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RISK ANALYSIS OF LEMON CITRUS (*Citrus limon*) FARMING IN CIHAURBEUTI, CIAMIS

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ABSTRACT

Lemon is known as a horticultural commodity that has the highest export value in Indonesia in 2021, reaching US$ 1,529 thousand with a production level of 2,513.86 tons. This lemon business opportunity can be a good prospect and has many benefits in various industries. Cihaurbeuti District is one of the lemon producing districts in Ciamis Regency, but there are fluctuations in production and fluctuations in prices. This happens because there are various farming risks such as production, cost, and income risks faced by farmers. The objectives of this study are to (1) identify the sources of risk of lemon farming, (2) analyze the level of risk of lemon farming, and (3) develop strategies that can be done by farmers in dealing with the risk of lemon farming in Cihaurbeuti District. The analysis model uses descriptive analysis and risk analysis (coefficient of variation). The results showed that there are four sources of risk identified in lemon farming, namely weather and climate, pests and diseases, production facilities, and price fluctuations. Based on the results of the analysis, the greatest level of risk faced in lemon farming is at the risk of costs with coefficient variation 3.32 (CV>0.5), it caused by fluctuations in input prices. The strategy carried out by farmers in dealing with production risk is done mechanically and chemically, while the cost risk strategy is to use a contingency budget, but has not done a handling strategy in the face of income risk.

INTRODUCTION

The agricultural sector has a very important role for human life, including providing oxygen, clothing, food, shelter, industrial raw materials, livelihoods, and so on (Situmeang, 2011). The agricultural sector also plays a role in improving economic development in Indonesia. Gross Domestic Product (GDP) is one of the indicators in macroeconomics used to determine the role of the agricultural subsector in national income. The agricultural sector is divided into five subsectors, namely food crops and horticulture, plantations, forestry, livestock, and fisheries. The horticulture sub-sector has enormous potential to be developed as an effort to grow the regional and national economy, because it has an influence on improving nutrition, income and welfare of farmers (Hadayani, 2012). The horticulture sub-sector has a contribution to GDP of 1.55 percent in 2021 or 262.5 trillion Rupiah of GDP at current prices, an increase in GDP from the previous year of 4.57 percent. This shows that the horticulture sub-sector has a contribution to Indonesia's GDP (BPS, 2022).

Lemon is known as a horticultural commodity that has the highest export value in Indonesia in 2021, reaching US$ 1,529 thousand with a production level of 2,513.86 tons (Pusdatin, 2022). This lemon business opportunity can be a good prospect. This is because lemon is a commodity that has many benefits in various industries, ranging from the food industry, cosmetic industry, medicine industry, and beverage industry (Wicaksana, 2005; Kementerian Pendidikan Tinggi, 2022; Sindarta, 2009; Agrofarm, 2008.). In addition, lemons contain vitamins, minerals, and fiber that are important for the human body. Lemon oranges are an additional 3 (three) new commodities included in the leading horticultural commodities because there is a positive increase in production of lemon oranges, namely production growth in 2022 against 2021 of 58.36 percent (Dirjen Horikultura, 2022).

Ciamis Regency is one of the areas in East Priangan that carries out lemon production in West Java Province. Based on (Open Data Jabar, 2024), in 2021 lemon production in Ciamis Regency reached 980 quintals, becoming the 6th highest lemon producer in West Java Province. In addition, there was an increase in the number of lemon trees in Ciamis Regency by 30.35 percent from 2021 to 2022 (Open Data Jabar, 2024). This shows that lemon cultivation has prospects that can be developed by farmers to meet the increasing demand for lemon. Cihaurbeuti sub-district is one of the lemon-producing sub-districts in Ciamis Regency, but lemon production has fluctuated. In addition to fluctuations in production, lemon commodities also experience fluctuations in prices reaching 50 percent due to simultaneous harvests and decreased production. This happens because there are various farming risks such as production, cost, and income risks faced by farmers. Production risk has an

impact on crop failure or a decrease in the number of harvests from the expected yield (Ekaria, 2018). Cost risks include the amount of production costs incurred in farming. Income risk includes fluctuations in selling prices and increases in the price of production facilities.

