Risk Management of Red Chili Farming in Wuluhan District Jember Regency

Eliyatiningsih[1], Rindha Rentina Darah Pertami[2], Abdurrahman Salim[3]

{eliyatiningsih@polije.ac.id[1], rindha_rentina@polije.ac.id[2], abdurrahman.salim@polije.ac.id[3]}

Agriculture Production Department Politeknik Negeri Jember, Jember, Indonesia[1,2,3]

Abstract. Red chili farming in Jember Regency has faced various kinds of risks that can harm farmers. This research aimed to assess the profit of red chilli farming, the amount of risk faced by farmers, the sources of risk on red chilli farming, farmers' efforts in handling risk impact on red chilli farming. The research was conducted in Ampel and Lojejer village, Wuluhan District, Jember Regency. The results showed that red chili farming in Wuluhan District was feasible with an R/C ratio of 1.59. Based on the risk analysis of farming, it is known that the risk of production, cost, and income in red chili farming is in the moderate category. The sources of risk toward red chilli farming were weather and climate, pest and disease attack, and price. The farmers made some efforts in addressing risk impact by using resistant varieties, using cultivation technology as recommended, and diversifying farming.

Keywords: farming, red chilli, risk management

1 Introduction

Red chili is a very important horticultural commodity in Indonesia. The demand for red chili continues to increase throughout the year along with the increasing trend of people consuming spicy dishes. The increase in consumption was recorded from 2002 to 2019, from 2.77 thousand tons in 2002 to 4.35 million tons in 2019, or an increase of 3.42% per year [1]. In terms of red chili production, there is also an upward trend. Badan Pusat Statistik recorded that the national chili production reached 2.77 million tons in 2020. This figure increased by 183.96 thousand tons or 7.11% compared to 2019. Throughout 2020, the highest chili production occurred in August, reaching 280.78 thousand tons with a harvested area of 73.77 thousand hectares. East Java Province is the largest chili producer in Indonesia with the production of 784.05 thousand tons or 28.28% of the national chili production [2].

Risk and uncertainty are distinctive features of agricultural cultivation, which significantly affect the production and income. Risk management is an important way for farmers to reduce risk and uncertainty [3]. Red chili farming cannot be separated from risks and farmers are faced with various risks, both production risk, price risk, technology risk, financial risk,

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institutional risk, and others [4][5]. The magnitude of the risk of farming can occur because agriculture is strongly influenced by nature, weather, pests and diseases, temperature, drought, flooding, and all kinds of other disasters. This kind of risk cannot be avoided by farmers, but smart farmers will find ways to minimize the risks that will occur so that losses are not too large [6]. There are several ways that can be applied by farmers to manage farm risk, including: (1) ex-ante risk management, which is managing risk before the farming activity is carried out, (2) interactive risk management, which is a strategy carried out by farmers when a shock occurs, which involves reallocating resources. so that the impact of risk on production can be minimized, and (3) ex-post risk management is a strategy that can be carried out by farmers after a shock occurs, which is directed to minimize subsequent impacts.

Ampel and Lojejer villages in Wuluhan District, Jember Regency are red chili production areas. Farmers in this area cultivate red chili in the second growing season throughout the year routinely. Red chili farming activities are classified as high risk because they have several obstacles, including the presence of pests and plant diseases that attack, inadequate technology, and difficult access to marketing [7][8]. Whitefly attacks on chili plants can reduce crop yields up to 20– 80%. In addition, anthracnose disease that causes fruit rot in chili can occur in both the rainy and dry seasons, and if not properly controlled it can cause losses of up to 50%. This high intensity pest attack causes red chili farming to have a big risk [9]. In terms of marketing, red chili also has a high risk. Inefficient marketing due to long marketing chain and large price margin. Inefficient marketing often harms some market players, such as producers who get prices below the market price [10]. This study aimed to examine the income of red chili farming, the magnitude of the risk received by farmers in red chili farming, and farmers' efforts in dealing with the impact of risks on red chili farming. Through this research, it is hoped that farmers can find out how the risks of red chili farming they face are expected to improve their ability to manage the risks they face, so that it is expected to increase farm productivity.

2 Research methods

This research was conducted in Ampel Village and Lojejer Village, Wuluhan District, Jember Regency. This location was chosen as the research area because the two villages are the centers of red chili farming in Wuluhan District. Determination of the sample was done by random sampling on farmers who cultivated red chili farming in the planting period of April-September 2021, with the number of samples taken as many as 50 respondents. The data collection method was conducted by interviewing the sample farmers with a structured questionnaire guide.

