Feasibility study of orange plantation initiatives on state-owned enterprise in Central Java, Indonesia

Budi Dharmawan*, *Anisur* Rosyad, *Teguh* Djuharyanto, *Tatang* Widjojoko, and *Ulfah* Nurdiani

Department of Agricultural Economics and Social Sciences, Universitas Jenderal Soedirman, Jl. Dr. Suparno, P.O. Box 125, Purwokerto 53123, Central Java, Indonesia

Abstract. The problem for the company is that its production volume has fallen short of market demand, necessitating the creation of a business scale. Along with scale growth, the market's ability to absorb the product must still be considered. As a result, the study's objectives are to 1) understand the level of investment feasibility of orange farming initiatives, and 2) understand the degree to which that level is sensitive to changes in costs. Using financial feasibility analysis, we assessed the company's ability to generate income as well as the number of costs incurred. With a 16 percent discount rate, the findings demonstrated that the state-owned firm in Brebes District's orange farming was financially viable to implement. The orange financial analysis results per hectare for all land groups show a positive NPV value, an IRR of more than 26 percent, NBC of one, and a BEP of one rupiah less than the actual value. According to the results of the sensitivity analysis using eleven change scenarios and a discount rate of 16 percent, orange farming on a one-hectare plot was possible for all change scenarios. Financial feasibility, oranges, and a state-owned firm are all.

1 Introduction

In Indonesia, the rate of volume growth of orange imports increased every year from 2008 to 2017, with the exception of 2010, when imports decreased by 17 thousand tons. Volume increased by 139 thousand tons in 2008, 210 thousand tons in 2009, 193 thousand tons in 2010, 218 thousand tons in 2011, and 258 thousand tons in 2012 [1]. The government has limited fresh orange imports due to the trend of increasing imports. Policies have been put in place to increase the productivity of native Indonesian fruits. Increased domestic production is expected to generate offers and improve the welfare conditions of the Indonesian people [2]. The indicator of consumers' choices for fresh fruits is becoming more diverse, with better quality and at a price level that most people can still afford [3].

The development of orange farming continues to face challenges and setbacks. Increased consumption has not been offset by increased harvested area, orange fruit production and productivity, technological advancements, or quality demands [4]. One impediment is that

* Corresponding author: budi.dharmawan@unsoed.ac.id

orange cultivation is a capital-intensive investment that is not offset by farming income for 2-3 years [5]. Orange farming necessitates a careful and precise analysis of its feasibility [6].

Since 2004, a state-owned enterprise has been growing oranges in the District of Brebes, Central Java, Indonesia. The project's goal is to maximize benefits while working with limited resources. The company's problem is that the amount of production has not been able to meet the current market demand, so business scale must be developed. However, scale development must be balanced against the market's ability to absorb the product. Therefore, the study's objectives are to 1) understand the level of investment feasibility of orange farming initiatives, and 2) understand the degree to which that level is sensitive to changes in costs.

2 Research framework

2.1 Research method

A feasibility analysis determines whether the business will generate more benefits than costs. The term "financial feasibility" refers to a company's ability to generate revenue as well as the amount of costs incurred [7]. The goal of financial feasibility analysis is to determine the investment plan by calculating expected costs and benefits, such as funds and capital costs. It is also necessary to determine whether the project will be able to repay the funds within the specified time frame and whether the business will be developed in the future [8].

2.2 Methods of analysis

2.2.1 Short-term financial feasibility analysis

2.2.1.1 Break Even Point (BEP)

The Break-Even Point is when total production costs equal total revenue. The break-even point indicates that the level of production has generated income equal to production costs. The number of units at the break-even point is as follows, assuming a constant selling price per unit of production.

$$BEP\ income = \frac{Fix\ cost}{1-\frac{Variable\ cost}{Income}} \quad (1)$$

2.2.1.2 Revenue Cost Ratio (R/C)

R/C demonstrates the importance of business efficiency. The comparison of business revenues and total costs incurred demonstrates the value of business efficiency. The R/C formula is as follows.

$$\frac{R}{C} Ratio = \frac{TR}{TC} \quad (2)$$

Whereas,
TR : Total Revenue
TC : Total Cost
R/C is the ratio of total revenue to costs; a ratio greater than one indicates that the project has a good chance of success.