The presence of risk in agriculture has a significant influence on farmers' production and investment decisions, so a good risk management concept is needed (Mubarokah et al, 2017). This makes farmers have to determine the most appropriate attitude and strategy in dealing with these risks, because farming risks can affect the size of the amount of production so that it affects the price and income received by farmers. The size of income is influenced by the level of production, production prices, and costs that will be incurred for the production process, in addition to the size of income is also influenced by the risks that will be faced (Lawalata et al, 2017).

The potential in doing lemon farming in Cihaurbeuti District and the existence of farming risks such as weather conditions, pests and diseases, and price fluctuations that must be faced by farmers is what motivates the author to conduct research, especially in Cihaurbeuti District which is part of the lemon production area in Ciamis Regency by strategizing and managing the farming risks faced.

RESEARCH METHODS

Cihaurbeuti sub-district is one of the lemon-producing sub-districts in Ciamis Regency, but lemon production has fluctuated. In addition to fluctuations in production, lemon commodities also experience fluctuations in prices reaching 50 percent due to simultaneous harvests and decreased production. This happens because there are various farming risks such as production, cost, and income risks faced by farmers. Production risk has an impact on crop failure or a decrease in the number of harvests from the expected yield (Lawalata et al, 2017).

Risk assessment is based on the measurement of deviation from the return of an asset. There are several risk measures including variance value, standard deviation, coefficient of variation. Risk assessment using variance and standard deviation values is an absolute measure and does not consider risk in relation to expected returns. The results of the right decision in analyzing the risk of a business activity must use a comparison with the same unit. Coefficient Variation (CV) is a measure of risk that can compare with the same unit by considering the risk faced for each return obtained in the form of income, production or price. Variance and Standard Deviation values are less appropriate for making decisions in assessing the risks faced in business activities. (Kadarsan, 2015)

The analysis of the company's risk management can be done in several stages, the first stage is to identify the risks faced by the company and the source of the risk. The next analysis analyzes the level of risk based on the Coefficient Variance (CV). This analysis was carried out using descriptive analysis methods through observation, interviews and discussions with farmers.

Method of Collecting Data

Research on the risk analysis of lemon farming was conducted on farmers in Cihaurbeuti District, Ciamis Regency. The research design used in this study is qualitative research, which means that researchers want to describe the research study in terms of the role of agricultural institutions and try to understand the phenomenon of the object of research as it is (Idrus, 2007). The research technique used is the case study research technique. One type of descriptive qualitative research is research with a case study approach, which is a detailed study of a particular object over a period of time. (Sugiyono, 2014).

The research uses primary and secondary data sources, both quantitative data and qualitative data. Primary data were obtained from direct observation, recording, and interviews using an interview guide with the source of information coming from one lemon farmer with the consideration that the farmer is the only lemon farmer in Cihaurbeuti District, Ciamis Regency regarding the source of risk that occurs in lemon farming, and risk management strategies that have been done. Furthermore, secondary data is obtained from literature studies and supporting literature sources, namely the Central Bureau of Statistics, Open Data Jabar, and Agricultural Service Data and supporting literature sources.

Data Analysis Method

The data analysis methods to answer the problems in this study are as follows.

1. Descriptive Analysis

Descriptive analysis is an analysis conducted to determine the value of independent variables, either one or more variables without making comparisons, or connecting with other variables (Sugiyono, 2012). Descriptive analysis in this study was used to analyze the sources of farming risks faced by lemon farmers, as well as strategies undertaken by farmers in overcoming these risks. This method is done by observation, interviews, and discussions with farmers.