The analysis carried out in this study included a feasibility analysis of farming and farming risk analysis. Farming feasibility analysis included the calculation of farm income or profit, R/C ratio, and B/C ratio. Farming income was the difference between revenue and the total costs incurred during farming activities. The income of a farm can be calculated by the following formula:

$$NR = TR - TC \quad (1)$$

That:
NR = Net Revenue/Iincome
TR = Total Revenue
TC = Total Cost

Farming risk analysis carried out includes included production, cost, and income risk which is was carried out quantitatively using the coefficient of variation with the following formula:

$$CV = \sigma/Xr \quad (2)$$

That:
CV = Coefficient of variation
Σ = Standard deviation
Xr = Average value

The criteria used are:

a. $CV \leq 0.5$, farming has a low risk
b. $0.5 < CV \leq 1$, farming has a moderate risk
c. $CV > 1$, farming has a high risk.

Farmers' attitudes towards risk are grouped into three which can be seen from the value of the coefficient of variation, which is as follows.:

CV > 1 Risk lover (likes risk),
CV = 1 Risk neutral (neutral to risk),
CV < 1 Risk averter (avoiding risk or averse to risk)

3 Result and Discussions

The results showed that red chili farmers in the cultivation center area were in the age range of 30-74 years with a proportion of more than 50% of farmers being over 50 years of age. The age of the farmers in the study area is classified as productive age , so that they are quite potential to carry out their farming activities. Age affects to physical ability of farmers in carrying out farming activities [11], productive age can support good farming management, so that it can help achieve optimal production [12]. The level of education that most respondents achieved was elementary school level as many as 23 farmers. The average respondents's farming experience is was about 15 years. The longer the farmer works in a farming activity, the more experience he gains, so that the farmer will better master cultivation techniques and mastery of technology related to his farming [13]. The large number of family members can affect the availability of laborlabour in the family for red chili farming activities. The number of household members of respondent farmers ranged from 1-6 people with an average of 4 people per household.

3.1 Production cost, revenue, and income of red chili farming

Production costs are costs incurred by red chili farmers in the red chili production center area in Wuluhan District in one planting season or one production process. Production costs include fixed costs and variable costs. Fixed costs include land rent, depreciation of agricultural equipment and land taxes and fees. Meanwhile, variable costs include the cost of purchasing seeds, fertilizers, pesticides, and labor. Analysis of farm income or profits was carried out to determine the feasibility of red chili farming cultivated by farmers, which was measured using the R/C ratio value. The calculation of farming analysis includes all costs used by farmers in one planting period, both cash and non-cash, as well as the income obtained by farmers in farming activities. The cost structure and profit analysis of red chili farming in the April-September 2021 planting season per 3.300 m2 area can be seen in Table 1.

Based on the Table 1, it can be said that red chili farming in Wuluhan District in the April-September 2021 planting period is feasible. It can be seen from the R/C ratio value of 1.59 or greater than 1. The income of red chili farmers in each planting season is strongly influenced by the yield harvest and product prices in the market [8]. In the planting period last year, the price of red chili at the farmer level was around IDR 10.000-30.000 per kg, while the average yield of red chili farmers reaches 6.6 tons/ha.

Table 1. Analysis of red chili farming per area of 3.300 m^2

Variable	Amount (IDR)
Fixed Cost	6.924.909
Variable Cost	12.515.940
Total Cost	19.440.849
Total Revenue	30.961.250
Income	11.520.401
R/C Ratio	1,59
B/C Ratio	0,59

3.2 Risks faced by red chili farmers in Wuluhan District

Risk is something faced by farmers in their farming and can cause possible losses in a farming [14]. There are several kinds of risks that are generally owned by farming so that it can reduce the level of farmers' income, namely production risk, cost risk, and income risk [15]. The sources that cause farming risk come from external and internal factors. External factors are shown through changes in weather/climate, pest and disease attacks, and prices, while internal factors are shown through the availability of capital, land tenure and managerial ability [16]. Based on the CV value, it can be concluded that the production, cost and revenue risks are included in the moderate risk category because the CV value is between 0.5 and 1 (Table 2). However, the CV value at production risk is lower than the CV value at cost and income risk. Based on the value of the coefficient of variation, it can also be stated that the value of the coefficient of variation is less than one, which means that farmers in the research area are included in the risk averter category or are risk averse.

Other studies [17] have shown that rice farmers in Java have a high production risk. Where the high production risk is caused by natural disasters, floods and pests that attack rice farming, resulting in crop failure. Rice farmers also face a fairly high cost risk, where the cost risk

faced by farmers is caused by the increase in urea fertilizer prices and pesticide prices. Production risk factors that affect rice farming are seeds and labor. Most rice farmers are included in risk averse farmers.

