

Feasibility Analysis Of Grafted And Ungrafted Pepper Farming In Mataiwoi Village, Mowila District, South Konawe Regency

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Abstract

This study aims to: (1) Determine the feasibility of grafted and ungrafted pepper farming in Mataiwoi Village, Mowila District, South Konawe Regency. (2) Determine the increase in the number of farmers and the area of land using the grafted system in Mataiwoi Village, Mowila District, South Konawe Regency. The number of samples in this study was 39 respondents. Data analysis used Net Present Value (NPV), Net Benefit Cost ratio (B/C ratio), Internal Rate of Return (IRR) and Payback Period. The results of the study showed that the grafted and ungrafted pepper farming in Mataiwoi Village at a discount factor (df) of 6.5% and 150% was financially feasible to be developed. The positive NPV at both discount levels confirms that pepper farming is not only feasible to run but also financially profitable to be developed further. The increase in the number of farmers and the area of land used for the grafted method increased very rapidly, this proves that the government has succeeded in providing counseling on the grafted method to farmers.

Keywords: Pepper, Feasibility Analysis

INTRODUCTION

Indonesia has the potential to spread business in the agricultural sector, especially agribusiness, in the midst of globalization. This business is expected to be able to make a greater contribution to the agricultural sector in order to increase the economy (Erimus et al., 2019). Southeast Sulawesi is one of the provinces in Indonesia that requires agricultural revitalization in an effort to develop simple agribusiness-based agricultural progress.

Pepper plant (*Piper Nigrum* L.) is a type of annual plant that is generally propagated vegetatively through cuttings. One of the advantages of vegetative propagation is that the

offspring are relatively uniform, resemble the parent, and grow quickly so that they can provide seeds more quickly than generative propagation (Rukmana, 2010).

According to Daras (2015), pepper commodities are important because they have various uses. Pepper can be used as a raw material for medicines, the food industry, perfumes and vegetable pesticides. The main products of pepper commodities traded internationally are white pepper and black pepper. White pepper and black pepper actually come from the same pepper fruit. White pepper is processed from pepper fruit that has ripened on the tree, harvested, peeled, and dried. Black pepper is produced from pepper fruit that is harvested before it is ripe and is still green, and is immediately dried without peeling.

Based on data from the Central Statistics Agency (2020). Pepper production in Southeast Sulawesi was 4,667 tons with a land area of 16,858 ha. This land area is spread across 15 regencies/cities. South Konawe is one of the central production areas for pepper plants with a production amount of 1,098 tons on a land area of 3,252 ha. Apart from the availability of sufficient land, agroclimatic factors also have an important role in pepper cultivation.

According to Hardi (pepper farmer), the main reason for the decline in production is the increase in fertilizer prices, so that the treatment of pepper plants is not optimal. One of the sub-districts that cultivates pepper plants with the largest production is the Mowila sub-district.

Mowila District is a sub-district that has the greatest potential for developing pepper plants in South Konawe Regency. This is evidenced by the enthusiasm of the community, most of whom make pepper farming their source of livelihood. According to BPS South Konawe, land use for pepper plants in Mowila District reaches 291 ha with a production of 79.9 tons. The main obstacle in pepper cultivation is the attack of pepper stem rot disease which can cause pepper plants to die, so regular replanting needs to be done every year. The death of pepper plants increases during the long dry season. For this reason, it is necessary to select and develop pepper varieties that are tolerant to climate variability. Developing grafted pepper to overcome the problem of pepper stem rot disease may face obstacles because melada plants are more susceptible to drought than pepper plants. The growth characteristics of melada plants need to be studied not only for the provision of planting material but also to support the successful planting and development of grafted pepper (Nova, 2021). Based on the statement of one of the pepper farmers in Mowila District, the application of grafted pepper in Mowila District was first carried out at the beginning of 2017.

