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Sago business development scenario in North Luwu Regency, South Sulawesi

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Abstract. North Luwu Regency is one of the sago producing areas in South Sulawesi. Sago is used as alternative food, in the form of basic food such as Sinonggi, Kapurung or Papeda. Sago business management is carried out traditionally production in the form of raw sago (wet). The development of sago is very strategic to support and guarantee the food availability. Analysis of financial feasibility was used to determine the feasibility of business in the development of Sago business in North Luwu Regency in South Sulawesi. Data were obtained through interviews using a questionnaire on sago business's actors. To calculate this feasibility of this effort was made in 2 scenarios namely Scenario 1 (Sago Plantation Forest Development) and scenario 2 (purchase of sago trees). The results showed that NPV in scenario 1 was Rp. 81,149,632 with a BCR value of 8, IRR 64% in the interest rate of 7%, and Payback Period for 0.04 years. Meanwhile, NPV in Scenario 2 showed Rp17,510,704 with a BCR value of 2, IRR 20.9% in the interest rate of 7% and payback period for 0.3 years. The analysis of sensitivity in the two scenarios also has the value of the rate of sensitivity <1 so that the two efforts are worthy of continuing.

Keywords: Financial analysis; North Luwu; Sago business; sensitivity analysis

1. Introduction

Sago (Metroxylon Sagu Rottb.) is an original southeast asian plant. The spread includes Western Melanesia to East India and from North Mindana to the island of Java and South Nusa Tenggara. Sago plants grow naturally especially in plain areas or swamps with abundant water sources [1]. The sago area of Indonesia is around 219,978 ha, with the amount of sago starch production in 2015 of 423,946 tons and 2016 of 440,516 tons. Riau Province is an area with a widest sago area of 91,944 ha. Some areas such as Maluku have sago area (41,496 ha), Papua (39,843 Ha), Central Sulawesi (6.106 ha), and Southeast Sulawesi (5,105 ha). South Kalimantan (7,857 Ha), West Sulawesi (1,7593 Ha), South Sulawesi (4,383 ha) and West Kalimantan (1,296 ha) [2].

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Sago in several regions of Indonesia is used as alternative food, in the form of staple food such as sinonggi, kapurung or papeda. Sago is also consumed as a companion food in the form of a sago plate, bagea and others. In addition, sago is used as composite flour for flour substitution. The development and utilization of sago is also very strategic to support and guarantee food availability. Moreover, the sago is famous as a plant that is resistant to climate change, drought, flooding and pest attacks and diseases [3]. The advantages of Sago plants are very high productivity compared to other carbohydrate producing plants.

The well-managed sago can reach 25 tons of dry / ha / year [4]. However, Sago's efforts are still managed traditionally. One of the sago-producing areas in South Sulawesi was located in North Luwu Regency. In this area sago also utilized as alternative food. The type of eating known and the community consumed by the community is kapurung. The community has also longed to try this sago as a source of income. Sago production by the communities or farmer is still raw sago (wet sago), which is packaged in the form of tumang. On the other hand, demand for sago production in the form of wet sago and dry sago is quite high. This is proven by the number of good sago requests from this region, as well as outside the North Luwu Regency. Based on the above and for the sago gift, it is necessary to do an analysis of the Sago business, especially financial analysis. Thus, the Sago Management Business is expected to contribute to the increase in community income.

2. Methods

2.1 Data Collection Technique

This research was conducted in Pengkajoang Village, West Malangke District, North Luwu Regency, South Sulawesi Province. The population in this study were actors involved in sago's business activities, namely related agencies, village governments, sago processors, and traders that involved in this business. Determination of the sample was carried out purposively for the village government and for sago processors was conducted census as many as nine business units. Data collection methods carried out are observation, interviews and literature studies. The data collected in this study consisted of two types, primary data and secondary data. Primary data is data obtained directly in the field, especially by making direct observations to the field and interview with some related parties that are considered to have an interest in the business concerned. Data taken are costs, production processes, equipment, raw materials, labour and income. Secondary data is used as a supporter of primary data including the general situation of the location, and related literature.

2.2 Data Analysis

Financial eligibility for sago businesses in analysis using NPV, IRR, BCR, PP, and sensitivity analysis. Financial eligibility analysis is divided into 2 scenarios. The first scenario is the financial feasibility of the development of a 10 ha sago plant forest. The second scenario is financially feasibility with the purchasing sago trees. The criteria used are NPV, BCR, IRR, BEP, PBP and analysis of sensitivity.

