RISKS OF TOMATO FARMING DURING THE RAINY SEASON IN AIMOLI VILLAGE, WEST ALOR DISTRICT
(Risiko Budidaya Tomat Pada Musim Hujan Di Desa Aimoli, Kabupaten Alor Barat)

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ABSTRACT
The objectives of this study were to determine 1) the risks of tomato farming during the rainy season in Aimoli Village, Alor Barat Laut District, 2) the comparison of tomato production during the rainy season in Aimoli Village, Alor Barat Laut District, and 3) the comparison of tomato income during the rainy season in Aimoli Village, Alor Barat Laut District. The research was conducted in September 2024 with a sample size of 58 tomato farmers. The results showed that: 1) The risks faced by tomato farmers in Aimoli Village were income risk, revenue risk, and production risk. The amount of income and revenue earned by tomato farmers in the dry season and rainy season differs due to differences in selling prices and production volumes. 2) In the dry season, tomato production in Aimoli Village reached 107 kg, while tomato production in the rainy season reached 45 kg. 3) The difference in tomato production between the dry season and rainy season causes a difference in the income levels of tomato farmers in Aimoli Village.

Keywords: income, production, risk, farming

ABSTRAK
Tujuan dari penelitian ini adalah untuk mengetahui 1) risiko usahatani tomat pada musim hujan di Desa Aimoli, Kabupaten Alor Barat Laut, 2) perbandingan produksi tomat pada musim hujan di Desa Aimoli, Kabupaten Alor Barat Laut, dan 3) perbandingan pendapatan tomat pada musim hujan di Desa Aimoli, Kabupaten Alor Barat Laut. Penelitian ini dilakukan pada bulan September 2024 dengan jumlah sampel sebanyak 58 petani tomat. Hasil penelitian menunjukkan bahwa: 1) Risiko yang dihadapi oleh petani tomat di Desa Aimoli adalah risiko pendapatan, risiko penerimaan, dan risiko produksi. Besarnya pendapatan dan penerimaan yang diperoleh petani tomat pada musim kemarau dan musim hujan berbeda dikarenakan adanya perbedaan harga jual dan volume produksi. 2) Pada musim kemarau, produksi tomat di Desa Aimoli mencapai 107 kg, sedangkan produksi tomat pada musim hujan mencapai 45 kg. 3) Perbedaan produksi tomat antara musim kemarau dan musim hujan menyebabkan adanya perbedaan tingkat pendapatan petani tomat di Desa Aimoli.

Kata kunci: pendapatan, produksi, risiko, usahatani

INTRODUCTION

The horticulture sub-sector is part of the agricultural sector that has the potential to be developed into a leading commodity. Vegetables, fruits, biopharmaceuticals, and ornamental plants provide benefits to human life, making them a focus of development (Pitaloka, 2020). This development process is carried out by the government with the aim of creating jobs in natural resource management, which will have an impact on regional economic growth (Martauli and Gracia, 2021).

Vegetables are horticultural commodities that are an important food source consumed daily by most Indonesians. Vegetables are horticultural commodities that have a fairly high commercial value because

these horticultural products are consumed at all times. This is also because, in general, vegetable cultivation is relatively easy and simple. One such vegetable is the tomato plant.

The tomato plant (*Lycopersicum esculentum Mill.*) is a horticultural plant whose fruit can be used as a raw material for medicines, cosmetics, and food processing such as sauces, fruit juices, etc. Wiryanta (2002) explains that tomatoes contain vitamin C, vitamin A, protein, calcium, sodium, potassium, phosphorus, thiamine, riboflavin, niacin, and ascorbic acid. Therefore, tomatoes are a versatile vegetable with high economic value.

Tomato plants can grow well in lowlands and highlands, depending on the variety used. These plants are not resistant to rain or intense sunlight; they prefer a cool, and dry climate and grow well in soil with a pH of 5-6, requiring loose and fertile soil. High temperatures and excessive rainfall cause a decrease in tomato yield and quality (Hamidi, 2017). The optimal average daily temperature for tomato plant growth ranges from 18ºC to 25ºC during the day and 10ºC to 20ºC at night. If the night-time temperature is too high or above 20ºC, followed by high humidity, it can cause excessive vegetative growth and low fruit production quality. Tomato plants require approximately 8 hours of sunlight per day with rainfall of 750 mm - 1,250 mm per year (Zahara, 2011).