2. Quantitative Analysis

Farm Risk Analysis

The magnitude of the risk level of lemon farming in the research location was analyzed using farm risk analysis. Farm risk is calculated using data on

production, costs, and income of lemon in one planting season lemon farmers in the study area. Furthermore, the analysis is carried out with the following steps:

a. Average value (Mean)

Determining the average value of production, costs, and income of lemon in one growing season based on data from lemon farmers in the research location using the following formula (Kadarsan, 2015):

$$\bar{x} = \frac{\sum_{i=1}^{n} Xi}{n}$$

Description:

$\bar{x}$ = Average production yield (kg/ha), average cost (Rp/kg), average income (Rp/kg)

Xi = Production yield (kg/ha), cost (Rp/kg), income (Rp/kg)

n = Number of farmers

b. Variance

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

Description:

S^2 = Variance

Xi = Production yield (kg/ha), cost (Rp/kg), revenue (Rp/kg)

$\bar{x}$ = Average production yield (kg/ha), average cost (Rp/kg), average revenue (Rp/kg)

n = Number of farmers

c. Standard Deviation

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

Description:

S = Standard Deviation

S^2 = Variance

d. Coefficient Variation

Determine the percentage of risk to the average production obtained and the lower limit of production.

$$CV = \frac{S}{\overline{X}}$$

Description:

CV= Coefficient Variation

S = Standard Deviation

$\bar{x}$ = Average production yield (kg/ha), average cost (Rp/kg), average revenue (Rp/kg)

e. Production Lower Limit

$$L = \overline{X} - 2S$$

Description:

L = Production Lower Limit

S = Standard Deviation

$\bar{x}$ = Average production yield (kg/ha), average cost (Rp/kg), average revenue (Rp/kg)

Based on the above formula, a relationship can be obtained between the value of the lower production limit (L) and the value of the coefficient of variation. If the CV value ≤ 0.5 then the value of L ≥ 0, as well as when CV> 0.5 then the value of L < 0. This shows:

a) If CV ≤ 0.5 then farmers avoid the risk in carrying out lemon farming.

b) If CV > 0.5 then there is a risk opportunity for farmers in carrying out lemon farming (Kadarsan, 2015).

RESULTS AND DISCUSSION

Overview of the Research Location

Based on (BPS, 2022), Cihaurbeuti District is one of the sub-districts located in Ciamis Regency, West Java Province, Indonesia. Cihaurbeuti sub-district has an area of approximately 68.54 km² and is located at coordinates 7°13′11″S 108°13′39″E. Topographically, this area has varying land conditions, ranging from lowlands to undulating. The sub-district is surrounded by several boundaries, which include Majalengka and Kuningan Regencies to the north, Tasikmalaya Regency to the west, and Cilacap Regency to the east. In 2022, the population of Kecamatan Cihaurbeuti reached approximately 52,339 people, with a population density of approximately 764 people per km². The sub-district consists of 11 villages, which are the smallest administrative units in the region. The sub-district has diverse economic potential, although the education

level of the community still varies. Many residents have primary education, with some continuing to higher levels. Challenges remain in terms of access to education and community awareness of its importance.

Data Analysis

Characteristics of Respondents

Respondents in this study were one lemon farmer with the consideration that the farmer is the only lemon farmer in Cihaurbeuti District, Ciamis Regency. The respondent is a man with an age of 58 years. Age is one of the factors that affect the productivity of farmers in farming, and has an influence on the receipt of information and the adoption of innovations that can affect the performance of farmers. Furthermore, the respondent's education level is at the Senior High School level, according to (Lawalta, 2017), education can affect a person in accepting and learning new innovations, there is a tendency that the higher the education will be easier in the process of accepting new things that can improve living standards. The respondent's farming experience as a lemon farmer has been done for 3 years, the experience of farmers will affect the information and knowledge related to lemon farming. Other characteristics are on land area, (Syamsiah et al, 2017) suggests that land area is a factor that affects the level of income earned by farmers, on lemon respondents, the area of land cultivated is 0.6 hectares and land ownership status is self-owned.

Identification of Farm Risk Sources

According to (Syamsiah et al, 2019), the risks that have the highest risk priority value and risk value are pest and plant disease attacks, erratic weather, low farmer productivity, high agroinput prices, excessive use of pesticides, unskilled labor, lack of farmer commitment, limited farmer knowledge, quality and quantity of supply not in accordance with market demand, fluctuating prices, dry water reservoirs, stakeholders who do not work together, production uncertainty, administrative areas that involve several regions, non-uniform maturity levels, and off season capital requirements.