Melada has been used as a rootstock to be grafted with ordinary pepper so that grafted pepper plants become resistant to pepper stem rot disease. The technical success of grafting has been widely reported, for example, up to 3 months, 82% of grafted pepper plants successfully



grow and sprout. However, the success of grafted pepper growth in the nursery is reported to not necessarily be permanent when planted in the field. When the plant reaches productive age, there is an increasing discrepancy in the graft due to differences in the vascular system between Piper species.

The increasing demand for pepper indicates that pepper has the potential to be developed in the area. In order for the pepper business to be carried out effectively and not cause problems in the future, it is necessary to conduct a business feasibility analysis which aims to avoid the risk of losses, facilitate planning, facilitate the implementation of work, facilitate supervision, and facilitate control.

Based on this background, the researcher is interested in conducting research on "Feasibility analysis of melada grafted and non-grafted pepper farming in Mataiwoi Village, Mowila District, South Konawe Regency".

MATERIALS AND METHODS

This research will be conducted in Mataiwoi Village, Mowila District, South Konawe Regency. The location selection in this study was determined intentionally (purposive), with the consideration that Mataiwoi Village is one of the areas that applies the grafting system in the development of pepper plants. This research will be carried out from December 2023 to September 2024.

RESULTS AND DISCUSSION

General Description of the Research Location

The research location is in Mataiwoi Village, Mowila District, South Konawe Regency. A general description of the research location is an explanation of the geographical and demographic conditions of the research area. This chapter will explain several aspects including geographical location and area, climate conditions, and population conditions. A general description of the research location is described in the following sections.

Geographical Location and Area

Mataiwoi Village is one of the areas located in Mowila District, South Konawe Regency, Southeast Sulawesi Province with an area of 6.38 km² or 5.00% of the total area of Mowila District. Based on its geographical position, Mataiwoi Village has the following regional boundaries (BPS South Konawe Regency, 2023):



- a. Bordered to the North by Monapa Village
- b. Bordered to the East by Mowila Village
- c. Bordered to the South by Rakawuta Village
- d. Bordered to the West by Toluwonua Village

Climate Condition

Changing climate conditions in Mataiwoi Village play an important role in managing agricultural businesses, especially pepper commodities. Changes in climate conditions will certainly require farmers in Mataiwoi Village to have effective adaptation strategies, especially in managing pepper plants which are greatly influenced by weather. Long dry seasons and high heat can lead to drought, making pepper plants susceptible to water stress, which in turn can affect productivity. Conversely, rainy seasons with high rainfall and lower temperatures can increase the risk of plant diseases due to excessive humidity.

Respondent Characteristics

Age

Table 1. Respondent Characteristics Based on Age Group in Mataiwoi Village, Mowila District, South Konawe Regency, 2024

No.	Age (Years)	Number (People)	Percentage (%)
1	0 – 14	0	0.0
2	15 – 54	33	85.0
3	> 55	6	15.0
	Total	39	100

Table 1 shows that more pepper farmer respondents are of productive age (85%) than non-productive age (15%). This productive age allows for a more decent life change because farmers still have good physical abilities to work compared to the non-productive age whose physical abilities will decline. Farmers of productive age will find it easier to maintain their cultivation activities and farming and be more able to increase pepper farming production.

Education

Table 2. Respondent Characteristics Based on Education in Mataiwoi Village, Mowila District, South Konawe Regency, 2024

No.	Education Level	Number (People)	Percentage (%)
1	Elementary School	1	3.0
2	Junior High School	13	33.0
3	Senior High School	23	59.0
4	Bachelor Degree	2	5.0
	Total	39	100

Based on Table 2, it can be seen that the education level of pepper farmers varies, dominated by junior and senior high school graduates. Thus, the pepper guava farmer respondents in Mataiwoi Village are classified as having a varied level of education, which is good enough for rural communities because they have met the compulsory education level, so that people can more easily absorb and understand information related to agriculture and pepper cultivation.

