyme and 1,2 mL kg^{-1} starch for 48 hours (Budiyanto et al., 2019). To get clear and thick liquid sugar, it is filtered with a thick cloth (jeans cloth) and heated (Budiyanto et al., 2006).

The measurement results of total dissolved solids in sago liquid sugar at 56,4°Brix indicate that there are 56,4 grams of sugar in 100 grams of solution. The value of total dissolved solids depends on the coagulation process. The longer the heating, the thicker the liquid sugar, causing the total dissolved solids to be higher. The resulting brix value affects the level of sweetness and the shelf life of liquid sugar. The liquid sugar content of the sago produced indicates the presence of sugar components in the form of glucose, fructose, sucrose, and various other compounds.

Reducing sugars are carbohydrate compounds capable of reducing gentle oxidizing agents such as Tollens' reagent, an alkaline solution of $Ag(NH_3)^{2+}$. Nonreducing sugars are carbohydrate compounds that are unable to reduce soft oxidizing agents such as tollens by producing a color other than brick red. Reducing sugars are a group of sugars that can reduce electron acceptor compounds, which include reducing sugars. Reducing sugars are all monosaccharides (glucose, fructose, and galactose) and disaccharides (lactose, maltose), except sucrose and starch (polysaccharides). The resulting sago liquid sugar reducing sugar was 51,36% with a total dissolved solid of $56,4^o$Brix, indicating a high reducing sugar content. Based on the production process of making sago liquid sugar through liquefaction and saccharification, it produces glucose at 32,69%. This shows that the glucose content of sago liquid sugar as a reducing sugar has the highest value compared to other reducing sugars, including fructose, galactose, lactose, and maltose.

The results of laboratory analysis show relatively the same results as stated by Budiyanto (2019), namely that liquid sugar produced from sago has characteristics of 60^{o}Brix, reduced sugar of 50,46, a sweet taste, a sweet aroma of sugar, and a yellowish-red color.

Sago Dregs Compost

Making sago pulp compost is carried out in an effort to increase the added value of sago pulp, which has only been waste so far.

Table 3. Results of Laboratory Analysis of Sago Dregs Compost in Southeast Sulawesi, 2021

Composition	Parameter	Result	Information
40% sago pulp + 50% animal manure and 10% lime	C Organic (%)	31,57	Fulfilling
	pH	6,53	
	N + P_2O_5 + K_2O (%)	6,1	
50% sago pulp + 40% animal manure and 10% lime	C Organic (%)	25,74	Fulfilling
	pH	7,16	
	N + P_2O_5 + K_2O (%)	9,08	
60% sago pulp + 30% animal manure and 10% lime	C Organic (%)	31,21	Did not fulfilling
	pH	7,52	
	N + P_2O_5 + K_2O (%)	3,15	

Source: results of analysis of sago compost at the BPTP of East Kalimantan Laboratory, 2022

Table 3 shows that the use of dregs as a basic ingredient for compost that can meet national standards has a maximum composition of 50%. This result is in line with Wahida and Limbongan's (2015) finding that the composition of sago waste with animal manure in composting is 2:1.

Financial Feasibility of Sago Bioindustry Products

The products of the sago bioindustry that are the focus of this research are liquid sugar and sago waste compost. Both products are subject to financial analysis to obtain an overview of the economic performance of the two bioindustry products. In addition, a financial analysis of the production of sago flour, the main product of sago, is also being carried out. This is to provide an overview of the performance economy of the sago processing business as well as predictive material for the future preparation of the sago bioindustry model.

Financial analysis of various sago processing models shows that all of these sago processing models are feasible, with the highest profit value obtained in the modern model, which is IDR 172.933.091 per year, and the lowest in the conventional processing system, which is IDR 19.992.909 per year. This is inseparable from processing patterns that reflect the level of investment and use of labor, where modern systems already use machine tools for everything from logging, grating, and flour extraction. This causes the efficiency of the modern sago processing business to also be better, which can be seen from the higher RCR value. Likewise, from the TIP and TIH values, in modern processing patterns, TIP is obtained only from production of around 47% of the total production achieved, while in conventional processing, it must reach around 76% of production to reach TIP.

Table 4. Financial Analysis of Semi-Conventional and Modern Sago Processing Businesses in Southeast Sulawesi, 2021

Description	Conventional			Semi Modern			Modern		
	Amount (kg/liter)	Price (IDR)	Total (IDR)	Amount (kg/liter)	Price (IDR)	Total (IDR)	Amount (kg/liter)	Price (IDR)	Total (IDR)
1. COST									
a. Sago tree	72	100.000	7.200,000	120	175.000	21.000.000	228	175.000	39.900.000
b. Labor	432	120.000	51.840.000	576	120.000	69.120.000	720	120.000	86.400.000
c. Fuel	480	10.000	4.800.000	720	10.000	7.200.000	1.995	10.000	19.950.000
d. Packaging	611	650	397.091	1.091	650	709.091	2.349	650	1.526.909
e. Depreciation of tools and machines			1.450.000			1.850.000			8.750.000
Total cost			65.687.091			99.879.091			156.526.909
2. REVENUE									
Sago floor production	20.160	4.250	85.680.000	36.000	4.250	153.000.000	77.520	4.250	329.460.000
3. PROFIT	19.992.909			53.120.909			172.933.091		
4. RCR	1,3			1,53			2,1		
TIP	15.456			23.501			36.830		
TIH	3.258			2.774			2.019		

Source: Primary data analysis, 2022

Compost Processing Financial Analysis

Sago dregs compost is one of the products of utilizing sago dregs, which have been a waste so far. This compost is very much needed in an effort to improve the chemical and biological properties of agricultural soil, especially in Southeast Sulawesi, where the soil type is Red Yellow Podzolic (PMK) soil, which is known as nutrient-poor soil.

The development of a compost processing business from sago waste must reflect the existence of financial incentives in its management. This will result in the sustainability of the business. The results of the financial analysis of the sago pulp compost business are presented in Table 5, which shows that the sago pulp compost business is feasible. Processing 1.5 tons of compost per month will provide a net income of IDR 19.380.000 per year. The TIP of this business will be achieved when compost production reaches 46% of the total production of around 18.000 kg per year.

Compost processing from sago waste can at the same time provide added value to the sago business, which so far has only focused on utilizing sago flour. Sago waste, which amounts to three times the production of sago starch, has great potential to be used as material for improving soil conditions in Southeast Sulawesi.