Based on the results of research and interviews with farmers, several things can be identified as sources of farming risk in Cihaurbeuti District. Sources of risk in lemon farming in Cihaurbeuti District are as follows:

1. Weather and Climate

Proper lemon cultivation can be done during the rainy season to ensure optimal soil moisture. In particular, lemon cultivation can be done during the rainy season which can help ensure that the soil remains moist, thus facilitating better growth of lemon plants (Sinaga, 2022).

The difficulty of predicting weather and climate means that farmers are faced with uncertain production outcomes. Extreme weather such as heavy rain or drought can cause damage to crops, reduce yields, or even result in crop failure (Sinaga, 2022). Based on information in the field, lemon production is higher in the rainy season than in the dry season. Water availability is very influential on plant survival, including lemon. Land conditions that still rely on rainfall (rainfed) are also one of the causes of fluctuations in lemon production in Cihaurbeuti District, Ciamis Regency. In line with research (Situmeang, 2011) states that natural conditions including uncertainty in weather and climate are part of the risks faced by farmers. Weather and climate uncertainty will affect the quality and quantity of products produced by farmers (Syamsiah, 2019). The way farmers reduce the impact of weather and climate risks is by creating a water source close to the land, so that it is expected to meet the water needs of plants.

2. Pests and Diseases

Citrus commodities are susceptible to pests and diseases. Pests and diseases in citrus plants are one of the obstacles faced by many farmers. Pest and disease attacks will affect the decline in production levels and can even experience citrus crop failure (Wijaya, 2017; Damayanti, 2021). Based on information obtained, there are several pests and diseases that often attack lemon in Cihaurbeuti District, Ciamis Regency, namely fruit flies, sooty dew disease, and scabies disease. These pests and diseases affect the quality and quantity of lemon produced. The attack of fruit fly mothers is one of the pests that is classified as detrimental, because it causes rot in lemon fruit.

Figure 1. Lemon Citrus Affected by Pests and Diseases

Furthermore, the disease that is often faced by lemon farmers in Cihaurbeuti District, Ciamis Regency is sooty dew, this sooty dew disease can attack the leaves to the fruit on lemon plants. Plants that are attacked by sooty dew have the characteristics of leaves, twigs, and fruit coated by a black layer. This can cause the resulting fruit to be smaller in size and delay the fruit ripening process (Endarto, 2014). Next is scabies, which is characterized by the

appearance of irregular cone-shaped pustules that resemble dense warts. Scurvy does not affect the quantity or flavor of the fruit, but it does reduce the quality and commercial value of the fruit and also affects the marketing of citrus fruits (Elfina, 2012). This disease is found in many lemons produced by farmers in Cihaurbeuti District, Ciamis Regency, which causes a decrease in value and even no sales are made on products affected by this disease. The strategies used by lemon farmers to reduce the impact of pests and diseases, one of which is to make fruit fly traps made from used gallon bottles filled with water, further handling is done physically or directly on the part of the plant that is attacked by pests and diseases, and the use of pesticides.

3. Means of Production

Production facilities include seeds, fertilizers, and pesticides. In the area around Cihaurbeuti Subdistrict, there are several agricultural shops, but not all production facilities needed by farmers can be obtained from the nearest shop. Lemon farmers sometimes make purchases to Tasikmalaya City or buy production facilities online, so farmers need to spend a lot of money because they have to buy to the city with a considerable distance or expensive shipping costs, as well as shipping time that takes a long time. In line with (Suharyanto, 2015) which states that the increasing use of pesticides without regard to the threshold will have a negative impact, because in addition to increasing production costs will also threaten the existence of natural enemies and even increase pest and disease resistance.

4. Price Fluctuation

Based on data (BPS, 2023) states that the condition of lemon prices in Indonesia can fluctuate which can be influenced by several factors, namely consisting of market demand, stock availability, production costs, and economic conditions. Price fluctuations are basically the result of an imbalance between the amount of demand and supply that occurs in the market, namely price conditions will increase if the amount of demand exceeds supply and vice versa the price will decrease if the amount of supply exceeds demand. Price fluctuations are often more detrimental to farmers than traders because in general farmers cannot organize their sales time to get a favorable selling price. The price of lemons in Cihaurbeuti District is fluctuating, which is influenced by the availability of lemons and demand. The amount of lemon production is erratic due to pests and diseases, causing low availability but constant demand, resulting in price changes.