Number of Family Dependents

Table 3. Respondent Characteristics Based on Family Dependents in Mataiwoi Village, Mowila District, South Konawe Regency, 2024

No.	Dependents (People)	Number (People)	Percentage (%)
1	> 4	36	92.0
2	5 – 6	3	8.0
3	> 7	0	0.0
	Total	39	100

Based on Table 3, the total number of family members supported by pepper farmer respondents is mostly more than 4 people (92%). A large household is said to have an influence on farmers' income. The more dependents in the family, the more income the crystal guava farmers must have so that all household needs can be met. Suharjo (1989) stated that fulfilling family consumption will be easier with a small number of family members in each household, because family members with a small number will be easier to meet their needs because the proportion of food expenditure is small. Reinforced by Risaida's opinion (2019), that the large number of family members will make it difficult to fulfill the needs of farmers' lives.

Farming Experience

Table 4. Respondent Characteristics Based on Farming Experience in Mataiwoi Village, Mowila District, South Konawe Regency, 2024

No.	Experience (Years)	Number (People)	Percentage (%)
1	< 5	0	0
2	5 – 10	36	92
3	> 10	3	8
	Total	39	100

Based on Table 4, there are 0 pepper farmers in Mataiwoi Village with less than 5 years of experience, with a percentage of 0%, and for those with experience between 5-10 years, there are 36 people or 92%, while for those with more than 10 years of experience, there are 3 people with a percentage of 8%. Thus, pepper farmers have good farming experience so it can be said that farmers have more knowledge to increase their farming income.

Cost Analysis

The financial aspect is an important element that determines the sustainability and success of a business (Sudana, 2017). In the context of this research, the financial aspect includes various components that provide a complete picture of the financial condition and economic performance of grafted and non-grafted pepper farming. A deep understanding of the financial aspects helps farmers in planning business strategies, managing costs, and optimizing income. Operational costs in this study include all costs associated with the operation of grafted and non-grafted pepper farming. This cost is part of the total cost that must be incurred to produce and sell processed cashew products. Operational costs consist of fixed costs and variable costs.

Fixed Cost

Table 5. Average Fixed Costs of Grafted Pepper Farming in Mataiwoi Village, Mowila District, South Konawe Regency in 2024

No	Investment Cost Component	Minimum Value	Maximum Value	Average	Class Interval (Rp)
1	Sprinkler	26.240	59.040	49.669	32.800
2	Machete	7.640	10.440	9.030	2.800
3	Hoe	6.120	6.120	6.120	0 (Fixed)
4	Plant Scissors	8.960	20.160	16.427	11.200

5	Tembilang	38.960	95.760	80.179	56.800
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Table 6. Average Fixed Costs of Non-Grafted Pepper Farming in Mataiwoi Village, Mowila District, South Konawe Regency in 2024

No	Investment Cost Component	Minimum Value	Maximum Value	Average	Class Interval (Rp)
1	Sprinkler	26.568	53.136	39.852	26.568
2	Machete	7.128	9.396	7.920	2.268
3	Hoe	5.508	5.508	5.508	0 (Fixed)
4	Plant Scissors	9.072	18.144	13.608	9.072
5	Tembilang	3.726	3.726	3.726	0 (Fixed)

Variable Cost

Table 7. Variable Costs of Grafted Pepper in Mataiwoi Village, Mowila District, South Konawe Regency in 2024

Component	Minimum Value	Maximum Value	Average	Description
Total Fertilizer Price	503.100	2.158.000	1.868.165	Cost of purchasing fertilizer
Total Pesticide Price	241.250	737.500	648.158	Cost of purchasing pesticides
Labor Costs	880.000	3.960.000	3.243.158	Labor wages per season
Transportation Costs	702.000	1.638.000	1,107,429	Transportation & other costs

Table 8. Variable Costs of Non-Grafted Pepper in Mataiwoi Village, Mowila District, South Konawe Regency, 2024

Component	Minimum Value (Rp)	Maximum Value (Rp)	Average (Rp)	Description
Total Fertilizer Price	391,300	2,158,000	1,355,702	Cost of fertilizer purchase per season

