THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT

Analysis of Income and Risk of Cassava Farming Business in Bosar Galugur, Simalungun, Indonesia

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Abstract:
This study was conducted to determine the production costs incurred by farmers for cassava farming per hectare per year to find out the net income obtained from cassava farming per hectare per year, how the level of production risk, costs and income of cassava farming is, and how the risk management of cassava farming is carried out by farmers in the research area. The research location is in Bosar Galugur Village, Tanah Jawa District, Simalungun Regency. Determination of the research area is done purposively (deliberately). The sampling method used the census method (saturated sample). The data analysis method used is descriptive analysis and coefficient of variation (CV) analysis. The results showed that the average production cost of cassava farming in the study area was Rp.13,766.604,65/ha/year. The average income of cassava farming in the research area is Rp. 35,303,706.64/ha/year and the average net income of cassava farming in the study area is Rp. 21,537,102/ha/year. The level of production risk, cost, and income faced by cassava farmers in the study area is low (KV < 0.5 and L > 0). The risk management of cassava farming carried out by farmers is the production risk of making beds and cleaning drainage/trenchments, the risk of farmers borrowing money from toke/agents, and the risk of income; there is no special management carried out by farmers because farmers cannot determine prices.

Keywords: *Cost, income, risk, cassava farming*

1. Introduction

The agricultural sub-sector is an important sector in Indonesia's development, considering that Indonesia is an agricultural country. The role of the agricultural sub-sector in the economic development of a country occupies a very important position. Indonesia has a large area of land and climatic conditions that have the potential to be developed as an agricultural business. One of the sub-sectors in agriculture is the food crops sub-sector. Food crops have become an important sector in Indonesia's development along with the establishment of the main target of strengthening food supply and the priority of being verified. Food consumption in Indonesia's development period from 2014 to 2019 is an increase in the availability of domestically sourced food for basic commodities (Bappenas, 2014).

North Sumatra is one of the cassava producing provinces in Indonesia. Cassava production in North Sumatra ranks fifth as a center for cassava production after Lampung, Central Java, West Java and East Java. The productivity of cassava in Simalungun Regency is still far from the target of the Ministry of Agriculture in 2014 which reaches a productivity of 40-60 tons/ha. The average productivity of cassava in Tanah Jawa Sub-district in 2015-2019 was 35.10 Tons/Ha and that is still low considering that cassava production can reach 40-60 Tons/Ha. Yields depend on seeds and varieties, as well as management in cultivation and post-harvest handling.

Risk management is an attempt to identify, analyze and control risks in every company activity with the aim of obtaining higher effectiveness and efficiency. The risk management function is better explained and understood through the steps in the decision-making process. The process begins by recognizing the various risks that are being faced. Then the risk must be measured, analyzed and evaluated in terms of frequency, severity and variability. Furthermore, decisions must be made such as selecting and using methods to deal with each of the identified risks (Darmawi, 2016).

Despite its high economic value, cassava is one of the agricultural commodities that has many risks, both the risk of production costs, production and income. Production risk has an impact on harvest failure or a decrease in the number

of harvests from the expected results; the risk of production costs includes the amount of production costs incurred in farming. Revenue risk includes fluctuations in selling prices or changes in lower selling prices and increases in production input prices (Ekaria, 2018).

In various business activities in the agricultural sector, extreme situations often occur, namely risk events and uncertain events. The risk of agricultural production is greater than the risk of non-agriculture because agriculture is strongly influenced by nature such as weather, pests and diseases, temperature, drought, and flooding. In addition to nature, risk can also be posed by marketing activities. The size of the risk faced by farmers will have an impact on production costs incurred by farmers and the level of production and income earned by farmers. The existence of these risks has an impact on the level of farmers' income. The higher the risk faced by farmers, the higher the chance of experiencing losses. Farmers' behavior towards risk is influenced by income levels and socio-economic variables (Siahaan, 2016).

Production problems are related to the nature of farming which always depends on nature supported by risk factors that cause high opportunities for production failure, so that it accumulates at the risk of low income received by farmers. The risks faced by cassava farmers can be in the form of yield risk or production risk, production selling price risk and income risk. Yield or production risk is caused by, among others, pest and disease attacks, weather or natural conditions, problematic water supply, and variations in inputs used. Natural conditions greatly affect the variation in yield, for example with very large or very small rainfall conditions, which can cause crop failure. Unpredictable weather conditions are often the cause of decreased production and productivity of cassava plants produced by farmers (Kumiati, 2012).