Farm Risk Level Analysis

Lemon farming risk in Cihaurbeuti District, Ciamis Regency consists of production risk, price risk, and income risk. The method used to assess these three types of risk is the coefficient of variation analysis. There is a relationship between the value of the lower limit of farming (L) and the value of the coefficient of variation. If the CV value ≤ 0.5 then the value of L ≥ 0, as well as when CV > 0.5 then the value of L < 0. The coefficient of variation (CV) value of less than 0.5 indicates no risk opportunities, whereas if the coefficient value (CV) is more than 0.5 then there is a risk opportunity in big red chili farming. The coefficient of variation (CV) is the value generated from production, cost, and income data only in one growing season, so it cannot be compared and can only be known whether there is a risk opportunity or not.

a. Production Risk

The following are the results of the calculation of production risk analyzed using the coefficient of variation (CV) using lemon production data in one year in Table 1.

Based on Table 1, it shows that the risk of lemon production in Cihaurbeuti District, Ciamis Regency has a coefficient of variation (CV) value of less than 0.5, namely 0.48, while the lower limit of production (L) is more than 0, namely 210.52. This shows that in running a lemon farm, farmers avoid production risk. However, the coefficient of variation (CV) obtained is close to 0.5, indicating that lemon farms run by farmers are likely to experience production risks but are still profitable. The majority of production risks are caused by weather, pest and disease attacks, thus affecting the quality and quantity of lemons produced by farmers. The results of this study are in line with (Baroroh, 2021), the level of risk obtained in pamelo orange farming obtained CV value <0.5 and L>0 value, meaning that pamelo orange farming in Bageng Village is still profitable.

Table 1. Lemon Citrus Production Risks

Description	Production Risk
Average Production (kg)	1.232,50
Standard Deviation	592,09
Coefficient Variation	0,48
Production Lower Limit	210,52

b. Cost Risk

The following are the results of the calculation of production risk analyzed using the coefficient of variation (CV) using lemon production data in one year in Table 2.

Table 2. Lemon Citrus Cost Risks

Description	Cost Risk
Average Production (kg)	4.128.734,72
Standard Deviation	13.693.463,93
Coefficient Variation	3,32
Production Lower Limit	-23.258.193,14

Based on Table 2, it shows that the cost risk on lemon farming in Cihaurbeuti District, Ciamis Regency has a coefficient of variation (CV) value of more than 0.5, namely 3.32, while the lower limit of production (L) is less than 0, namely -23,258,193.14. This shows that lemon farming in Cihaurbeuti District, Ciamis Regency has the opportunity to experience risk. The cause of the cost risk is due to the large costs incurred by farmers in terms of the use of seeds, fertilizers, and labor. Farmers use 3-month-old seeds obtained from other farmers, causing the high cost of seeds incurred by farmers. In addition, the use of a lot of manure with the level of fertilizer prices that tend to increase, causing the costs incurred by farmers is quite large. This is supported by research (Kurniari, 2014) which states that the amount of use of production facilities will certainly be related to the amount of sacrifice in obtaining these means of production. The greater the use of production facilities, the higher the sacrifice costs that must be incurred by farmers. The cost of production that is taken into account is the cost derived from the sum of fixed costs and variable costs.

c. Revenue Risk

The following are the results of the calculation of production risk analyzed using the coefficient of variation (CV) using lemon production data in one year in Table 3.

Income is the value obtained by lemon farmers from the receipt of sales of production after deducting the costs incurred in conducting farming. The income in question here is net income or profit.

Based on Table 3, it can be seen that the risk of lemon farming income in Cihaurbeuti District, Ciamis Regency has a coefficient of variation (CV) of more than 0.5, namely 3.28, while the lower limit of income (L) is less than 0, namely -17,300,467.28. This indicates that there is an opportunity for income risk in

running a lemon farm. Income risk can be influenced by lemon production, costs incurred, and lemon price fluctuations. In making sales, lemon farmers sell to retail traders in the surrounding market and consumers around the region, with low prices.