2.2.1. Net Present Value (*NPV*).

A business can be said to be feasible if the total number of benefits he receives exceeds costs incurred [5].

$$NPV = \sum_{t=1}^{n} \frac{Bt-Ct}{(1-t)^t}$$

Where :
NPV = *Net Present Value*
Bt = Benefit from sago business unit
Ct = *cost* in the year to-t
N = project age (year)
I = *Discount rate*

Financial feasibility assessment based on NPV are:
NPV > 0 = means that financially sago farming is worth trying
NPV < 0 = means financially sago farming is not feasible to be cultivated

2.2.2. Internal Rate of Return (*IRR*).
IRR is a formula used to find an interest rate that equates the present value of expected future cash flow or cash receipts, by issuing an initial investment. The IRR value is obtained by using the following formula:

$$IRR = i_1 + \left(\frac{NPV_1}{NPV_1 - NPV_2}\right)(i_2 - i_1)$$

Where :
IRR =. *Internal Rate of Return*
NPV_1 = *present value* positive
NPV_2 = *present value* negative
i_1 = *discount* factor, if NPV > 0
i_2 = *discount* factor, if NPV < 0

2.2.3. Benefit Cost Ratio (BCR).
Benefit Cost Ratio (BCR) is one of the methods of investment feasibility. Basically, the calculation of this investment feasibility method emphasizes more on the benefit and sacrifice (cost) of an investment.

$$BCR = \frac{\sum_{t=1}^{n} \frac{Bt}{(1+i)^t}}{\sum_{t=1}^{n} \frac{Ct}{(1+i)^t}}$$

Where :
BCR = *Benefit Cost Ratio*
Bt = Benefit from sago business unit
Ct = *cost* in the year to-t
t = year to 1,2,3 etc.
n = project age (year)
i = *Discount rate*

Financial feasibility assessment based on Net B/C are:
Net B/C > 1= means the project is viable and profitable
Net B/C < 1= means the project is unprofitable and unprofitable.

2.2.4. Payback Period (PP).

Payback period is a period necessary to recoish investment expenses using cash flow. The PBP formula is as follows:

$$PP = \frac{K_0}{Ab} \times 1 \text{ year}$$

Where :

PP = Payback Period
K_0 = initial investment
Ab = benefit obtained in each period

2.2.5. Analisis Sensitivitas.

Switching value analysis is a variation on sensitivity analysis. This indicates that if there is a change in input and output, the change should not exceed the switching value limit [5]. In other words, if it exceeds the value of the replacement, then the business becomes unfit or NPV<0. Sensitivity rate analysis can be formulated as follows [8].

$$\text{Sensitivitas} = \frac{\frac{|X_1 - X_0|}{X}}{\left|\frac{Y_1 - Y_0}{Y}\right|} \times 100\%$$

Where:
X1 = NPV/IRR/Net B/C ratio after a change.
X0 = NPV/IRR/Net B/C ratio before the change occurs.
X = Average change in NPV/IRR/Net B/C ratio.
Y1 = Selling price / production cost / production after a change.
Y0 = Selling price / production cost / production before the change.
Y = Average change in selling price/production cost/production.

3. Results

3.1. Unit Management analysis

The topography of the sago forest area in Pengkajoang village is flat and close to transportation access. The sago forest area is also near the riverbank and swampland type. Good sago comes from sago forest areas that have a good drainage system, and the change of water entering the area also affects this because the water coming in from the river carries some of the nutrients needed by sago such as potassium, phosphate, calcium, and magnesium.

Sago trees in Pengkajoang village before was developed naturally and then cultivated using weeds from the previous tree. The sago tree was taken from sago groves that produced high starch. The sago trees taken are in the sapihan phase (sucker), and the leaves or fronds and shoots of plants are still fresh green. The weeds taken are the weeds that do not stick directly to the parent tree and the banir or food reserves are already hard and have many roots and the shape of the letter L between the banir and the sago header. The weeds that have been taken are stored in polybags and watered, in shades, fertilizers, and the pawning of plant-destroying organisms.