Bosar Galugur village is one of the areas in Java which is known as a producer of cassava, with an area of cassava cultivated by farmers ± 0.2 – 1 hectare. In addition to cassava farming, farmers in the village also operate several branches of farming, including rice paddy, oil palm, corn, and so on. Farmers in Bosar Galugur Village complain about the difficulty of getting subsidized fertilizer from the government while the price of non-subsidized fertilizer in the market is quite expensive; so, it requires a large amount of capital; behind that there is also a lack of capital in doing farming and fluctuating output prices. In addition, external factors, the influence of weather/nature changes and rainfall are also one of the problems faced by cassava farmers in Bosar Galugur Village which affect cassava productivity. And the fluctuations in productivity and output prices faced by farmers will have an impact on the instability of income earned by farmers. This indicates that there is a risk experienced by cassava farmers in Bosar Galugur Village.

2. Research Method

This research was conducted in Bosar Village, Tanah Jawa District, Simalungun Regency. This village was chosen as the research area for the reason that Bosar Galugur Village is one of the centers of cassava production in Tanah Java District, so that farmers in Bosar Galugur Village are considered to be able to represent cassava farmers in Tanah Java District. The method used in sampling in this study was the census method (genus sample) because the population of farmers who grew cassava in the study area was only 31 families; therefore, in this census method, all 31 households were designated as samples.

The data collected in this study are primary data and secondary data. Primary data was obtained from structured interviews with farmers and informants at the research location with the help of a previously prepared questionnaire, while secondary data was obtained from the Central Statistics Agency and the Village Head Office.

Data were obtained from direct observations in the field by interviewing cassava farmers using questions (questionnaires), and then all the obtained data were tabulated; after tabulating, according to the research objectives, it is used with the following calculations:

- The total cost of production is used by the formula:

$TC = TFC + TVC$

Information:
TC = Total Cost
TFC = Total Fixed Cost
TVC = Total Variable Cost

- Calculating net income by using the formula:

$TR = P \times Q$
$TC = TFC + TVC$
$\pi = TR - TC$

Information:
π = Profit (income)
TR = Total Revenue
TC = Total Cost
P = Price
Q = Production

- Analyzing production risks, costs, and revenues can be calculated by:

According to Ichsa in Shinta (2011), to measure the spread of risk using a quantitative approach, it can be calculated using the expected return value as an indicator of the probability of investment and the measure of variance and standard deviation as an indicator of risk. Variety can be calculated by the formula:

$\sigma^2 = (\sum_{i=1} (X_i - \bar{X})) / (n-1)$

Information:
σ^2 = Variance
X_i = Yield (Kg)/Cost (Rp)/Revenue (Rp)
$\bar{X}$ = Average Production Yield (Kg)/Average Cost (Rp)/ Average Income (Rp)
n = Number of Farmer Samples

- The standard deviation can be calculated by the formula:

$\sigma=\sqrt{\sigma^2}$

The higher the value of variance (σ^2) and standard deviation (σ), the higher the level of risk. Variety and standard deviation are used to measure production risk, cost and income. According to Kadarsa in Shinta (2011), the coefficient of variation or the lowest level of risk is a comparison between the risk that must be borne by farmers and the amount of income that will be obtained as a result of a certain amount of capital invested in the production process. So it can be said that the farm that has the highest coefficient of variation is the one with the most risk. The coefficient of variation can be calculated by the formula:

Production Risk: $CV = (\sigma)/\bar{Q}$
Cost Risk: $CV= (\sigma)/\bar{C}$
Income Risk: $CV= (\sigma)/(\bar{y})$
Information:
CV = Coefficient of Variation
σ = Standard Deviation
Q = Average Production (Kg)
C = Average Cost (Rp)
Y = Average Income (Rp)

The lower limit of the highest yield (L) or the upper limit of income, according to Hernanto in Shinta (2011), is to indicate the lowest nominal value of income that may be received by farmers. If the value is less than zero, it is likely to experience a loss. The lower limit of the highest yield can be calculated by the formula:

$L = \bar{X} - 2\sigma$

Information:
L = Yield Lower Limit
σ = Variance
$\bar{X}$ = Average Production Yield (Kg)/Average Cost (Rp)/ Average Income (Rp)

Based on the above formula, a relationship can be obtained between the lower limit value of production, cost and income (L) with the coefficient of variation value. It shows:
a) If CV < 0.5 and L > 0 then farming has a small risk
b) If CV > 0.5 and L < 0 then farming has a big risk (Fauziah, 2011)

The risk management of cassava farming is carried out by farmers in Bosar Galugur Village, Tanah Jawa District, Simalungun Regency. The risk management analysis carried out by farmers is descriptively described according to the answers given to farmers or informants at the research location.

3. Results and Discussions

The results showed that the average age of cassava farmers was 54 years with a farmer's age ranging from 33 to 80 years. The average level of education of farmers is low. Where the high school graduates and the lowest are Diploma/Bachelor graduates, the higher the level of education, the better the farmer's mindset will be. Most of cassava farming experience ranges from 5 – 55 years, which means that it has been quite a long time. Experience in farming affects the technical ability of farmers so that farming activities can run well.

3.1. Total Production Cost

Total production costs are all costs incurred for cassava farming activities, such as for purchasing fertilizers, herbicides, labor, equipment depreciation, PBB and land rent. Details of the total production costs of cassava farming per year incurred by farmers can be seen in Table 1.

No	Description	Biaya Total (Rp)		
		Farmer	Hectar	Percentage (%)
1	Fertilizer	1.588.225,81	3.268.661,62	23.85
2	Herbicide	235.748,85	479.690,32	3,51
3	Labor	3.909.322,58	8.045.348,39	58,70
4	Tool Shrink	192.682,58	498.865,61	3,39
5	Land lease	193.548,39	516.129,03	3,48
6	PBB	43.290,32	87.096,77	0,64
7	Tractor Rental	432.967,74	870.812,90	6,41
Average		6.595.786,27	13.766.604,65	100

Table 1: Average Total Production Cost of Cassava Farming in 2022

The data in Table 1 shows that the average production cost per hectare per year for cassava farming in the study area is the highest for labor costs and the lowest for PBB costs; hence, the average production cost for cassava farming is Rp. 13,766,604.65/ha/year; this figure is much higher than the Siregar analysis (2015) which is Rp. 9,908.042.76/ha/year. This is because of the wages of labor and the prices of different means of production such as fertilizers and medicines.

3.2. Net Income of Cassava Farming

Farmer's revenue is the amount of physical production and the selling price prevailing at the time of sale, assuming the production is sold at harvest so that farmers' income can be calculated. If the selling price of cassava is relatively high, farmers will also receive relatively high income and vice-versa, which means if the selling price of cassava is low, farmers will also receive low income. This will affect farm income. The average net income of cassava farming can be seen from Table 2.

No	Description	Net income (Rp)	
		Per-Farmer	Per-Hectar
1	Production	13.700	29.029,55
2	Price	1.216,13	1.216,13
3	Revenue	16.660.981	35.303.706,64
4	Production cost	6.595.786,27	13.766.604,65
5	Net income	10.065.194,63	21.537.102

Table 2: Average Net Income of Cassava Farming in 2022

The production ability of cassava farming in Bosar Galugur Village shows a number that is still not good with an average production of 29,029.55 kg/hectare. This productivity is indeed still low when compared to the results of Rendy Fadillah's research (2018) which concludes that the average productivity of cassava is 48,640,000 kg/hectare. Revenue is the multiplication of all production results from the selling value of the product. The average price during the research was IDR 1,216,13/kg and the average production was 29,029.55kg/hectare. Then the total revenue is an average of IDR 35,303,706.64/hectare/year. The average cassava farming in the research area is much lower than the results of Rendy Fadillah's (2018) analysis of Rp.47,408,166/ha/year with a simple random sampling method of 30 families. This difference is caused because one of them is cassava production. Income is influenced by several factors such as: low selling price, high production cost and low production.

3.3. Farming Risk Level Analysis

The results of the calculation of the level of production risk were analyzed using the coefficient of variation (CV) using cassava production data per hectare in Bosar Galgur Village, which can be seen in Table 3.