Table 3. Lemon Citrus Revenue Risks

Description	Revenue Risk
Average Production (kg)	3.107.931,94
Standard Deviation	10.204.199,61
Coefficient Variation	3,28
Production Lower Limit	-17.300.467,28

Based on the results of research on the level of risk carried out in Cihaurbeuti District, Ciamis Regency shows that the biggest farm risk borne by lemon farmers in Cihaurbeuti District, Ciamis Regency is at risk of cost with a coefficient of variation (CV) of 3.32. Cost risk is one possibility that can cause losses experienced by lemon farmers. There are various sources of cost risk, namely unexpected variable costs, non-optimal fixed costs, dependence on expensive inputs, and lack of access to capital (Misqi dan Karyani, 2020). Unexpected variable costs can arise as a result of inputs or production factors such as fertilizers, seeds, and pesticides used experiencing price fluctuations. If there is an increase in the price of the inputs used, the production costs of farmers will also increase, so that it can affect the level of profit, namely experiencing a decrease in the level of profit or even experiencing a loss.

Furthermore, non-optimal fixed costs such as crop depreciation and a decrease in the quality of the facilities used can increase depreciation costs which will also affect profits. Next is dependence on expensive inputs, farmers who depend on such inputs may face the risk of high costs. If the price of such inputs increases, then production costs will increase significantly. Another source is lack of access to capital, farmers who do not have access to sufficient capital to purchase the necessary inputs may face the risk of high costs. Farmers are likely to take out loans with high interest rates or use unreasonable credit, which can increase production costs.

Farmers' Strategies in Facing Farm Risk

Changes in natural conditions are a risk that cannot be predicted, but can be managed by adjusting cropping patterns. The risks faced by lemon farmers consist of production risks, cost risks, and income risks. Production risks faced by lemon farmers are pests and diseases that affect the quantity and quality of

products produced. The strategy carried out by farmers in handling production risks in pest attacks is to use traditional traps to catch fruit flies which are one of the pests that cause lemon damage in Cihaurbeuti District, Ciamis Regency. Another pest is aphids, on this pest, lemon farmers do direct handling by cutting the lemon fruit affected by the pest. Basically, to prevent the risk of pest attacks, there are several management activities or strategies, such as cultivation, mechanical, biological, and chemical. Choosing the use of disease-free seeds, adjusting the planting time, hoeing and weeding, using stage varieties, and selecting well-adapted plants are part of the cultivation risk strategy (Ashraf, 2014).

Furthermore, the strategy of mechanical control directly removes or kills pests, or physically prevents insect pests from reaching their hosts by using barriers or traps (Ashraf, 2014), namely by pruning and removing diseased plants, pest traps, removing pests by hand, and mulching. In terms of biological control, it is the use of predators, parasitoids, and pathogens (Ashraf, 2014). Many people think that chemicals have no place in plant pest control, but pesticides can be incorporated into plant pest control programs if used responsibly. However, the extensive use of chemicals has led to the spread of resistant phytophytogen strains, accommodating the effectiveness of treatments (Palou, 2008). Chemical pesticides can act as a last resort support for plant pest control programs.

The next strategy is the strategy in overcoming cost risk, lemon farmers in Cihaurbeuri District, Ciamis Regency, namely by conducting a contingency budget, which is setting aside a budget to cover unexpected costs with reserve funds. Furthermore, at the risk of income, lemon farmers have not implemented a special strategy, because lemon farmers menturkan income earned can still be used to meet household needs and the needs of lemon cultivation.

CONCLUSIONS AND POLICY IMPLICATIONS

Conclusions

Based on the results and discussion, there are the following conclusions:

1. Sources of risk for lemon farmers in Cihaurbeuti District, Ciamis Regency are weather and climate, pests and diseases, production facilities, and price fluctuations.
2. There are risk of lemon farming, namely at the risk of cost, income risk, and production risk. Cost risk is the biggest risk faced by lemon farmers in Cihaurbeut District, Ciamis Regency, which is caused by the use of production facilities to overcome pests and diseases that attack plants.

3. Strategies carried out by farmers in dealing with production risks are mechanical and chemical, while the strategy of handling cost risks by using contingency budgets (reserve funds) and income risk strategies have not been carried out.

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