2.2.2 Long-term financial feasibility analysis

2.2.2.1 Net Present Value (NPV)

Net Present Value (NPV) is a tool for determining the viability of an investment. The present value of income streams generated by investments at a certain interest rate, or the difference between the net value of benefits and costs in each year of business activity, is referred to as the net present value (NPV).

$$NPV = \sum_{t=i}^{n} \frac{(B-C)_t}{(1+i)^t} \quad (3)$$

Whereas,

NPV : Net Present Value
B_t : benefit in year t
C_t : cost in year t
n : project life
t : current year
i : discount rate

Indicator:
NPV > 0: The project is feasible
NPV < 0: The project is not feasible
NPV = 0: After calculating the applicable discount rate, the project's capital will be returned.

2.2.2.2 Internal Rate of Return (IRR)

Internal rate of return is the annual percentage rate of return on capital used in a project. When the NPV is zero, the IRR value represents the interest rate. The IRR can be calculated using the formula below.

$$IRR = i' + \frac{NPV'}{(NPV'-NPV'')}(i''-i') \quad (4)$$

Whereas,

IRR : Internal Rate of Return
i' : Actual discount rate factor
i'' : Discount rate factor after adjustment
NPV' : NPV at true factor discount rate
NPV'' : NPV at discount rate factor after adjusting

2.3 Data analysis method and techniques

2.3.1 Data analysis method

The interactive analysis method was used in this study to analyze data. This model includes four analysis components: data collection, data reduction, data presentation, and drawing conclusions [11].

2.3.2 Data analysis techniques

The data analysis process is divided into four stages. The first step is to perform a short-term financial analysis of the business development plan [12]. R/C, profitability, and the degree of operating leverage are the analytical tools employed. The second step is a long-term financial analysis of the development strategy. Net Present Value (NPV) and Internal Rate

of Return (IRR) are the analytical tools used (IRR). Third, based on interviews with the company, calculate the estimated total uptake of the target market products to be compared with the results of long-term and short-term financial analysis. The fourth step is to conduct a sensitivity analysis to determine the level of robustness of farming.

3 Results and discussion

A financial feasibility analysis of a state-owned enterprise's orange farming in Brebes District, Central Java, Indonesia, was conducted on a 1 Ha plot. This is due to the company's limited data due to the similar pattern and planting time, making it difficult to find the age of the existing land group for all planting ages.

3.1 The cost of investing in a one-hectare plot of land

In the first year, the total investment cost per hectare was IDR 4,656,345 (IDR 116,408,625/25 ha). The cost of land clearing was IDR 2,205,268/ha (IDR 55,131,700/25 ha), while the cost of LCC Plant was IDR 331,012/ha (IDR 8,275,300/25 ha). Orange planting also resulted in investment costs of IDR 2,511,150 for the purchase of seeds. A total of IDR 4,500,000 was spent on the construction of fences and huts. IDR 3,610,000 was spent on agricultural equipment such as hoes, cuttings scissors, buckets, emrats, hand sprayers, and spray machines.

3.2 Operational costs per hectare of orange farms for twenty years

Every year, the operational costs for orange farming increase because the age of plants and orange trees grows older, requiring more nutrients and care for oranges. Orange farmers experienced the greatest increase in operational costs when the orange plant was 5 years old, because orange plants are entering adulthood, where the roots, stems, and leaves have grown bigger and thicker, resulting in higher maintenance costs.

The net income of an orange farm per hectare on an area was 0 (zero) in the first year because the cash inflow equaled the cash outflow. Orange farming receipts on a 1-hectare area for each planting season beginning in the fourth year of a surplus of IDR 1,052,616. This revenue increases with the age of the plant, with the highest revenue obtained when the plant was 15 years old, when the profit could reach IDR 30,456,138/ha.