Table 2. Amount of production, cost, and income risk in red chili farming in wuluhan district

Risk	CV	Risk Category
Production	0,59	Moderate
Cost	0,64	Moderate
Income	0,82	Moderate

3.2.1 Production risk

Production risk is strongly influenced by internal factors of farmers in carrying out cultivation activities. Production risk is in the moderate category indicating that each sample farmer has a productivity per hectare that is not too different. This condition implicitly indicates that the sample farmers have almost the same mastery of red chili cultivation technology. The risk that often interferes with red chili plants usually comes from production. Red chili production is strongly influenced by natural conditions and Plant Pest Organisms (OPT), namely pests and plant diseases. There are several types of pests that often interfere with red chili plants, namely: whitefly, trips, and fruit flies, while the most common plant diseases are fusarium wilt, bacterial wilt, and anthracnose. If the plant is attacked by pests, it will cause production failure. That is why farmers use simultaneous planting methods throughout the village so that pests from one farmer's field do not interfere with other red chili plants if they are planted irregularly. Production risk is also caused by erratic weather/climate which can hinder/disturb the production process. A study stated production risk occurs from the uncertainty of the natural growth of red chili plants which can affect the quality and quantity of production. This risk can occur due to natural and weather uncertainties as well as several other factors. From the result, there are eight sources of risk from production risk factors faced by red chili farmers in Aceh Besar District. From the eight risks, the risk of fruit rot disease is the risk with the highest RPN value [18].

3.2.2 Cost risk

The cost risk in red chili farming is in the medium category. Cost risk is strongly influenced by external factors that cannot be controlled by farmers, such as input prices or production facilities. If the prices for seeds, fertilizers, and pesticides are expensive, it will greatly affect the higher production costs. Farmers will be able to minimize costs if farmers can allocate production factors in farming efficiently [19]. Other research [20] states that price risk is strongly influenced by the expected selling price of the commodity different from the price that occurred at the time harvest. Price differences may occur due to differences in yield quality stock of goods on the market.

3.2.3 Income risk

The income risk in red chili farming is in the medium category. Income risk is strongly influenced by the price of red chili received by farmers. So far, farmers are in the position of not being able to determine prices or price takers so that the risk of income tends to be high. The level of risk in farming activities becomes a reference in determining the amount of profit generated [21]. The higher the risk that farmers will face, the higher the expected yield or profit [22]. In general, farming activities with high risk are believed to provide large profits, meaning that profits are in line with the level of risk or profit and risk has a positive relationship. This is supported by the results of research by [23] on income and income risk of irrigated and non-irrigated rice farming, where the risk of income for non-irrigated rice fields is greater than for irrigated rice fields, which is indicated by the coefficient of variation (CV). which is high, namely for irrigation areas of 0.83 with an income of Rp. 4,356,216.00 and non-irrigated areas of coefficient of variation (CV) of 0.89 with income received of Rp. 4,312,562.00. This shows that the higher the risk faced by the farmer, the lower the profit obtained.

3.3 Strategies to handle the risks of red chili farming

Many efforts can be made by farmers to minimize risks and reduce the impact on their business continuity. The risk of declining production quality can be overcome by applying appropriate cultivation and post-harvest technology. Meanwhile, market risk can be handled in several ways, namely diversification, vertical integration, forward contracting, future markets, hedging and partnerships [21]. The risk management strategies carried out by farmers can be grouped into 3, namely [24]: (1) ex-ante strategy which is a strategy carried out by farmers before the risk occurs, this business is designed to prepare the farm so that it is not in a position that is too vulnerable when the risk occurs, (2) interactive strategy is a strategy that is carried out by farmers when a shock occurs, which involves relocating resources so that the risk impact on production can be minimized, and (3) an ex-post strategy is a strategy that can be carried out by farmers after a shock occurs, which is directed at minimizing the next impact.

Other strategies to reduce ex-ante risk are some farmers use the same varieties and are varieties that are resistant to fusarium wilt and bacterial wilt. To avoid using uncertified seeds, most of the farmers choose to buy seeds from farm shops and only a few use their own seeds. The interactive strategy carried out by farmers to reduce risk is more emphasized on the use of farming technology in accordance with the recommendations, including using the recommended planting distance, immediately replanting, the use of chemical fertilizer and organic fertilizers in a balanced way. The management of ex post farming strategies is carried out, among others, by diversifying farming. The farmers do not cultivate red chili as the only one commodity. In addition to planting red chili, farmers also plant other commodities such as tobacco, sweet corn, and cabbage. Doing farming with various commodities or planted in polyculture will minimize the risk of production. The research [16] stated that polyculture of clove and cabbage cultivation provides a low level of production risk compared to clove or cabbage monoculture.

4 Conclusion

Red chili farming in the central area in Jember Regency is feasible because it has an R/C ratio of 1.59. Based on the analysis of the Coefficient Variation (CV) on production, costs and income, red chili farming is categorized as a moderate-risk farm with farmer behavior that tends to avoid risk or risk averter. The sources of risk toward red chilli farming were weather and climate, pest and disease attack, and price. The farmers made some efforts in addressing risk impact by using resistant varieties, using cultivation technology as recommended, and diversifying farming.

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