



Analysis of the Risk of Profit Loss in Papaya Farming Affected by Yellow Mosaic Disease

Ridha Rizki Novanda¹, Mimi Sutrawati¹, Dwi Wahyuni Ganefianti¹

¹Faculty of Agriculture, University of Bengkulu, Bengkulu, Indonesia

*Corresponding Author: Ridha Rizki Novanda

Email: rrizkin@unib.ac.id



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Abstract

Profit loss is a phenomenon caused by the loss of most of the harvest resulting in operating costs greater than the revenue earned. This phenomenon deserves to be analyzed the risk of losses that will be obtained due to pests and plant diseases. So that in this study an analysis of the risk of Profit loss due to yellow mosaic disease on papaya calina was carried out. This research was conducted in October 2020 in Bengkulu Province on 31 Calina Papaya farmers. The location selection was carried out purposively based on the existence of the Calina papaya garden. Meanwhile, the selection of respondents was carried out using the Snowball sampling method in several districts in Bengkulu Province. Data analysis was carried out to determine the Profit loss. Based on the results of the analysis, it was found that there were differences in the benefits of papaya calina which were attacked by the Yellow Virus Mosaic and those that were not attacked by the Yellow Virus Mosaic. Profit loss for a year is Rp 9,135,203,-. This value is a big value, so farmers must handle this disease better.

Introduction

Papaya is a superior fruit in Bengkulu Province and has high economic value. Papaya fruit contains lots of vitamins A, B1, and B2 as well as papain enzymes that play a role in digesting protein-rich foods, and are widely used also in the pharmaceutical industry (Arvind et al., 2013). Viruses are one of the important pathogens in papaya plants. Younger plants when infected show more severe symptoms. Plants can be infected by two or more viruses and cause more severe symptoms than plants infected with only one virus, (Davis & Mazumi, 2007; Brunt, et al., 2011; Mazumi, et al., 2007). Viral infection that causes the main mosaic in papaya is difficult to distinguish only based on symptoms on the plant surface (Nameth, 2005).

Symptoms of mosaic disease on Calina papaya plantations in Bengkulu province were first reported in Rejang Lebong Regency in December 2018. Based on a 2019 survey in 4 districts namely Rejang Lebong, Kepahiang, Central Bengkulu and Seluma, yellow mosaic disease only occurs in Calina papaya, or people call it Calina papaya with a disease incidence of 42.75 - 100%. Symptoms of yellow mosaic on leaves and striped chlorosis on petiole and chlorosis spots on fruit, but yellow mosaic symptoms were not seen in local papaya species even though they were planted together on the same land as Calina papaya. Like plants in the tropics and sub-tropics, papaya plants are hosts to many types of pests and pathogens.

Yellow mosaic disease on papaya has only been reported in Bengkulu, even in Indonesia. So there is not much information about the distribution of the disease, the severity of the disease, and its impact on the yield of papaya plants. Most of the papaya farmers in Kab. Rejang Lebong and Kepahiang are currently planting the Calina papaya which is thought to be susceptible to yellow mosaic disease with a disease incidence of up to 100%.

Crop loss can be caused by abiotic and biotic environmental factors, which leads to reduced crop performance and results in lower actual yields than the site-specific achievable yields of crops (Oerke, 2006). Loss of yield from environmental factors, one of which is caused by pests and plant diseases. Where pests and diseases are production risks that must be overcome by their spread. According to Popp, Pető, & Nagy (2013), Cost-benefit analysis is an important tool to inform policy decisions about the use of pest and disease control tools.

Based on research conducted by Giuliani et al., (2017) in Brazil, where pests and diseases cause huge losses in the Brazilian agricultural sector. Pests and diseases are very detrimental and attack productive plants. Due to pest and disease attacks, farming becomes detrimental, especially when it attacks productive plants. In addition, they need high-yielding seeds that are resistant to pests and diseases and farmers feel discouraged because they have not succeeded in eradicating the disease, despite their efforts. The risk of loss due to attacks by pests and diseases of yellow mosaic plants is one of the important problems to know. So that in this study an analysis of the risk of profit loss due to yellow mosaic disease in papaya was carried out. It is necessary to estimate the yield loss of papaya to Begomovirus infection as a basis for determining the economic threshold of jaundice in papaya, and for making jaundice control decisions