Table 5. Financial Analysis of the 2021 Sago Dregs Compost Business

No	Description	Amount	Price (IDR/liter/kg/labor day)	Total (Rp)
A	Production facilities			
	a. Sago dregs (kg)	9,000	250	2,250,000

	b. Lime (kg)	1,800	1,100	1,980,000
	c. Livestock manure (kg)	7,200	500	3,600,000
	d. Decomposer (liter)	30	33,000	990,000
B	Labor (labor day)	60	120,000	7,200,000
C	Others			
	Packaging (sheet)	240	2,500	600,000
D	Total cost			16,620,000
E	Compost production	18,000	2,000	36,000,000
F	Profit	19,380,000		
G	RCR	2,17		
H	TIP (kg)	8.310		
I	TIH (Rp/kg)	923		

Source: Primary data analysis, 2022

The Financial Feasibility of Sago Liquid Sugar

An important factor that must be considered in developing a liquid sugar business is whether the sago sugar production activity is financially feasible. A financial analysis of sago liquid sugar production on a scale of 3.600 kg of wet sago in a year is presented in Table 6, which shows that the business of liquid sugar from sago flour provides quite good profits, reaching IDR 41.465.000 per year with a processing capacity of up to 3.600 kg of wet sago per year. This is also supported by the fairly good price of liquid sugar, reaching IDR 24.500 per liter (cassava liquid sugar).

Table 6. Financial Analysis of Sago Liquid Sugar Production in Southeast Sulawesi, 2021

No	Description	Amount	Price (IDR/liter/kg/labor day)	Total (Rp)
A	Material			
1	1. Wet sago (kg)	3.600	4.200	15.120.000
2	2. Gas fuel (cylinder)	108	25.000	2.700.000
3	3. Enzyme (cc)	4.320	500	2.160.000
B	Labor	72	120.000	8.640.000
C	Others			
	1. Depreciation			475.000
	2. Packaging	576	7.500	4.320.000
D	Total			29.095.000
E	Liquid sugar production (liter)	2.880	24.500	70.560.000
F	Profit			41.465.000
G	RCR	2,43		
H	TIP (kg)	1.188		
I	TIH (Rp/kg)	10.102		

Source: Primary data analysis, 2022

In Table 6, it can be seen that, in general, the liquid sugar production business is feasible to carry out with an RCR value> 1. It can further be seen that the portion of the cost for materials is >50%. This still shows that this business is capital-intensive. However, the largest proportion of capital is wet sago, which is one of the regional potential commodities, so this processing is expected to increase the added value of sago.

Sago Bioindustry Model

The sago bioindustry model that we want to build is a value-added and sustainable sago management model. The development of the system dynamics model is designed in the form of a causal loop that connects the needs and problems encountered as a link (Figure 3) (Sumarni et al., 2017). This aims to analyze the application of bioindustry to increase the income of sago farmers in a sustainable manner.

In general, the causal loop can be divided into six parts: (a) the sago farming sector (cultivation); (b) the wet sago flour processing sector; (c) the population sector and labor supply; (d) liquid sugar processing; (e) the compost processing sector; and (f) sector total revenue. The inter-sectoral linkages are shown in Figure 3.

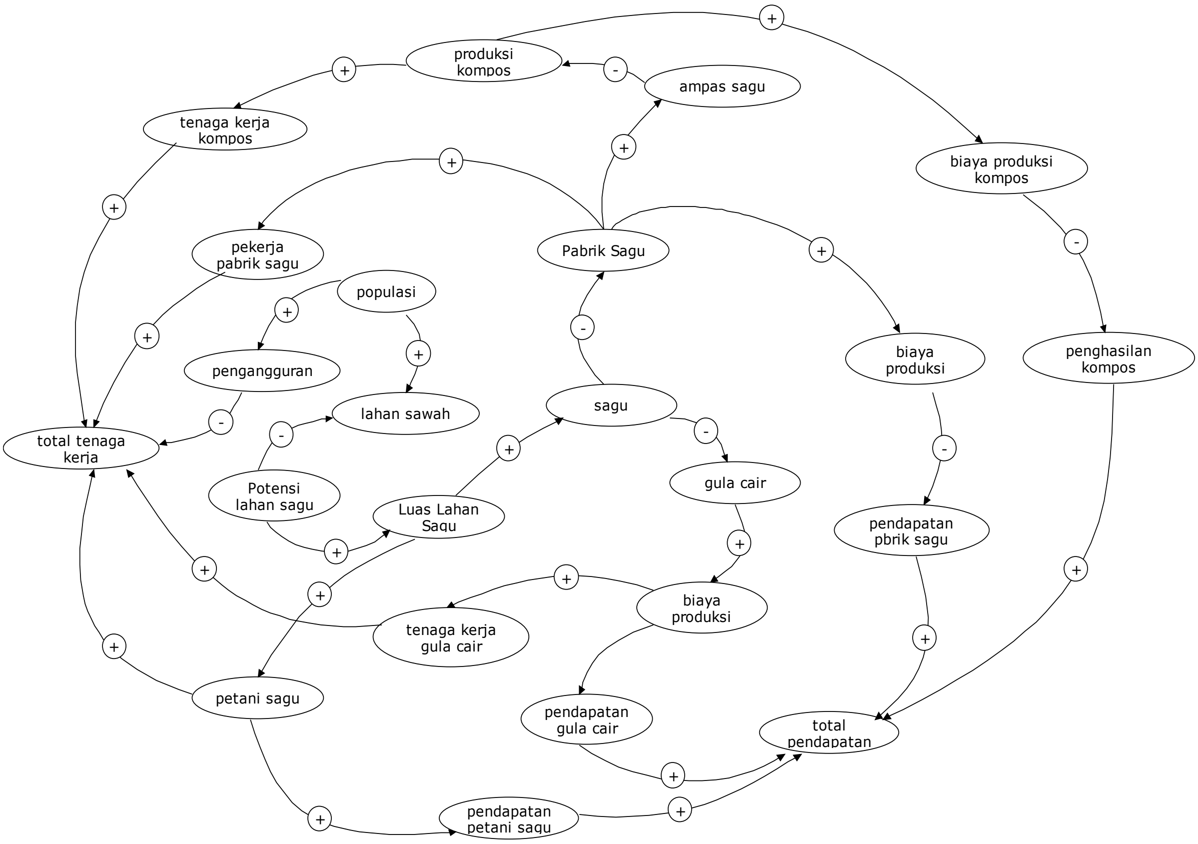

Figure 3. Causal Loop Model of The Sago Bioindustry in Southeast Sulawesi

The causal relationship shown in the diagram illustrates the interrelationships between elements in the Sago bioindustry system. After the causal diagram is formed, the next step is to interpret the diagram into an input-output diagram (Marimin and Magfirah, 2010; Tasrif, 2007). Model formulation is done by drawing a stock and flow diagram in which the sago problem is formulated mathematically, which can represent the real system of sago bioindustry production (Figure 4).