The weeds are in the polybag for 3-4 months or at the time of appearing leaves as much as 2-3 pieces and appear a lot of new roots with a length of 10 cm. The weeds are planted with a planting distance of 8x10 m with a rectangular planting system. Sago planting hole measuring 30 cm x 30 cm x 30 cm, the planted child should be given a restraint of leaf bone and placed crossed at the front of the seed stem after being stockpiled with soil to the neck of the seed.

Maintenance in the sago area in the form of control of weeds and disease pests where weed control is carried out mechanically. This aims to minimize nutrient competition and eliminate the host of plant-destroying organisms. Control is carried out in the form of cleaning weeds around the tree and also doing sanitation. Sanitation is the felling of dead trees so as not to affect other trees, wood from sanitation can still be processed into building wood, household furniture or firewood.

Sago trees in Pengkajoang Village are harvested at the age of 5-7 years [9] the age of a good sago harvest is 8-10 years. Other characteristics that identify that sago is ready to harvest are the number of leaves on the shoots as much as 3-4 pelepah, and the flower has not bloomed (the tops swell). Other features of thorns in the leaf fronds are getting less and slippery and the height of trees 10-15 m, diameter 60-70 cm, thick outer skin 10 cm, and thick stems containing sago 50-60 cm.

The area and trunk of the tree are cleaned before harvesting the sago tree. This aims to facilitate the process of moving sago to the production site and make it easier for workers to cut down. Tools used in the logging process in the form of chainsaws and camphor. The use of camphor aims to reduce the impact of damage on chainsaw machines. Logging is done as close as possible around the roots; it is done to take the trunk as much as possible. After the tree is cutting down, then the trunk is cleaned and cut into pieces with a size of 1-2 meters, with the aim to facilitate transportation to the management place.

Sago tree trunks that have been cut below to the processing site using motor vehicles or drifted through the river. After arriving at the sago processing place that has been cut then shredded using a grated machine. The processed remains of the sago tree trunk can be used for the roof of the house or firewood. The result of grated sago starch is then filtered with a filter and during the filtering process the sago starch is watered with running water using a water pump. The result of starch that escapes from the sieve will be accommodated into a large container shelter in the form of tarpaulin to be collected, the rest of the filtering process that does not pass in the dump and includes waste. In 1 month of harvesting, farmers can cut down up to 20 trees and 1 sago tree containing 400 kg of sago starch so that farmers can collect 8 tons / month of sago starch. These farmers sell the sago in the form of sacks with a maximum weight of 50 kg and tumang weighing 6 to 10 kg. Thus, farmers in 1 month can produce 160 sacks of wet sago weighing 50 kg and 1000 tumang weighing 6 kg.

Farmers when harvesting and processing, they needed labor or other farmers. Workers who help in harvesting and processing activities as much as 2-3 people with a wage of Rp 40,000 - Rp 50,000 per day working people. On the other hand, the other farmers use a profit-share system, the profit from the proceeds of the development in the flat with the farmers who help in the process of such activities.

3.2 Financial Feasibility Study

Financial feasibility analysis is processed based on data obtained in the field along with the review of the library concerned. The cost analysed is the cost of expenditure of land processing activities until the production process of wet sago. In the financial feasibility analysis also calculates the needs of tools, materials, and labor carried out in the process of activities. The price of the tool is based on the market price while the number of tools is based on the number of workers in managing the sago forest area.

Financial feasibility analysis is divided into 2 scenarios. The first scenario is the financial feasibility of the development of sago plantation forest covering an area of 10 ha. The second scenario

is the financial feasibility of purchasing sago trees. The criteria used to assess business feasibility are using NPV (Net Present Value), BCR (Benefit Cost Ratio), IRR (Internal Rate of Return), and PP (Payback Period). The interest rate used in the feasibility analysis is based on the bank's current KUR (People's Business Credit) interest rate of 7%.

Based on the results of the interview that the average number of workers is 2 people covering an area of 1 hectare, the cost of expenditure for labor based on the number of workers who manage an area of 1 hectare based on The Day of Work (HOK). Determination of the number of HOK and cost per HOK for each activity based on assumptions and interviews with resource persons. In calculating business feasibility, income and expense data are needed every year. Financial feasibility scenarios for both activities are presented as follows:

3.2.1 Financial Feasibility Scenario for Sago Plantation Forest

3.2.1.1. Cost Analysis.

Cost analysis of tools, materials, and labor is grouped based on activities carried out from the beginning of the year to the end of the cycle. Details of the activities carried out are as follows:

a. Land preparation.