Based on Alor Barat Laut figures for 2022, tomato production in the Alor Barat Laut sub-district in 2020 was 417 kw/ha with a land area of 5 ha, but there was a 32.36% decline in production in 2021 to 12.5 kw/ha on 5 ha of land. This was due to extreme climatic conditions that the tomatoes were unable to adapt to. In addition, tomato cultivation technology still uses traditional farming systems.

Tomato farming in the Alor Barat Laut sub-district is carried out throughout the year with different seasons, which of course have different risks. The agroclimate in two different seasons also has an impact on tomato production. Risks occur during the production process and in relation to the selling price. According to Mahmudah et al. (2019), risks can be influenced by internal and external factors. Internal factors include capital, land, and managerial capabilities, while external factors include changes in weather/climate, pest attacks, production facilities, output prices, and others. In addition, tomato farming in different seasons also has an impact on the allocation of farming costs and farmer income, where tomato farming in the rainy season has a higher risk than tomato farming in the dry season (Syukur et al., 2015).

Based on this background, this study aims to determine: (1) the risks of tomato farming in the rainy season in Aimoli Village, North Alor District, (2) a comparison of tomato production in the rainy season in Aimoli Village, North Alor District, and (3) a comparison of tomato income in the rainy season in Aimoli Village, North Alor District. It is hoped that the results of this study can provide input for tomato farmers, relevant agencies in making agricultural sector policies, especially those related to tomato development, and as information for other authors for further research.

RESEARCH METHODOLOGY

Time and place of research
This research was conducted in September 2024 in Aimoli Village, North Alor District.
Determination of Respondents
The total population of tomato farmers in Aimoli Village, Alor Barat Laut District, is 58 farmers, so the sample used is a saturated sample, i.e., the entire population is used as the sample.

Types of Data
Primary data is data obtained directly from respondents, namely tomato farmers who are the objects of the study, and secondary data is data obtained from literature studies, from other data sources related to the research material, such as the Alor Regency Central Statistics Agency (BPS) and the Alor Regency Plantation Service and other related tourism agencies.

Data Collection Techniques

The data collection techniques used in this study were interviews, note-taking, and observation.

Data Analysis Method

The data obtained was analysed in several stages, namely:

1. Tomato Farming Risk Analysis

   The data analysis used to determine the magnitude of the risk of tomato farming during the rainy season used the following formula:

$$S = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$$

   Where:

   S: Standard deviation

   x_i: Value of X1

   $\bar{x}$: Sample mean

   n: Sample size

2. Analysis of the comparison of tomato farming income during the rainy season and summer, as well as the comparison of tomato farming production during the rainy season and summer, used the t-test and t-table analysis methods with the formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(s_1{}^2 + s_2{}^2)}{n}}}$$

   Where:

   $\bar{x}_1$: mean of sample 1

   $\bar{x}_2$: mean of sample 2

   s_1: standard deviation of sample 1

   s_2: standard deviation of sample 2

   $s_1{}^2$: variance of sample 1

   $s_2{}^2$: variance of sample 2

   n : sample size

RESULTS AND DISCUSSION

Respondent Characteristics

1. Age

   Most respondents in Aimoli Village were aged between 15 and 59 years old, accounting for 81.43% of the total number of respondents (45 people). In contrast, only 18.57% (13 people) fell into the non-productive age category. These data indicate that most tomato farmers are still of productive age.

2. Gender

   Farmers in Aimoli Village are predominantly male, with a percentage of 88.57%, while women only make up 11.43%. This difference reflects the strong gender role division that still exists in the agricultural sector. Traditionally, men are often associated with heavy physical work, while women are more involved in domestic activities and processing agricultural products. These gender stereotypes influence the distribution of tasks and responsibilities within farming families. Although men dominate as farmers in

Aimoli Village, women play an important role in processing the harvest. However, their access to resources such as land and capital is often limited. This condition hinders women's full participation in improving agricultural productivity and family welfare.