Description	Production Risk
Average Production (Kg/Ha)	29.029,55
Varians	23.359.258,59
Standard Deviation	4.833,14

Table 3: Analysis of the Risk Level of Cassava Farming Production in 2022

Based on Table 3, it can be seen that the average cassava production is 29,029.55 kg/ha/year. And it can be seen that the standard deviation (Standard Deviation) is 4,833.14. The KV value of the risk of cassava production (kg) faces a risk of 0.17 meaning that for each unit produced, the magnitude of the production risk faced is 0.17, and L or can be interpreted as the lowest production value that farmers may receive is 19,363, 27 kg/ha.

The coefficient of variation value which is less than 0.5 (0.17 < 0.5) and L value which is greater than 0 (19.363.27 > 0) indicates that the level of risk of cassava production in Bosar Galugur Village is quite low or there is an opportunity for it to occur. This is because the production obtained by farmers is quite stable. The results of this study are almost similar to the results of Pratiwi's research (2018) showing a KV of 0.057 and L > 20,061; so, it can be concluded that the level of risk experienced by farmers is low or the chance of occurrence of risk is small.

The results of the calculation of the cost risk level were analyzed using the coefficient of variation (CV) using data on the total cost of cassava per hectare in Bosar Galgur Village, which can be seen in Table 4.

Description	Production Risk
Average Production (Kg/Ha)	13.766.604,65
Varians	3.710.712.732.542,83
Standard Deviation	1.926.321,04

Table 4: Analysis of the Risk Level of Cassava Farming Costs in 2022

Based on Table 4, it can be seen that the average total cost of cassava is Rp. 13,766,604.65/ha/year. And it can be seen that the standard deviation (Standard Deviation) is 1,926,321.04. The KV value of the risk of the cost of cassava (Rp) faces a risk of 0.14 meaning that for each unit produced, the magnitude of the cost risk faced is 0.14 and L or can be interpreted as the lowest cost value that may be incurred by farmers of Rp. 9,913,965,92ha/year.

Variation coefficient value which is less than 0.5 (0.14 < 0.5) and L value which is greater than 0 (9.913.965.92 > 0) indicates that the risk level of cassava costs in Bosar Galugur Village is quite low or there is little chance of it occurring. The results of this study are different from the results of Ekaria's research (2018) in Gorua Village which shows a KV of 6.45, so it can be concluded that the level of risk experienced is low or the chance of occurrence of risk is small; this is due to the high cost of transportation.

The results of the calculation of the level of income risk were analyzed using the coefficient of variation (CV) using data on net income of cassava per hectare in Bosar Galgur Village, which can be seen in Table 5.

Description	Income Risk
Average Production (Kg/Ha)	21.537.102
Varians	28.377.271.177
Standard Deviation	5.327.032,11

Table 5: Analysis of the Risk Level of Cassava Farming Income in 2022

Based on Table 5, it can be seen that the average net income of cassava is Rp. 21,537,102/ha/year. And it can be seen that the standard deviation (Standard Deviation) is 5,327,032.11. The KV value of the risk of cassava income (Rp) faces a risk of 0.25, meaning that for each unit produced, the amount of income risk faced is 0.25 and L or can be interpreted as the lowest income value that may be received by farmers of Rp. 10,883,037., 78/ha/year.

Variation coefficient value which is less than 0.5 (0.25 < 0.5) and L value which is greater than 0 (10,883,037.78 > 0) indicates that the risk level of cassava income in Bosar Galugur Village is quite low or there is little chance of it occurring. The results of this study are not much different from the results of Saputra's research (2017) in Tanjung Kemala Barat Village which shows a CV of 0.019 and an L of 10,883,993.4; so, it can be concluded that the level of risk experienced is low or the chance of occurrence of a risk is small.

3.4. Risk Management of Cassava Farming by Farmers

3.4.1. Production Risk

The production risk faced by farmers in running cassava farming in Bosar Galugur Village is the problem of unpredictable and frequently changing natural conditions. Farmers in Bosar Galugur Village said that the continuous rainfall caused a decrease in cassava production and a longer dry season in one year. This causes the soil fertility to decrease which will reduce their cassava yields.