Land preparation activities are activities that aim to make the condition of the land are suitable place to grow. The tools needed in the activity are chopper, saws, and shover and crowbar. The number of tools needed 3 chopper, 3 saws, and 3 shover and crowbar. Activities carried out in the preparation of land is the cleaning of shrubs and shrubs. Other activities are the regulation and manufacture of drainage systems. Cleaning the field using chopper and saws where the time required 3 in the cleaning of an area of 1 hectare. Drainage manufacturing activities take 3 working days to function properly. The details of the analysis of the cost of tools, materials and labor in land preparation activities are as follows:

Table 1. Cost of analysis of land preparation activities

No	Activities	unit	Total	Cost unit (Rp.)	Total cost (Rp.)
	Land preparation				
1	Tools and materials				
	Chopper	Unit	3	40,000	120,000
	Shovel	Unit	3	30,000	90,000
	Crowbar	Unit	3	30,000	90,000
2	Labor				
	Land clearing	HOK	3	50,000	150,000
	Drainage manufacturing	HOK	3	50,000	150,000
				Total	600,000

b. Plantation.

Sago planting is carried out on sago seed aged 2-3 months. Planting is done at the beginning of the rainy season because sago plants require sufficient water availability during their growth. The cost of

spending in planting activities is obtained from the market price of tools and materials used in planting. Tools used based on the number of workers in 1 hectare are 3 shover and 3 crowbars. Materials used in planting activities are polybags, and sago weeds. Determination of the amount of material needed in planting activities is obtained from the taking of seed from the previous sago tree. Polybag unit cost based on market price, while sago plant unit cost is Rp 25,000. Labor needed in the process of planting activities is the manufacture of planting holes and planting. The number of Working Operational Days in the manufacture of planting and planting holes is 3 days. The details of the analysis of the cost of tools, materials and labor in land preparation activities are as follows:

Table 2. Cost of analysis of land use activities

No	Activities	unit	total	Unit cost (Rp.)	Total cost (Rp.)
	Planting				
1	Tools and materials				
	Shovel	unit	3	30,000	90,000
	Crowbar	unit	3	30,000	90,000
	Fertilizer	Kg	100	1,000	100,000
	Seed	unit	125	25,000	3,125,000
	Polybag	unit	130	500	65,000
2	Labor				
	Planting hole making	HOK	3	50,000	150,000
	Transportation and Planting	HOK	3	50,000	150,000
		Total			3,770,000

c. Maintenance.

Maintenance is an activity to maintain the growth of sago plants. Tools used is chopper and saw, the number of tools needed is 2 choppers and 2 saws. Activities carried out are weed control, pest and disease control. The labor needed in maintenance is weed control as well as pest and disease control. The number of working operational days in weed control also pest and disease control activities takes 3 days. Maintenance activities are carried out at least 3-4 times a year. The details of the analysis of the cost of tools, materials and labor in maintenance activities as follows:

Table 3. Cost of analysis of land maintenance activities

No	Activities	unit	Total	Total Unit (Rp.)	Total Cost (Rp.)
	Maintenance				
1	Tools and materials				
	Chopper	unit	3	40,000	120000
2	Labor				

	weed control	HOK	3	50,000	150000
	pest and disease control	HOK	3	50,000	150000
	Total				420000

d. Harvesting.

Harvesting on sago trees is cutting the trunks of sago tree, then processed into wet sago for sale in collectors. Harvesting sago until the management is completed immediately because it will affect the results of the sago. The details of the analysis of the cost of tools, materials and labor in harvesting and harvesting activities as follows:

Table 4. Cost of analysis of harvesting and land clearing activities

No	Activities	Unit	Total	Total unit (Rp.)	Total cost (Rp.)
	Harvesting and management				
1	Tools and materials				
	Chainshaw	Unit	1	850,000	850,000
	Kampak	Unit	3	30,000	60,000
	Mesin Parut grated machine	Unit	1	250,000	250,000
	Mesin pompa air water pumping machine	Unit	1	220,000	220,000
	Terpal	Unit	1	150,000	150,000
	Ember	Unit	2	35,000	70,000
2	Harvesting and management				
	Harvesting sago tree	HOK	3	50,000	150,000
	Sago tree management	HOK	3	50,000	150,000
	Total				1,900,000