Total Pesticide Price	215,000	737,500	484,118	Cost of pesticide purchase per season
Total Labor Wages	880,000	3,960,000	2,402,353	Labor wages per season
Transportation Costs	702,000	1,638,000	1,096,667	Transportation costs and other operational costs

Total Cost (Total Cost)

Table 9 Total Production Costs of Pepper Farming in Mataiwoi Village, Mowila District, South Konawe Regency, 2024

Component	Minimum (Rp)	Maximum (Rp)	Average (Rp)	Description
Total Price Fertilizer	503,100	2,158,000	1,857,277	Purchase cost fertilizer per season
Total Price Pesticide	241,250	737,500	617,655	Purchase cost pesticide per season
Total Salary Labor	880,000	3,960,000	3,246,667	Labor wages per season
Cost Transportation	702,000	1,638,000	1,147,143	Transportation costs and other operational costs
Total Overall Cost	1,907,100	8,433,613	6,095,726	Total accumulated cost per season (all components)

Revenue (Revenue)

Table 10 Average Revenue of Pepper Farming in Mataiwoi Village, Mowila District, South Konawe Regency, 2024

Description	Production (kg)	Selling Price (Rp)	Total Cost (Rp)	Gross Income (Rp)	NetIncome (Rp)
Grafted Pepper	543	105,000	6,095,726	57,015,000	50,919,274
Non-Grafted Pepper	384	105,000	5,470,506	40,365,938	34,895,432

Total	927	—	11,566,232	97,380,938	85,814,706
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Source: processed primary data, 2024

Table 10 illustrates that the average production of grafted pepper is 543kg/season with an average total revenue of Rp 57,015,000, while the average production of non-grafted pepper is 384kg/season with an average total revenue of Rp 40,320,000.

Farming Feasibility

The feasibility analysis in this study is a projection of investment cost needs and total costs in pepper farming, as well as the amount of production and revenue obtained during a period of fifteen harvest seasons, which is calculated based on several indicators including Net Present Value (NPV), Net Benefit Cost Ratio (NBCR), Internal Rate of Return (IRR) and Payback Period (PP). The net benefit value is obtained by using a discount factor (df). Discount factor (df) is a concept in finance used to calculate the present value of cash flows to be received in the future, which is based on an interest rate or discount rate that reflects the time value of money, i.e. the value of money today compared to the same value in the future.

Net Present Value (NPV)

Net Present Value (NPV) is an important indicator in assessing the financial feasibility of a project or business. NPV calculates the difference between the present value of expected cash inflows and the present value of expected cash outflows (Kasmir, 2016).

Net Benefit Cost Ratio (NBCR)

Table 11. Net Benefit Cost Ratio (NBCR) of Pepper

Description	Production (kg)	Total Cost (Rp)	Total Revenue (Rp)	NBCR
Grafted Pepper	543	6,095,726	57,015,000	8.35
Non-Grafted Pepper	384	5,470,506	40,365,938	6.38
Total	927	11,566,232	97,380,938	7.42

Table 11 presents the feasibility criteria for pepper farming in Mataiwoi Village, Mowila District, South Konawe Regency, measured by the Net Benefit-Cost Ratio (NBCR). NBCR is the ratio between the net benefits generated by a project or business and the costs incurred. An

NBCR value greater than 1 indicates that the benefits obtained are greater than the costs incurred, so the business is economically viable.

Internal Rate of Return (IRR)

Table 12. Internal Rate of Return (IRR) of grafted pepper

Year Interval	Net Cash (Rp)	NPV 5.5% (Rp)	NPV 15% (Rp)	Estimated IRR (%)
0	-1,089,120	-1,089,120	-1,089,120	< 0 (Negative)
1 – 5	-223,380,849	-199,423,999	-4,840,811	< 0 (Negative)
6 – 10	-331,880,544	-211,903,788	-158,996	< 0 (Negative)
11 – 15	-316,671,469	-171,765,645	-91,714	< 0 (Negative)

Table 12 shows the Internal Rate of Return for grafted pepper; the IRR for non-grafted pepper will be explained in the following table:

Table 13. Internal Rate of Return (IRR) of non-grafted pepper

Discount Rate (%)	NPV (Rp)	Feasibility
5.5	Positive (large)	Feasible
8.6	Close to zero	Marginally feasible
15	Negative	Not feasible
IRR (estimation)	20.3	Break-even point / Feasible

Tables 12 and 13 show the feasibility criteria for farming in Mataiwoi Village, Mowila District, South Konawe Regency, focusing on the Internal Rate of Return (IRR) for two pepper cultivation methods: grafted pepper and non-grafted pepper. IRR is the discount rate at which the present value of cash inflows equals the present value of cash outflows; in other words, IRR is the expected rate of return on investment. The higher the IRR value, the more profitable the investment.

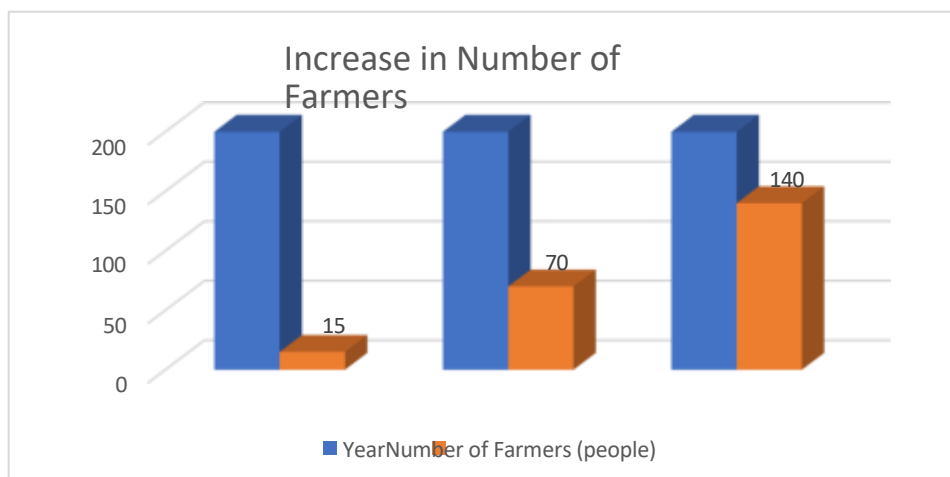
Payback Period

Table 14. Payback Period of Pepper

Description	Total Cost (Rp)	Net Income (Rp)	Payback Period (months)
Grafted Pepper	6,095,726	50,919,274	1.5
Non-Grafted Pepper	5,470,506	34,895,432	2

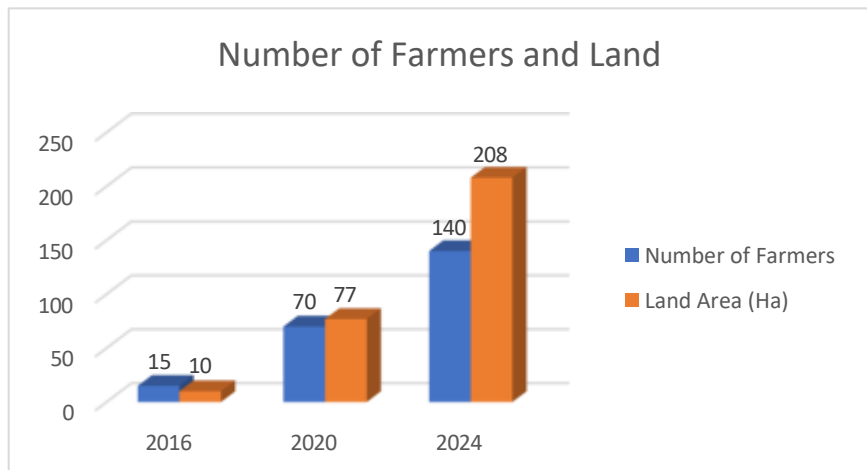
Based on Table 14 , the Payback Period analysis shows that the Grafted Pepper business is able to return the investment capital in about 1.5 months, while the Non-Grafted Pepper business takes longer, about 2 months. This indicates that the Grafted Pepper business is more efficient in the use of capital and provides positive cash flow faster than Non-Grafted Pepper. This speed of return on capital is an important indicator for farmers and investors in determining business choices that provide lower risk and faster liquidity.