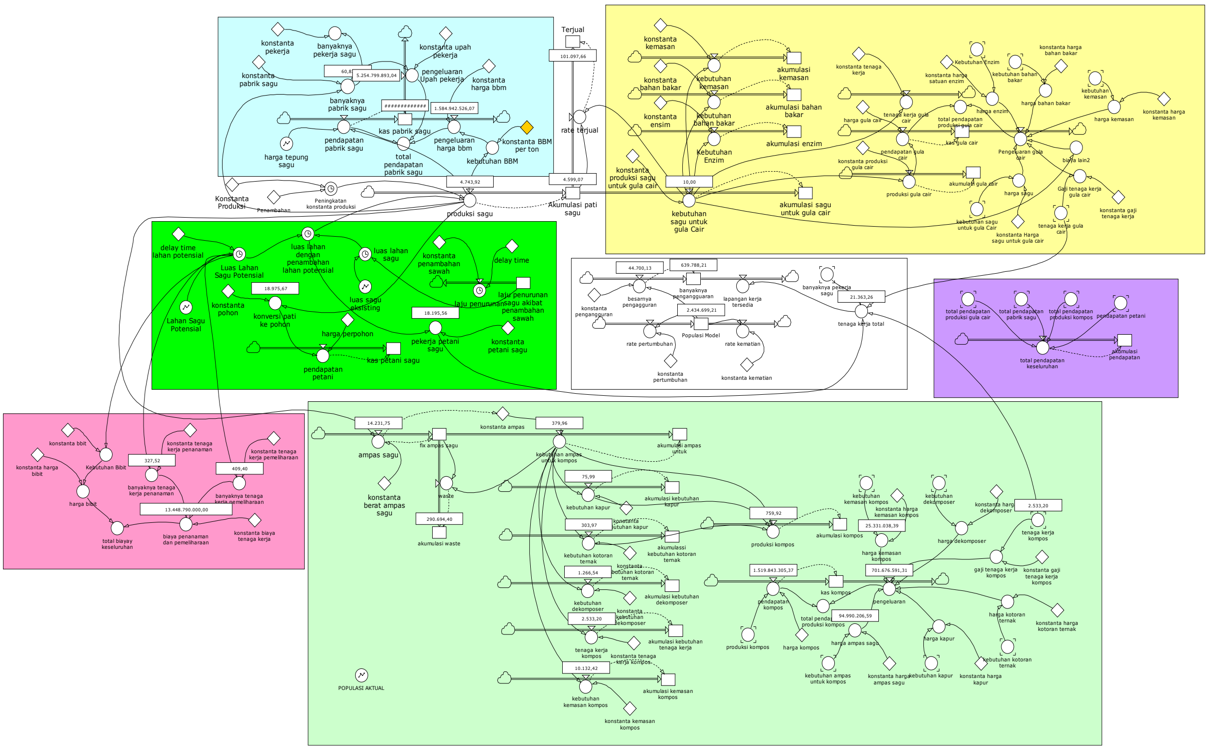

Figure 4. Mathematical Model of The Sago Bioindustry in Southeast Sulawesi

Model Validation

Validation is carried out to test the stability of the model, namely the consistency of the model, especially in relation to the units used. The validation test was carried out on sago production, as presented in Table 7, which shows that the production validation MAPE value is 0,004%, which means that the model is valid to use (Zhou, 2014).

Table 7. Sago Production Submodel Validation

Year to-	Sago Production	
	(St)	(At)
	Simulation	Actual
1	2.047,56	2.459,00
2	2.047,56	2.472,00
3	2.035,85	2.425,10
4	2.323,43	2.137,88
5	2.232,22	2.129.00
6	2.298,14	2.074,92
7	2.303,80	2.102,29
8	2.240,90	1.979,00
9	2.265,04	2.113,30
10	2.244,35	2.366,03
11	2.207,49	2.190,65
Mape	**-0,004**	

Source: Primary data analysis, 2022

Sago Bioindustry Model

The simulation results of implementing sustainable sago bioindustry in general have a significant impact both in terms of production, employment, and aggregate total income of the sago business. In scenario 1, in 2050, the area of sago land is only around 2.963 ha, the employment is 6.721 people, the sago flour production is 1.941,68 tons, the income of sago farmers is IDR 1.165.006.553, and the income of sago factories is IDR 12.782.249. In this scenario, it seems that the impact of the decline in sago land is the main trigger for the decline in production, labor absorption, and sago business income, both from sago farmers and sago factory income.

In scenario 2, in 2050, there will be employment for 9.554 people with additional income from implementing bioindustry, namely from compost amounting to IDR 818.166.714 and from liquid sugar amounting to IDR 85.430.555, so that the overall total income is IDR 14.851.697.635. The addition of labor and income in aggregate is the result of the implementation of bioindustry through the processing of liquid sugar and compost, although at the same time there has been a significant decrease in sago land.

Furthermore, in scenario 3, with government intervention through planting 250 ha of sago per year starting in 2023, which is also accompanied by the implementation of the sago bioindustry, it will have an impact on absorbing land area, employment, and overall sago income. In this scenario, in 2050, there is an area of 7.713 ha of sago land, with employment of 21.248 people, with income from sago farmers of IDR 10.853.806.553, sago factory income of IDR 119.099.244.799, income from compost of IDR 818.166.714, and from liquid sugar of IDR 85.430.555, so that the total income is IDR 130.856.648.621.

Changes in the area of sago fields (Figure 5) show that in scenarios 1 and 2, the area of sago fields continues to decrease as in current conditions, while in scenario 3, there will be a significant increase in the area of the fields. This is due to the addition of 250 ha of sago land per year.

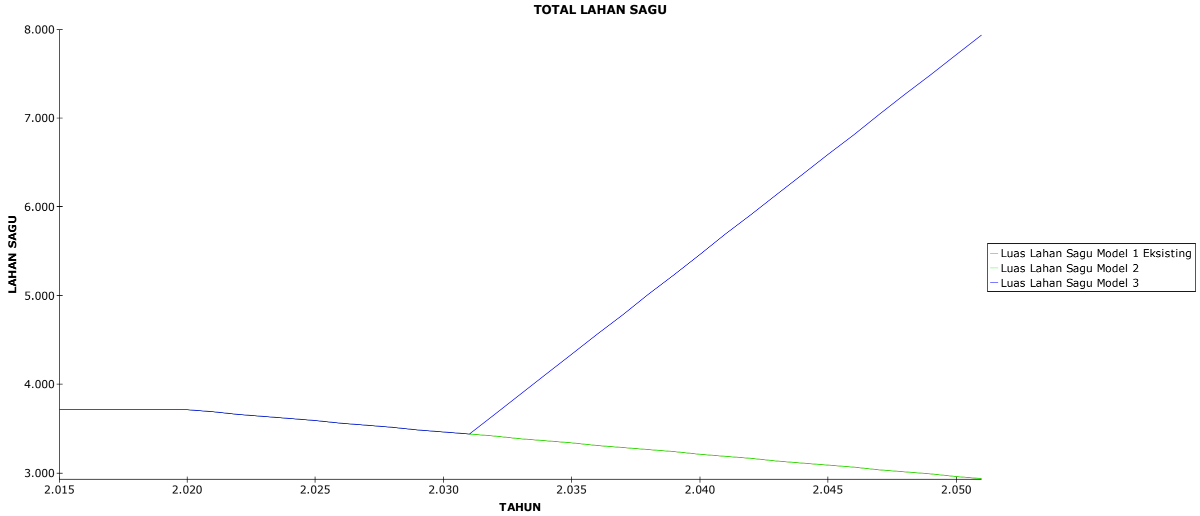

Figure 5. Sago Land Area in Three Scenarios

Absorption of labor in Figure 6: It appears that in the existing conditions (Scenario 1), employment will tend to continue to decline along with the trend of decreasing sago area. Furthermore, in scenario 2, there is also a downward trend in employment, but the number of workers absorbed by the application of bio-industry in the form of the compost industry from sago pulp and the liquid sugar industry is higher than the absorption of labor in the existing conditions. In scenario 3, the application of labor is initially the same as in scenario 2, but will increase in year 8 (2031) after the intervention to increase the area of sago land (2023). This is because in the 8th year, it is predicted that sago plants that are cultivated according to the intervention model can already be harvested. This is because in year 8, there are already sago palms in the clump that can be harvested, while the others will grow continuously. This is in accordance with Bintoro et al. (2010) and Yan et al. (2022), who found that sago trees can be harvested and produced at the age of 8–12 years.