3.2.1.2. Revenue analysis.

The revenue of sago plantation forest is obtained from the sale of sago starch contained in the trunk of sago trees. In the harvesting process, in 1 month the harvest period can cut down up to 20 trees, each of trunk's sago tree, content the average of sago starch is 300 kg. It means, in 1 month farmers can collect 6 tons of sago starch per month. Wet sago is sold in the form of sacks weighing 50 kg (Rp. 110,000) and tumang weighing 6 kg (Rp. 20,000). Revenue from sago sales is presented in the following table:

Table 5. Receipt of sago in the form of sacks

Year	Product	Unit	Total	Revenue (Rp/Kg)	Total Revenue (Rp/Kg)
0	-	-	-	-	-
1	-	-	-	-	-
2	-	-	-	-	-
3	-	-	-	-	-
4	-	-	-	-	-
5	Sago	Kg	300	2,500	750,000

6	Sago	400	2,500	1,000,000
7	Sago	500	2,500	1,250,000
		Total		3,000,000

Table 6. Sago revenue in the forms of *tumang*

Year	Product	Unit	Total	Revenue (Rp/Kg)	Total Revenue (Rp/Kg)
0	-	-	-	-	-
1	-	-	-	-	-
2	-	-	-	-	-
3	-	-	-	-	-
4	-	-	-	-	-
5	Sago	Kg	300	3,333	999,900
6	Sago		400	3,333	1,333,200
7	Sago		500	3,333	1,666,500
			Total		3,999,600

3.2.1.3. Revenue.

Revenue analysis is derived from the results of the request minus the cost. The value of the cost is derived from all the equipment purchased as well as the depreciation value and labor costs each year. Revenue analysis on sago plant development scenario is presented in Table 7.

Table 7. Sago revenues for sago forest development scenarios

Years	Cost (Rp)	Benefit (Rp)	Cash Flow	(1+i)^ t	NPV
0	5,690,000	0	(5,690,000)	1	0
1	1,026,000	0	(1,026,000)	1.07	0
2	1,026,000	0	(1,026,000)	1.14	0
3	1,026,000	0	(1,026,000)	1.23	0
4	1,026,000	0	(1,026,000)	1.31	0
5	1,026,000	34,998,000	33,972,000	1.40	24,953,090
6	1,026,000	46,664,000	45,638,000	1.50	31,094,194
7	1,026,000	58,330,000	57,304,000	1.61	36,324,992
Total	12,872,000	139,992,000	127,120,000		92,372,276

3.2.2. Financial Feasibility Scenario for Sago Tree Purchase

3.2.2.1. Cost Analysis.

Cost analysis for tools and labor is grouped based on the activities carried out. In the purchase of sago trees that distinguish from the development activities of the sago area, namely maintenance activities,

harvesting activities, and logging activities. Details of the cost of tree purchasing activities are same as the development activities of the sago tree area. Details of costs on sago tree purchasing activities can be seen in the following table:

Table 8. Cost of analysis of land maintenance activities

No	Activities	Unit	Amount	Unit cost (Rp)	Total cost (Rp)
	Maintenance				
1	Tools and materials				
	Chopper	unit	3	40,000	120000
2	Labor				
	Weed cleaning	HOK	3	50,000	150000
	Cleaning pests and diseases	HOK	3	50,000	150000
				Total	420000

Table 9. Cost analysis of harvesting and production

No	Activities	Unit	Amount	Unit Cost (Rp)	Total cost (Rp)
	Harvesting and production				
1	Tools and materials				
	Chainsaw	Unit	1	850,000	850,000
	chopper	unit	3	30,000	60,000
	Grated machine	unit	1	250,000	250,000
	Water pumping machine	unit	1	220,000	220,000
	Tarpaulin	unit	1	150,000	150,000
	Bucket	unit	2	35,000	70,000
2	Harvesting and management				
	Weed control	HOK	3	50,000	150,000
	Pest and disease control	HOK	3	50,000	150,000
		Total			1,900,000

In the activity of purchasing sago trees farmers buy trees at a price of Rp. 150,000/trunk. In one hectare of sago tree area there are an average of 125 sago trees so that the total cost of purchasing trees is Rp 18,750,000/ha.