3. Level of Education

The education level of tomato farmers in Aimoli Village at the primary school level was 27 people or 38.57%, and at the high school or equivalent level was 5 people or 24.29% of respondents. Based on this, it can be said that the respondents' education level is still very low, which will result in farmers' slow absorption of technological developments, causing difficulties and requiring a long time to adopt new innovations. On average, farmers only learn through self-study based on what their predecessors have done. Therefore, they need to be guided and retrained so that they are well-prepared and their agricultural yields can increase in line with the times.

4. Land Area

The results of the study show that the majority of respondents (64.29%) have large-scale tomato fields (< 1 hectare), while only a handful (35.71%) have fields < 0.5 hectares. The dominance of small-scale land indicates that most tomato farmers in Aimoli Village are marginal farmers. This condition has the potential to hamper increases in farmer productivity and income, as well as making it difficult for them to access modern agricultural technology. When compared to the average agricultural land area in Aimoli Village as a whole, it can be concluded that tomato farmers tend to have much smaller plots of land. This shows that tomato cultivation in the village is a side business or additional source of income for most farmers. This data shows that the majority of tomato farmers in Aimoli Village are farmers with very small-scale businesses. The characteristics of these small farmers are usually associated with limited access to resources such as capital, technology, and information. As a result, their productivity and income tend to be lower than those of farmers with larger-scale businesses. Special strategies are needed in the development of tomato cultivation. Agricultural development programmes need to be designed taking into account the needs and constraints faced by farmers, such as the provision of high-quality seeds, training in cultivation techniques, and access to markets.

5. Family Burden

Most respondents (96.83%) have 1-4 family members. This figure indicates the success of the family planning programme in the village. The traditional view that 'many children bring good fortune' seems to be abandoned by farmers, in line with the increasing awareness of the importance of small and quality families. A relatively small number of family members (1-4 people) can have a positive impact on the welfare of farming families. With a limited number of family members, the burden of daily expenses can be reduced. In addition, focusing on improving the quality of human resources can also be a priority. Although a small number of family members has several advantages, it should be remembered that family labour is also an important factor in agriculture. If the number of family members is too small, farmers may find it difficult to meet labour needs at peak times such as harvest time. Apart from the success of family planning programmes, other factors such as education levels, access to health services, and socio-economic conditions can also influence family size. Further research is needed to identify the most dominant factors.

RESULTS AND DISCUSSION

Risks of Tomato Farming During the Rainy Season in Aimoli Village, North Alor District

The results of the study show that the risks of tomato farming during the rainy and dry seasons in Aimoli Village, North Alor District include income risk, revenue risk, and production risk. In the dry season, the average income of tomato farmers in Aimoli Village was £74,700 with an average revenue of

£6,030. Meanwhile, in the rainy season, the average income of tomato farmers in Aimoli Village was £77,500 with an average revenue of £6,300. The difference in income and revenue is due to differences in tomato production and selling prices. Tomato production in the summer reached 107 kg with a selling price of £10.448/kg, while in the rainy season, tomato production only reached 45 kg, but the selling price reached £25,000/kg. Based on the research results, the income earned by tomato farmers in Aimoli Village during the summer season is not much different from the income during the rainy season. Although production during the rainy season is only 45 kg, the selling price reaches £25,000/kg, resulting in high revenue.

According to research by Sinaga et al. (2025), tomato farmers face various risks such as weather changes and falling selling prices. This is especially true for farmers who sell their crops to middlemen, as the selling price set by the middlemen can be lower than the market price, resulting in low incomes for tomato farmers. One strategy that farmers can implement to mitigate the risk of falling selling prices is to stop selling their harvest to middlemen and instead sell directly to the market. This strategy is one way to minimise the existing risks.