Methods

This research was conducted in October 2020 in Bengkulu Province on 31 Calina Papaya farmers. The location selection was carried out purposively based on the existence of the Calina papaya garden. Meanwhile, the selection of respondents was carried out using the Snowball sampling method in several districts in Bengkulu Province. Profit loss analysis was carried out to see the loss of most of the crop yields which resulted in operating costs greater than the revenue earned ($TR < TC$). Profit loss analysis or profit loss analysis is carried out by tabulating the results of research in the field using a questionnaire and doing a comparative analysis of income if there is Begomovirus and not. The following describes the stages of analyzing lost profit with various provisions.

Yield and loss of production

Calculating the amount of production under normal conditions and calculating the amount of production under conditions of pests and diseases is stated by (1) Production Results Before being attacked by pests/diseases, (2) Production Results After being attacked by pests/diseases.

Revenue from sales and loss of revenue from sales Calculating the amount of sales proceeds and lost revenue from sales in conditions of pests and diseases

To measure farm profits, the net income of the farm is calculated by subtracting the gross income of the farm by the total expenditure of the farm. Then to measure the remuneration of the farmer's capital by subtracting the value of family work from the net income of the farm. And to measure the remuneration for working capital by subtracting the value of family work from the net income of the farm. Meanwhile, to calculate remuneration for workers in the family by means of net income from farming with interest on farmers' capital (own capital) (Soekartawi, 2011). Profit analysis is carried out before and after exposure to pests/diseases. Furthermore, the lost profile is the difference between the profit before being affected by the pest and the profit after the pest/disease.

Results and Discussion

Respondents Overview

There are not too many Calina papaya farmers in Bengkulu, this condition is indicated by the unavailability of farmer groups or statistical information at the Bengkulu statistical center. The search for respondents was carried out using the snowball sampling method which was carried out by research in areas indicated by the Begomo virus, namely Rejang Lebong Regency, Kepahyang Regency, Seluma Regency and Bengkulu City. The selected respondents were 31 farmers with a 100% infection rate of Begomo virus.

Based on the results of the study, it was found that the majority of Calina papaya farmers were male. Men hold a percentage of 86% to open a calina papaya farm. According to the 2018 Agricultural Census, horticultural farming is still dominated by men compared to women's ownership. This shows that only 14% of women are interested in calina papaya farming in Bengkulu. The female farmer continues her husband's farming because her husband has to work in other sectors to supplement the family's income.

Research on calina papaya in Bengkulu Province cannot be separated from the influence of age. Based on the results of the analysis, the majority of farmers have an age range of 45 years to 61 years. This age is the age of the majority of Calina papaya farmers in Bengkulu Province. The number of productive age farmers who do business in horticultural farming shows that horticultural farming is still in demand by some of the productive age population in Bengkulu. According to Mardhan (2015), the number of productive age is quite large so it is very possible to do Calina papaya farming in order to increase their income to the maximum.

The majority of calina farmers are domiciled in Kepahyang Regency with a percentage of 89%. This is because Kepahyang Regency is the center of Calina papaya in Bengkulu Province. Calina papaya has been widely cultivated in Kepahyang Regency for the past few years and has become a typical horticultural souvenir of Kepahyang Regency. Until now, several home industries have also grown that manage calina papaya, namely the papaya dodol industry. Papaya dodol is a typical food from Kepahyang Regency. The development of the calina papaya dodol industry in Kepahyang with a small and medium-scale business has good prospects, considering that the market potential is very supportive (Simanjuntak, 2014).

The level of education of farmers affects the way of thinking and acting of papaya farming actors. Most of the farmers have a junior high school education level with a percentage of 36%. This can be a big obstacle, because education will have an influence in acting or making decisions, as well as learning and applying new technologies in farming. The number of dependents of the farming family will affect the level of family welfare. If it is not balanced with sufficient income, the number of dependents will show the level of family welfare (Purwanto, 2018). The number of family members is very influential on the distribution of farm income. Based on the results of the analysis, the majority of farmers have family dependents as many as 3 to 6 people. The fewer family members indicate the fewer needs that must be met by the family, and vice versa. So that in a family with a large number of members, there will be many needs that must be met.