Increase in Number of Farmers



Based on the graph above, it can be seen that in 2016, the number of grafted pepper farmers was 15 people, for 2020 there was an increase of 55% so that the number of farmers for 2020 was 70 people, for 2024 there was a more significant increase with the number of farmers as many as 140 people.

Increase in Land Area



Based on the graph above, it can be seen that for 2016 the land area used was 10 ha, in 2020 the amount of land area used increased significantly to 77 ha, in 2024 the land area used for grafted pepper farming increased by more than 100% compared to 2020 to 208 ha.

Sensitivity Analysis

1. Grafted Pepper

- Selling Price +10% = Rp115,500 → Gross Revenue = $543 \times 115,500 = \text{Rp}62,716,500$
→ Net Revenue = $\text{Rp}62,716,500 - \text{Rp}6,095,726 = \text{Rp}56,620,774$
→ Increase = 11.2%
- Selling Price -10% = Rp94,500 → Gross Revenue = $543 \times 94,500 = \text{Rp}51,313,500$
→ Net Revenue = $\text{Rp}51,313,500 - \text{Rp}6,095,726 = \text{Rp}45,217,774$
→ Decrease = -11.2%

2. Non-Grafted Pepper

- Selling Price +10% = Rp115,500 → Gross Revenue = $384 \times 115,500 = \text{Rp}44,352,000$
→ Net Revenue = $\text{Rp}44,352,000 - \text{Rp}5,470,506 = \text{Rp}38,881,494$
→ Increase = 11.4%
- Selling Price -10% = Rp94,500 → Gross Revenue = $384 \times 94,500 = \text{Rp}36,288,000$
→ Net Revenue = $\text{Rp}36,288,000 - \text{Rp}5,470,506 = \text{Rp}30,817,494$
→ Decrease = -11.7%

Sensitivity analysis is an important approach in assessing the feasibility and resilience of a farming business to changes in economic variables such as selling prices, production costs, and the amount of harvest. In this study, it was found that grafted pepper farming produces an

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average production of 543 kg with a selling price of Rp105,000/kg, resulting in a gross income of Rp57,015,000 and a net income of Rp50,919,274 after deducting total costs of Rp6,095,726. Conversely, in non-grafted pepper farming, the average production is only 384 kg with a net income of Rp34,895,432. From the sensitivity analysis to price fluctuations of $\pm 10\%$, grafted pepper farming still shows better economic resilience compared to non-grafted.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Based on the research results, it can be concluded that:

1. Grafted and non-grafted pepper farming in Mataiwoi Village at a discount factor (df) of 6.5% and 15% is financially feasible to develop. The positive NPV at both discount rates confirms that pepper farming is not only feasible to run but also financially profitable to develop further.
2. The increase in the number of farmers and land area used for the grafted method has increased very rapidly, this proves that the government has succeeded in providing counseling about the grafted method to farmers.
3. Sensitivity analysis shows that grafted pepper farming is more resistant to fluctuations in selling prices and production costs compared to non-grafted pepper. The grafted system provides more stable economic benefits, so it is more recommended for pepper development in Mataiwoi Village.

Suggestions

Based on the research that has been done, the researcher provides several suggestions, including:

1. For farmers, to continue paying attention to factors that affect the profitability of pepper
2. farming, such as product prices and operational costs, identifying and reducing inefficient costs, and improving marketing strategies to increase sales can help improve farming performance.
3. For the government, to provide support in the form of policies and programs to strengthen the pepper farming sector, including support in terms of access to capital, farmer skills training, and market development.
4. For further researchers, to continue this research by exploring other factors that may affect the feasibility of farming. Further research can also be carried out to evaluate





risk management strategies that can improve the performance of pepper farming.

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