Tomato Production During the Rainy Season in Aimoli Village, North Alor District
A comparison of tomato farming production during the rainy season and the dry season can be calculated using the standard deviation as follows:
1. Rainy Season

$$S = \sqrt{\frac{\sum(x_i-\bar{x})^2}{n-1}}$$

$$s_1 = \sqrt{\frac{694.068.777,77}{58-1}} = 12.176.645,22$$

2. Dry Season

$$s_2 = \sqrt{\frac{586.568.084,15}{58-1}} = 10.290.668,14$$

From the standard deviation calculation, it is known that the standard deviation value for production in the rainy season is 12,176,645.22 and the standard deviation value for tomato production in the dry season is 10,290,668.14. Furthermore, using these standard deviation values, the t-value can be calculated as follows:

The t-test and t-table analysis method uses the formula:

$$t = \frac{\bar{x}_1-\bar{x}_2}{\sqrt{\frac{s_1{}^2}{n}+\frac{s_2{}^2}{n}}}$$

$$t = \frac{107-45}{\sqrt{\frac{121.766,22}{58}+\frac{10.290.668,14}{58}}} = 0.14$$

Based on the calculations, the t-value is 0.36. If the t-value is compared with the t-table value and the error rate of 1% (0.01), the t-value is greater than the t-table value (0.14 > 0.01). There is a significant difference in tomato production between the rainy season and the dry season. The results of this analysis show that tomato production in Aimoli Village has significant differences between the rainy season and the dry season. The average tomato production in the rainy season is 45 kg, which is lower than the average tomato production in the dry season, which is 107 kg.

Kusrini and Aryuni (2020) explained in their research that rainfall can have a negative impact on tomato plant productivity. Very high rainfall can inhibit the fall of pollen onto the pistils of tomato plants.

During the rainy season, humidity increases and stimulates the emergence of plant-disturbing microorganisms, so the risk of bacterial and fungal infection tends to be high. The presence of these pests can lead to a decline in tomato production.

Tomato Income During the Rainy Season in Aimoli Village, North Alor District

The comparison of tomato farming income during the rainy season and the dry season can be calculated using the standard deviation as follows:

1. Rainy Season

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

$$s_1 = \sqrt{\frac{39.561.920.332.,94}{57}}$$

$$s_1 = 694.068.777,77$$

2. Dry Season

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

$$s_2 = \sqrt{\frac{33.434.380.769,67}{57}}$$

$$s_2 = 586.658.084,15$$

From the standard deviation calculation, it is known that the standard deviation value for income during the rainy season is 694.068.777,77, and the standard deviation value for tomato income during the dry season is 586,568,084.15. Furthermore, using these standard deviation values, the t-value can be calculated as follows:

The t-test and t-table analysis method was used with the formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n} + \frac{s_2^2}{n}}}$$

$$t = \frac{921.897 - 903.776}{\sqrt{\frac{694.068.777,77}{58} + \frac{586.568.084,15}{58}}}$$

$$t = 3,8$$

Based on calculations, the t-value is 0.08. If the t-value is compared with the t-table value and the error rate of 1% (0.01), then the t-value is greater than the t-table value, i.e. (3,8 > 0.01). There is a significant or noticeable difference in tomato farming income between the rainy season and the dry season. Tomato farmers in Aimoli Village, District, experience a significant difference in income between the rainy season and the dry season.

The results of research by Levita et al. (2024) explain that Lembah Gumanti District often experiences a decline in tomato production due to weather conditions, pests and diseases, and often also a shortage of fertilisers and pesticides, making it difficult for farmers to cultivate their crops. Similarly, research by Safitri et al. (2021) explains that during the rainy season, tomato production declines because many seedlings fail to grow. This decline in production during the rainy season certainly has an impact on farmers' income levels.

CONCLUSION AND RECOMMENDATION

Conclusion

Based on the results of research conducted in Aimoli Village, West Alor District, it can be concluded that:

1. The risks faced by tomato farmers in Aimoli Village are income risk, revenue risk, and production risk. The amount of income and revenue earned by tomato farmers in the dry season and rainy season differs due to differences in selling prices and production volumes.
2. During the dry season, tomato production in Aimoli Village reached 107 kg, while tomato production during the rainy season reached 45 kg.
3. The difference in tomato production between the dry season and the rainy season causes a difference in the income levels of tomato farmers in Aimoli Village.

Recommendations

To reduce the production and income risks experienced by tomato farmers due to the rainy and summer seasons, farmers can diversify their farming activities. Farmers can plant commodities that are resistant to rain and use superior seeds that are resistant to extreme weather so that production is stable. In addition, farmers are advised to start planning the right time for planting.

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