Papaya farming experience greatly influences skills and decision making in developing their business. Past experience can be used as knowledge in running the farm, so as to reduce or eliminate the risk of failure in papaya farming. Most of the papaya farmers have less than 4 years of farming experience. This shows that the experience of papaya farmers in running their business is quite long and has known many obstacles and the right solution to overcome them (Mardhan, 2015).

Profit Loss Analysis

One of the conditions for the development of papaya cultivation is the use of superior varieties and quality seeds of papaya varieties that can increase production yields. Papaya Calina is the result of plant breeding from the Center for the Study of Tropical Fruits, Bogor Agricultural University (PKBT-IPB) under the name IPB-9 or Calina. This small papaya is more oval in shape with an average weight of 1.3 kg per fruit. This plant can thrive throughout the year (regardless of season) in Indonesia. By planting Calina papaya is expected to increase farmers' income (Rahmawati, 2015).

The Calina papaya plant is one type of papaya that is being loved and is starting to be planted by many farmers at this time because it is very profitable. This Calina papaya has its own characteristics and advantages, namely the fruit is not too large with a weight of 0.8 – 1.5 kg/fruit, thick and smooth green skin, oval in shape, yellow ripe fruit, sweet taste, chewy and thick flesh. This variety of Calina papaya is a superior type and matures early, the tree/stem is antique dwarf/shorter than other types of papaya, the plant height is about 1.5 – 2 meters and can be harvested after 8 – 9 months. The tree can bear fruit until the age of four years. In one month can be harvested up to four times. Once harvested, each Calina papaya tree can produce 2 to 3 fruits, with one harvest every week reaching 1.9 to 3.6 tons per hectare.

Investment costs are costs incurred at the beginning of papaya farming. The initial investment in papaya farming is in the form of using seeds, purchasing equipment, houses/warehouses, land rental costs, labor costs for land processing and planting, fertilizer costs and burning husks before planting. Based on the search results, it was found that the average capital issued by calina papaya farmers was Rp. 2,975,867, - with an average land area of 0.34 ha. The source of initial capital ownership for investment is private property, but there are also farmers who rent land for their farming interests. On average, farmers do not borrow money either in formal or non-formal institutions. Some farmers own 64% of buildings which use capital costs while non-building is 36%.

Table 1. Papaya Calina Farming Infected With Yellow Virus Mosaic

Cost and revenue components	Total
Investment cost	Rp. 2.975.867
Equipment Cost	Rp. 913.821
Fertilizer	Rp. 405.089
Wage	Rp. 1.787.143
Tax	Rp. 38.200
Land Rent	Rp. 1.666.667
Total Cost	Rp. 5.724.742
Total revenue	Rp. 21.201.429
Profit	Rp. 15.476.687

Fixed costs are production costs whose size is not affected by production volume and the results do not run out in one growing season, these fixed costs consist of tax costs, annual equipment costs and also annual rental costs. Rental costs are one part of fixed costs. The annual rental fee of Rp. 1,666,667,- is paid by the farmers to rent the land they use. Meanwhile, the tax paid annually is IDR 38,200. Other costs include equipment costs, namely hoes, sickles, machetes, pagodas/wheelbarrows, handsprayer and baskets/sacks/beronang. The tools used in calina papaya farming are purchased at the time of the initial investment and also annually to be

replaced. However, at this fixed cost, the equipment purchased is equipment that is used annually. So the amount of fixed costs is IDR 2,618,688 which is issued by farmers for one year.

Variable costs are costs whose size is influenced by the size of production and is exhausted in one production process. Variable costs are costs allocated to purchase variable inputs such as fertilizer and wages for labor outside the family (Ardiyansah, 2020). The use of fertilizers in papaya calina farming are manure, NPK, KCL and urea fertilizer. The use of fertilizers is considered not large in cultivation activities. This is because farmers use manure which is privately owned or obtained at a low price. Manure is the most widely used fertilizer in Calina papaya farming with relatively very cheap prices. According to Hadi (2018), the goal is for manure to be easily absorbed and not cause heat effects for papaya plant seeds. Manure can be classified as organic fertilizer which has several advantages, namely improving soil structure, increasing soil absorption of water, improving living conditions in the soil, and as a source of nutrients for plants. In addition to using manure, NPK fertilizer is the second most widely used fertilizer by Calina papaya farmers. Furthermore, KCL fertilizer is also used 18% in calina papaya farming. While urea fertilizer is used as much as 11%.