3.3 Orange farming financial feasibility analysis

The financial feasibility of an orange farm investment was calculated using a discount rate of 16 percent. This is done to determine the investment feasibility of an orange farm when loan capital with investment credit interest rates is used.

The NPV value obtained in the financial analysis of orange farming for a 1-hectare area at a discount rate of 16 percent was IDR 21,087,974 or IDR 527,199,366/25 ha. The positive NPV value indicates that the orange farming will profit IDR 21,087,974/ha. The IRR value of the analysis was 26 percent, which is higher than the discount rate used. If the farm investment is carried out, the IRR value indicates that the investment will provide a return of 26 percent of the initial investment. The NBCR value calculated was 2592. According to the NBCR value, each IDR 1.00 spent on orange farming on a 1-hectare plot of land results in a profit of IDR 2,592. The rupiah BEP value is also close to the price of an orange, which is sold for IDR 10,000 - IDR 15,000.

Table 1. Financial feasibility analysis of orange farming on a 1-hectare plot of land in the District of Brebes, Central Java, Indonesia, using a 16-percent discount rate.

Description	16 Percent Discount Rate
NPV	21,087,974
IRR	26
NBCR	2,592
BEP in IDR	790,062

With a discount rate of 16 percent, Table 1 shows that orange farming on a 1-hectare plot is financially feasible. Table 4 shows the financial analysis results, which show a positive NPV value, an IRR value greater than 16 percent, and a BEP in IDR of 790,062. This is in line with investment eligibility requirements, which include NPV > 0, IRR > discount rate, NBCR > 1, and BEP in IDR real value.

3.4 Sensitivity analysis of orange farming

Based on the NPV, IRR, and NBCR values from the financial analysis, it appears that orange farming is a viable option. An investment, including orange farming, must always face uncertainty because whether or not orange farming is appropriate depends on changes in investment, both in terms of revenue and expenditure [13].

Because of uncertainty, initial projections in orange farming may change [14]. Changes in production volumes, increases in farm input costs, and decreases in production prices can all occur. A sensitivity analysis is performed on several possible changes to determine the extent of the effect of changes on orange farming [15].

This study's sensitivity analysis employs 11 different change scenarios. These modifications include changes in production quantities, selling prices, and operating cost increases. The change scenario used in the sensitivity analysis in this study is based on field conditions. The following is the change scenario that was used.

(1) Output prices decreased by 20 percent, production volumes decreased by 7.5 percent and operating costs increased by 12 percent.
(2) Output prices decreased by 20 percent, fixed production volumes and operational costs increased by 12 percent.
(3) Output prices decreased by 20 percent, production volumes increased by 7.5 percent and operating costs increased by 12 percent.
(4) Fixed output prices, production volumes decreased by 7.5 percent and operating costs increased by 12 percent.
(5) Fixed output prices, fixed production volumes and operational costs increased by 12 percent.
(6) Fixed output prices, production volumes increased by 7.5 percent and operating costs increased by 12 percent.
(7) Output prices increased by 20 percent, production volumes decreased by 7.5 percent and operating costs increased by 12 percent.
(8) Output prices increased by 20 percent; fixed production volume operating costs increased by 12 percent.
(9) Output prices have risen by 20 percent, production volumes have increased by 7.5 percent and operational costs increased by 12 percent.
(10) Output prices decreased by 20 percent, fixed production volumes and fixed fertilizer costs.
(11) Fixed output prices, production volumes have decreased by 7.5 percent and fertilizer costs have remained.

Table 2. Sensitivity analysis of financial feasibility of orange farming for 1-hectare land in state-owned enterprise in District of Brebes, Central Java, Indonesia.