3.2.2.2. Revenue Analysis.

In the analysis of revenue data obtained based on the results of sago sales. In 1 hectare of sago tree area there are 125 trees, 1 sago tree average sago starch that can be as much as 300 kg and in one month farmers can cut down 20 trees. The price of sago trees obtained from interviews with sago

farmers and farmers sell in the form of wet sago with a weight of 50 kg. The revenue result of sago tree purchasing activities as follows:

Table 10. Revenue analysis of sago purchasing activities

Years	Product	Total (kg)	Revenue (Rp/Kg)	Total revenue (Rp/Kg)
0	-	-	-	-
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	Sago	300	2,500	750,000
6	Sago	400	2,500	1,000,000
7	Sago	500	2,500	1,250,000
			Total	3,000,000

3.2.2.3. Revenue Analysis.

The cost value of the revenue analysis is derived from all the equipment purchased as well as the depreciation value and labor costs each year. Revenue analysis on sago plant development scenario is presented in the following table:

Table 11. Revenue analysis of sago tree purchasing activities

Years	Costs (Rp)	Revenue (Rp)	Income (Rp)
1	20,670,000	0	(20670000)
2	620,000	0	(620000)
3	620,000	0	(620000)
4	620,000	0	(620000)
5	620,000	15,000,000	14380000
6	620,000	20,000,000	19,380,000
7	620,000	25,000,000	24,380,000
	24,390,000	60,000,000	35,610,000

3.2.1.4. Financial Feasibility Study

a. Net Present Value (NPV). A business can be said to be feasible if the total amount of benefits it receives exceeds the costs incurred [5]. NPV values for 2 consecutive scenarios are presented in Table 12 and In Table 13.

Table 12. NPV value in the scenario of forest area development activities with an interest rate of 7%

Year	Costs (Rp)	Benefit (Rp)	Cash Flow (Bt-Ct)	(1+i)^t	NPV (Cash flow/(1+i)^t)
0	5,690,000	0	-5,690,000	1	-5,690,000
1	1,026,000	0	-1,026,000	1.07	-958,879
2	1,026,000	0	-1,026,000	1.14	-896,148
3	1,026,000	0	-1,026,000	1.23	-837,522
4	1,026,000	0	-1,026,000	1.31	-782,730
5	1,026,000	34,998,000	33,972,000	1.40	24,221,566
6	1,026,000	46,664,000	45,638,000	1.50	30,410,526
7	1,026,000	58,330,000	57,304,000	1.61	35,686,051
Total	12,872,000	139,992,000	127,120,000		81,152,865

Table 13. NPV value in the scenario of sago tree purchasing activities with an interest rate of 7%

Years	Cost (Rp)	Benefit (Rp)	Cash Flow (Bt-Ct)	(1+i)^t	NPV (Cash Flow/(1+i)^t
1	20,670,000	0	-20670000	1.07	(19,317,757)
2	620,000	0	-620000	1.14	(541,532)
3	620,000	0	-620000	1.23	(506,105)
4	620,000	0	-620000	1.31	(472,995)
5	620,000	15,000,000	14380000	1.40	10,252,741
6	620,000	20,000,000	19,380,000	1.50	12,913,712
7	620,000	25,000,000	24,380,000	1.61	15,182,639
Total	24,390,000	60,000,000	35,610,000		17,510,704

Based on Table 12 and Table 13 NPV value of sago plant forest development scenario is Rp 81,149,632 and for purchasing tree scenario is Rp 17,510,704. With both NPV values of more than 0 which means both scenarios provide an advantage, so it is said both scenarios are worth doing.

b. Benefit Cost Ratio (BCR). Benefit Cost Ratio (BCR) is one of the methods of investment feasibility. Basically, the calculation of this investment feasibility method emphasizes more on the benefit and sacrifice (cost) of an investment.

Table 14. BCR value in 2 activity scenarios with an interest rate of 7%

No	Activities	BCR
1	Sago plantation forest	8
2	Purchasing sago tree	2

Based on Table 14 BCR values of both scenarios, in the first scenario is 8 and for the second scenario is 2. With both BCR values of more than 1 means both scenarios are feasible and profitable.

c. Internal Rate of Return (IRR). IRR is an IRR is a formula used to find an interest rate that equates the present value of expected future cash flow or cash receipts, by issuing an initial investment.