Labor is an important factor in farming operations. The labor barrier encountered in farming is the lack of available labor. This occurs at the stage of land processing and harvesting. This is because many workers have changed professions. Papaya farming uses more family labor than non-family workers. So that the wages of labor issued are very small in the amount of Rp. 1,787,143.

Farming revenue is the production value obtained in a farm. Total Revenue (TR) is obtained by multiplying the amount of production by the price per unit (Rahmawati, 2015). This farm generates revenue of Rp. 21,201,429, -. The value of money received from the sale of farming products can be in the form of three things, namely the sale of products to be sold, the sales of by-products, and products consumed by households during farming activities. The acceptance of Calina papaya farming for one year is considered quite high.

Profit is the total revenue after deducting production costs (costs paid) and calculated costs. The amount of income is the profit or loss of farming, so that income is the difference between the amount of profit or loss of farming. Based on the calculation results, obtained a profit of Rp 15,476,687, - with an average land area of 0.34 ha for one year. This is in line with research conducted by Rachmawati (2015), the average income of Calina papaya farmers in Bakalan Village, Kapas District, Bojonegoro Regency is. Rp. 13,308,900 the income is obtained from the total revenue (TR) minus the total cost (TC).

Profit loss is a phenomenon caused by the loss of most of the harvest which causes operating costs to be greater than the revenue earned. This shows that this phenomenon deserves to be analyzed. more specifically regarding the risk of losses that will be obtained due to pests and plant diseases. However, this disease is still considered harmless to calina papaya farmers. There is no record of this disease and it is not being treated. This disease is considered not a disease for farmers. Papaya leaves only turn yellow and there is no further handling. So the Profit loss analysis is difficult to analyze because farmers do not record or remember when they were attacked by the Yellow Virus Mosaic pest. To find out the yield loss, a comparative study was conducted with other studies.

Table 2. Profit Loss Analysis

Previous Studies	Researcher Data	Susanti (2014)	Profit Difference	Information
Profit/ha	Rp. 15.476.687,- (0,36ha) Rp 42.990.797,- (1 ha)	Rp 52.126.000,- (1 ha)	Rp 9.135.203,-	There is a difference in profit

There is a difference in profits. Based on the results of the analysis, it was found that there was a difference in the benefits of papaya calina which were attacked by the Yellow Virus Mosaic and those that were not attacked by the Yellow Virus Mosaic. Profit loss for a year is Rp 9,135,203,-. This value is a big value, so farmers must handle this disease better.

The decrease in papaya production caused by conditions of attack and development of pests and plant diseases increasing is a very serious problem in the cultivation of the Calina papaya plant because it can result in crop failure. Related with efforts to increase crop production, income farmers, production competitiveness, and conservation environment, we need a technique proper pest control and focus on principles that the control system in an area can carried out quickly, precisely, effectively and efficiently and environmentally friendly. This disease is a disease that is not familiar in the community. So far, people do not think that the yellow spots on Calina papaya are plant diseases. So there is no control for this disease. This shows that there is a lack of public knowledge about this type of disease. socialization regarding the attack of the mosaic virus must be carried out to the community, especially the Calina papaya farmers.

Conclusion

Based on the research results, several conclusions were obtained, namely: Profit loss is a phenomenon caused by the loss of most of the harvest resulting in operating costs greater than the revenue earned. This shows that this phenomenon deserves to be analyzed regarding the risk of losses that will be obtained due to pests and plant diseases. Based on the results of the analysis, it was found that there were differences in the benefits of papaya calina which were attacked by the Yellow Virus Mosaic and those that were not attacked by the Yellow Virus Mosaic. Profit loss for a year is Rp 9,135,203,-. This value is a big value, so farmers must handle this disease better.

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