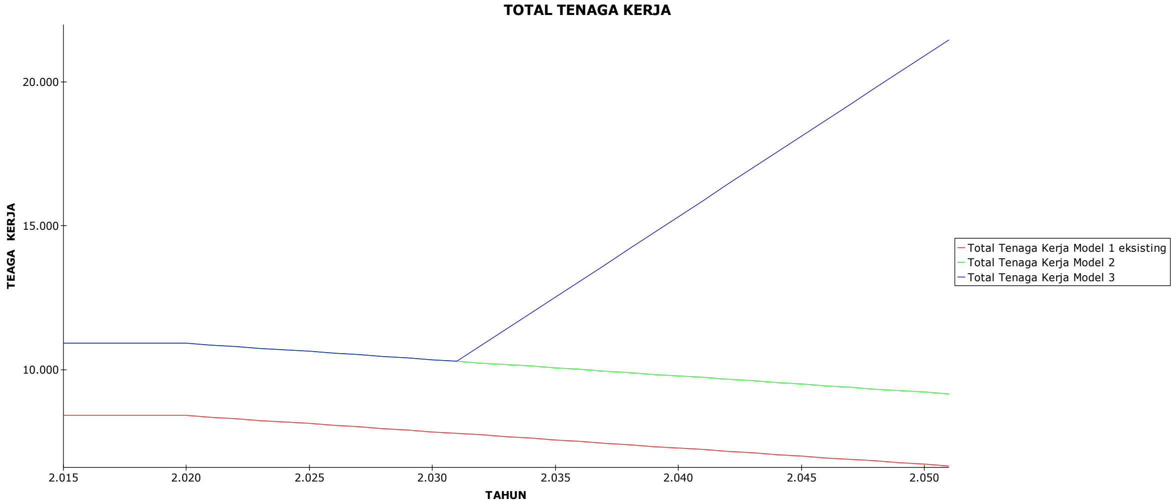

Figure 6. Labor Absorption in Three Scenarios

Total sago production (Figure 6) shows that there is a decreasing trend along with the decreasing trend of sago land, but in scenario 3, it appears that there is an increase in total sago production as sago has been produced, namely in the 8th year after the intervention.

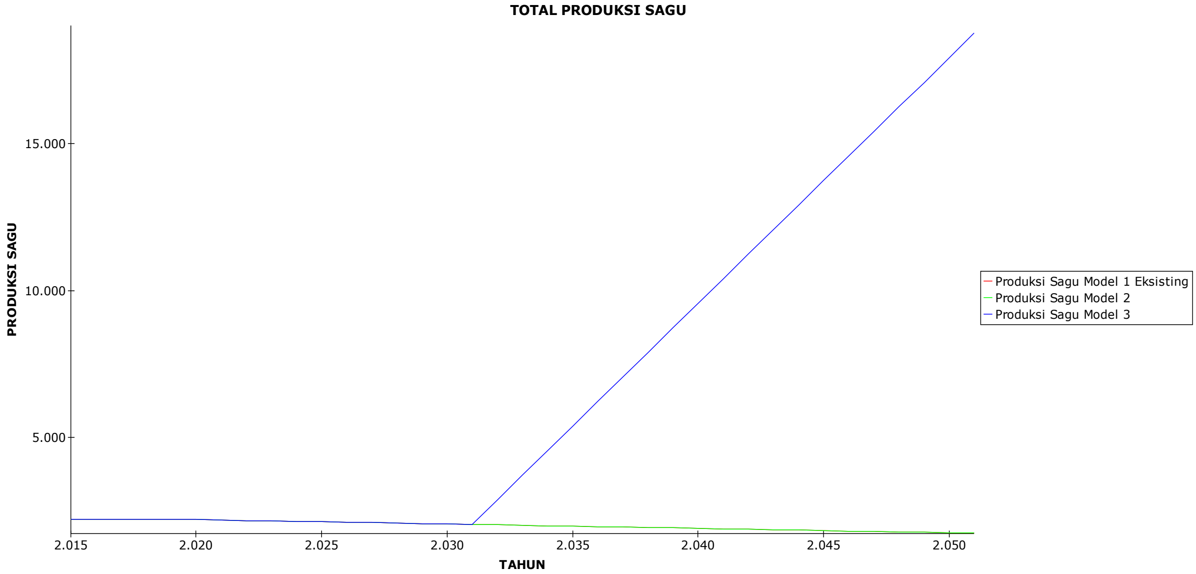

Figure 7. Sago Production in Three Scenarios

The total income of sago obtained from all sago processing activities including the introduction of the sago bioindustry model is presented in Figure 8 which shows that the total income of sago in the optimistic scenario (scenario) is the best which is marked by a significant increase in total income, especially after the 8th year sago planting intervention.

Furthermore, in general, the application of the bioindustry model will increase total income in the management of sago plants in Southeast Sulawesi.