Change scenario	NPV (IDR)	IRR (%)	NBCR
1	627,6783.85	22.93	1.163
2	15,227,063.3	26.67	1.400
3	24,177,342.7	30.04	1.643
4	33,651,478.7	33.34	1.909
5	45,061,328.0	36.91	2.239
6	53,138,644.9	38.81	2.488
7	61,470,173.6	41.63	2.736
8	74,895,592.8	45.19	3.163
9	88,321,011.9	48.52	3.609
10	23,884,704.20	30.50	1.682
11	42,309,119.66	36.97	2.250

According to the results of the sensitivity analysis of orange farming with a discount rate of 16 percent in Table 2, orange farming is feasible in all change scenarios. Variables that impede business are frequently derived from unexpected sources [16]. Because the feasibility limit that applies to each variable in the sensitivity analysis for a 1-hectare area, orange farming is feasible to cultivate in eleven different change scenarios. The output price should not fall more than 32.4 percent, and the production volume should be fixed. If the output price falls by 20 percent, the fertilizer price cannot rise by more than 1.35 percent.

4 Conclusions

The following conclusions can be drawn from the research described in the previous discussion.

1. With a 16 percent discount rate, orange farming at the state-owned enterprise in Brebes District, Central Java, Indonesia is financially feasible. The results of the orange financial analysis per hectare in all land groups show a positive NPV value, IRR greater than 26 percent, NBCR greater than one, and BEP in IDR real value.
2. The results of the sensitivity analysis with eleven change scenarios at a discount rate of 16 percent show that orange farming on a 1-hectare plot is feasible in all change scenarios. The most influential factor in the sensitivity scenario is the output price, whose value fluctuates a lot.

Acknowledgment. The Institute of Research and Community Service of Jenderal Soedirman University funded this research through the "RISIN" scheme (Contract No. 161/UN23/14/PN.01.00/2019).

References

1. Irawan, R. Yuristia, *Economía agraria y recursos naturales*, 21(**2**), 29-45. (2021).
2. J.J. Siregar, E. Budiarto, *International Conference of Reliable Information and Communication Technology*, 270-282. Springer, Cham. (2022).
3. A. Taghizadeh-Alisaraei, S.H. Hosseini, B. Ghobadian, A. Motevali, *Renewable and Sustainable Energy Reviews*, **69**, 1100-1112. (2017).
4. E. Euriga, M.H. Boehme, S. Amanah, *AGRARIS: Journal of Agribusiness and Rural Development Research*, *7*(**2**), 225-240 (2021).

5. M. Li, X. Cao, D. Liu, Q. Fu, T. Li, R. Shang, *Agricultural Water Management*, **259**, 107235. (2022).
6. A.A. Sulaiman, Y. Sulaeman, B. Minasny, *Resources*, 8(**1**), 34. (2019).
7. S.J. Kim, S.J. Bae, S. Yoo, Y. Kim, S. Yoon, J. Kim, *Journal of Korean Society of Rural Planning*, 27(**1**), 21-28. (2021).
8. H. Balali, N. Hashemi-Amin, *Village and Development*, 24(**2**), 91-120. (2021).
9. L. Rodrigues, B. Hardy, B. Huyghebeart, J. Fohrafellner, D. Fornara, G. BarančíkováJ. Leifeld, *Global Change Biology*, 27(**24**), 6363-6380. (2021).
10. C.L. Lee, R. Strong, K.E. Dooley, *Sustainability*, 13(**18**), 10295. (2021).
11. S.O. Oruma, S. Misra, L. Fernandez-Sanz, *IEEE Access*, **9**, 83592-83627. (2021).
12. L. Chiwona-Karltun, F. Amuakwa-Mensah, C. Wamala-Larsson, S. Amuakwa-Mensah, A. Abu Hatab, N. Made, A.R. Bizoza, *Ambio*, 50(**4**), 794-811. (2021).
13. B. Dharmawan, A.R. Karim, U. Nurdiani, *IOP Conference Series: Earth and Environmental Science*, **250**, 1, 012069. (2019).
14. B. Dharmawan, M. Böcher, M. Krott, *Ocean & Coastal Management*, **130**, 250-259. (2016).
15. Suyono, B. Dharmawan, A. Sutanto, Mujiono, Tarjoko, *IOP Conference Series: Earth and Environmental Science*, **250**, 1, 012064. (2019).
16. D. Dumasari, W. Darmawan, A. Iqbal, B. Dharmawan, I. Santosa, *International Journal on Advanced Science, Engineering and Information Technology*, 9(**2**), 717-723. (2019).