Table 15. NPV value at interest rate 7%, 21%, 65%

No	Activities	NPV		
		Bunga 7%	Bunga 21%	Bunga 65%
1	Sago plantation forest development	81,149,632	-	-294,996
2	Purchasing sago tree	45,562,014	-6,128	-

Table 15 shows that at an interest rate of 7% the NPV value for both scenarios is still positive which means it still provides an advantage, while the NPV value at the 65% interest rate in the sago forest development scenario is negative which means the IRR value for the sago forest development scenario is between 7% and 65%. The IRR value for the tree purchase scenario is at 7% and 21% interest. Calculation of IRR value in sago plant forest development scenario is as follows:

$$IRR = 7 + \frac{\text{Rp.}81{,}149{,}632}{\text{Rp.}81{,}149{,}632 - (\text{Rp.} - 294{,}996)}$$

IRR = 64%

The calculation above is known that the IRR value is 63.94%. Calculation of IRR value for tree purchase scenario as follows:

$$IRR = 7 + \frac{\text{Rp.}45{,}562{,}014}{\text{Rp.}45{,}562{,}014 - (\text{Rp.} - 6{,}128)}$$

IRR = 20.9 %

d. Payback Period (PP). According to Umar (2007) Payback period is a period needed to recoish investment expenses using cash flow.

Table 16. Payback Period Value

No	Activities	PP (year)
1	Sago plantation forest development	0.04
2	Purchasing sago tree	0.3

Based on the value in Table 16, the payback period value of both scenarios is less than one year. Calculation of payback period value in sago plant forest development scenario is as follows:

$$PP = \frac{5{,}690{,}000}{139{,}992{,}000}\ X\ 1\ Tahun$$

PP = 0,04 year

The calculation above is known that the PP value is 0.04 years. Calculation of PP value for tree purchase scenario as follows:

$$PP = \frac{20{,}670{,}000}{60{,}000{,}000}\ X\ 1\ Tahun$$

PP = 0.3

3.2.3. Sensitivity analysis.

In the sensitivity analysis the parameters tested are cost value and revenue value. Sensitivity parameters were tested with a change rate of 10% - 20 %. The result of parameter changes in both of harvesting activities are as follows:

Table 17. Sensitivity analysis of sago stem purchase

% change	Cost	NPV	% Sensitivity
0%	Rp 12,876,200	Rp 81,152,865	0
10%	Rp 128,720,000	Rp -19,821,823	0.5
20%	Rp 64,360,000	Rp 36,275,222	0.8

Table 18. Sensitivity analysis of cost production development

% change	Income (Rp)	NPV (Rp)	% Sensitivity
0%	6,999,600	651,827	0
10%	69,996,000	42,219,351	0.06
20%	271,234,500	170,819,451	0.81

Based on the table above, with a change of 10% - 20% on the cost is not sensitive to changes this is based on the rate of sensitivity <1 so that sago development activities are not sensitive to changes. And in the price table also shows the value of sensitivity rate less than 1 so that in planting activities until harvesting sago trees, the activity is not sensitive to price and cost changes. In the analysis of the purchase of trees as follows:

Table 19. Sensitivity analysis of sago tree purchase cost

% change	Cost	NPV	% Sensitivity
0%	Rp 24,390,000	Rp 17,510,704	0%
10%	Rp 243,900,000	Rp -181,206,391	0.7%
20%	Rp 121,950,000	Rp -70,808,005	0.5%

Table 20. Sensitivity analysis of sago tree purchase cost

% change	Income	NPV	% sensitivities
0%	Rp 60,000,000	Rp 17,510,704	0%
10%	Rp 600,000,000	Rp 373,824,130	0.6%
20%	Rp 300,000,000	Rp 175,875,226	0.6%

Based on the table above a 10% - 20% increase in costs and prices proves that sago tree purchasing activities are insensitive to this change in evidenced by the sensitivity rate of <1, the same as the development activities of the sago area.

4. Conclusions

Based on the data obtained, it can be concluded that> both activities are worth continuing. It is proven by the net present value (NPV) worth Rp 81,149,632 and Rp 17,510,704 respectively in scenarios 1 and 2 with an interest rate of 7%. The IRR (internal rate of return) of both businesses is 64% and 20.9%, and the payback period (pp) of both business scenarios has a fast rate of return. Both business scenarios are insensitive to changes in price and production costs where the sensitivity rate of both businesses is less than 1. Thus, both scenarios in the form of sago tree purchase and sago forest development in Pengkajoang Village, Malangke Barat District, North Luwu Regency, South Sulawesi Province deserve to continue.

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