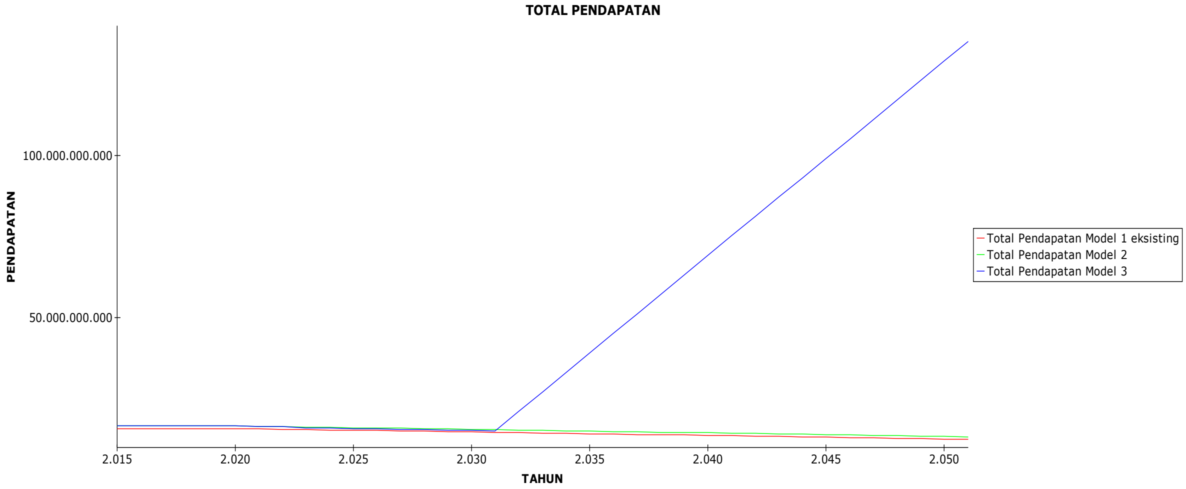

Figure 8. Sago Total Income in Three Scenarios

4. Conclusion

The products of the sago bioindustry, both in the form of primary products, namely the production of sago flour, and derivative products, namely liquid sugar and compost, are economically feasible to cultivate. The simulations carried out on the dynamic model show that the sustainable sago management model is able to encourage the achievement of system goals, namely to be able to provide sago management alternatives to increase farmers' income through downstream products and increase the sago area to withstand the conversion of sago land. The application of the sago bioindustry will provide 218% additional production, 160% additional land area, 216% additional employment, and 254% additional total income compared to without the application of the bioindustry and without government intervention through increasing the planting area. The application of bioindustry is able to provide direction so that the development of sago is sustainable and competitive.

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ATTACHMENT

1. Scenario Data 1 Management of Sago (existing)

year	produksi sagu	pekerja petani sagu	banyaknya pekerja	total tenaga kerja
2.015	2.533,07	8.589,93	178,61	8.768,54
2.016	2.539,32	8.611,11	179,05	8.790,17
2.017	2.469,99	8.376,00	174,17	8.550,17
2.018	2.496,59	8.466,22	176,04	8.642,26
2.019	2.473,79	8.388,89	174,43	8.563,32
2.020	2.433,16	8.251,11	171,57	8.422,68
2.021	2.416,78	8.195,56	170,41	8.365,97
2.022	2.400,39	8.140,00	169,26	8.309,26
2.023	2.384,01	8.084,44	168,10	8.252,55
2.024	2.367,63	8.028,89	166,95	8.195,84
2.025	2.351,25	7.973,33	165,79	8.139,13
2.026	2.334,86	7.917,78	164,64	8.082,42
2.027	2.318,48	7.862,22	163,48	8.025,70
2.028	2.302,10	7.806,67	162,33	7.968,99
2.029	2.285,71	7.751,11	161,17	7.912,28
2.030	2.269,33	7.695,56	160,02	7.855,57
2.031	2.252,95	7.640,00	158,86	7.798,86
2.032	2.236,57	7.584,44	157,71	7.742,15
2.033	2.220,18	7.528,89	156,55	7.685,44
2.034	2.203,80	7.473,33	155,40	7.628,73
2.035	2.187,42	7.417,78	154,24	7.572,02
2.036	2.171,04	7.362,22	153,09	7.515,31

2.037	2.154,65	7.306,67	151,93	7.458,60
2.038	2.138,27	7.251,11	150,78	7.401,89
2.039	2.121,89	7.195,56	149,62	7.345,18
2.040	2.105,50	7.140,00	148,47	7.288,47
2.041	2.089,12	7.084,44	147,31	7.231,75
2.042	2.072,74	7.028,89	146,15	7.175,04
2.043	2.056,36	6.973,33	145,00	7.118,33
2.044	2.039,97	6.917,78	143,84	7.061,62
2.045	2.023,59	6.862,22	142,69	7.004,91
2.046	2.007,21	6.806,67	141,53	6.948,20
2.047	1.990,83	6.751,11	140,38	6.891,49
2.048	1.974,44	6.695,56	139,22	6.834,78
2.049	1.958,06	6.640,00	138,07	6.778,07
2.050	1.941,68	6.584,44	136,91	6.721,36

Information:
Produksi sagu = Sago production
Pekerja petani sagu = Sago farmer labors
Banyaknya pekerja = Amount of labors
Total tenaga kerja = Total labor

year	luas lahan sagu	pendapatan petani	total pendapatan pabrik sagu
2.015	3.865,47	1.519.843.305,37	7.222.314.872,31
2.016	3.875,00	1.523.591.087,81	9.629.623.071,88
2.017	3.769,20	1.481.992.136,30	8.277.439.078,54
2.018	3.809,80	1.497.955.439,06	8.414.272.082,01
2.019	3.775,00	1.484.272.608,13	10.719.435.805,02
2.020	3.713,00	1.459.895.150,72	13.853.287.411,89
2.021	3.688,00	1.450.065.530,80	15.909.866.915,62
2.022	3.663,00	1.440.235.910,88	15.802.018.034,68
2.023	3.638,00	1.430.406.290,96	15.694.169.153,75
2.024	3.613,00	1.420.576.671,04	15.586.320.272,81
2.025	3.588,00	1.410.747.051,11	15.478.471.391,87
2.026	3.563,00	1.400.917.431,19	15.370.622.510,94
2.027	3.538,00	1.391.087.811,27	15.262.773.630,00
2.028	3.513,00	1.381.258.191,35	15.154.924.749,07
2.029	3.488,00	1.371.428.571,43	15.047.075.868,13
2.030	3.463,00	1.361.598.951,51	14.939.226.987,20
2.031	3.438,00	1.351.769.331,59	14.831.378.106,26
2.032	3.413,00	1.341.939.711,66	14.723.529.225,33
2.033	3.388,00	1.332.110.091,74	14.615.680.344,39
2.034	3.363,00	1.322.280.471,82	14.507.831.463,45
2.035	3.338,00	1.312.450.851,90	14.399.982.582,52
2.036	3.313,00	1.302.621.231,98	14.292.133.701,58
2.037	3.288,00	1.292.791.612,06	14.184.284.820,65
2.038	3.263,00	1.282.961.992,14	14.076.435.939,71
2.039	3.238,00	1.273.132.372,21	13.968.587.058,78
2.040	3.213,00	1.263.302.752,29	13.860.738.177,84
2.041	3.188,00	1.253.473.132,37	13.752.889.296,90
2.042	3.163,00	1.243.643.512,45	13.645.040.415,97
2.043	3.138,00	1.233.813.892,53	13.537.191.535,03

2.044	3.113,00	1.223.984.272,61	13.429.342.654,10
2.045	3.088,00	1.214.154.652,69	13.321.493.773,16
2.046	3.063,00	1.204.325.032,77	13.213.644.892,23
2.047	3.038,00	1.194.495.412,84	13.105.796.011,29
2.048	3.013,00	1.184.665.792,92	12.997.947.130,36
2.049	2.988,00	1.174.836.173,00	12.890.098.249,42
2.050	2.963,00	1.165.006.553,08	12.782.249.368,48

Information:

Luas lahan sagu = Sago land area

Pendapatan petani = Farmer's revenue

Total pendapatan pabrik sagu = Total sago factory revenue

2. Scenario Data 2 of the Sago Bioindustry

year	produksi sagu	pekerja petani sagu	banyaknya pekerja pabrik sagu	tenaga kerja gula cair	tenaga kerja kompos	tenaga kerja total
2.015	2.533,07	8.589,93	178,61	300,00	2.533,20	11.601,74
2.016	2.539,32	8.611,11	179,05	300,00	2.533,20	11.623,36
2.017	2.469,99	8.376,00	174,17	300,00	2.533,20	11.383,36
2.018	2.496,59	8.466,22	176,04	300,00	2.533,20	11.475,46
2.019	2.473,79	8.388,89	174,43	300,00	2.533,20	11.396,52
2.020	2.433,16	8.251,11	171,57	300,00	2.533,20	11.255,88
2.021	2.416,78	8.195,56	170,41	300,00	2.533,20	11.199,17
2.022	2.400,39	8.140,00	169,26	300,00	2.533,20	11.142,46
2.023	2.384,01	8.084,44	168,10	300,00	2.533,20	11.085,75
2.024	2.367,63	8.028,89	166,95	300,00	2.533,20	11.029,04
2.025	2.351,25	7.973,33	165,79	300,00	2.533,20	10.972,33
2.026	2.334,86	7.917,78	164,64	300,00	2.533,20	10.915,61
2.027	2.318,48	7.862,22	163,48	300,00	2.533,20	10.858,90
2.028	2.302,10	7.806,67	162,33	300,00	2.533,20	10.802,19
2.029	2.285,71	7.751,11	161,17	300,00	2.533,20	10.745,48
2.030	2.269,33	7.695,56	160,02	300,00	2.533,20	10.688,77
2.031	2.252,95	7.640,00	158,86	300,00	2.533,20	10.632,06
2.032	2.236,57	7.584,44	157,71	300,00	2.533,20	10.575,35
2.033	2.220,18	7.528,89	156,55	300,00	2.533,20	10.518,64
2.034	2.203,80	7.473,33	155,40	300,00	2.533,20	10.461,93
2.035	2.187,42	7.417,78	154,24	300,00	2.533,20	10.405,22
2.036	2.171,04	7.362,22	153,09	300,00	2.533,20	10.348,51
2.037	2.154,65	7.306,67	151,93	300,00	2.533,20	10.291,80
2.038	2.138,27	7.251,11	150,78	300,00	2.533,20	10.235,09
2.039	2.121,89	7.195,56	149,62	300,00	2.533,20	10.178,37
2.040	2.105,50	7.140,00	148,47	300,00	2.533,20	10.121,66
2.041	2.089,12	7.084,44	147,31	300,00	2.533,20	10.064,95
2.042	2.072,74	7.028,89	146,15	300,00	2.533,20	10.008,24
2.043	2.056,36	6.973,33	145,00	300,00	2.533,20	9.951,53
2.044	2.039,97	6.917,78	143,84	300,00	2.533,20	9.894,82
2.045	2.023,59	6.862,22	142,69	300,00	2.533,20	9.838,11
2.046	2.007,21	6.806,67	141,53	300,00	2.533,20	9.781,40
2.047	1.990,83	6.751,11	140,38	300,00	2.533,20	9.724,69
2.048	1.974,44	6.695,56	139,22	300,00	2.533,20	9.667,98
2.049	1.958,06	6.640,00	138,07	300,00	2.533,20	9.611,27
2.050	1.941,68	6.584,44	136,91	300,00	2.533,20	9.554,56

Information:

Produksi sagu = Sago production

Pekerja petani sagu = Sago farmer labors

Banyaknya pekerja pabrik sagu = Amount of sago factory labors

Tenaga kerja gula cair = Liquid sugar labor

Tenaga kerja kompos = Compost labor

Tenaga kerja total = Total labor

year	luas lahan sagu	pendapatan petani	total pendapatan pabrik sagu	total pendapatan produksi kompos	total pendapatan gula cair	total pendapatan keseluruhan
2.015	3.865,47	1.519.843.305,37	7.222.314.872,31	818.166.714,07	86.274.999,68	9.646.599.891,42
2.016	3.875,00	1.523.591.087,81	9.629.623.071,88	818.166.714,07	86.274.999,68	12.057.655.873,44
2.017	3.769,20	1.481.992.136,30	8.277.439.078,54	818.166.714,07	86.274.999,68	10.663.872.928,58
2.018	3.809,80	1.497.955.439,06	8.414.272.082,01	818.166.714,07	86.274.999,68	10.816.669.234,81
2.019	3.775,00	1.484.272.608,13	10.719.435.805,02	818.166.714,07	86.274.999,68	13.108.150.126,89
2.020	3.713,00	1.459.895.150,72	13.853.287.411,89	818.166.714,07	86.274.999,68	16.217.624.276,35
2.021	3.688,00	1.450.065.530,80	15.909.866.915,62	818.166.714,07	86.274.999,68	18.264.374.160,16
2.022	3.663,00	1.440.235.910,88	15.802.018.034,68	818.166.714,07	86.274.999,68	18.146.695.659,30
2.023	3.638,00	1.430.406.290,96	15.694.169.153,75	818.166.714,07	86.274.999,68	18.029.017.158,45
2.024	3.613,00	1.420.576.671,04	15.586.320.272,81	818.166.714,07	86.274.999,68	17.911.338.657,59
2.025	3.588,00	1.410.747.051,11	15.478.471.391,87	818.166.714,07	86.274.999,68	17.793.660.156,73
2.026	3.563,00	1.400.917.431,19	15.370.622.510,94	818.166.714,07	86.274.999,68	17.675.981.655,87
2.027	3.538,00	1.391.087.811,27	15.262.773.630,00	818.166.714,07	86.274.999,68	17.558.303.155,02
2.028	3.513,00	1.381.258.191,35	15.154.924.749,07	818.166.714,07	86.274.999,68	17.440.624.654,16
2.029	3.488,00	1.371.428.571,43	15.047.075.868,13	818.166.714,07	86.274.999,68	17.322.946.153,30
2.030	3.463,00	1.361.598.951,51	14.939.226.987,20	818.166.714,07	86.274.999,68	17.205.267.652,45
2.031	3.438,00	1.351.769.331,59	14.831.378.106,26	818.166.714,07	86.274.999,68	17.087.589.151,59
2.032	3.413,00	1.341.939.711,66	14.723.529.225,33	818.166.714,07	86.274.999,68	16.969.910.650,73
2.033	3.388,00	1.332.110.091,74	14.615.680.344,39	818.166.714,07	86.274.999,68	16.852.232.149,88
2.034	3.363,00	1.322.280.471,82	14.507.831.463,45	818.166.714,07	86.274.999,68	16.734.553.649,02
2.035	3.338,00	1.312.450.851,90	14.399.982.582,52	818.166.714,07	86.274.999,68	16.616.875.148,16
2.036	3.313,00	1.302.621.231,98	14.292.133.701,58	818.166.714,07	86.274.999,68	16.499.196.647,31
2.037	3.288,00	1.292.791.612,06	14.184.284.820,65	818.166.714,07	86.274.999,68	16.381.518.146,45
2.038	3.263,00	1.282.961.992,14	14.076.435.939,71	818.166.714,07	86.274.999,68	16.263.839.645,59
2.039	3.238,00	1.273.132.372,21	13.968.587.058,78	818.166.714,07	86.274.999,68	16.146.161.144,73
2.040	3.213,00	1.263.302.752,29	13.860.738.177,84	818.166.714,07	86.274.999,68	16.028.482.643,88
2.041	3.188,00	1.253.473.132,37	13.752.889.296,90	818.166.714,07	86.274.999,68	15.910.804.143,02
2.042	3.163,00	1.243.643.512,45	13.645.040.415,97	818.166.714,07	86.274.999,68	15.793.125.642,16
2.043	3.138,00	1.233.813.892,53	13.537.191.535,03	818.166.714,07	86.274.999,68	15.675.447.141,31
2.044	3.113,00	1.223.984.272,61	13.429.342.654,10	818.166.714,07	86.274.999,68	15.557.768.640,45
2.045	3.088,00	1.214.154.652,69	13.321.493.773,16	818.166.714,07	86.274.999,68	15.440.090.139,59
2.046	3.063,00	1.204.325.032,77	13.213.644.892,23	818.166.714,07	86.274.999,68	15.322.411.638,74
2.047	3.038,00	1.194.495.412,84	13.105.796.011,29	818.166.714,07	86.274.999,68	15.204.733.137,88
2.048	3.013,00	1.184.665.792,92	12.997.947.130,36	818.166.714,07	86.274.999,68	15.087.054.637,02
2.049	2.988,00	1.174.836.173,00	12.890.098.249,42	818.166.714,07	86.274.999,68	14.969.376.136,17
2.050	2.963,00	1.165.006.553,08	12.782.249.368,48	818.166.714,07	86.274.999,68	14.851.697.635,31