In the results of Pratiwi's research (2018), it concluded that all cassava farmers in Bumi Agung Marga Village were neutral in facing risks; most farmers tended to ignore the risk and continue to do farming as usual. This is different from farmers in this research area; to overcome or minimize these risks, farmers carry out strategies or management on their farms. During the rainy season to reduce high humidity, farmers cope by making beds so that water can flow and not flood the cassava plants much.

And occasionally, farmers, whose land is quite close to the ditch/drainage, work together to clean the ditch/drainage so that water can flow when it rains continuously. And during the fertilization process in the rainy season, farmers do it by ditugal or by immersing it into the ground and closing it again. This can reduce the amount of wasted fertilizer that washes away during the rainy season. If the weather is long dry, the farmers cannot do anything because many lands do not have special irrigation.

3.4.2. Cost Risk

The cost risk faced by farmers in running cassava farming in Bosar Galugur Village is the problem of lack of capital and higher input prices; in this case, the capital in question is the cost of purchasing fertilizers, herbicides, and labor. Farmers will also incur large costs in purchasing subsidized fertilizers that are difficult to obtain.

Management or countermeasures are carried out by farmers in dealing with the problem of lack of capital. Usually, farmers in Bosar Galugur Village borrow capital with agents on the condition that the loaned capital will be returned during harvesting or while selling cassava production, agents do this as a form so that farmers do not move to other agents. Apart from borrowing from agents, farmers also sometimes borrow money from relatives/family as capital. This is the same as the results of Misqi's research (2019) in Sukalaksana Village, Bayuresmi District, Garut Regency which concluded that management was carried out to overcome the problem of lack of capital by borrowing money from the dealer, and later the loan would be repaid by deducting the income from the harvest that was sold to the dealer.

3.4.3. Income Risk

The income risk faced is the problem of fluctuating output prices. Fluctuating output prices will affect the income that farmers will receive. Farmers cannot do anything if output prices fall because farmers cannot determine prices at will. Even though the price of cassava is low, farmers will still sell their crops; this is done because cassava farmers need funds to pay for labor or household needs. Farmers, as price takers, only accept the price set by the agent/toke without having a bargaining position. This is in line with the results of Naftaliasari's research (2015) in Raman Utasa District, East Lampung Regency which states that there is no handling whatsoever in dealing with fluctuations in output prices because farmers are only recipients of prices set by agents/bandars. If the agent/toke is not able to accommodate all the production produced by farmers and provides a much lower price, this will cause losses to be suffered by farmers. According to the

results of interviews with farmers in Bosar Galugur Village, farmers sell cassava harvests to agents/toke because farmers are unable to bear the transportation costs if they are sold directly to the market and farmers feel that it is easier for them to have toke/agents because they come and bring transporters at the same time so that farmers do not need to rent another vehicle. One way to overcome this problem is to increase production output because if the production is large, the risk of income will be reduced.

4. Conclusion

From the results of research on the Risk Analysis of Cassava Farming in Bosar Galugur Village, Tanah Jawa District, Simalungun Regency, the average production cost of cassava farming in the research area is Rp. 13,766.604,65/Ha/Year. The average production cost incurred in cassava farming per hectare is dominated by labor costs outside the family (TKLK). The average net income of cassava farming in the research area is Rp. 21,537,102/ha/year. Net income is obtained by deducting the average total cost of Rp. 13,766,604.65/Ha/Year from the average revenue of Rp. 35,303,706.64/Ha/Year. The level of production risk, cost and income faced by cassava farmers is low (KV < 0.5 and L > 0).

The production risk problem faced by cassava farmers in Bosar Galugur Village is mainly because of fluctuating weather. So, farmers carry out risk management by making beds and working together to clean drainage/trenchments during continuous heavy rains. But, during a prolonged dry season, the farmers cannot do anything but accept the risk. The cost risk faced by farmers is the lack of capital in running cassava farming; especially, at this time, the price of inputs is expensive so that farmers incur quite large costs. One of the managements carried out by farmers is by borrowing money from agents/toke for farming costs and returning it when the harvest arrives or when the produce is sold. The income risk faced by farmers is fluctuating output prices so that it will affect the income received; there is no special management to deal with fluctuating output prices because farmers are only recipients of the price set.

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