Information:
Luas lahan sagu = Sago land area
Pendapatan petani = Farmer's revenue
Total pendapatan pabrik sagu = Total sago factory revenue
Total pendapatan produksi kompos = Total compost production revenue
Total pendapatan gula cair = Total liquid sugar revenue
Total pendapatan keseluruhan = Total overall revenue

3. Scenario 3 Data Introduction of Additional Land Area of 250 ha per Year and Bioindustry

year	produksi sagu	pekerja petani sagu	banyaknya pekerja sagu	tenaga kerja gula cair	tenaga kerja kompos	tenaga kerja total
2.015	2.533,07	8.589,93	178,61	300,00	2.533,20	11.601,74
2.016	2.539,32	8.611,11	179,05	300,00	2.533,20	11.623,36
2.017	2.469,99	8.376,00	174,17	300,00	2.533,20	11.383,36
2.018	2.496,59	8.466,22	176,04	300,00	2.533,20	11.475,46
2.019	2.473,79	8.388,89	174,43	300,00	2.533,20	11.396,52
2.020	2.433,16	8.251,11	171,57	300,00	2.533,20	11.255,88
2.021	2.416,78	8.195,56	170,41	300,00	2.533,20	11.199,17
2.022	2.400,39	8.140,00	169,26	300,00	2.533,20	11.142,46
2.023	2.384,01	8.084,44	168,10	300,00	2.533,20	11.085,75
2.024	2.367,63	8.028,89	166,95	300,00	2.533,20	11.029,04
2.025	2.351,25	7.973,33	165,79	300,00	2.533,20	10.972,33
2.026	2.334,86	7.917,78	164,64	300,00	2.533,20	10.915,61
2.027	2.318,48	7.862,22	163,48	300,00	2.533,20	10.858,90
2.028	2.302,10	7.806,67	162,33	300,00	2.533,20	10.802,19
2.029	2.285,71	7.751,11	161,17	300,00	2.533,20	10.745,48
2.030	2.269,33	7.695,56	160,02	300,00	2.533,20	10.688,77
2.031	2.252,95	7.640,00	158,86	300,00	2.533,20	10.632,06
2.032	2.416,78	8.195,56	170,41	300,00	2.533,20	11.199,17
2.033	2.969,83	8.751,11	209,41	300,00	2.533,20	11.793,72
2.034	3.158,37	9.306,67	222,71	300,00	2.533,20	12.362,57
2.035	3.346,91	9.862,22	236,00	300,00	2.533,20	12.931,42
2.036	3.535,44	10.417,78	249,29	300,00	2.533,20	13.500,27
2.037	3.723,98	10.973,33	262,59	300,00	2.533,20	14.069,12
2.038	3.912,52	11.528,89	275,88	300,00	2.533,20	14.637,97
2.039	4.101,06	12.084,44	289,18	300,00	2.533,20	15.206,82
2.040	4.289,59	12.640,00	302,47	300,00	2.533,20	15.775,67
2.041	4.478,13	13.195,56	315,77	300,00	2.533,20	16.344,52
2.042	4.666,67	13.751,11	329,06	300,00	2.533,20	16.913,37
2.043	4.855,20	14.306,67	342,35	300,00	2.533,20	17.482,22
2.044	5.043,74	14.862,22	355,65	300,00	2.533,20	18.051,07
2.045	5.232,28	15.417,78	368,94	300,00	2.533,20	18.619,92
2.046	5.420,81	15.973,33	382,24	300,00	2.533,20	19.188,77
2.047	5.609,35	16.528,89	395,53	300,00	2.533,20	19.757,62
2.048	5.797,89	17.084,44	408,83	300,00	2.533,20	20.326,47
2.049	5.986,43	17.640,00	422,12	300,00	2.533,20	20.895,32
2.050	6.174,96	18.195,56	435,41	300,00	2.533,20	21.464,17

Information:

Produksi sagu = Sago production

Pekerja petani sagu = Sago farmer labors

Banyaknya pekerja pabrik sagu = Amount of sago factory labors

Tenaga kerja gula cair = Liquid sugar labor

Tenaga kerja kompos = Compost labor

Tenaga kerja total = Total labor

year	luas lahan dengan penambahan lahan potensial	pendapatan petani	total pendapatan pabrik sagu	total pendapatan produksi kompos	total pendapatan produksi gula cair	:otal pendapatan keseluruhar
2.015	3.865,47	1.519.843.305,37	7.222.314.872,31	818.166.714,07	85.430.555,23	9.645.755.446,98
2.016	3.875,00	1.523.591.087,81	9.629.623.071,88	818.166.714,07	85.430.555,23	12.056.811.428,99
2.017	3.769,20	1.481.992.136,30	8.277.439.078,54	818.166.714,07	85.430.555,23	10.663.028.484,14
2.018	3.809,80	1.497.955.439,06	8.414.272.082,01	818.166.714,07	85.430.555,23	10.815.824.790,37
2.019	3.775,00	1.484.272.608,13	10.719.435.805,02	818.166.714,07	85.430.555,23	13.107.305.682,45
2.020	3.713,00	1.459.895.150,72	13.853.287.411,89	818.166.714,07	85.430.555,23	16.216.779.831,91
2.021	3.688,00	1.450.065.530,80	15.909.866.915,62	818.166.714,07	85.430.555,23	18.263.529.715,72
2.022	3.663,00	1.440.235.910,88	15.802.018.034,68	818.166.714,07	85.430.555,23	18.145.851.214,86
2.023	3.638,00	1.430.406.290,96	15.694.169.153,75	818.166.714,07	85.430.555,23	18.028.172.714,00
2.024	3.613,00	1.420.576.671,04	15.586.320.272,81	818.166.714,07	85.430.555,23	17.910.494.213,14
2.025	3.588,00	1.410.747.051,11	15.478.471.391,87	818.166.714,07	85.430.555,23	17.792.815.712,29
2.026	3.563,00	1.400.917.431,19	15.370.622.510,94	818.166.714,07	85.430.555,23	17.675.137.211,43
2.027	3.538,00	1.391.087.811,27	15.262.773.630,00	818.166.714,07	85.430.555,23	17.557.458.710,57
2.028	3.513,00	1.381.258.191,35	15.154.924.749,07	818.166.714,07	85.430.555,23	17.439.780.209,72
2.029	3.488,00	1.371.428.571,43	15.047.075.868,13	818.166.714,07	85.430.555,23	17.322.101.708,86
2.030	3.463,00	1.361.598.951,51	14.939.226.987,20	818.166.714,07	85.430.555,23	17.204.423.208,00
2.031	3.438,00	1.351.769.331,59	14.831.378.106,26	818.166.714,07	85.430.555,23	17.086.744.707,15
2.032	3.688,00	1.450.065.530,80	15.909.866.915,62	818.166.714,07	85.430.555,23	18.263.529.715,72
2.033	3.938,00	1.781.900.452,49	19.550.701.988,17	818.166.714,07	85.430.555,23	22.236.199.709,95
2.034	4.188,00	1.895.022.624,43	20.791.858.792,90	818.166.714,07	85.430.555,23	23.590.478.686,63
2.035	4.438,00	2.008.144.796,38	22.033.015.597,63	818.166.714,07	85.430.555,23	24.944.757.663,31
2.036	4.688,00	2.121.266.968,33	23.274.172.402,37	818.166.714,07	85.430.555,23	26.299.036.639,99
2.037	4.938,00	2.234.389.140,27	24.515.329.207,10	818.166.714,07	85.430.555,23	27.653.315.616,67
2.038	5.188,00	2.347.511.312,22	25.756.486.011,83	818.166.714,07	85.430.555,23	29.007.594.593,35
2.039	5.438,00	2.460.633.484,16	26.997.642.816,57	818.166.714,07	85.430.555,23	30.361.873.570,03

2.040	5.688,00	2.573.755.656,11	28.238.799.621,30	818.166.714,07	85.430.555,23	31.716.152.546,71
2.041	5.938,00	2.686.877.828,05	29.479.956.426,04	818.166.714,07	85.430.555,23	33.070.431.523,39
2.042	6.188,00	2.800.000.000,00	30.721.113.230,77	818.166.714,07	85.430.555,23	34.424.710.500,07
2.043	6.438,00	2.913.122.171,95	31.962.270.035,50	818.166.714,07	85.430.555,23	35.778.989.476,75
2.044	6.688,00	3.026.244.343,89	33.203.426.840,24	818.166.714,07	85.430.555,23	37.133.268.453,43
2.045	6.938,00	3.139.366.515,84	34.444.583.644,97	818.166.714,07	85.430.555,23	38.487.547.430,11
2.046	7.188,00	3.252.488.687,78	35.685.740.449,70	818.166.714,07	85.430.555,23	39.841.826.406,79
2.047	7.438,00	3.365.610.859,73	36.926.897.254,44	818.166.714,07	85.430.555,23	41.196.105.383,47
2.048	7.688,00	3.478.733.031,67	38.168.054.059,17	818.166.714,07	85.430.555,23	42.550.384.360,15
2.049	7.938,00	3.591.855.203,62	39.409.210.863,91	818.166.714,07	85.430.555,23	43.904.663.336,82
2.050	8.188,00	3.704.977.375,57	40.650.367.668,64	818.166.714,07	85.430.555,23	45.258.942.313,50

Information:

Luas lahan dengan penambahan lahan potensial = Area of land with the addition of potential land

Pendapatan petani = Farmer's revenue

Total pendapatan pabrik sagu = Total sago factory revenue

Total pendapatan produksi kompos = Total compost production revenue

Total pendapatan gula cair = Total liquid sugar revenue

Total pendapatan keseluruhan = Total overall revenue

4. Costs Incurred from Efforts to Introduce 250 Sago Trees per Year

year	biaya penanaman dan pemeliharaan	harga bibit	total biayay keseluruhan
2.015	0,00	0,00	0,00
2.016	0,00	0,00	0,00
2.017	0,00	0,00	0,00
2.018	0,00	0,00	0,00
2.019	0,00	0,00	0,00
2.020	0,00	0,00	0,00
2.021	0,00	0,00	0,00
2.022	0,00	0,00	0,00
2.023	0,00	0,00	0,00
2.024	0,00	0,00	0,00
2.025	0,00	0,00	0,00
2.026	0,00	0,00	0,00
2.027	0,00	0,00	0,00
2.028	0,00	0,00	0,00
2.029	0,00	0,00	0,00
2.030	0,00	0,00	0,00
2.031	0,00	0,00	0,00
2.032	6.057.540.000,00	4.978.800.000,00	11.036.340.000,00
2.033	6.468.165.000,00	5.316.300.000,00	11.784.465.000,00
2.034	6.878.790.000,00	5.653.800.000,00	12.532.590.000,00
2.035	7.289.415.000,00	5.991.300.000,00	13.280.715.000,00
2.036	7.700.040.000,00	6.328.800.000,00	14.028.840.000,00
2.037	8.110.665.000,00	6.666.300.000,00	14.776.965.000,00
2.038	8.521.290.000,00	7.003.800.000,00	15.525.090.000,00
2.039	8.931.915.000,00	7.341.300.000,00	16.273.215.000,00
2.040	9.342.540.000,00	7.678.800.000,00	17.021.340.000,00
2.041	9.753.165.000,00	8.016.300.000,00	17.769.465.000,00
2.042	10.163.790.000,00	8.353.800.000,00	18.517.590.000,00
2.043	10.574.415.000,00	8.691.300.000,00	19.265.715.000,00
2.044	10.985.040.000,00	9.028.800.000,00	20.013.840.000,00
2.045	11.395.665.000,00	9.366.300.000,00	20.761.965.000,00

2.046	11.806.290.000,00	9.703.800.000,00	21.510.090.000,00
2.047	12.216.915.000,00	10.041.300.000,00	22.258.215.000,00
2.048	12.627.540.000,00	10.378.800.000,00	23.006.340.000,00
2.049	13.038.165.000,00	10.716.300.000,00	23.754.465.000,00
2.050	13.448.790.000,00	11.053.800.000,00	24.502.590.000,00

Information:
Biaya penanaman dan pemeliharaan = Planting and maintenance costs
Harga bibit = Seed price
Total biaya keseluruhan = Overall total cost